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THE

PENNY CYCLOPÆDIA

OF

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FOR THE

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VOLUME XXIII.

STEARIC ACID——TAGUS.

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THE PENNY CYCLOPÆDIA

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STEARIC *ACID*. This substance is procured from stearin [STEARIN], which is a compound of stearic acid and a peculiar sweet substance called glycerin, which is treated of under the head of SOAP.

When stearin is saponified by potash, stearate of potash is procured; and when warm dilute hydrochloric acid is added to the solution, the stearate is decomposed, chloride of potassium remains in solution, and the stearic acid is precipitated.

The properties of this acid are, that it has the form of brilliant white scaly crystals; it is inodorous, tasteless, insoluble in water, soluble in its own weight of æther and in hot alcohol, and the solution reddens litmus-paper; but its acid action is feeble, for it expels carbonic acid from the alkaline carbonates only at a boiling heat. It melts at about 158° Fahrenheit, and on cooling it forms a crystalline mass; it is volatile, and may be distilled unaltered in close vessels. In the air it burns like wax. Its composition is somewhat differently stated by authors, but no one statement differs much from—

68 equivalents of carbon	.	408	79·4
66 equivalents of hydrogen	.	66	12·8
5 equivalents of oxygen	.	40	7·8
Equivalent		514	100·

In the state of crystals it contains two equivalents of water = 18, or nearly 3·4 per cent. It forms compounds with the alkalis, earths, and metallic oxides, which are called *stearates*.

Stearate of Ammonia.—Stearic acid absorbs ammoniacal gas; the resulting compound is white, inodorous, and has an alkaline taste. It is dissolved by boiling water, and the solution, on cooling, deposits pearly crystals of stearate of ammonia.

Di-stearate of Potash is formed by boiling equal weights of the acid and alkali dissolved in five times their weight of water. It forms a white granular compound, which is opaque, and may be purified by solution in boiling alcohol; as the solution cools, the salt separates in white brilliant scales. This compound may also be procured by treating potash soap with alcohol.

It is composed of—

One equivalent of stearic acid	.	514
Two equivalents of potash	.	96
Equivalent		610

Stearate of Potash is obtained by dissolving one part of potash soap made with suet and caustic potash, in six of hot water, and then adding about ten times their weight of cold water to the solution; the precipitate which results contains the stearate of potash mixed with margarate of the same base; from the latter it is separated by repeated treatment with alcohol, and is then obtained in soft silvery crystalline scales.

It is composed of—

One equivalent of stearic acid	.	514
One equivalent of potash	.	48
Equivalent		562

Di-stearate of Soda and stearate of soda may be obtained by processes similar to those described for the stearates of potash; they are less soluble than the salts of potash, and enter into the composition of hard soaps.

Stearate of Lime, *Stearate of Barytes*, and *Stearate of Lead*, are all white insoluble powders, and are not applied to any useful purpose.

Stearic Acid, besides its use in the manufacture of soap, is now very largely employed in the making of candles.

STEARIN (from *στέαρ, fat*) is the harder portion of animal fats; olein, or elain, being the softer one. To obtain stearin in a pure state, mutton-suet is to be melted with ten times its weight of æther in a water bath; as the solution cools, crystals of stearin are deposited, which, after washing with cold æther, are to be strongly pressed.

The properties of stearin are, that it has a pearly lustre, is soft to the touch, but not greasy; it melts at about 140° to 145° Fahrenheit; and, on cooling, solidifies into a mass, like wax, which is not crystalline in its texture, and is reducible to powder. Stearin is insoluble in water, but is dissolved both by hot alcohol and æther, from which it almost entirely separates on cooling; it possesses weak acid properties, and may be combined with potash; it is the chief and most important ingredient of the harder kinds of fat, and the harder they are the more they contain.

Stearin is separable into two different principles, namely stearic acid and glycerin, as has already been noticed in the preceding article; it appears to be a bi-stearate of glycerin, consisting of—

Two equivalents of stearic acid		.	1028
One equivalent of glycerin	.	.	83
Two equivalents of water	.	.	18
Equivalent			1129

The composition of stearic acid has already been given. glycerin is composed of, probably—

Six equivalents of carbon	.	.	36
Seven equivalents of hydrogen		.	7
Five equivalents of oxygen	.	.	40
Equivalent			83

STEARON is obtained by the partial decomposition of stearic acid; when distilled with lime, carbonic acid is formed, and the stearon produced at the same time is volatilized, and condenses in the state of a volatile liquid: it appears to consist of—

Sixty-six equivalents of carbon		.	396
Sixty-six equivalents of hydrogen		.	66
One equivalent of oxygen	.	.	8
Equivalent			470

So that it seems to be stearic acid deprived of two equivalents of carbonic acid.

STEAROPTEN. Volatile oils, as obtained by distillation from plants, appear, like expressed oils, to consist of two substances; one solid, which has received the name of *stearopten*, and the other liquid, called *elaopten:* the former generally crystallizes when the oil has been long kept.

Camphor is the most remarkable substance of the class of stearoptens. It is obtained by distillation with water, and in the plant is mixed with camphor-oil, from the gradual oxidation of which it appears to be produced.

STEATITE, *Soapstone, Speckstein, Talc-Steatite.* This mineral, which is principally a hydrated silicate of magnesia, is met with massive in amorphous masses, which sometimes contain crystals of this substance of the form of quartz and calcareous spar, and which are probably pseudomorphous. Structure compact. Fracture uneven, splintery. Soft, and has a greasy feel. Colour yellowish, greenish, and greyish-white. Streak shining. Dull. Translucent on the edges. Specific gravity 2·604 to 2·632.

Before the blowpipe it is infusible either alone or with additions. It occurs plentifully in Baireuth, Saxony; in Cornwall, in Scotland, and many other parts of the world.

According to Klaproth it consists of—

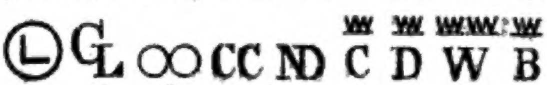
	Baireuth.	Cornwall.
Silica . .	59·50	45·00
Magnesia . .	30·50	24·75
Alumina . .	0·00	9·25
Oxide of iron .	2·50	1·00
Water . .	5·50	18·00
	98·	98·

STEEL. Iron possesses many qualities which render it applicable to innumerable purposes in the arts: but there are some uses for which it is not sufficiently hard, and this defect is supplied by converting it into steel.

At Eisenärzt in Styria the manufacture of steel has been carried on ever since the eighth century, and yet the exact nature of the operation is perhaps even now imperfectly understood. It is generally admitted that steel is an intimate compound of iron and charcoal, for soft iron contains a considerable portion of charcoal, and it is by no means clear that the quantity is increased in the process of steel-making, and therefore we must conclude that some more intimate union is effected between them when iron is converted into steel. Whatever the theory may be, we shall now describe the mode in which the operation is conducted in this country, and principally at Sheffield.

In the first place it is to be observed that hitherto Swedish and Russian bar-iron have been exclusively employed in the manufacture of the best steel; the preference given to this iron is decided, though from what cause it arises has not been satisfactorily made out.* We may however remark that the foreign iron used is made from magnetic iron-ore with charcoal, while British iron is obtained mostly from the impure carbonate of iron, called argillaceous iron-ore, or from hæmatite, which is a peroxide of iron, and both of these are reduced by employing coal or coke prepared from it.

Bar-Steel is made, with few exceptions, from the Swedish and Russian iron, the bars of which are marked *hoop l* (1), *gl* (2), and *double bullet* (3); these, which are the best kinds, fetch from 31*l.* to 35*l.* per ton. Iron of lower quality is also used, such as (4), which is a Russian iron, and *c and crown* (5), *d and crown* (6), which are Swedish irons; these cost the importer about 20*l.* per ton; whilst there is a medium quality at about 25*l.* per ton, viz. *w and crowns* (7), *b and crown* (8); these also are Swedish. These steel irons are imported almost exclusively by English merchants residing in Hull; the limited quantity of the fine iron allowed to be produced from the mines of Danemora in Sweden accounts in some degree for the high price at which they are sold. The quantity of iron, of the various qualities stated, which is imported into this country for the manufacture of steel is estimated at 12,000 to 15,000 tons, of which at least 9 come from Sweden.



The usual operation in large steel-works is first to cut bar-iron into certain lengths, leaving room in the vessels the expansion of the iron, which amounts to $\frac{1}{16}$. The clc vessels in which the bars are heated are usually twelve in length, and divided into two pots or troughs, on bottom of which the workman strews charcoal to the thi ness of about an inch, and upon this he places on their side a layer of bars; then about three-fourths of an i more of charcoal is added, and upon this he places anot layer of bars, and so on till the troughs are filled; these then covered with a ferruginous earth coming from grinding-stones, called wheelswarf, to the thickness of ab eight inches. All the apertures of the furnace are tl closed with loose bricks and plastered over with fire-cl The fire is then lighted, and in four days and nights furnace is at its full heat, at which it is kept for seve days, according to the degree of hardness required. order to be able to test the progress of the carbonization hole is left in one of the pots near the centre, and three four bars are placed in the furnace in such a manner tl the ends come through this opening, and after the sixth one is pulled out. If the iron be then not sufficiently bonized, the heating is continued from two to four d longer: a bar is drawn every two days, and when the i is completely converted, the fire is heaped up with sm coal, and the furnace is left to burn out, and it requi from this period fourteen days' time to cool sufficiently allow a person to go in and discharge the steel.

It is of the greatest importance that the pots or troug be kept completely air-tight; the smallest crack will op when the furnace is hot, and admit the air: this of cou frustrates the object of the operation, and any steel wh has thus suffered is placed aside to be reconverted. It is the greatest importance to give the iron the exact quant of carbon required and no more.

1st. *For coach-springs.*—The iron must *not* be convert to the centre.

2nd. *For common cutlery, single and sheer steel,* and f purposes where steel has to be welded to itself or to iron, tl conversion should be low, and gradually disseminat throughout the whole thickness of the bar.

3rd. *For double sheer steel*—the conversion should l somewhat harder than the preceding.

4th. *For files* and all instruments where resistance fine cutting-edges are required, the conversion should b hard, and the iron fully carbonized throughout the bar, an the fracture should present small facets.

No definite rules can be laid down, nor can any distinc instructions be given to enable the uninitiated to judge the temper or degree of hardness of a bar of steel; but b habit workmen soon acquire the means of distinguishin between the different degrees of hardness of two pieces c steel. This knowledge of the degree of temper is of grea importance to the steel-maker, for though he is enabled t adapt the temper (hardness) of the steel to the wants of th manufacturer, a file, made from soft steel which would b valuable for welding purposes, would be useless in the arts and a coach-spring made from steel hard enough to make file could not be applied to its intended purpose.

A converting furnace contains generally fifteen tons o iron; and there are some large enough to hold eighteen t twenty tons. The bar-steel, when discharged from the furnace, is partially covered with small raised portions of the metal; and from the resemblance of these to blisters, the steel is called *blistered steel*. It has been supposed that these blisters arise from the expansion of carbonic oxide gas, formed and confined during the process of cementation; this however is not the case, for they evidently arise from the unsoundness of the iron, which is not throughout perfectly welded.

It has been found by the experiment of placing a bar of Swedish and one of Staffordshire bar-iron in the same furnace, that the former was much blistered, while the latter had scarcely any blisters larger than a pea. It must however be admitted that the cause of the blistering in one case, and its slight production in the other, are circumstances difficult of explanation.

At one time it was common for the steel-maker to receive orders for steel *well blistered.* This arose from a mistaken idea regarding the perfection of the steel, it being supposed that the more it was blistered, the more it was carbonized, and consequently that its quality was indicated thereby; now however manufacturers are better informed, and steel so blistered is complained of.

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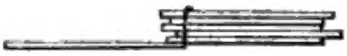
* A patent has lately been obtained by Mr. Charles Sanderson for making iron fit for conversion into steel; from some instruments made from the steel so produced, now in the possession of the writer of this article, he is inclined to think favourably of the process.

Bar-steel as it comes from the converting furnace is used for various purposes without refining; those parts which are free from flaws and blisters are broken out and hammered or rolled to the sizes required by the manufacturer for files, edge-tools, table knives and forks, and coach-springs, and a great variety of common agricultural implements. It is also manufactured into what is called *single and double sheer steel;* for this purpose the converted bar is selected of equal degree of hardness, and broken into pieces of about two feet in length; these are taken to the forge, heated to a full cherry red, and hammered into bars two inches by three-quarters of an inch in thickness; six of these pieces are put together and kept firmly so by a hoop, which is fixed at the end of a handle, thus—



they are then placed in a hollow fire urged by a soft blast, and heated gradually up to a full welding heat, during which the workman covers the surface with clay beaten very fine; this runs over the surface, and to some extent prevents oxidation. When fully heated, they are placed under the hammer, carefully welded together and drawn into a bar of about two inches square at the same heat; the other end is then put into the fire and welded in the same way; this is termed *single* sheer steel. It is made *double* by nicking the bar in the middle and doubling it together, giving a second welding heat and drawing it out as before to a bar of about two inches square; it is then *hammered, tilted,* or *rolled* to the size required; by this process *bar steel* becomes more homogeneous, of a finer texture, and any instrument made of it will receive and retain a finer edge; the steel is also rendered much tougher, which is supposed to arise from the abstraction of a small portion of carbon, and the mechanical elongation of the fibre by these doublings, &c.

Manufacture of Cast Steel.—The fabrication of *cast steel* is comparatively a recent invention. it was first made by Mr. Huntsman, at Attercliff, near Sheffield, in 1770, since which time the manufacture of it has very much increased, and it is daily superseding the use of bar or shear steel, on account of the equality of its temper, and the superior quality as well as beauty of the articles which are made of it. The process adopted is that of taking bar steel converted to a certain degree of hardness and breaking it into pieces of about a pound each; a crucible charged with these is placed in the melting-furnace, similar to that used by brass-founders. The cellar is usually arched, and the stacks are about 40 feet high; the furnaces are 20 inches long by 16 inches wide, and 3 feet deep. The most intense heat is kept up for two hours and a half or three hours, coke being used as fuel. When the furnace requires feeding, the workman takes the opportunity of lifting the lid of each crucible and judging how long the charge of each will be before it is completely melted: all the crucibles are usually ready about the same time; they are taken out of the furnace, and the liquid steel is poured into ingots of the shape and size required: the crucibles are immediately returned into the furnace; and when the contents of all have been poured into the moulds, the crucibles are again charged: they are used three times, and then rejected as useless. The ingots are taken to the forge-tilt or rolling-mill, and hammered into bars or rolled into sheets, as may be required. The celebrated *wootz*, or Indian steel, is cast-steel; but it is frequently so imperfect as to resemble cast-iron rather than cast-steel. It is however made of iron obtained, as the Swedish is, from the magnetic ore. Wootz is made by the natives from malleable iron, packed in small bits with wood in crucibles, which are then covered with some green leaves and clay: about two dozen of these crucibles are packed in one furnace; they are covered with fuel, and a blast given for about two hours and a half, which terminates the operation. When the crucibles are cold, they are broken, and small cakes of steel are obtained in the form in which it comes to England.

Having stated the mode in which steel is prepared, we shall now give an account of its properties and composition, and a concise view of the theories of its formation.

The properties of steel are, that it is of a lighter grey colour than iron, and which is so characteristic as to be described as a *steel-grey:* it is susceptible of receiving a very high polish, and this is greater as the grain is finer. The density of steel before hammering or hardening varies from 7·73 to 7·84. Dr. Thomson found the density of good blistered steel to be 7·823; by heating it to redness and sudden immersion in cold water, the density was reduced to 7·747: a piece of soft cast-steel similarly treated was reduced in density from 7·8227 to 7·7532. It follows therefore that when steel is hardened its volume is increased. When steel is heated to redness and slowly cooled, it is scarcely harder than iron; but by very rapid cooling it becomes hard, and so brittle as to be readily broken. The fracture of steel is usually fine grained; in ductility and malleability it is much inferior to iron, but exceeds it greatly in elasticity and sonorousness. It may be subjected to a full red heat, or 2786° Fahr., without melting, and is therefore less fusible than cast-iron, but much more so than wrought-iron. Pieces of steel which have not been cast may be readily welded together or with iron; but after casting the operation is more difficult. Steel does not acquire magnetic polarity so readily as iron, but retains it much longer; by exposure however to a moderate degree of heat this power is lost.

In order to give to steel the different degrees of hardness required for the various purposes to which it is applied, it is subjected to the process of what is called *tempering*. It has been mentioned that steel is hardened by heating and sudden cooling; and it is found that the higher the temperature to which it is raised, and the more sudden the cooling, the greater is the hardness: thus when immersed in mercury the hardness is greatest, on account of the good conducting power of the metal, and its consequent ready abstraction of heat. After this comes acidulated water, salt water, common water, and lastly oily or fatty bodies. It is found that, according to the degree to which steel is tempered, it assumes various colours, and formerly these colours served as guides to the workman; now however a thermometer, with a bath of mercury or of oil, is employed, and the operation is performed with a much greater degree of certainty.

Into this bath the articles to be tempered are put, with the bulb of the thermometer graduated up to the boiling-point of mercury. The annexed are the tempering heats, colours, and uses of steel of different degrees of hardness:—

430°	Fah.,	very faint yellow; for lancets.
450°	„	pale straw; razors and surgeons' instruments.
470°	„	full yellow; penknives.
490°	„	brown; scissors and chissels for cutting old iron.
510°	„	brown with purple spots; axes and plane-irons.
530°	„	purple; table-knives and large shears.
550°	„	bright blue; swords, watch-springs, truss-springs, and bell-springs.
560°	„	full blue; small fine saws, daggers, &c.
600°	„	full blue, verging on black; this is the softest of all the gradations, and the steel is fit only for hand and pit saws.

The degree at which the respective colours and corresponding hardness are produced being thus known, the workman has only to heat the bath and its contents up to the required point.

The degree of hardness attainable by steel depends upon the temperature to which it is raised, and the coldness or conducting power of the liquid into which it is immersed; so that, as observed by Mr. Brande, if very cold water cannot be procured, the steel-die or other article must be heated proportionably high; a dull red heat into water at 34°, a cherry-red into water at 50°, an orange heat into water at 80°, a dull white heat into water at 100°, produce nearly the same effects: a red heat and water at 45° is the most desirable for the hardening; and although by subsequent tempering the die may, if necessary, be *brought down* or softened, it is always safest to give it due hardness by the first operation. In some cases steel is sufficiently hardened before any change of colour is produced. Capt. Kater found that 212°, or the heat of boiling water, was the exact point at which the knife-edges attached to a pendulum were properly tempered. The colour produced on the surface of the steel is supposed to be derived from slight oxidizement; and it is stated in corroboration of this opinion, that when steel is heated and suffered to cool under mercury or oil, none of the colours appear; nor do they when it is heated in hydrogen or azotic gases: the cause however of the different degrees of hardness produced at the same time with the changes of colour has not been hitherto satisfactorily explained.

Case-hardening is the operation by which articles made of malleable iron or cast-iron are superficially converted into steel by heating them with charcoal in a crucible.

With respect to the composition of steel and the nature of the admixture requisite to constitute it, differences of opinion have long existed, and the question even now is considered by some as hardly decided, whether carbon is indispensably necessary to its formation, and whether certain substances or metals, especially silicon, may not give rise to it; and it is generally admitted that phosphorus is always present. Berzelius mentions iron containing manganese as particularly eligible, and yet the analyses which we shall presently state show that this metal is not present in steel in most cases; but we have understood that it is so in the steel made in Germany from spathose iron-ore, or carbonate of iron.

An experiment performed and described by Mr. Pepys in the 'Phil. Trans.' for 1815, seems not only to prove the necessity of carbon, but also that the diamond is capable of producing the same effect. In order to get rid of the objection that the carbonaceous matter of a common fire might supply carbon when iron and diamond were heated by means of it, he placed diamond-powder in a piece of pure soft iron wire; and having properly secured it, he heated it by means of voltaic electricity: after a few minutes' heating, the diamond had disappeared, and the interior surface of the iron was converted into perfect blistered steel, which, being heated to redness and plunged into cold water, became so hard as to resist the file and scratch glass.

Some years since also a method was discovered by Mackintosh of converting iron into steel by means of the carbon of carburetted hydrogen gas.

The following are the results of four analyses of the cementation-steel of Remmelsdorf, department of the Moselle, by Vauquelin:—

Iron . .	98·72	98·38	98·27	97·74
Carbon .	0·79	0·12	0·79	0·63
Silicon .	0·15	0·82	0·15	0·11
Phosphorus	0·34	00·68	0·79	1·52
	100·	100·	100·	100·

It appears from the following analyses of cast-steel by Gay-Lussac that during fusion the steel loses much silicon and a little carbon: the samples analyzed were (1) English, first quality; (2), French, first quality; (3), French, second quality; (4), Isère.

	(1).	(2).	(3).	(4).
Iron .	99·32	99·24	98·87	99·27
Carbon .	0·62	0·65	0·94	0·65
Silicon .	0·03	0·04	0·08	0·00
Phosphorus	0·03	0·07	0·11	0·08
	100·	100·	100	100

In the opinion of Mr. Brande, the quantity of carbon in the above analyses is somewhat underrated; and he has found that when the carbon has fallen short of one per cent., the steel was deficient in hardness; and when it has exceeded this proportion, the dies have split or not stood their work. He states, at the same time, that minute quantities of other bodies appear to influence the quality of steel; and that unless it contain phosphorus it cannot be depended on for the manufacture of dies in coining.

Dr. Thomson examined some cast-steel furnished him by Mr. Buttray, a steel-maker near Glasgow: the general result of his trials gave him—

Iron .	99
Carbon with some silicon .	1
	100

and this composition, he observes, approaches 20 atoms of of iron + 1 atom of carbon, and this he thinks likely to be the constitution of cast-steel, an opinion corroborated by the fact above stated by Mr. Brande. Mr. Faraday and Mr. Stodart published in the 'Phil. Trans.' for 1822 a valuable series of experiments on alloys of steel, from which it appears that by combining steel with other metals its quality is improved· for the details we refer to the memoir, merely stating that a very minute addition was found sufficient to produce a good effect: thus one 500th of silver gave an alloy harder than cast-steel; one 100th of nickel gave a very hard alloy, susceptible of a fine polish: alloys of rhodium and platinum were also formed; and these, with the all iridium, osmium, and palladium, formed the most val compounds.

STEEL ENGRAVING. In the article ENGRA [vol. ix., p. 437] the history of the art of engraving metallic plates for the purpose of producing prints, o pressions, in ink, upon paper and other substances, a as the chief points requiring notice in the practice o art, has been treated of; and therefore it merely remai this place to notice such matters as refer to the use of plates, which have of late been very extensively and a tageously substituted for those of copper.

As far as regards facility of execution, whether by etc or by cutting with the graver, probably no material be found superior to copper, which is still preferred by engravers, where the fine and free character of the wo more important than the durability of the plate; but comparative softness of copper occasions it to wea rapidly in the process of printing, that the beauty of engraving is very soon impaired, and it is impossibl produce, from a single plate, a sufficient number of im sions for the illustration of books of large circulation. should be borne in mind that, in copper-plate printing, whole surface of the plate is covered with thick unct ink, which is rubbed into the lines with a ball of cloth plied with considerable force. The superfluous ink is wiped off with a rag, and the surface of the plate is roughly cleaned by repeated wiping or rubbing with palm of the hand, so as to leave the ink only in the line incisions in the plate, from which it is transferred to paper by very powerful pressure in a rolling-press. operation, being repeated with every impression, tends the rapid deterioration of the plate, the surface of wh is so worn by the constant friction, that the finest li soon disappear, while the edges of the widest and de est incisions become so rounded that they will not cont the proper quantity of ink. Hence it becomes necessa where many impressions are required, to retouch and deep the engraving after printing a few hundred copies; but e this measure, troublesome and expensive as it is, will restore the engraving to its original beauty. The use steel plates for diminishing this inconvenience, althou not extensively resorted to until within the last twe years, is a measure of which the possibility was conceiv at an early period. It is believed that Albert Dürer, w also made experiments upon plates of tin, silver, &c., e graved a few steel plates; impressions of which, or of some which, are preserved in the collection of the works of th artist in the British Museum. They appear to be execut chiefly, if not entirely, by the process of *etching*. Probab many other engravers may have tried engraving upon ste but the difficulty of cutting it, on account of its hardnes and the want of a good menstruum for the purpose etching, prevented the accomplishment of anything impor ant in steel engraving until recently.

The introduction of the modern art of steel engravin appears to be attributable, in a considerable degree, to th excitement which existed rather more than twenty year since on the subject of the forgery of bank notes. Th subject was investigated in 1818 by a committee of the Society for the Encouragement of Arts, Manufactures, an Commerce, who received several proposals for renderin bank-notes more difficult of imitation; and the very interesting communications made to the committee were published by the Society in 1819, as a supplement to thei 'Transactions.' The introduction of superior workmanship in the engraving of plates for bank notes was one of the measures particularly recommended on this occasion; but, while it was shown that the employment of superior engravers, and the introduction of well executed vignettes, had been found advantageous by country banks as a means of preventing forgery, it was a measure inapplicable to the small notes then circulated in immense numbers by the Bank of England, which were the notes most extensively forged. 'It is in evidence,' observe the committee, 'that the average number of copies taken from each copper plate does not much exceed six thousand;* hence, if the expense of engraving were greatly enhanced, the profit arising from the issue of one-pound notes would entirely cease.' 'If,' it proceeds, 'the daily issue of small notes from the Bank of England amount to thirty thousand,—and, from the evidence produced, there is reason to believe that it exceeds rather than falls short of this number,[*]—there is a daily consumption of five plates, or fifteen hundred in the year; and there might perhaps be some difficulty in finding a sufficient number of superior artists to produce the required quantity of plates.' The substitution of steel for copper is then adverted to as a measure likely to obviate these difficulties, because, owing to its greater hardness, it was believed that a steel plate might be made to afford twenty, or perhaps thirty times the number of impressions that copper would do; so that, while perfect similarity might be insured in a much larger number of notes, a far greater expense might be advantageously incurred in the engraving of each plate. Mr. J. T. Barber Beaumont, in his communication to the committee, after alluding to the ultimate economy of the plan, notwithstanding the increased cost of the proposed steel plates with well-executed vignettes, as compared with the badly engraved copper-plates then used, which contained nothing worthy of the name of a work of art, observes:—'A further effect of this system in preventing forgeries would be found in all the notes of one kind for a long period of years being taken from one plate, whence a person having a genuine note might compare it with the minutiæ of another suspected to be forged; and as it would be impossible even for the artist himself who had engraven an original plate to follow, in a copy, the length, sweep, depth, and number of the strokes in his original, a detection would be easily made, even by those who knew nothing of the arts.' The conditions of this argument, although unattainable to the extent here intimated by the use of soft steel plates, might be perfectly accomplished by the transferring process hereafter described. Mr. Warren exhibited to the committee a specimen of engraving upon soft steel, which fully proved its practicability; and it was also explained by several witnesses that a block or plate of steel might be softened so as to render it easy to cut, and subsequently hardened to enable it the better to resist wear in printing. Something of this kind indeed had been practised in North America. American bank-notes were shown to the committee, containing ornamental borders, partly of machine-work, which were pronounced to be 'scarcely, if at all, imitable by the common process of engraving.' Mr. Clymer, a gentleman who had been engaged in the production of bank-notes in the United States, stated that these borders were engraved upon thick plates of soft steel, and proceeded to describe the process as follows:—'After the pattern has been completed, the plates are hardened. These plates are then employed to impress a reverse on rollers of very soft cast steel, by repeatedly passing the plate between the rollers. The rollers are then hardened, and from these the impression is transferred to plates of copper, on which the writing and vignette are afterwards engraved in the usual way.' The Report of the committee was accompanied by impressions from two steel plates, engraved by Mr. Williamson. They consist of engine-turned patterns; and, although not remarkably delicate, are very well executed.

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* Mr. Warren stated that about seven thousand copies were taken by the Bank of England before the copper plates used by them required to be retouched; but other witnesses mentioned from five to six thousand as the number of impressions which each plate would afford. It is almost needless to observe that the great difference between the early and late impressions rendered it more difficult for an inexperienced person to detect a forgery than it would have been if no perceptible difference existed between the genuine notes.

The resumption of cash payments by the Bank of England, and the subsequent discontinuance of small notes, rendered the proposed improvements less imperatively necessary; yet steel plates have been, since the date of this Report, rapidly extending in use, both for bank-notes and other matters in which writing and ornamental machine-work form the principal feature, and for engravings of higher character. The principal improvements by which this very important change has been effected, are recorded in the published 'Transactions' of the Society of Arts; and that association has done much to encourage the progress of steel engraving. In noticing some of the chief improvements in question, a distinction will be made between the process of engraving on decarbonised plates which are intended for subsequent hardening, and that of engraving upon such plates of soft steel as are printed from without hardening.

The former of these is the process introduced into this country, in connection with the transferring operation above alluded to, by Messrs. Perkins and Fairman, from the United States. Their method of producing engraved steel-plates was established in England soon after the date of the Society's Report; Mr. Charles Heath, the eminent English engraver, being associated with the American artists; and it is fully described in a communication from the three partners to the thirty-eighth volume of the 'Transactions' of the Society of Arts, whence it was transferred to several other works. The engraving is executed upon a plate or block of cast-steel, which, to prevent the risk of warping, is of considerable thickness. About five-eighths of an inch is stated to be the average thickness of the plates used by Mr. Perkins. The surfaces of this plate are decarbonised by placing it in a close cast-iron box, with a sufficient quantity of iron-filings to cover the plate to the thickness of at least half an inch, and exposing it, while thus enclosed, to a white heat, until the steel is decarbonised, or converted into very pure soft iron, to a depth equal to about three times the depth of the incisions to be made in executing the intended engraving. The box is then cooled very slowly, being covered up with fine cinders to prevent the access of air. In performing this process, it is said that the plates are least likely to warp when in a vertical position; and that it is advisable to decarbonise each side of the plate equally. On the plate thus softened the engraving is effected with facility; and, when it is completed, the hardness of the surface is restored by exposing the plate for some hours to a red heat, the surface being thickly covered with animal charcoal, formed of burnt leather or bones, and the whole being, as before, enclosed in a cast-iron box. The plate is afterwards cooled in water; but it is not allowed to remain in the water till quite cold, but taken out so soon as it is cooled to the tempering heat, which is ascertained by careful attention to the sound emitted. The plate should be taken out when at the heat required for tempering to a straw-colour, and afterwards lowered by holding it over a fire until tallow, smeared on its surface, is decomposed by the heat, so that smoke arises from it. It is then again put into water till the sound emitted is rather weaker than before. These operations are repeated until the plate has been three times lowered, or softened, over the fire, and three times partially hardened by cooling, after which it is finally cooled in water. It is then cleaned off, and again tempered over a fire to a brown or such other colour as may be needed. From this hardened plate the engraving is transferred to a softened steel roller, of small diameter, which is pressed against the plate with such force that its surface becomes embossed with a perfect transfer or impression of the engraved device. The roller, or cylinder, is then hardened in a similar manner to the original plate, and is afterwards made to transfer the devices from its surface to any required number of softened or decarbonised plates, which are then hardened for printing from. This beautiful process is not only applicable to transferring engravings from one plate to another; but, in cases where one ornament has to be repeated several times on one plate, the device may, by being once engraved, be impressed as often as necessary upon different parts of the same plate. The power of multiplication is, for all practical purposes, unlimited. An instance of its utility, which will be familiar to every one, is afforded by the adhesive stamps used as postage labels since the adoption of the penny postage: the device of the queen's head has been only once *engraved*, although, by the application of this process, it has already been multiplied about *six thousand* times, each impression or transfer upon steel being equal to the original engraving, and capable of yielding an immense number of prints or impressions on paper. The number of impressions yielded by each hardened steel plate depends much upon the character of the engraving, and in some degree upon the success of the recarbonising or case-hardening operations, but it may be stated generally to range between fifty and a hundred thousand. In some cases the latter number has been greatly exceeded; and, in the paper from which the above account of the art is chiefly derived, an instance is mentioned in which *five hundred thousand* copies were printed from a plate which was strongly engraved. During the twenty years in which this process, which was formerly termed *siderography*, has been practised in this country, several minor improvements have been effected; but we believe that the above account remains substantially correct. The perfection which has been attained is almost beyond conception; the finest writing, and the most minute and intricate patterns, being transferred from plate to plate with such precision that the keenest scrutiny cannot detect a difference between the original and the transfer. Even the early specimens which accompany the paper above referred to, fully justify this remark. The plan has been much used for country bank-notes and similar purposes, and has been occasionally resorted to for engravings of pictorial character, for which however the kind of steel engraving yet to be noticed is most commonly employed.

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[*] 'Mr. Ramshaw stated, that he has heard from good authority, that the daily issue of Bank of England notes of all descriptions is about *sixty thousand*, in producing which about fifty-three pressmen are employed.' (*Minutes of Evidence*, p. 64 of *Report*.)

The application of steel engraving to matters of fine art is, in a great measure, due to the late Mr. Charles Warren. In 1823 that gentleman made a communication upon the subject to the Society of Arts, who voted him their large gold medal for his improvements in the art; a prize which he did not live to receive. Owing to his death before the rewards of that year were bestowed, the Society were deprived of a full communication which was to have been made by him, and consequently the details published in the forty-first volume of their 'Transactions' are less perfect than might be desired. It is there stated that Warren had in his youth been engaged in engraving for calico-printers and gunsmiths, by which employment he was led to devote some attention to steel engraving. Mr. Gill, one of the chairmen of the committee of mechanics in the Society of Arts, and subsequently editor of the 'Technical Repository,' suggested to him the method practised at Birmingham in ornamenting snuffers and other articles of cast steel, by decarbonising the surface to render the execution of the pattern easy, and subsequently case-hardening the article; a process very similar to that described as forming part of the art of siderography. Serious difficulties impeded the application of this plan to plates suitable for engraving; because, if they were made thin, like ordinary copper plates, they were liable to warp in hardening; while if thick enough to avoid this danger, it was impossible to beat up the surface from the back in the usual way, when it was necessary to make any correction or erasure. When alterations were required in a thick plate, it was found necessary either to grind down the whole surface of the plate, thereby losing the whole of the work instead of merely the defective part, or to force up the surface in the faulty place by inserting a screw in a hole drilled at the back. These inconveniences led Warren to try the durability of steel plates when printed without hardening. It was ascertained that such plates would yield a sufficient number of impressions for ordinary purposes; while, by dispensing with the hardening process, they might be made thin enough to allow of beating up without inconvenience. Prints were exhibited to the Society from two soft steel plates engraved by Warren, containing very delicate work in landscape and figures, of which four and five thousand impressions had been taken respectively, and yet between one of the first and one of the last copies there was no perceptible difference. Some other of the specimens produced, portraits for the 'Evangelical Magazine,' had printed twenty-five thousand copies, and yet remained in good order; and in another case the engraver's proofs were not taken till twenty thousand copies had been printed.

Warren's original mode of decarbonising steel plates was similar to that adopted by Perkins, excepting that the box was filled with a mixture of iron turnings and pounded oyster-shells, instead of simply iron filings, and that several plates were laid in the same box, alternating with layers of the decarbonising mixture. Mr. Hughes, a copper-plate maker, improved upon this process by substituting a box or case of refractory clay for the cast-iron box; by which means he was enabled to apply a degree of heat that would have melted the iron, and thereby to soften the plates more completely. Each plate required two or more 'cementations' to soften it to the required degree; and Warren rectified any accidental warping by striking the plate with a hammer between these operations. Hughes found it better to perform this operation with a mallet, and to apply that with as little force as possible.

It is recommended that the surface of a steel plate should not be polished very highly, and that in applying etching ground to it, the plate should not be heated quite so much as is usual with copper. In either case the ground is apt to granulate or *honeycomb* upon the plate, by contraction in cooling. The ground should also be laid rather thicker than upon copper. Warren tried several different menstruums, but that which he most approved consisted of half an ounce of crystallized nitrate of copper, dissolved in a pint and a half of distilled water, with a few drops of nitric acid added to the solution. He recommended that it should be laid on the plate in a layer not exceeding one-sixth of an inch deep, to enable the operator to see the action distinctly; that the plate should be constantly swept with a camel- brush, to remove the precipitated copper, which, if le the lines, would render them rugged. When this kin menstruum is employed, it is necessary to lay on Brunswick black or other varnish used for covering parts as are sufficiently etched, or *bitten in*, very smoot because anything like a ridge retains the deposited cop and where it remains the ground is liable to give way.

In 1824 the Society of Arts gave their large gold m to Mr. Edmund Turrell for his improved menstruum etching on steel, by which the inconvenience of swee away the copper was avoided. It consists of four pa *by measure*, of the strongest pyroligneous (acetic) acid, one part of alcohol, or highly rectified spirits of wine. Th should be mixed, and gently agitated for about hal minute, after which one part of pure nitric acid should added. The rapidity of the process of etching may be creased or diminished by exceeding or reducing the pro tion of nitric acid in the mixture. This menstruum sho not be mixed long before it is wanted, as it deteriorates keeping many hours. After etching, the plate should washed with a mixture of one alcohol to four water. T rell recommends that Egyptian asphaltum dissolved essential oil of turpentine be used for stopping out, as common Brunswick black of the shops is affected by alcoh In 1826 the Society rewarded Mr. Humphrys for a m struum for soft steel, consisting of a quarter of an ounce corrosive sublimate and the like quantity of alum, b powdered, dissolved in half a pint of hot water, but coo before it is applied to the plate. This menstruum sho be kept constantly stirred with a camel-hair brush wh acting; and, as it soon becomes turbid, it should, in etchi fine work, be thrown away and renewed after acting a sh time. This menstruum has received the sanction of seve eminent engravers. Some engravers, we believe, use t different kinds of menstrua for etching on steel; one biting-in the more delicate tints, and another for etchi the parts that require considerable depth.

Allusion has been made to the difficulty experienced the early steel engravers in consequence of the hardness the metal, which rendered it very inconvenient to cut, a constantly broke the points of their tools. In Gill's 'Tec nical Repository,' vol. iii., p. 356, it is stated that Warr found the best gravers for the purpose to be those made Mr. Stodart, of his alloy of cast-steel and rhodium. In t eighth volume of the same work, p. 296, Turrell recommen a process of cold hammer-hardening for gravers for ste plates.

In the application of steel engraving to matters of fin art, the accomplishment of mezzotinting upon steel plat is one of the most important points, as the wear of coppe plates engraved in this manner is very rapid. The adva tages of steel plates, and the peculiarities of the mezzotin ing process as applied to them, are alluded to in a previou volume. [Mezzotinto, vol. xv., p. 169.] According to Gil (*Tech. Rep.*, vol. iii., p. 287), mezzotinto engraving wa executed upon steel as early as 1820, by Messrs. Perkins Fairman, and Heath. In 1822 Mr. Thomas Lupton wa rewarded by the Society of Arts for an engraving in th manner on soft steel, and he then exhibited good impressio from a plate which had yielded fifteen hundred impressions and in 1824, in the forty-second volume of the Society' 'Transactions,' an interesting paper was published upo the invention, progress, and advantages of engraving i mezzotinto upon steel, by Mr. Charles Turner. That artist states that the subject was suggested to him as early a 1812, and that, finding steel, as then prepared, too hard, he tried brass, but without success. In January, 1820, Say executed a mezzotint engraving on one of Perkins's plates, and before the date of Mr. Turner's communication, this new branch of art had been practised also by Ward, Reynolds, Lupton, &c. 'In engravings in mezzotinto on steel,' he observes, 'the tones are far better defined than those obtainable upon copper. From the superior density of the metal, the clearness of the lighter tints is carried to much greater perfection; and, from the same cause, the darks have also a decided preference, being distinguished by their superior richness.'

To preserve steel plates from injury by rust, it has been recommended to smear their surface with sheep's suet rubbed on while the plate is warm. Some use virgin wax for the same purpose; heating the plate to such a degree that a cake of wax, when gently rubbed over it, leaves a thin but perfect film upon it.

The cost of engraving upon steel is considerably greater than that of engraving upon copper;* yet, as steel plates afford so many more impressions than copper, they enable the publisher, by calculating his returns upon a large instead of a small number, to issue works of art at so low a price as may ensure their very wide circulation. This may be illustrated by referring to the series of maps published by the Society for the Diffusion of Useful Knowledge. The cost of production in this and in every similar case, may be divided into two parts: the cost of authorship, engraving, &c., which is a fixed sum, independent of the number of impressions required; and the cost of paper and printing, which is a fixed sum *for each impression*, whether the edition be large or small. The latter part of the cost forms therefore an unalterable sum for each copy; but the former must be incurred alike for twenty or two thousand copies, and may be met either by a large sum added to the price of each copy in a small edition, or by a small sum charged upon each copy in a large edition. Had the Society calculated upon a sale of only two thousand copies of their maps (which was the utmost number that experience would have entitled them to hope for), the estimate would have stood somewhat as follows:—

Expenses incurred for each plate, independent of the number of copies required—

Assumed cost of authorship . .	£21	0	0
Assumed cost of engraving (*on copper*)	24	0	0
	£45	0	0

Expenses dependent upon the number of copies printed—

Paper for two thousand copies . .	£5	0	0
Printing two thousand copies . .	8	0	0
	£13	0	0

Dividing these sums by two thousand, it will be seen that the cost of paper and printing for each copy is about 1·56*d.*, and the proportion of the cost of the plate chargeable upon each copy is 5·40*d.*, making the total expense of each copy 6·96*d.*, or very little under *7d.* Allowing therefore the usual addition of one-third for the profits of the retailers, the price to the public could not have been less than 10½*d.* Supposing the number sold to be four thousand, the total cost per copy would have been reduced to 4·26*d.*, because the expense of the plate, being distributed over double the number of copies, would have been but 2·70*d.* for each. But this number of impressions would have worn out a copper plate, even supposing, which would be an extreme case, that so large a number could have been printed without too great a deterioration of the engraving. The Society however determined upon going to the greater expense of steel plates, which the engraver undertakes shall be capable of furnishing twenty thousand copies; and they calculated their returns upon a sale of eight thousand copies. The estimate of first cost therefore stands nearly as follows:—

Assumed cost of authorship . .	£21	0	0
Cost of engraving (*on steel*) at least .	35	0	0
	£56	0	0

but by dispersing this larger sum over a number of eight thousand copies, the proportion chargeable to each is reduced to 1·68*d.*, which, with 1·56*d.* for paper and printing, makes the total cost of each copy 3·24*d.*, or rather less than 3¼*d.* Thus the maps were profitably published, even with the addition of a wrapper, at 6*d.* each. The result has fully justified this measure, as, of some of the earlier numbers, upwards of twenty thousand copies have been sold, a number which the best engraved plates have yielded without perceptible injury. The sum mentioned as the cost of engraving is about the least which has been paid; but assuming it to be the cost, the proportion of first cost chargeable on each copy of the maps which have been most extensively circulated is only ·672*d.*, which, with the price of paper and printing, makes the cost per copy 2·232*d.*, or little more than 2¼*d.* If copper plates had been used, notwithstanding the smaller cost of engraving, it would probably have been impossible to reduce the cost per copy below 4½*d.*, or from that to 5*d.*; because, if twenty thousand impressions had been required, *five* plates must have been engraved, at an expense of at least 120*l.*, instead of one at the expense of 35*l.*

In the production of illustrated books, the advantages of steel engraving are strikingly observable, since, by acting upon the principle above stated, many works have been published of late years which could not have been produced with copper-plate engravings, because the number of impressions being so limited, the price of each copy must have been such as to preclude the possibility of a remunerative circulation. To take an instance, by no means the most recent, it may be mentioned that the beautifully illustrated edition of Rogers's 'Italy,' issued in 1830, was published profitably at the low rate of twenty-eight shillings, although seven thousand pounds had been expended in its production; so that, merely deducting one-fourth for the regular allowance to booksellers, at least seven thousand copies must have been sold to return the cost of production. The volume of poems by the same author, which was published soon afterwards, although issued at the same price, was still more expensive in its production. (*Printing Machine*, vol. i., p. 13.) In periodical publications of large circulation the use of copper plates was attended with great expense and inconvenience. The 'Evangelical Magazine,' for example, in order to supply portraits for an edition of more than twenty thousand copies, was compelled to use four distinct plates, each of which, in many cases, had to be repeatedly retouched by the engraver to make it yield the necessary number. In January, 1823, steel was first adopted for this work; and, one plate being sufficient, much more elaborate engravings were used. Of the portraits engraved on steel for this and another work of similar character, it is not unusual to take the full number now required, about sixteen thousand copies, without any repair being done to the plate.

The recently invented art of multiplying engraved copper-plates by voltaic electricity may possibly have some effect upon the future use of steel engraving; since it affords the means of obtaining an indefinite number of impressions without deteriorating the original plate. The inferior density of electrotype plates, which would, it is supposed occasion their rapid wear, has been urged as an objection to their use for printing long numbers; but the writer has been assured that ten thousand impressions have been obtained from one electrotype plate, the engraving of which was strong and deep.

STEELE, SIR RICHARD, was born at Dublin in 1671. His father, who was private secretary to James, first duke of Ormond, sent his son to be educated at the Charterhouse in London; thence Steele was removed to Merton College, Oxford, and admitted a postmaster on that foundation in 1691. He afterwards was an ensign in the Guards, and in 1702 attracted the notice of the public as an author by the publication of 'The Funeral, or Grief à-la-Mode,' a comedy, successfully acted in that year. Two more comedies, 'The Tender Husband,' acted in 1703, and 'The Lying Lover,' 1704, followed this first attempt. In 1709 he commenced 'The Tatler,' the first, in our literature, of a series of periodical works in the form of short essays. He was soon after made one of the commissioners of the Stamp-office. In 1711 he began, in conjunction with Addison, 'The Spectator,' and in 1713 'The Guardian.' In this year he was dismissed from his situation in the Stamp-office, and was elected member for Stockbridge in Hampshire. In March of this year he was expelled the House for writing two pamphlets, 'The Englishman' and 'The Crisis,' on the succession to the crown of England, alleged to contain treasonable matter relative to the reigning family: he was supported on this occasion by Addison, and other distinguished members of parliament.

After the accession of George I., in 1715, Steele was made surveyor of the royal stables at Hampton Court, and was knighted on the presentation of an address. The same year he was chosen member for Boroughbridge in Yorkshire, and appointed one of the commissioners of forfeited estates in Scotland. He continued to write articles relative to the political events of the time, and in the latter years of his life appears to have suffered much from poverty, caused partly by a habit of speculating in new projects. He sustained a considerable loss—nearly 10,000*l.* by his own account (see his letter to the duke of Newcastle, *Epis. Corr.*, 469)—by the revocation, in 1719, of the patent by which he was constituted governor of the royal company of comedians. In 1722 his comedy of 'The Conscious Lovers' was acted. Some time before his death he retired into Wales, to his seat at Llangunnor, near Caermarthen, where he died September 1, 1729. He had been twice married, first, to a lady of Barbadoes, secondly, to Elizabeth, the daughter of Jonathan Scurlock of Llangunnor, Esq., by whom he had a daughter, married in 1732 to the Hon. John Trevor, afterwards Baron Trevor of Bromham.

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* In the infancy of the art it was usual to charge engraving upon steel double the price demanded for the same work upon copper; and even now the comparative expense of engraving upon steel and copper is, we believe, in most cases, about as three to two.

Steele has the merit of having originated a kind of periodical literature not before known in this country. Of the value of the series of works commencing with 'The Tatler,' of which, in conjunction with Addison, he was the author, it is needless here to speak. They are remarkable for a style combining with the ease of familiar conversation grammatical correctness and purity of language, for the invention and judgment shown in the choice, and the versatility in the treatment, of the subject, and, above all, for the refined and Horatian satire which, expressing itself in a tone of playful irony, and by means of allegory and representation of character never directly personal, formed the taste and reformed the manners of the generation by whom the perusal of these writings was regarded as a passing amusement.

There is a full biography of Steele in Chalmers's 'Biographical Dictionary.' Authority for the principal facts there stated may be found in his Epistolary Correspondence, published from the originals in the British Museum, and illustrated with literary anecdotes, by John Nichols, 2 vols., 1788; who also edited, in 1791, 'The Theatre, with the Anti-Theatre,' Steele's Case with the Lord Chamberlain, with other of his tracts; and in 1790, 'The Town Talk,' 'Fish Pool,' 'Plebeian,' 'Old Whig,' 'Spinster,' &c., 8vo. His plays were published in 12mo. by Tonson, 1755.

STEELYARD, in mechanics, a kind of balance or weighing-machine, consisting of a lever of unequal arms. The most common kind of steelyard, which is often called the Roman balance, is a lever of the first order, and is used by suspending the article to be weighed from the end of the shorter arm, and sliding a determinate weight along the longer arm, to a greater or less distance from the fulcrum, until the instrument remains in equilibrium in an horizontal position; the weight of the substance attached to the short arm of the lever being indicated by observing the position of the moveable balance-weight with respect to a graduated scale marked upon the long arm of the steelyard. In the common steelyard a hook or hooks are usually suspended from the short arm, to hold the article the weight of which is to be ascertained; but sometimes a scale-plate or dish suspended by chains is added. The moveable weight is commonly attached to a ring, the form of which enables it to rest in notches cut on the upper edge of the steelyard, corresponding with the graduations engraved on its side. A ring or hook is also attached to the fulcrum, so that the instrument may be conveniently hung upon a fixed support, or if small, held in the hand; and a vertical index or pointer, similar to that attached to the beam of common scales, is sometimes added. The fulcrum, and the axis from which the weight is suspended, should, when much nicety is required, be provided with knife edges or bearings resembling those used in other lever-balances. Many steelyards are supplied with a second fulcrum; the two being placed at different distances from the point to which the hook or scale is attached, and having their respective pointers and suspending-hooks on opposite sides of the lever, or rather, when held in the position for use, one above and the other below it, as shown in the cut of an antient Roman steelyard which is inserted at the end of this article. In using a steelyard of this kind, capable of weighing from one to sixty pounds, the fulcrum which is nearest to the middle is used if the article be under fifteen pounds; while, if it exceed that weight, the instrument must be inverted, and suspended from the fulcrum which divides the lever most unequally. Of course when this arrangement is adopted, the shackles, from which the article to be weighed and the moveable weight are suspended, must be so formed as to hang equally well in either position of the lever; and different graduated scales must be used for each. It scarcely need be observed that, while it is a peculiar character of this kind of balance that the weight used is much lighter than the article weighed, it is possible to use it for bodies of less weight, by placing the moveable weight nearer to the fulcrum than the fulcrum is to the axis from which the article hangs. The degrees of sensibility and stability mu regulated in the same way as in an ordinary equal-a balance. [Balance, vol. iii., p. 307.]

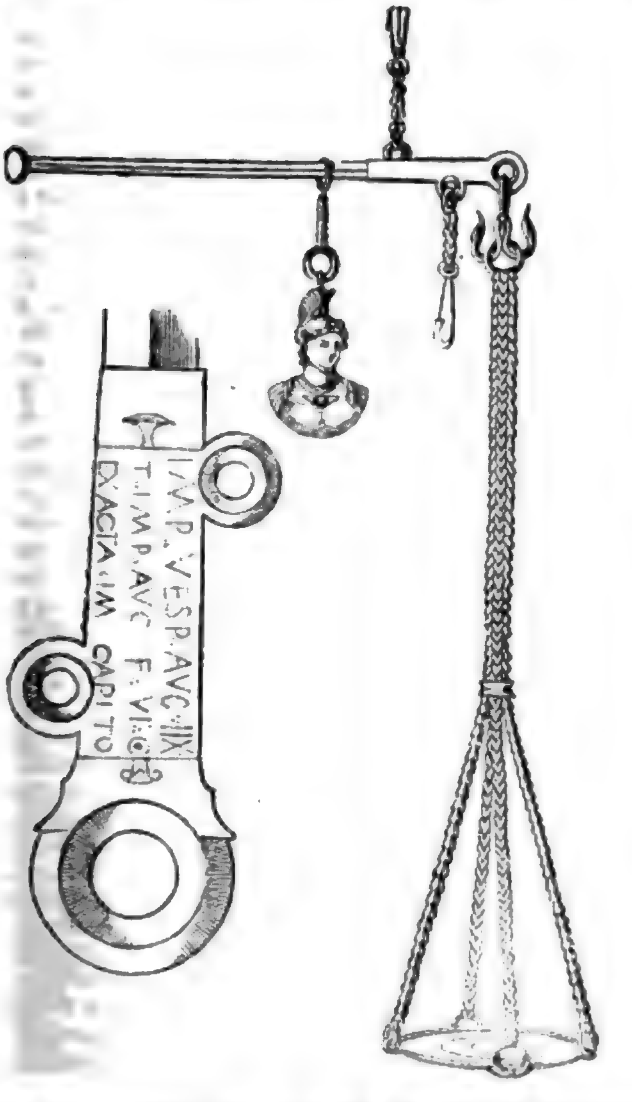
Various modifications of the steelyard have been trived for delicate scientific purposes, or for adapting the purpose of weighing very heavy bodies. The imp ments made by C. Paul, of Geneva, about forty years s rendered this kind of balance capable of weighing great nicety. They are fully detailed in the third vol of Tilloch's 'Philosophical Magazine,' in a paper transl from No. xlv. of the 'Journal des Mines;' and also in second volume of Gregory's 'Mechanics,' under the 'Steelyard.' M. Paul placed the points of suspen exactly in the same horizontal line as the divisions of beam; and he balanced the steelyard in such a way t when unloaded, the beam might remain perfectly horizon and the index or cock attached to it perfectly verti Hence it became easy to ascertain the accuracy of the st yard by simply unloading it. Instead of obtaining power of weighing substances of very different weights the use of two fulcrums, as above described, he used t different weights, with the same fulcrum and gradua scale; one weight being a multiple of the other; so th for instance, if the heavier indicated, when placed agai the figure 10 on the graduated scale, a weight of ten *poun* the smaller, placed in the same position, would indicate t *ounces*. By using the two weights together, the weight o very heavy body might be ascertained with great nice A steelyard which Paul constructed was capable, it is stat of indicating as little as *one ten-thousandth part* of t weight with which it was loaded. Another advantage tending the use of two weights of this kind consists in t facility which they afford for testing the accuracy of t balance by transposing the weights. Thus, with a corr steelyard, graduated for avoirdupois weight, the balance w be the same whether the larger or *pound* weight be plac at 1, or the smaller or *ounce* weight at 16. The gener adoption of such a contrivance would obviate the princip objection to the use of the steelyard for the ordinary pu poses of commerce, the facility which it affords for fraudu lent deception. Tilloch gives a representation of one of M Paul's steelyard balances, contrived for scientific purpose for which it was proposed to use different sets of weigh with the same engraved scale, to indicate the weight of th object under examination according to various systems weights. In a steelyard contrived by Mr. Patten, of Rhod Island, United States, for purposes for which much delica is required, the weight is attached to a sliding-box, whic traverses along the beam by means of a screw. The scre passes through the sliding-box, and is secured by bearing at its ends in a position parallel with the beam, and it i turned by a milled head. In a large balance on the principl of the steelyard, known as Payne's weighing-machine, th weight is attached to a long box or case, which slides along the beam, and is supplied with a thumb-screw, the point o which is made to press against the side of the beam in orde to secure the slide at any required point. The large weight attached to this sliding-box indicates, by a scale marked on the beam, the larger amounts, as hundreds and quarters; and the smaller, as pounds and ounces, are shown by means of a small weight traversing a scale engraved upon the sliding-box.

Several ingenious bent-lever balances have been contrived, some of which, from the circumstance of the levers being of unequal arms, resemble the steelyard in principle. These, and the steelyard weighing-machines for ascertaining the weight of loaded carriages, are noticed under Weighing-Machine.

The balance known as the Danish or Swedish steelyard differs from that above described in having the weight fixed at one extremity of the lever, while the fulcrum itself is moveable.

Though probably not so antient an invention as the equal-armed balance, the steelyard is an instrument of very early origin. Under the name of statera it was well known to the Romans, who often used a weight in the form of a bust. Vitruvius (book x., chap. 8) mentions the statera, and describes the principle on which it acts. Many Roman stateræ of brass still exist, some of which are very like the steelyards of the present day. One of these, with a double fulcrum, weight, and scale-plate suspended by chains, is represented in the annexed cut. It appears, by the inscription on the beam, to have been made about the year 77 of our ers. A kind of steelyard is used by the Chinese for weighing very delicate matters, as gems and precious metals. From the manner in which the steelyard is mentioned in a curious tract published in 1578, it would appear that it was not at that time much known in England. The author recommends it for weighing charges for artillery, as being less troublesome than ordinary scales, owing to the use of but one weight, and that of small dimensions, and observes that the instrument was 'altogether used in South Spaine to wey all kinde of marchandise,' and that it was called 'statery.' (Bourne's *Inuentions or Deuises*, p. 45.)

The portable weighing-machine called the spring or pocket steelyard is noticed under Spring-Balance, vol. xxiii., p. 385.



Antient Roman steelyard, found at Pompeii, with part of the beam and inscription on a larger scale.

STEELYARD, MERCHANTS OF THE, a body of aliens who enjoyed various commercial privileges in England from an early period to the middle of the sixteenth century. 'The emperor's men,' mentioned in some ordinances of Ethelred II. (A.D. 978-1016) as trading to England, were the predecessors of the merchants of the Teutonic Gild. In 1220 the merchants of Cologne had a hall or factory in London for the legal possession of which they made an acknowledgment to the king. 'It seems that this Gildhall, by the association of the merchants of other cities with those of Cologne, became in time the general factory and residence of all the German merchants in London, and was the same that was afterwards known by the name of the German Gildhall (*Gildhalla Teutonicorum*)'. (Macpherson, *Annals of Commerce*, i. 383.) In 1235 Henry III. gave them permission to attend fairs in any part of England, and also to buy and sell in London, saving the liberties of the city; and they were exempted from several customs and payments. In the fifteenth century we find the Hanse merchants engrossing the privileges of the above antient incorporation, Cologne being a member of the League, and the whole of the German merchants resident in London probably belonging to one or other of the Hanse towns. At least, after 1475, they had but one factory in London, which was the Steel-yard, or Steel-house, as it was sometimes called, situate a little east of Dowgate, between Thames Street and the river. In 1475 Edward IV. entered into a treaty with the Hanseatic League, by which the privileges of the London factory were placed on a more secure foundation, instead of being granted only for a short period, and being at times curtailed and even occasionally suspended. By way of settling former disputes, it was thought worth while to pay them 10,000*l.*, or rather to remit customs duties on their goods to that amount. The king was to appoint two or more judges to act without the ordinary legal formalities in all civil and criminal cases between the Hanse merchants and English; and similar regulations were to be adopted in reference to English subjects residing at the Hanse towns. The fee simple of the Steelyard was conveyed by this treaty, also the Steelyard at Boston, and a house at Lynn. Under this treaty and their old charters the Hanse merchants of the Steelyard were enabled to monopolise certain branches of trade, in which they were exempted from duties payable by other traders; and by their combination and capital, they were doubtless formidable competitors in other branches of foreign trade; but though the activity of foreigners might be tolerated while native capital was wanting, yet a trade from which English merchants were virtually excluded could not possibly be permanent. Besides exciting popular indignation, the privileges of the Steelyard merchants were politically inconvenient, for when the direct trade with the Netherlands was stopped in 1493, large quantities of Flemish goods were imported from the Hanse towns into the Steelyard. On this occasion the journeymen and apprentices of London attacked the warehouses of the obnoxious Germans.

In 1505 a rival interest was created, by a charter granted to the Company of Merchant Adventurers for trading in woollen cloth to the Netherlands. The merchants of the Steelyard were bound in heavy penalties not to interfere with the trade of this new incorporation, which soon became a powerful rival not only to the German merchants, but to the merchants of the staple. In 1551 various allegations of the Merchant Adventurers, with the counter-statements of the merchants of the Steelyard, were put into the hands of the solicitor-general and the recorder of London, upon whose report the council came to a resolution that the Steelyard merchants had forfeited their privileges, their charters being contrary to the laws of the realm. The council reported that, no particular persons or towns being mentioned in these charters, the corporation had extended their privileges to whomsoever they pleased; that English subjects had not enjoyed reciprocity of privileges in the Hanseatic towns; that their English trade was no longer confined to the Hanse towns; that they had engrossed almost the entire trade carried on by foreigners in the kingdom; lastly, that they had reduced the price of wool, and also of corn by their importations of foreign grain. The articles which they imported, besides grain, are stated to have been cordage and other naval stores, flax and hemp, linen, cloth, and steel. The English Merchant Adventurers flourished on the ruin of the older incorporation, which however continued to linger until 1597, when the emperor Rudolph having ordered the factories of the English Merchant Adventurers in Germany to be shut up, Queen Elizabeth directed the lord mayor of London to close the house occupied by the merchants of the Steelyard. It is said that in 1554 Queen Mary had restored their privileges, and in a year or two afterwards withdrawn them, but the facts are not very clear on this point. [Hanse Towns; Staple.]

(Strype's *Eccles. Mem.*, iii. 77; Anderson's *Commerce;* Macpherson's *Commerce*.)

STEEN, JAN, one of the most celebrated painters of the Dutch school, was born at Leyden, in the year 1636. His father was a brewer, who, complying with his son's desire to be a painter, put him apprentice to Nicholas Knupfer, a German artist of considerable note, at that time residing at Utrecht. He afterwards studied under Van Goyen, who was so pleased with his agreeable manners, and his talents as a painter, that he gave him his daughter Margaret in marriage. Though Steen soon acquired great reputation, he did not gain sufficient to live with comfort, because he spent much time on his pictures, which he finished with extraordinary care. His father therefore advised him to set up a brewery at Delft, in which he had every prospect of success, but his propensity to an idle, intemperate, and dissolute course of life made him neglect his business, and having incurred debts, he was driven by necessity to his pencil. With the assistance of his relations he set up a public-house, which was much frequented, but only gave him more opportunity and temptation to indulge in his intemperate way of life. The scenes which he saw here he transferred, often in a state of intoxication, with unrivalled skill to the canvas. None of his able contemporaries surpassed him in the naiveté of his compositions, in the expression and character of his figures, and the skilful distribution of light and shade. 'In spirit, humour, and invention,' says Dr. Waagen, 'Steen excels all other Dutch painters in the same line; to this is added a free, light, easy touch, a great freshness and clearness of colouring, and sometimes a delicacy of execution approaching if not equal to Metzen.' He sometimes attempted historical subjects, such as Moses striking the Rock, but it is in scenes of domestic life, of the higher as well as the lower classes, that he is without an equal. It seems that he also painted portraits. At Lord Spencer's seat at Althorpe there is a fine portrait of Sir Kenelm Digby ascribed to him.

After the death of his wife, by whom he had six children, he married a widow with two children. His business failed, and he was scarcely able to procure sufficient for his subsistence, by the sale and pawning of his pictures, which in his latter years were slightly painted. He died in 1689, leaving his family in the utmost distress. His works, which had not fetched great prices during his life, rose rapidly in value after his death, and are now greatly coveted, and sold at high prices. Several of his finest pictures are in England, in the collections of the Duke of Wellington, Lord Ashburton, Sir Robert Peel, Mr. Hope, Mr. Beckford, and in the private collection of his late majesty King George IV. His drawings are excessively scarce. He likewise executed a few very spirited etchings, which are also very scarce.

(Houbraken; Pilkington, by Fuseli; Bryan; *Conversations Lexicon*.)

STEENWYK, HENRY, the Elder, a celebrated painter, of the Flemish school, was born at Steenwyk in 1550. He studied under his father, who was well versed in painting, architecture, and perspective; and also under John Fredemann, called De Vries. Like his master, he painted architectural subjects; but excelled him and all his contemporaries in truth, delicacy, transparence, and neatness. His favourite subjects were the interiors of magnificent Gothic churches and convents, and most frequently views by night, when they were illuminated by flambeaux or tapers. He was a consummate master of chiaroscuro, and his lights and shadows are distributed with the greatest judgment. The reflections of his lights are beautiful, and every column, cornice, and other member of the Gothic architecture is represented with the most perfect truth and precision. His pictures are usually enriched with figures by Breughel, Van Tulden, and other distinguished artists. His genuine works are extremely rare, and very highly prized all over Europe. To avoid the troubles of war, he retired to Frankfort, where he died in 1603 or 1604.

STEENWYK, HENRY, the Younger, the son of the preceding, was born in 1585. He followed the style of his father, by whom he was very carefully instructed, and very good judges have thought that he often equalled or even surpassed him. His friend Vandyck, for whom he often painted the architectural and perspective backgrounds of his pictures, induced him to visit England, and introduced him to the court of Charles I., where he met with the encouragement due to his talents, and found employment in this country for several years. He died at London, when still young, but in what year is uncertain. His widow, who had been instructed by her husband, retired to Amsterdam after his death, and practised painting there: her works were greatly esteemed and readily purchased at high prices. The celebrated Peter Neefs, father and son, were among the disciples of the elder Steenwyk. The portrait of the son by Vandyck is engraved in the collection of the portraits of the chief artists of his time.

STEER. [Ox. p. 73.]

STEEVENS, GEORGE, was born at Stepney, in 1736. His father was connected with mercantile pursuits in London, being a director of the East India Company. George Steevens was placed on the foundation at Eton, and became a scholar of King's College, Cambridge, in 1754. His first publication, and a most useful one, was the reprint, in four volumes, octavo, of 'Twenty of the Plays of Shakespeare, being the whole number printed in quarto during his Lifetime,' &c. These plays profess to be literal copies of these rare editions; and in several instances the various read of other quarto editions are given in the foot-notes. was an acceptable service to all students of our great p and a comparison of many of these plays with the origi enables us to say that the reprints are remarkably faith This reprint appeared in 1766. The reputation wh Steevens thus acquired led, no doubt, to his association Johnson in the edition of Shakspere which appeared 1773 with their joint names. In this edition his assista was of essential service; for he brought to the task of ing Shakspere qualities in which Johnson was deficient more accurate knowledge of early English literature, greater precision in verbal criticism. Neither his chara nor that of the age to which he belonged would have him to any complete conception of Shakspere's excellen but what he professed to do, he did satisfactorily. He lated all the copies diligently; he restored many readi which had been tampered with by his editorial predecess and he judiciously adhered to the old copies, without attem ing to regulate the metre according to the poetical cree his day. In 1778 the second edition by Johnson Steevens appeared, in which Malone had rendered so assistance; but Malone, in 1780, published a supplem containing the doubtful plays and the poems. This appea something like a setting-up on his own account; Steevens, who thought too highly of himself to pay mu respect to others, scarcely forgave this. He and Malo at length became rival editors, each working with v laudable diligence in that species of commentary wh resulted from their antiquarian knowledge; but each w incapable of throwing any new light upon the poet b genial admiration and a philosophical estimate of his w derful performances. Their rivalry, in all probability, ga a new direction to the labours of Steevens. He dedica himself to the production of another edition, in which should cast aside the principles which had guided his form labours. He possessed a more decided and more act mind than Malone; and, with an ill-concealed contempt the plodding diligence of his old fellow-labourer, he we to work to give us a new Shaksperian metre, such as wou satisfy the most precise disciple of the ten-syllable scho He proposed, 'instead of a timid and servile adherence antient copies,' to proceed to the 'expulsion of useless a supernumerary syllables, and an occasional supply of suc as might fortuitously have been omitted.' The edition which this process was perfected was produced in 179 in fifteen vols.; and such was his commendable anxie for its correctness, that he often walked from his hou at Hampstead to his printer's in London, before da break, that he might correct the proof-sheets. His e periment was perfectly successful with a public not ve critical, who were thus presented with what he called ' commodious and pleasant text of Shakespeare.' Th text remained undisputed in its authority till the publica tion of Malone's posthumous edition by Boswell in 1821, i which some attempts were made to adhere to the earl copies; and no popular edition, conducted upon a differen principle, appeared till that of Mr. Knight, in 1838. In h edition of 1793 Steevens made his well-known avowal th he did not reprint the poems of Shakspere, 'because th strongest act of parliament that could be framed would fa to compel readers into their service.' With the exceptio of his various editions of Shakspere, Steevens did not appl himself to any extensive work. He assisted Nichols i his 'Biographical Anecdotes of Hogarth,' and Isaac Ree in the 'Biographia Dramatica.' His ample means put him above the necessity of literary labour. But his leisure wa amply filled up by a system of excitement, which was no calculated to add to his happiness or his reputation. H had the command, which his acuteness and sarcastic powe might easily secure, of a newspaper and a review; and th 'St. James's Chronicle' and the 'Critical Review' were made the vehicles of the bitterest attacks upon the literary characters of those to whom in private he was all smiles and courtesy. In some satirical verses, as malignant as his own paragraphs, and rather coarser, we have this character of him (Nichols's *Literary Anecdotes*, viii., 540):—

> 'Mark the old beau's grimaces, his smirk and palaver;
> Mark his crest and fine folds, but beware of his *slaver*.'

Johnson said of him, in answer to Beauclerk's assertion 'He is very malignant,' 'No, Sir, he is not malignant. He is mischievous, if you will. He would do no man an essential injury; he may indeed love to make sport of people by vexing their vanity.' This, most probably, was the true state of the case. Steevens had no domestic ties, and men were afraid of him. Johnson said, on another occasion, in which there is little doubt he alluded to him, 'Sir, he lives like an outlaw.' His mock praise, his sarcastic politeness, his anonymous ridicule, gratified his sense of power. He had higher abilities and more scholarship than many of the solemn critics who were then busied about our early literature; for then, as it always must be, the small men, who applied themselves to verbal criticism, fancied themselves great (to use Bentley's forcible image) when they were on a giant's shoulders. While Steevens, in his own notes on Shakspere, is making the most profound bows to this man's learning and that man's ingenuity, we can see him winking as it were upon his readers, and whispering, 'what owls!' Amongst other tricks, he set up mock commentators, under the names of Amner and Collins, to perpetrate dirty annotations; and he once signed a bitter attack on Capell, in his own edition, with the name of his timid rival Malone. George Steevens died at Hampstead, in January, 1800; and was buried at Poplar, where his memory is graced by one of Flaxman's monuments.

STE'FANO (called *Fiorentino*) was born at Florence in 1301. Though his most celebrated works, in the church of Ara Coele at Rome, Santo Spirito at Florence, and elsewhere, are no more, he deserves to be mentioned as a disciple of Giotto, and the only one who attempted something beyond the mere imitation of his master, whom, according to Vasari, he excelled in every department of the art. He was Giotto's grandson, by a daughter named Caterina. He was the first who attempted foreshortening, and if he did not completely succeed in this, he certainly made improvements in perspective, and gave new variety of character and life to his heads. No authenticated picture of his remains in Tuscany, 'unless,' says Fuseli, 'we except a Madonna, in the Campo Santo of Pisa, undoubtedly in a greater style than the works of his master, but retouched.

STE'FANO, TOMMASO DE, supposed to have been the son and pupil of the preceding, was called Giottino, from the resemblance of his works to those of Giotto. A Pietà, at S. Remigi at Florence, and some frescoes of his at Assisi, bear indisputable marks of that style.

STE'FFANI, AGOSTI'NO, an Italian composer of great eminence in the seventeenth century, was born, about the year 1650, at Castello Franco. In his youth he was entered a chorister at St. Mark's, Venice, where a German nobleman, pleased with his singing and appearance, obtained his discharge from the church, took him into Bavaria, there bestowed on him a most learned and liberal education, the musical part of it under Ercole Bernabei, and finally, when he had arrived at the proper age, got him ordained, and thenceforward he took the title of *abate*, or abbot, by which he is now commonly known. His ecclesiastical compositions soon became numerous, were much admired, spread his fame, and attracted the notice of Ernest, duke of Brunswick, father to George I. of England, who, though a Protestant, invited the Roman Catholic and clerical musician to Hanover, made him director of his chamber music, and committed to him the management of the opera, then just beginning to raise its head in Germany. But the intrigues of singers at length wearied him of his theatrical and rather incongruous occupation, though not till he had composed several operas, which, translated from Italian into German, were performed at Hamburg from the year 1694 to 1700. These however are forgotten; but his madrigals, motets, and, more especially, his duets, of which Caroline, consort of George II., collected nearly a hundred, are the best known of all his works, and of which it is enough to say, that Handel acknowledged his twelve celebrated duets to have been written in imitation of them.

Steffani was not only a musician but a statesman. He had a considerable share in concerting, with the courts of Vienna and Ratisbon, the scheme for erecting the duchy of Brunswick-Lünenburg into an electorate, for which service the elector assigned him a handsome pension, and Pope Innocent XI. gave him the bishopric of Spiga. In consequence of this he no longer put his name to his compositions, but adopted that of his secretary, Gregorio Piva; and in 1708 relinquished his appointments in Hanover in favour of the, afterwards, great Handel. He died at Frankfort, in the year 1729.

STEIBELT, DANIEL, a celebrated composer for, and performer on, the piano-forte, was born at Berlin, in 1755, where his father was a manufacturer of musical instruments. When a youth, attracting the notice of William III. of Prussia, he was educated at the charge of that monarch, and soon distinguished himself. In his travels he visited Paris and London. In the former city he had the honour to introduce Haydn's *Creation*, and also published many works. In the latter he made a considerable stay, took many pupils, and produced and printed much piano-forte music. He afterwards returned to his native country, and finally settled at St. Petersburg, where he was appointed *maître de chapelle* to the emperor. He there died, in 1823, in distressing circumstances, for he had lived thoughtlessly, to use a very mild epithet. Steibelt may almost be said to have formed a piano-forte school, to which the term *sparkling* may be applied. His best compositions are remarkable for brilliancy, and what we will venture to call picturesque effect, and his execution of them was singularly delicate, animated, and beautiful. He composed also some operas, which were performed in Paris and in St. Petersburg, but these did not survive their author.

STELLA'RIA (from *stella*, a star), the name of a genus of plants belonging to the natural order Caryophylleæ, and the section Alsineæ. The calyx has 5 sepals; the corolla is composed of 5 petals, which are either bifid or bipartite; the stamens are 10 in number; the ovary simple, with indefinite ovules; styles 3, and the fruit a capsule with six valves. There are 67 species of this genus enumerated. Most of them are weeds, which are distributed over all parts of the world. Eight of them are found in Great Britain. In common with the whole order to which they belong, they possess no active properties. Few of them are thought worthy of cultivation, and when planted in gardens they require but little care.

S. Holostea, the greater Stitchwort, is a British species, and is the handsomest plant of the genus. It has a nearly erect stem; lanceolate, acuminated, finely serrated leaves; inversely heart-shaped bifid petals, twice as long as the calyx. It is often planted in gardens as a border flower, for which, on account of its early delicate white flowers, it is well adapted.

S. media is the common chickweed, which is so common and abundant on road-sides and waste places all over Europe. It is characterised by its procumbent stems possessing an alternate line of hairs between each pair of leaves. It has small white flowers, which are open almost all the year. It is frequently eaten as a pot-herb, and small birds are very fond of its seeds.

S. cerastoides, and *scapigera*, the Alpine and many stalked stitchworts, are both of them British plants, and are sometimes cultivated in pots.

STELLA'TÆ, the name of a natural order of plants formed by Ray. The verticillate arrangement of the leaves of the plants of this order gives them a starlike appearance, whence the name. The order is called by Lindley Galiaceæ. [GALIACEÆ.]

STELLENBOSCH. [CAPE OF GOOD HOPE.]

STELLE'RUS, Cuvier's name for a genus of *Herbivorous Cetacea*, *Rytina* of Illiger. [WHALES.]

STE'LLIO, Cuvier's name for a genus of IGUANIANS, under which he arranges the following subgenera:—*Cordylus*, *Stellio*, *Doryphorus*, *Uromastix*, *Agama*, *Trapelus*, *Leiolepis*, *Tropidolepis*, *Leposoma*, Spix (*Tropidosaurus*, Boie), *Calotes*, *Lophyrus*, *Gonocephalus*, *Lyriocephalus*, *Brachylophus*, and *Physignathus*.

Cuvier defines the *Stelliones* to be those Saurians which have, with the general characters of the *Iguanians*, the tail surrounded by rings composed of great scales which are often spiny.

Mr. G. E. Gray places *Stellio* under the family *Agamidæ*, together with the following subgenera, which are included in Cuvier's arrangement:—*Uromastix*, *Agama*, *Trapelus*, *Leiolepis*, *Calotes*, *Lophura*, *Goniocephalus*, *Lyriocephalus*, and *Physignathus*. [AGAMA; REPTILES, SAURIANS.]

STELLIONATE, a word derived from *stellio*, the name of an animal of the lizard kind, mentioned by Pliny (*Hist. Nat.*, l. 3, c. 10), and by Virgil (4 *Geor.*, 243), is a term used in the Roman law to denote all such crimes, in which fraud is an ingredient, as have no special names to distinguish them, and are not defined by any written law. In general, wherever a civil action might be brought on the ground of fraud, there might be a criminal prosecution for stellionate. The term however is chiefly applied to cases where a person sells, exchanges, or transfers to one, property with respect to which he has already entered into a contract with another. It is also applied to cases of pledging another man's property, substituting base for precious metals, dealing in counterfeit or adulterated goods, and generally to the practice of any species of imposture. The punishment of stellionate was of necessity discretionary. Where the criminal was a person of distinction, the ordinary punishment appears to have been temporary banishment and degradation from his rank; and where he belonged to the lower orders, it seems to have been competent to inflict any punishment short of condemnation to work in the mines. (*Dig.*, 47, tit. 20; Hellfeld, *Jurispr. For.*, s. 2067.) The term stellionate is used in the law of Scotland in nearly the same sense as in the Roman law. (Ersk., *Inst.*, 4, tit. 4, s. 79.)

STELLIRIDIANS, M. de Blainville's name for the third order of his *Actinozoaria*, comprehending those radiated animals which are commonly known as *Star-fishes*, or *Sea-Stars*, and may be arranged under the great genus ASTERIAS of Linnæus.

The following is M. de Blainville's definition of the order:—

Body generally depressed, wide, and regularly formed, at its circumference, into angles which are more or less sharp, often prolonged into lobes or rays perfectly similar, covered with a skin more or less sustained by calcareous pieces.

Intestinal Canal provided with a single buccal orifice,[*] unarmed, but surrounded by tentaculiform suckers.

Ovaries radiated and opening at the margin of the mouth.

M. de Blainville remarks that this extremely natural order corresponds almost exactly to the genus *Asterias* of Linnæus; but it has become necessary to add to it the *Encrini*, which the latter author had arranged as species of *Isis*, or *Pennatulæ*.

The character of the order, according to M. de Blainville, rests—

1. On the nature of the skin, which is more or less flexible, although solidified by very diversiform, calcareous pieces, and which present, at the buccal surface, a sort of vertebral disposition serving for locomotion.

2. On the absence of the anus from the intestinal canal, which last is no more than a stomach more or less lobated at its circumference.[†]

3. On the constant termination of the ovaries, disposed in rays, at the circumference of the mouth.

As to the form of the body, M. de Blainville admits that it is often very different, although it is always at least regularly polygonal; in fact, he adds, these angles, which are sometimes very obtuse, can be developed so that in the family of the *Ophiuræ* and *Comatulæ* they become true appendages in the form of long rays, sometimes even divided or dichotomized. This disposition has led to the comparison of these animals with stars.

Geographical Distribution.—Very wide. Few or no seas are without some species of the order.

ORGANIZATION.

Digestive System.—The nutritive apparatus of the Stelliridians is very simple; presenting in most of the family a single orifice destitute of teeth in the centre of the lower surface of the body, performing the functions both of the mouth and the anus; but in some presenting a digestive cavity with an orifice for the evacuation of its contents distinct from that by which the food is taken in. In the catalogue of the Physiological series in the museum of the Royal College of Surgeons in London, there are examples of both these modifications.

Illustrative of the first section, consisting of those star-fishes which have the digestive cavity simple, or without distinction of stomach and intestine, receiving and expelling its contents by the same orifice, we find No. 432. a preparation of a star-fish (*Asterias papposa*, Linn.; *Stella dodecactis*, Link; *Asterias helianthoides*, Pennant; *Stellonia papposa*, Agassiz; and *Solaster papposa*, Forbes). It exhibits the central orifice of the digestive cavity, and a portion of the integument has been reflected on the opposite side of the body, to show the numerous cæca continued from the digestive cavity. No. 433 presents a vertical section of the same species, showing the interior
same cavity. In No. 444 the integument has been re
from the whole of the anterior part of the body
Asterias rubens, Linn. (*Asterias glacialis* and *A*
clathrata, Penn.; *Stellonia rubens*, Ag.; *Uraster*
of the same, Forbes), showing the membranous
tive cavity, containing some small bivalves. N
is a specimen of *Asterias discoidea*, Lam., from whic
rays have been removed, showing the singular and b
fully ramified form of the digestive cavity. The me
nous pouches appear to be given off in two series, are
lated, and strung, as it were, upon a mesentery.

The second modification is shown in No. 435 A,
presents the body of a star-fish (*Alecto glacialis*, L
Here the alimentary canal is continued in a spiral dir
from the central orifice or mouth, and terminates by a
direct orifice or anus, situated at the extremity of a
tube, which projects forwards by the side of the mout

M. de Blainville states that the liver is apparent
rather considerable in the star-fishes; it occupies th
cumference of the stomach, forming bunches or *racem*
espèces de grappes), which are prolonged more or less
the cavity of the appendages when there are any; at
he observes, such is the opinion of Cuvier, who is foll
by Spix and Meckel. Delle Chiaje, on the contrary
gards these organs as a kind of stomachal cæca (and
an opinion seems to be strengthened by the preparat
above noticed), and thinks that the liver is an irregula
gan, situated on the upper part or dome of the stomac
which no other author, according to M. de Blainville, m
mention, and which he himself had not observed.
organ is a racemose little bag of a yellowish-green or yel
colour, and its contents present a similarity to bile bot
the sight and taste.

Food.—The very dilatable mouth and gullet of the s
fishes is admirably adapted for securing the testace
mollusks and other animal substances on which the fan
feed. When the prey is apparently disproportioned to
parts into which it is to be conveyed, the œsophagus
gullet, together with part of the stomach itself, can be p
truded and everted so as to draw the desired food into
cavity by the application of the everted surface to it. Th
the shell-fish is swallowed whole, and specimens still livi
have been taken from the cavity. At other times the jui
of the prey are sucked out, and the exhausted bivalve
left dead with its shell gaping. Not that the old suppo
tion that the star-fish succeeded, in this last mode of feedi
by inserting a ray or finger into the gaping shell, and if
found the bivalve too strong for it, got rid of the difficul
and the ray at once, conscious of its power of reproduci
another, seems to be at all founded in fact. Star-fish
have been detected in the act of sucking the juices of co
chifera through perforations, and also with their mout
applied to the edges of the valves. From the apparent
paralyzed state of the bivalves found in such situations,
has been conjectured that the star-fish introduces some de
leterious secretion within the valves, and thus leaves th
mollusk torpid and deprived of the power of closing i
valves against the attacks of its destroyer. Star-fishes ar
considered, and not without reason, as great enemies t
oyster-beds. [ASTERIAS, vol. ii., p. 515.] But it is not o
living prey alone that the star-fishes feed. They seem t
assist materially in cleansing the sea from dead and decomposing animal matter. A human tooth has been found i
the stomach of a star-fish.

Respiratory System.—Although there does not appea
to be any special organ for respiration in the Stelliridians, the oxygenization of the circulating fluid is extensively provided for by the exposure of the peritoneal cavity, and all the viscera, to the sea-water, which is freely admitted through membranous pipes, which have thence obtained the name of respiratory tubes. 'These,' says Dr. Sharpey, 'communicate at their base with the interior of the body, and are perforated at the summit by an orifice which can be very accurately closed. Most of them are placed in groups or patches, and opposite each group the fibrous membrane, forming the wall of the body, presents on its inside a shallow pit perforated with holes, through which the tubes communicate with the internal cavity. The tubes are formed externally of the superficial layer of the skin, and are lined in the inside by a prolongation of the peritoneal membrane. This membrane lines the parietes of the body, and is reflected over the contained parts; at least it

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[*] *Comatula* (*Alecto*, Leach) is an exception.

[†] But note the exception above alluded to.

covers the stomach and cæca, and probably also the ovaries and vesicles of the feet; opposite the perforated pits it sends prolongations through the holes into the tubes, as may be easily seen on stripping off a portion of it. There can be no doubt that sea-water enters the peritoneal cavity. The animal slowly distends itself with that fluid, and again, but at no stated interval, gives out a portion of it. This is obvious from the fact that the same animal may be seen distended at one time and flaccid at another. Naturalists are generally of opinion that the water enters and issues by the respiratory tubes, and indeed no other orifices have been discovered; we must however freely own that we have never been able actually to observe its passage through these tubes. The peritoneal membrane seems to be the principal seat of respiration; spread over the viscera and the parietes of their containing cavity, and lining the respiratory tubes, it presents a great extent of surface continually in contact with the surrounding medium; and we have found that a beautiful provision exists for maintaining currents of water along the membrane, and thus effecting that constant renovation of the fluid in contact with its surface, which is required in the respiratory process. These currents are produced by means of cilia. Ciliary currents take place also on the external surface of the body, which probably partakes in the process of respiration; we have moreover observed them within the tubular feet, and on the internal surface of the stomach and cæca. In this last situation they are probably subservient to digestion.' (*Cyclopædia of Anatomy and Physiology.*)

Circulating System.—Tiedemann and Delle Chiaje are the authorities from whom a knowledge of the circulating system of the Stelliridians is principally derived; but this part of the organization of these animals is so obscure, that we need not be surprised at the difference which exists in the views of those observers. Thus, the true sanguiferous system is, according to Tiedemann, restricted in a great measure to the alimentary organs and ovaries, and he consequently supposes that the ducts which convey the fluid supplied to the feet, afford nutrition to other parts of the body. In other words, he recognises two distinct systems of nutrient vessels; one a true sanguiferous system, consisting of vessels which carry blood, and the other a set of vessels (those of the feet) conveying a nutritious fluid secreted from the blood.

Delle Chiaje contends that the two orders of vessels above alluded to intercommunicate, and so form but one system.

Dr. Sharpey is disposed to conclude, from his own observations, that the vessels of the feet form a system apart from the blood-vessels, as Tiedemann maintained; but he observes that there is considerable reason to doubt whether, as that author supposes, they serve as the nutritious vessels of the parts in which they run; for, according to Tiedemann's description, it does not appear that they ramify in the tissues. Moreover, Dr. Sharpey adds, their contained liquid does not present the usual characters of blood, or of a fluid adapted to nourish the textures. He admits it to be true that there are floating particles suspended in it, but he states that the clear fluid, when filtered, yields no trace of animal matter, but agrees almost entirely in composition with sea-water. Such, at least, was the result of Dr. Sharpey's examination of it in the *Asterias*; and he proceeds to give an account of the proper sanguiferous system, following Tiedemann as his leading authority, but, at the same time, stating the more material points in which Chiaje differs from him, thus—

'In *Asterias*, a delicate vessel runs along the upper surface of each of the cæca. There are of course ten such vessels in *Asterias aurantiaca* (from which the description is taken), corresponding in number with the cæca. They commence near the extremity of the rays, and, receiving branches from the branches and lobes of the cæca, proceed to the central part of the animal, where they terminate in a circular vessel which runs round the upper part of the body on the internal surface. The circular vessel also receives ten branches from the ovaries, and five from the stomach, which, before joining it, unite into two. The vessels described seem to constitute the venous system, and Tiedemann further supposes that the cæcal and gastric veins convey the chyle or nutritious part of the food from the alimentary organs. The circular vein opens into a vertical canal, which descends along the prominent angle between the two rays, inclosed in the same membranous sheath with the sand canal, and terminates in an inferior circular vessel. The descending canal is dilated in the middle; its comparatively thick, brown-coloured parietes are smooth externally, but reticulated on the inside and composed of interlaced fibres, which Tiedemann found to possess muscular irritability. He accordingly considers this canal as the heart. The inferior circular vessel (which must not be confounded with the circular canal connected with the feet) surrounds the mouth on the outside or inferior surface; it sends out five branches which pass into the interior of the body, and are distributed to the stomach, cæca, and ovaries. Tiedemann regards these branches, with the circular vessel from which they proceed, as arteries, and he thinks it probable that their minute ramifications open into the radicles of the veins, though from their delicacy he has not been able to ascertain the fact by injection. Tiedemann's view of the function of the respective vessels is derived solely from a consideration of their anatomical disposition, and while in the same way it may be inferred that the blood circulates in a direction conformable with this view, it must nevertheless be kept in mind that no direct physiological proof of such a course of the blood has been yet obtained. Besides the vessels described, Tiedemann found yet another circular vessel surrounding the mouth on the under surface, and placed more superficially than the last-mentioned; it is of an orange colour, and sends a branch along each of the rays in the groove which is on the middle of their inferior surface. He could trace no connection between this vessel or its branches and the rest of the vascular system, and he professes himself at a loss to conjecture what may be its function.'

'According to Delle Chiaje, the circular vessel into which the canals of the feet open receives also the veins from the upper surface of the cæca and stomach. The same vessel, which he names the venous sinus, gives out:—1, twenty short *dental* arteries; 2, the *mesaraics* to the under surface of the cæca; 3, five *vertebral* arteries which open into the vesicles of the feet; 4, the *radial* to the under part of each ray; 5, the *dorsal* arteries to the upper part of the ray, which extend their ramifications to the external surface of the body.' (*Cyclopædia of Anatomy and Physiology.*)

Nervous System and Senses.—Professor Owen, in his preface to the third volume of the *Descriptive and Illustrated Catalogue of the Physiological Series of Comparative Anatomy contained in the Museum of the Royal College of Surgeons in London*, remarks that when the nervous system begins to be distinctly eliminated in the form of fibres, it is accompanied by a distinct development of the muscular system; and the digestive canal is provided with a proper contractile tunic, and floats freely in an abdominal cavity. He observes that the nervous fibres in the classes of animals in which they are first discernible proceed from a ganglion or ganglions in the neighbourhood of the mouth, and extend in a radiated or longitudinal direction according to the form of the body, but are not afterwards brought into communication by ganglionic masses.

'The Echinoderms, as the Star-fish and Sea-Urchins,' writes the Professor, 'first present these conditions of the nervous, muscular, and digestive systems. A very gradual transition from the radiated to the elongated form is traceable from this class through the *Holothuriæ* and *Sipunculi* to the cavitary *Entozoa* or *Cælelmintha* (intestinal worms having an abdominal cavity), and thence to the *Epizoa* and *Rotifera*, which make a near approach to the annulose division of the animal kingdom; but at the same time do not possess that structure of the nervous system which is its true characteristic. The four classes of animals, thus distinguished by a common character of the nervous system from the *Acrita* on the one hand, and the *Articulata* on the other, constitute a second division of the animal kingdom, which may be termed *Protoneura*.'

The preparation No. 1292 A, in the series illustrative of the nervous system of the *Nematoneura* is a star-fish (*Asterias papposa*, Lam.) with the membrane removed from the oral surface of the central disk, to show the simple nervous chord surrounding the mouth and distributing filaments to each ray. These filaments run in the interspace of the tubular feet, extending from between the spines which protect the ambulacral grooves. (*Catalogue.*)

Tiedemann, who discovered the nervous system in these animals, describes it in *Asterias aurantiaca* as composed of a delicate white chord surrounding the mouth, in form of a ring immediately on the external side of the circular vessel into which the heart opens, and of filaments arising and diverging from the annular chord opposite to the rays—three filaments for each ray—one running along the under surface in the median line, and appearing to send small branches to the feet; the other two, shorter, passing between the first and second segment of the ray into the interior of the body, and probably distributed over the stomach. No ganglia were discovered by Tiedemann, but minute ganglia have been described by others as existing at the points whence the diverging filaments spring. (Grant's *Comp. Anat.*)

Touch.—All of course agree in assigning the sense of touch to the star-fishes, but many would confine their endowment to that sense. Professor Ehrenberg however, who is a keen and accurate observer, is disposed to think that some of them, at least, are gifted with visual organs under the form of a single red speck at the termination of each ray. These specks had been long noticed, but without any determinate conjecture as to their use in the animal economy, till he, struck by their outward resemblance to the eyes of the *Entomostraca* and *Infusoria*, thought that they might be organs of sight, and he traced the long nerve of the ray up to the extremity, where it enlarges into a sort of ganglion connected with the red speck.

Mr. Rymer Jones, after noticing the nervous system of these animals, thus expresses his dissent from Professor Ehrenberg's views:—

'Such an arrangement can only be looked upon as serving to associate the movements performed by the various parts of the animal, for no portion of these simple nervous threads can be regarded as being peculiarly the seat of sensation or perception. But this inference is not merely deducible from an inspection of the anatomical character of the nerves: it is based upon actual experiment. We have frequently, when examining these animals in a living state—that is, when, with their feet fully developed, they were crawling upon the sides of the vessel in which they were confined—cut off with scissors successive portions of the body so as to expose the visceral cavity; but so far from the rest of the animal appearing to be conscious of the mutilation, not the slightest evidence of suffering was visible: the suckers placed immediately beneath the injured part were invariably retracted; but all the rest, even in the same ray, still continued their action, as though perfectly devoid of participation in any suffering caused by the injury inflicted. Such apathy would indeed seem to be a necessary consequence resulting from the deficiency of any central seat of perception whereunto sensations could be communicated; nevertheless Ehrenberg insists upon the existence of eyes in some species of the star-fish, attributing the function of visual organs to some minute red spots visible at the extremity of each ray, behind each of which he describes the end of the long nerve which runs along the ambulacral groove as expanding into a minute bulb. We must however confess that the proofs adduced in support of such a view of the nature of these spots, appear to us to be anything but satisfactory; and as we have already stated in the first chapter the physiological objections which may be urged against the possibility of any localised organ of sense being coexistent with a strictly nematoneurose condition of the nervous system, they need not be repeated here. The general sense of touch in the *Asteridæ* is extremely delicate, serving not only to enable them to seize and secure prey, but to recognise its presence at some little distance, and thus direct these animals to their food. A person who has been in the habit of fishing with a line in the shallow bays frequented by star-fishes, and observed how frequently a bait is taken and devoured by them, will be disposed to admit this; yet to what are we to attribute this power of perceiving external objects? It would seem most probably due to some modification of the general sensibility of the body, allowing of the perception of impressions in some degree allied to the sense of smell in higher animals, and related in character to the kind of sensation by which we have already seen the *Actiniæ* and other polyps able to appreciate the presence of light, although absolutely devoid of visual organs.' (*General Outline of the Animal Kingdom and Manual of Comparative Anatomy.*)

Mr. Forbes, although he admits that the existence of ganglions in the nervous system of these animals is generally regarded as doubtful, seems, from the frequent recurrence of the terms 'eye' and 'eyelid,' to be of opinion that the specks above alluded to are visual organs. (*History of British Star-fishes and other Animals of the Class Ec dermata.*)

Our own opinion and observation are in favour c views of Ehrenberg; and we think that those who accurately watched the star-fishes which are furnished these specks on the sea-coast will in general be irresi led to the conclusion that the organs, though not eyes i strict sense of the term, serve the purposes of vision fied to the exigences of the animal, enabling it to see avoid objects according to its will. Nor does analogy, i view of the case, present any difficulty. We have on consider that the centre is a head as well as a stoma condition that will hardly be denied to it, and the rays ceeding from it may be viewed as so many antennæ—(those of the snail for example, with their terminal oc points, as in some degree analogous)—with visual dot their extremities. This, at all events, may solve the prob of the destructive visitation of these animals to the ba line, more in unison with the analogies than the supp existence of a general olfactory sense, of whose presence the slightest trace has been observed.

Locomotive System.—The organs of motion in *Stelliridians* are various. The rays themselves are mo able; and in the free Stelliridians aid in the remova the animals from place to place. Thus the common s fish can bend its rays towards the upper or towards lower surface of the centre or disk, and can approxim some whilst it extends others; so that they are widely *di* ricated laterally, and thus facilitate its advance in the wa or its passage through small spaces. In the common st fish these motions are slow, but in *Ophiocoma* they are co paratively rapid, and manifested in active contortions some occasions. According to M. Sars, the young *Asterias Sanguinolenta*, which have four short club-shad appendages or arms at their anterior extremity, move slov but uniformly in a straight line with their fore-arms fo most. Vibratile cilia are supposed to form the movi power in this case: the arms also enable the little anim to creep at a slow pace along the rocks. When the anim is more fully developed (post, p. 15) the power of swi ming ceases.

Tiedemann considers that the power of moving the ra resides in the contractile skin. Meckel states that the are distinct muscles leading between the calcareous plat which form the floor of the rays. Dr. Sharpey has doubt that the motions are partly effected by the skin, b he had himself observed a distinct band of muscular fibr running along the roof of each ray, between the coriaceo skin and peritoneal membrane when it is stript off.

But the principal locomotive organs of the free Stellir dians, as well as of the *Echinodermata* generally, are th membranous tubes which can be protruded at will throug the ambulacral apertures, and which have been termed th feet. The clearest description of this complicated and i some degree obscure apparatus known to us is that by D Sharpey; and we therefore give it in his own words.

'These,' writes Dr. Sharpey, treating of the membranou tubes or feet,' are very numerous, and are usually dispose in regular rows: they contain a clear fluid, which is con veyed to them by a peculiar system of vessels. Each foot consists of two parts, an internal and generally vesicula portion placed within the body, and a tubular part on the outside, projecting from the surface, and continues with the first through an aperture in the skin or shell. The tube is closed at the extremity, and terminates there in a sucker, which has usually the form of a disk slightly depressed in the centre. Both parts of the foot are evidently muscular, the fibres of the tubular portion being disposed in a circular and longitudinal layer; the cavity is lined with a transparent membrane, and the tubular part moreover receives an external covering from the epidermis. The foot is extended by the contraction of its internal vesicle, which forces the fluid into the tube; or when a vesicle is wanting, by the projection of a fluid into the tube from a communicating vessel. The tubular part is thus distended and elongated it retracts itself of course by its muscular fibres; and when this takes place, the fluid is forced back again into the vesicular or internal part. In progression the animal extends a few of its feet in the direction in which it desires to go, attaches the suckers to rocks, stones, or other fixed objects immediately in advance; then shortening its feet, it draws its body in the wished-for direction. In the star-fish the feet are disposed in rows along the under surface of the rays, diminishing in size as they approach the extremity. There are usually two simple rows in each ray, and the vesicular part is for the most part deeply cleft into two lobes, as in *Asterias aurantiaca*. In other cases, as *Asterias rubens*, there are two double rows in every ray, and each foot has a round undivided vesicle. The canals or vessels which convey the fluid to and from the feet are all connected with a circular vessel situated in the vicinity of the mouth. This vessel lies immediately within the calcareous ring already described as connecting the rays at the commencement; from it a straight canal proceeds along the floor of each ray in the median line, and in its progress gives off lateral branches, which open into the vesicles of the feet. There are moreover connected with the circular vessel—First, a certain number of bodies (ten in five-rayed species), which Tiedemann compares to glands; they are very small, brown, sacculated organs, each opening by a small orifice into the circular vessel: Tiedemann supposes them to be the source from which the fluid filling the feet is derived.—Secondly, pyriform sacs: in *A. aurantiaca* there are four groups of these; and each group consists of three or four sacs, which open by a common tubular pedicle into the circular vessel. In some other species there are five simple sacs. They are muscular, and Tiedemann conceives them to be the chief agents by which the fluid is forced into the vesicles of the feet, to which they are placed in a sort of antagonism. It would seem however that this purpose may be accomplished by other means; for, according to Meckel's statement, and, we may add, our own observation, they are not present in all species.—Lastly, the circular vessel receives the singular organ named the stone-canal or sand canal by Tiedemann, who describes it as a membranous canal containing a friable mass of sandy or earthy matter, which commences by a wide origin on the inferior or internal surface of the calcareous disk already described as situate on the upper part of the body, descends in a duplicature of fibrous membrane, and opens by a narrow orifice into the circular vessel, the upper or wide end being closed by the disk. Ehrenberg has correctly remarked that this organ is not filled with an amorphous mass of earthy or cretaceous matter: he describes it as exhibiting a dense network of calcareous fibres, with hexagonal and pentagonal meshes, resembling, in some respects, the cavernous structure of the penis. The result of our own examination, in more than one species, is different still. We have always found the earthy matter forming a jointed calcareous tube. This tube, which is about the thickness of a surgeon's probe, is composed of rings of calcareous substance connected by membrane, so that viewed externally it is not unlike the windpipe of a small animal. On cutting it across however it is found to be more complex in structure than appears externally; for it contains within two convoluted laminæ of the same nature as its calcareous parietes. These laminæ are rolled longitudinally: they rise conjointly, or as one, from the internal surface of the tube, pass inwardly a certain way, then separating, are rolled in opposite directions, something after the same manner as the inferior turbinated bone of the ox. These internal laminæ become more convoluted towards the upper end, where at last they, as well as the more external part of the tube, join the dorsal disk, appearing gradually to become continuous with its substance. The disk is perforated with numerous pores, which open into the tube. Tiedemann conceives the function of the sand-canal to be that of secreting the earthy matter required for the growth of the calcareous skeleton. Meckel considered this view as very improbable, and the description we have given does not tend to corroborate it. We must confess ourselves unable to offer more than mere conjecture as to the use of this singular structure. If the fluid contained in the feet and their vessels be sea-water (either pure, or with an admixture of organic particles), which is probable from its chemical composition, may it not be introduced, and perhaps again discharged, through the pores of the disk and the calcareous tube, the porous disk serving as a sort of filter to exclude impurities?' (*Cyclopædia of Anat. and Physiol.*)

Generative System.—The generation of the Stelliridians appears to be monœcious, of that nature which Professor Owen terms *Cryptandrous Hermaphroditism.* Ovaries are, as far as we are aware, the only organs relating to the generative functions hitherto discovered; but Fabricius, in his *Fauna Groenlandica*, would seem to affirm that two individuals are necessary for the propagation of the species, and states that the coition takes place in the month of May—'congreditur oribus arctè connexis, altera supina.' The ovaries, which appear to vary in number in different species, form, in general, an oblong cluster of tubes branching from a single stem, by which the whole is attached, and ending in circular dilated vesicles. In some species, *Asterias aurantiaca*, for instance, the tubes form numerous bundles (about 20), each of which is distinctly attached, so that they are not all connected by a single stem. In the museum of the College of Surgeons (London), No. 2236 is a portion of a star-fish (*Asterias rubens*, Lam.) prepared to show the ovaria, ten in number, attached on each side of the base of each ray, near the angle of divergence; the ova are not developed in this specimen. No. 2237 exhibits an *Asterias papposa*, Lam., with the anterior parietes of one ray, and the posterior parietes of another ray, dissected off, showing the ovaria with the ova at the commencement of their development. The ovaria are two in number in each ray, as in the preceding species, and are similarly attached on each side of the base of the ray, where they may be distinguished from the digestive and locomotive cæca by their greater opacity and granular structure. No. 2238 is the same species with the posterior parietes of the central disk removed, showing the commencement of the digestive cæca and the ovaries. No. 2239 is a portion of one of the rays of *Comatula solaris*, Lam., showing the ovarian receptacles occupying the inner side of each of the pinnæ, or articulate processes sent off from the rays. Three of the receptacles are laid open to expose the contained ova. (*Catalogue, Physiol. Series.*)

M. Sars states that the young of *Asterias Sanguinolenta* immediately after birth have a depressed and rounded body with four very short club-shaped appendages or arms at their anterior extremity, as above stated. When they are a little more developed, papillæ disposed in five radiating rows on the upper surface may be distinguished. At the expiration of twelve days, the five rays of the body, which up to that time had been rounded, begin to increase; and at the conclusion of eight days more, the two ranges of feet or tentacula are developed under each ray, and assist in the locomotion of the animal by alternate elongation and contraction, and performing the office of suckers.

Skeleton and Dermal Envelopement.—The integuments of a star-fish are—1, a leather-like tough membrane in which portions of calcareous matter, which may be termed the skeleton of the animal, are imbedded; 2, an external membrane of a softer texture; 3, certain appendages. 'The calcareous pieces,' writes Dr. Sharpey, *loc. cit.*, 'form inferiorly a ring round the mouth and a series of transverse segments placed in succession along the floor of each ray. The first of these segments is connected with the ring; they decrease in size as they approach the point or distal end of the ray, and openings are left between them for the passage of the feet. In the *Asterias rubens*, which has five rays, the central ring consists of ten larger and five smaller pieces, the former disposed in pairs opposite the commencement of the rays, the latter corresponding to the angles between the rays. The segments of the rays are symmetrical; in the species mentioned they consist of two oblong pieces united in the median line, and two smaller ones placed laterally. On the sides of the ray the calcareous substance is disposed, as it were, in ribs; these rise from the floor at first nearly parallel with each other, and are connected by cross bars, but on approaching the upper part or roof of the ray they cross in all directions and form an irregular network, the intervals of which are occupied by softer integument. The ribs and bars are made up of small pieces joined by plane but oblique surfaces, a mode of construction calculated to admit of their being lengthened and shortened upon one another, and thus to allow the cavity they surround being dilated and contracted. A broad calcareous disk is situated on the upper surface of the body, in the angle between two of the rays, which is connected internally with the sand-canal. The calcareous pieces are of a homogeneous structure, without cells or fibres; they consist, according to Hatchett's analysis, of carbonate of lime, with a smaller proportion of phosphate of lime. The coriaceous membrane which connects the pieces of the skeleton is made up of white glistening fibres. It is contractile and irritable, for it slowly shrinks on being scratched with the point of a knife, or when it is cut through. The external membrane is much thinner and softer than that just described; in various parts it is coloured, or in these parts there is a coloured layer underneath it. The appendages or processes on the surface of the body are of three kinds. First, calcareous spines; these are found over the whole surface, except the grooves for the feet. They are attached by a moveable joint at their base to the calcareous pieces of the skin, and are invested by the external soft membrane nearly as far as their point. Those on the upper surface are solitary, short, and for the most part club-shaped, their broader summit being marked with radiating points; whence they were named stelliform processes by Tiedemann. On each side of the groove for the feet, the spines are thickly set; these in *Asterias rubens* have three rows, in the middle and innermost of which they are placed three deep. On this part of the surface they are also longer and pointed. The spines are slowly moved at the will of the animal. The appendages of the second kind are of a very singular nature; they have the appearance of pincers of crab's claws in miniature, and were described by Müller as parasitical animals under the name of *Pedicellaria*. Monro gave the name of antennæ to analogous organs which are found on the sea-urchin. They probably do not exist in all species, for Tiedemann makes no mention of them in his description of *A. aurantiaca*. In *A. rubens* they cover the surface generally, and form dense groups round the spines. Each consists of a soft stem, bearing on its summit, or (when branched) at the point of each branch, a sort of forceps of calcareous matter not unlike a crab's claw, except that the two blades are equal and similar. When the point of a fine needle is introduced between the blades, which are for the most part open in a fresh and vigorous specimen, they instantly close and grasp it with considerable force. The particular use of these prehensile organs is not apparent; their stem, it may be remarked, is quite impervious. The third sort of appendage consists of those which are named the respiratory tubes.' In the other Stelliridians the same general construction of the skeleton may be observed; but the modifications differ with the forms. In some it consists of hundreds of pieces disposed in various patterns, and fitting with the most minute accuracy. In some these pieces are soldered together, as in the calcareous central purse from which the arms of the *Ophiuræ* radiate; and in others they are united by ligaments, as in the rays of these *Ophiuræ*, the *Gorgonocephali*, and the *Encrinites*.

Voluntary dismemberment; and restoration of lost or injured parts.—The sudden and voluntary act of dismemberment by which many of the Stelliridians will save their central disk at the expense of their rays or arms must have struck those who have observed these animals in their native seas, as well as the length of time during which the severed parts still continue to be endowed with motion. This power of dismemberment seems to be carried to its fullest extent in *Ophiocoma* and *Luidia*, and we refer our readers to Mr Forbes's account of the voluntary breaking up of these genera, especially the latter, in his highly interesting *History of British Star-fishes*, &c. above alluded to.

With regard to the power of restoration, few collectors have not come into possession of a specimen with a budding or growing ray occupying the place of a lost one. Such a case is figured in the article ENCRINITES, vol. ix., p. 390. Jussieu, Guettard, and Gerard de Villars brought to Reaumur specimens of star-fish with four large rays and a small one still growing; they found others, he tells us, with only three large rays and two very small ones; and others with two large rays and three very small, and, as it seemed, very young ones. More than once they met with a large ray, from which four young rays had begun to sprout. Reaumur speaks of the fact as being well known to the fishermen, and in allusion to certain experiments which Jussieu and Guettard had been carrying on, he remarks that the portions into which they had divided the animals appeared to go on well, the wounds healed and consolidated; but he adds, that those who made the experiment were obliged to limit their stay on the coast to about fifteen days; too short a period, he observes, to trace the progress of a reproduction which apparently requires several months, or perhaps even more than a year for its completion.

Systematic Arrangement.

Link, in his volume *De Stellis Marinis* (fol., Leipzig), arranges and figures a considerable number of species, in the method of which the outline is here given.

Section I.
De Stellis fissis.
Class 1.
Oligactis (Star-fishes with fewer than five rays)
Genera, *Trisactis*, *Tetractis*.

Class 2.
Pentactinodos (Quinquefid star-fishes).
Genera, *Pentagonaster*, *Pentaceros*, *Astropecten*, *mipes*, *Stella coriacea*, *Sol marinus*, *Pentacdylosaster*.

Class 3.
Polyactinodos (Multifid star-fishes).
Genera, *Hexactis*, *Heptactis*, *Octactis*, *Enneactis*, *cactis*, *Dodecactis*, *Triscaidecactis*.

Section II
De Stellis Integris.
Class 1. Stellarum vermiformium.
Genera, *Stella lumbricalis*, *Stella scolopendroides*.
Class 2. Stellarum crinitorum.
Genera, *Decacnemos*, *Triscaidecacnemos*, *Caput Med*
Class 3. Astrophyton.
Genera, *Arachnoïdes*, *Astrophyton costosum*, *Astroph* *scutatum*.

Linnæus divided his genus *Asterias* into the follov sections:—

1. *Integra.*

Example, *Asterias Luna*, the only species.

2. *Stellatæ.*

This section contained nine species. Example, *Aste* *papposa*.

3. *Radiatæ.*

Containing six species. Examples, *Asterias Ophi* *Ast. Caput Medusæ*, &c.

Position of the genus between *Medusa* and *Echinus*.

Gmelin arranged the genus in three sections also, ret ing the names of Linnæus for the two last; but alte that of the first, under which he includes four species *Lunatæ*.

Position of the genus, between *Physsophora* and *Echi*

Lamarck, who, according to M. de Blainville, 'a sui peu près les erremens de Link dans la distribution tematique des Stellérides,' arranged them as the section or family of the *Echinodermatous Radiata*, separated them into the genera *Comatula*, *Euryale*, *Ophi* and *Asterias*.

The number of recent species of *Comatula* (*Alecto*, Lea *Antedon*, Frem.) recorded in the last edition of Lamarc nine. From these Agassiz separates *Comatula multirad* for the type of his genus *Comaster*. The same author c siders the *Ganymeda* of Gray to be the isolated disk some species of *Comatula*.

We must here notice *Holopus*, a new genus of the noidean family [ENCRINITES] characterised by M. d'Orbig from the stony skeleton (squelette pierreux) of a spe fished up alive at Martinique and brought home by M. Ra and named by M. d'Orbigny *Holopus Rangii*.

Generic Character.—Animal fixed to the ground b root taking the form of the solid bodies upon which attaches itself. From this root or base springs a foot entire body, which is short, thick, and hollow, contai the viscera, and opening in a mouth, which fulfils at same time the functions of an anus placed in the bottom an irregular cavity formed by the reunion of dichotomo thick stony arms, convex externally, hollowed into gut within, divided into numerous articulations, and furnis alternately along their length with small conical ramul which are strongly compressed. (D'Orb.)

Upon this M. Dujardin remarks that the author, hav seen no more than the stony skeleton, has been only able conjecture the position and structure of the viscera; a that analogy would lead to the supposition that there is distinct anus, as in *Comatula*. The individual describ was about three inches (French) in height.

The genus *Euryale* (*Astrophyton*, Link; *Gorgono* *phalus*, Leach; OPHUIRA, vol. xvi., p. 450) consists of species, from which Agassiz separates such species as *Eur* *ale palmifera* (OPHIURA, loc. cit.) under the generic na of *Tricuster*.

Ophiura is divided by Lamarck into two distinct section 1st, Those species which have the rays rounded or conv on the back. 2nd, Those species which have the r flattened on the back, *i.e.* above as well as below. Th comes a crowd of species under the title of 'Espèces que n'ai point vues.'

We shall presently see that M. de Blainville divides t *Ophiuræ* according to the length and disposition of t spines, without regard to the cylindrical or flattened ch racter of the rays employed by Lamarck.

Agassiz divides the *Ophiuræ* into five sections:—

1. *Ophiura.*

Those species which have the disk very much depressed,[*] the rays simple, scaly, and furnished with very short spines, and embracing or close down upon the rays.

Example, *Ophiuræ texturata, lacertosa*, Lam.

2. *Ophiocoma.*

Those species which differ from the preceding by having very long and moveable spines upon the rays.

Example, *Ophiuræ squamata, echinata*, Lam.

3. *Ophiurella* (*fossil* only).

Those species whose disk is hardly distinct.

Examples, *Ophiuræ carinata*, Münst.; *Egertoni*, Brod. (see post, p. 18).

4. *Acroura* (fossil only).

Differing only from *Ophiura* in having spines on the sides of the rays instead of scales; while the rays themselves are very slender.

Examples, *Ophiura prisca*, Münst., *Acroura Agassiz*, Münst.

5. *Aspidura* (fossil only).

Having the upper surface of the disk covered by a star of ten plates, whilst the rays, which are proportionally stout, are surrounded by imbricated scales. (*Ophiura loricata*, Goldf.)

Asterias is arranged by Lamarck under the following divisions:—

1.

Those species which have the body scutellated. These are numerous, and comprise the genera *Scutaster*, *Plataster*, *Palmaster*, and *Solaster* of De Blainville.

2.

Those which have the body radiated, consisting of numerous species also, and comprising the genera *Solaster* and *Pentaster* of De Blainville.

The *Stelleridæ*, in Lamarck's arrangement, are immediately followed by the *Echinidæ*.

Cuvier makes the *Echinodermes* the first class of zoophytes, and the *Pédicellés* the first order of that class, observing that Linnæus established three genera of them (meaning apparently the three divisions above stated), which are very natural, but numerous enough, and comprise species sufficiently varied to be considered as three families.

Cuvier divides the species into—

1st. *Les Astéries* (*Asterias*, Linn.), commonly called *sea-stars*. He recognises some of the genera of Leach and Lamarck, and observes that the *Encrinites* (*Encrinus*, Guettard) ought to be placed near the *Comatulæ*.

The *Oursins* (*Echinus*, Linn.) immediately follow the sea-stars.

M. de Blainville divides the Stelliridians into three families:—1. Those with a stelliform body; 2, those with a disciform body; 3, those with a cupuliform body.

1. *Asteridians.*

Genus *Asterias*, comprising the following divisions or sub-genera:—

A.

Species whose body is pentagonal, and but little or not at all lobated on its circumference; the angles being fissured (*Les Oreillers*).

Example, *Asterias Luna.*

B.

Pentagonal species: delicate, and, as it were, membranous (*Les Palmastéries—Palmipes* of Link).

C.

Quinquelobated species, which are not articulated on the circumference.

Example, *Asterias minuta*, Linn. (*Pentaceros*, Link; *Asterina*, Nardo.)

D.

Pentagonal species more or less lobated and articulated at their circumference (*Les Scutastéries*, ou *Platastéries*).

Example, *Asterias tessellata.* [Asterias.]

M. de Blainville remarks that the species of this section, many of which exist in the European seas, do not appear to him to have been examined by zoologists with sufficient accuracy; and he thinks that many species have been confounded under the same name.

E.

Species deeply divided into five rays (*Pentastéries*).

*

Triangular, depressed, and articulated on the edges (*Astropecten*, Link; *Crenaster*, Llhuyd).

Example, *Asterias aranciaca*, Linn.

* *

Triangular, rather short, and rounded above.

Example, *Asterias rubens*, Linn. (*Uraster*. Ag.)

* * *

Rays long, strait, and often narrowed at their origin.

Examples, *Asterias variolata*; *Asterias granifera*, Lam.

De Blainville remarks that the species which enter into this section are numerous, but that their distinction is not yet sufficiently established. He is certain, for example, that four species have been confounded under the name of the Fringed Star (*Astérie frangée*). On the other hand, he thinks that those of the last section may have been too greatly multiplied.

F.

Species which are divided into a greater number of rays than five or six. [Solasteries.]

Examples, *Asterias tenuispina*; *Ast. endeca*; *Ast. papposa*.

II. *Asterophidians.*

Genera, *Ophiura*, *Euryale*.

Ophiura

A.

Species the spines of whose rays are very short, and applied upon the latter.

Example, *Ophiura texturata*, Lam.

B.

Species the spines of whose rays are long, and not applied upon the latter.

Example, *Ophiura squamata*, Lam. [Ophiura.]

Euryale.

A.

Species whose rays dichotomize but little, and far from the root.

Example, *Euryale palmifera*, Lam.

B.

Species whose rays divide and dichotomize from the base.

Example, *Euryale scutata.* [Ophiura.]

III.

Asterencrinidians.

1.

Free *Asterencrinidians*. Example, Comatula.

2.

Fixed Asterencrinidians.

Genera, *Encrinus*; *Phytocrinus*[*]; *Pentacrinus*; *Apiocrinites*; *Poteriocrinites*; *Agathocrinites*; *Actinocrinites*; *Rhodocrinites*; *Platycrinites*; *Caryocrinites*; *Marsupites*; *Pentremites*. [Encrinites.]

Agassiz also divides the Stellirideans into three families or principal sections, but he gives them different names.

1st. *Asterians*, consisting of those species which have for their digestive organ a single orifice surrounded by suckers, but deprived of teeth; a madreporiform tubercle on the back between the two posterior rays, and deep furrows occupied by many rows of pedicles, going from the mouth to the extremity of the arms.

2nd. *Ophiurians*, comprising those whose body forms a flattened[†] and distinct disk, to which are annexed more or less elongated, or even ramified rays, deprived of furrows on their lower surface.

3rd. The *Crinoidians*, having two separate, but closely approximated orifices to the intestinal canal; and being for the most part fixed by the dorsal surface, by means of an articulated pedicle.

Before we enumerate the genera into which this zoologist divides *Asterias*, we must notice the division of M. Nardo, who had previously proposed the following:—*Stellaria* (*Ast. aranciaca—Ast. calcitrapa*); *Stellonia* (*Ast. rubens—Ast. glacialis*); *Asterina* (*Ast. exigua—Ast. minuta*); *Anseropoda* (*Ast. membranacea—Ast. rosacea*); *Linkia* (*Ast. lævigata—Ast. variolosa*).

The following is the division of Agassiz.

1. *Asterias* (*Astropecten*, Link; *Crenaster*, Llhuyd; *Pentaster*, Bl.; *Stellaria*, Nardo).

2. *Cœlaster*, Ag., differing from the preceding in having the interior cavity circumscribed by plates disposed like those of the *Echini*, at the summit of which may be perceived a star with ambulacra. A genus approaching the

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[*] N. B. This character must be received with great caution; the disk of those *Ophiuræ* known to us is plumped out, so to speak, when they are alive; though in the dead and dried specimen it is flat.

[*] A young *Comatula*.

[†] See note in opposite column.

Crinoidians in its organization, whilst its general form is that of the true star-fishes. Example, only one species, and that fossil, *C. Couloni*, Ag.

3. *Goniaster*, Ag. (*Scutaster* or *Plataster*, Bl.)

Examples, *Ast. tessellata*, Lam.—*Ast.* equestris, Linn.

4. *Ophidiaster*, Ag. Example, *Ast. ophidiana*, Lam.

5. *Linkia*, Nardo. Example, *Ast. variolata*, Lam.

6. *Stellonia*, Nardo (*Pentaster* in part and *Solaster* in part, Bl.) Examples, *Ast. rubens*; *Ast. glacialis*; *Ast. endeca*; *Ast. papposa*; *Ast. Helianthus*, &c.

7. *Asterina*, Nardo (*Asterias*, sect. C., Bl.; *Pentaceros*, Link). Example, *Ast. minuta*.

8. *Palmipes*, Link (*Palmaster*, Bl.; *Anseropoda*, Nardo). Example, *Ast. membranacea*.

9. *Culcita*, Ag. (*Oreiller*, Bl.) Example, *Ast. discoidea*.

Mr. G. R. Gray makes the *Hypostomuta* the second class of the first section (*Echinodermata*) of his subkingdom *Centroniæ*.

The *Hypostomata* consist of two orders:—1. *Asteroida*; 2. *Ophiurida*.

Asteroida.

Fam. 1. *Asteriadæ*. Genera, *Asterias*; *Heliaster*; *Tonia*.

Fam. 2. *Astropectinidæ*. Genera, *Nauricia*; *Astropecten*; *Luidia*; *Pentulaster*; *Soluster*; *Polyaster*; *Henricia*.

Fam. 3. *Pentaceridæ*. Genera, *Culcita*; *Pentaceros*; *Stellaster*; *Hippoaster*; *Culleaster*; *Goniaster*; *Echinaster*; *Gymnasteria*; *Dactylosaster*; *Stellonia*; *Cribrella*; *Linckia*.

Fam. 4. *Asterinidæ*. Genera, *Palmipes*, *Asterina*.

Ophiurida.

Fam. 1. *Ophiuridæ*. Genera, *Ophiocoma*; *Ophiura*; *Rosula*; *Aspidura*; *Ophiurella*; *Anoura*.

Fam. 2. *Euryalidæ*. Genera, *Astrophyton*; *Euryale*; *Natalia*; *Laspalia*.

The third class is named *Blasteroida*; and consists of one family—*Pentremitidæ*, comprising the genera *Pentremites* and *Orbitremites*.

The fourth class is named *Sphæronoidea*, and comprises the genera *Sphæronites*; *Hemicosmites*, and *Cryptocrinites*.

The fifth class, *Crinoidea*, is divided into four families:

1. *Pentacrinitidæ*. Genera, *Comatula*; *Pentacrinites*, &c.

2. *Apiocrinitidæ*. Genera, *Apiocrinites*, *Holopus*, &c.

3. *Cyathocrinitidæ*. Genera, *Cyathocrinites*; *Marsupites*.

4. *Asterocomidæ*. Genus, *Asterocoma*. (*Cat. Brit. Mus.*, 1840.)

Early in the same year, Müller of Berlin read his paper on the genera of star-fishes to the Berlin Academy, in which the anus or anal pore is employed as characteristic of family distinction. This aperture is described as present in all star-fishes, excepting *Asterias* proper and *Hemichemis*, which, according to Mr. Forbes, seems to be identical with his previously established *Luidia*. 'His genus *Crossaster* also,' says Mr. Forbes, 'is my *Solaster*, published a year before. Several generic names, previously adopted by Agassiz and Nardo, are wantonly changed; thus *Uraster* is turned into *Asterocanthium*, and *Palmipes* into *Asteriscus*, with which he unites *Asterina*. In this paper Müller maintains that one of the five intermediate inferior plates of the *Ophiuridæ* bears a madreporiform tubercle, or rather corresponds to that body, a view which I am not inclined to adopt.'

With regard to *Solaster*, we have seen how long ago *Solastérie* was used by De Blainville; but the practice of wantonly changing names is productive of so much confusion that it cannot be too strongly reprobated. Mr. Forbes admits, as all indeed must, that the generic characters in Müller's papers are excellently drawn up; and no difference of opinion can exist as to the great general value of the memoir.

Of Mr. Gray's arrangement Mr. Forbes says, 'The other memoir to which I must allude is one by Mr. Gray on the Starfishes, which he calls the class *Hypostoma*, and defines somewhat ambiguously, published simultaneously with my two first numbers,* in the *Annals of Natural History*. I am afraid I must censure Mr. Gray for changing names still more than Müller, and with less reason. It is a pity zoologists do not take a lesson from their fellow-labourers in the field of nature, the botanists, in this respect. Mr. Gray has increased the confusion by giving fragments of descriptions instead of genuine and specific characters, probably from carrying too far a laudable desire for brevity. His essay deserves praise however for recording many new foreign habitats of the beautiful animals he catalogues.'

In the same work* Mr. Forbes has arranged the *Echinodermata* in six orders, the three first of which are conversant with the Stelliridians:—

'I. *Pinnigrada. Crinoidea.*—First appearance of cirrhi, springing from brachial membranes, which, with the true arms, form the organs of motion.

'II. *Spinigrada. Ophiuridæ.*—Disappearance of brachial membranes, cirrhi as before; true arms clothed with spines for motion.

'III. *Cirrhigrada.*† *Asteriadæ.*—Arms disappear; body more or less lobed, and lobes channelled beneath for cirrhi, which act as suckers, and are the organs of motion.'

He looks upon the *Echinodermata* and *Arachnodermata* as two parallel groups, and holds it as a law that the divisions of parallel groups should be based on a common principle, (Introduction, p. xiv.)

FOSSIL STELLIRIDIANS.

The number of fossil species of COMATULA given in the last edition of Lamarck is five, including *Comaturella Wagneri*, Münst., which is marked with a? All these are from the lithographic slate of Solenhofen, and all but the last are figured by Goldfuss (*Petref.*); but Agassiz considers the species published by Goldfuss as belonging to different genera. Thus, on *Comatula pectinata*, Goldf., he establishes the genus *Pterocoma*, characterized by its pinnated rays, which are so developed and bifurcated that the disk would seem to be null; whilst he refers the three other species, *Comatulæ tenella*, *pectinata*, and *filiformis* to the genus *Saccoma*, which has the disk in the form of a rounded pouch, on the border of which are articulated five slender rays, simply bifurcated up towards their base and pinnated. The same zoologist views the *Glenotremites paradoxus* of Goldfuss, a fossil from the chalk, as the isolated disk of a species of *Comatula*.

For the fossil ENCRINITES in general, the reader is referred to that article; but we must here advert to the genera *Hypanthocrinites* and *Dimerocrinites*. These Crinoidean genera are established and described by Professor Phillips in Murchison's *Silurian System*, where they are beautifully figured, with other Encrinites, in plates 17 and 18. Both genera are from the Wenlock limestone. Mr. Murchison states that columns and plates of *Crinoidea* occur in all the Silurian formations, from the Upper Ludlow Rock to the base of the Llandeilo flags, and also in the underlying Cambrian Rocks; but he adds that clearly determinable species have as yet been found in the Wenlock limestone only.

M. Hermann von Meyer has lately characterised two new genera of *Encrinites*, viz. *Isocrinus* and *Chelocrinus*.

The last edition of Lamarck records eight fossil species of *Ophiura*, including *Ophiurella*, Ag. (*Ophiura carinata*, Münst.; *Oph. speciosa*, Münst.; *Oph. Milleri*, Phil.; and *Oph. Egertoni*, Brod.): *Acroura*, Ag. (*Oph. prisca*, Münst.); and *Aspidura*, Ag. (*Oph. loricata*, Goldf.). Of these, *Ophiuræ speciosa* and *carinata* are from the lithographic slate of Solenhofen; *O. prisca*, from the muschelkalk of Baireuth; *O. loricata*, from the muschelkalk of Würtemberg; *O Egertoni*, from the lias at Lyme Regis; *O. Milleri*, from the Yorkshire lias; a nameless species from the same locality (Williamson, *Mag. of Nat. Hist.*, 1836); and *O. Agassiz*, from the muschelkalk.

Thirteen species of fossil *Asterias* are given in the last edition of Lamarck from the lias of Coburg and Bamberg, the lias and muschelkalk of Würtemberg, the upper arenaceous beds of the Westphalian Jurassic formation; the Jurassic limestone of Würtemberg and Baireuth; siliceous from the upper beds of the Jurassic limestone of Baireuth; in the Jurassic limestone of Baireuth; the lower oolite, and the Yorkshire lias. Of these, *Asterias tabulata*, Goldf., from the upper argillaceous beds of the Jurassic limestone of Baireuth; *Ast. scutata*, Goldf., siliceous from the upper beds of the same Jurassic limestone; and *Ast. stellifera*, Gold., from that limestone, are only established on detached osseous pieces; and Agassiz suspects that they are the *calices* of unknown Crinoidians.

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* October and November, 1840.

* 'History of British Star fishes,' &c., 8vo., London. 1841.

† See the article, in which this term—De Blainville writes it *Cirrhigrades*—is employed for the order (the 2nd) of *Arachnodermata*, comprising the genera *Velella*, *Rataria*, and *Porpita*.

Dr. Mantell notes two species of *Pentagonaster*, *Semilunatus* being one, in the chalk formation at Lewes.

Mr. Gray has lately established two fossil genera of Starfishes—*Comptonia*, from the Whetstone pits in the green sand of Blackdown; and *Frania*, comprehending the tessellated Star-fishes found in the chalk.

M. Dujardin observes that M. Desmoulins has described (*Act. Soc. Linn. Bord.*, t. v., 1832), under the names of *Asterias poritoïdes*, *A. lævis*, and *A. Adriatica*, the insulated small bones (osselets) of star-fishes (*Asterias*) coming from the tertiary formation; and that the same author gives the names of *A. stratifera*, *A. chilipora*, and *A punctulata* to other *osselets* of *Asterias* found in the chalk formation; but M. Dujardin observes that the characters could only be taken from the very variable form of these osselets, and the more or less smooth, or more or less punctated and granulated, state of their external surface, and consequently they do not appear to M. Dujardin to possess sufficient value. In truth, he adds, as much might be said of many of the species established by Goldfuss, and also of two established by Agassiz under the names of *Goniaster porosus* and *Gon. Couloni*, on some osseous pieces of *Asterias* found in the chalk formation. He adds that it is at least permissible to think that many of the objects studied and classed by MM. Desmoulins and Agassiz ought to be referred to the *Asterias quinqueloba* of Goldfuss, which is also found in the chalk.

STELLI'NI. [Padova (Town).]

STEM, in Botany, is that part of the plant which seeks the light and developes itself in the air, forming its ascending axis, and grows in an opposite direction to the root or descending axis. Although some plants are said to be without stems or roots, this cannot be absolutely true, as all plants develop themselves in two directions, upwards and downwards; the one growth forming the stem, the other the root.

The stem, or ascending axis, is composed of fibrous, spiral, and cellular tissues, arranged in various ways, mostly assuming a cylindrical form, and having a perpendicular direction, and bearing upon it the various parts of the plant. Its form and direction are however subject to much variation in particular cases. In their internal structure stems present three principal modifications characteristic of the three great natural classes into which the vegetable kingdom is divided, viz. exogens, endogens, and acrogens. The stems of exogens are the most complicated in structure: they possess a central pith, and radiating medullary rays filled up with woody tissue, which is deposited in zones of yearly growth, and the whole is covered with an external bark. [Exogens.] The stems of endogens possess no pith or medullary rays or bark, but the same tissues which exist in the exogens are distributed irregularly throughout the mass of the stem. [Endogens.] In their mode of growth they also differ, for whilst the increase of the exogenous stem takes place from the centre towards the circumference, the endogenous stem deposits its tissues from the circumference towards the centre. In acrogens the stem is mostly composed of cellular tissue, and only in a few of the higher orders does it possess a cylindrical form. Of these, the stems of tree-ferns are most conspicuous, which contain, in addition to the cellular tissue, both woody and vascular tissue in their structure. The mode of development of the stem of acrogens is also different from that of the others. 'Instead of its increasing by the deposition of matter originating in the leaves, it appears to be a mere extension of some common vegetating point, which becomes cylindrical and long, when it is capable of being acted upon by the influence of light, as in Ferns, Lycopodiaceæ, &c., which expands irregularly and remains flat and foliaceous in such orders as Hepaticæ and many Algæ, which develops in straggling threads in some of the latter, and which collects these threads into masses of reproductive matter in Fungi.' (Lindley, *Natural System*, p. 395.) Although the character of the stem in the large bulk of the orders will at once point out the class to which they belong, yet there are exceptions, and in many instances the structure of the stem would be no guide to its class. This is particularly seen amongst those orders which grow in damp, marshy, and watery places. Thus *Pilularia*, *Marsilea*, *Isoetes*, and *Salvinia*, amongst acrogens; *Naias*, *Caulinia*, *Zannichella*, *Zostera*, and *Potamogeton* amongst endogens; and *Hippuris*, *Myriophyllum*, *Callitriche*, *Trapa*, and *Ceratophyllum* amongst exogens; have a structure closely resembling each other, from which alone the class to which they belong could not be assigned.

Although the most common direction taken by the stems of exogenous and endogenous plants is vertical, yet a great number of them depart from this course, and on this account, or for some peculiarity of form or function, they have received a variety of distinctions. In some plants the stem or primary ascending axis is never pushed above the surface of the earth, and hence stems thus formed are called *subterraneous*. These stems were mistaken by older botanists for roots, and this error is still frequently committed, but the mode of their growth and their structure will always at once distinguish the subterranean stem from the root. [Root.]

A common form of the subterranean stem is the *tuber*, of which a good example is afforded in the potato. The tuber is in reality only the thickened part of a subterranean stem, as may be easily seen on examining a bunch of these in the common potato. The tuber mostly produces at irregular intervals buds which are called eyes, any one of which, being removed by a knife, is capable of existing, and forming, when planted, an independent plant. Tubers frequently contain amylaceous matter, and on this account are nutritive, and used as articles of food.

The *cormus* is another form of subterranean stem. It is only seen in endogenous plants, forming a dilated basis from whence the leaves and flowers spring. It is often mistaken for a bulb, but differs from that organ in being entirely solid. The crocus, the colchicum, and the arum afford examples of this form of the stem.

The *soboles*, or creeping stem, is a form of the subterranean. It runs along horizontally under the surface of the earth, giving off at intervals roots and buds. It is frequently called a creeping root. The best example is the couch or spear grass. It is on account of the facility this kind of stem affords to growth, that this weed is so difficult of eradication. Only a small portion left in the earth will be found sufficient to reproduce the plant, which soon rapidly spreads by means of its creeping stems.

Those stems which appear above the surface of the earth are called *aerial*. Of these the following forms are commonly distinguished:—The *root-stock*, or *rhizoma*, is a prostrate hardened stem, scarcely distinguishable from the roots, giving off branches or young plants. It is seen in the *Aspidium Filix mas*, *Pteris aquilina*, *Juncus effusus*, *Iris germanica*, *Nymphæa alba*, *Gratiola officinalis*, &c. The *surculus*, or *Sucker*, 'is a branch which proceeds from the neck of a plant beneath the surface, and becomes erect as soon as it emerges from the earth, immediately producing leaves and branches, and subsequently roots from its base.' (Lindley.) This term has been very variously used by botanists, but the above definition expresses its most frequent and legitimate application. Link uses the word *soboles* synonymously with it. The *stole* is only a modification of the sucker. The *runner* (*sarmentum*, *flagellum*) is a long slender stem, running upon the ground and forming at its extremity roots and a young plant. This is seen in the strawberry. In Orchidaceæ, the leaves and flowers are developed from the apex of an oblong green body which in its structure resembles a tuber, but it is above ground; this form of stem, peculiar to Orchidaceous plants, is called a *pseudo-bulb*.

The stem, being the primary axis of the plant, necessarily supports all the other organs. The first of these which are developed is the leaves, which grow from a point of the stem called the *node*. These nodes are either opposite each other or alternate on the stem, and the space between them is called an *internode*. The internode is composed of tissues which are arranged parallel in a vertical direction; but when a node is formed, the tissues take a horizontal direction, passing into the leaf at an angle with the stem. At this point the tissues are more or less contracted, from the suspended vertical development, and in some plants this is very evident, as in many Lamiaceous plants, the grasses, and the bamboo. The point of union between the leaf and stem is called the *axil*, and at this point is constantly developed a bud. [Leaf-Bud.] Although in all cases this bud does not come to perfection, it is always a consequence of the existence of a leaf. The consequence of the growth of a bud is the formation of a branch (*ramus*). When the branches are numerous, the smaller ones are called *ramuli*, and a collection of branches forming the head of a forest-tree is called a *coma*.

The functions of the stem are to support the various organs of the plant, to serve as a medium for conveying the sap from the roots to every other part, and to become the depository in many plants of their various secretions.

(For further information see SAP; SECRETIONS, VEGETABLE; ROOT: TISSUES, VEGETABLE.)

STE'MMATOPUS. [SEALS, vol. xxi., p. 164.]

STENCILLING [PAPER-HANGING.]

STENEOSAURUS. [CROCODILE, vol. viii., p. 168.] Professor Owen, in his *Report on British Fossil Reptiles* to the British Association for the advancement of Science, retains the generic name *Steneosaurus* (proposed by Geoffroy St. Hilaire, for the gavial-like crocodilians with subterminal nostrils, but applied by the latter to species with vertebræ of two distinct systems, and altogether rejected by M. Hermann Von Meyer) for that section of the Geoffroyan genus which includes the species with vertebræ concave at both extremities, as in the genus *Teleosaurus*.

Remains of the genus thus circumscribed occur in the Kimmeridge clay at Shotover, and in the great or middle oolite. [STREPTOSPONDYLUS.]

STENO, NICHOLAS, was born in 1638, at Copenhagen, and there also first studied the medical and other sciences. Bartholin was his preceptor in anatomy, and induced him to pursue it with an ardour which was crowned with eminent success. Having left Copenhagen, Steno studied for three years at Leyden, and for two at Paris, and then travelled through the greater part of Germany and Italy. At Florence, Ferdinand II., grand-duke of Tuscany, appointed him his physician in 1667; and Cosmo III., the next duke, retained him in the same post, and made him tutor to his son. In 1669 Steno renounced the Lutheran faith, in which he had been born and educated, but in which his confidence had been shaken during his residence at Paris by Bossuet, and embraced the Roman Catholic religion. Soon after, Frederic III. of Denmark recalled him, but it was not till Christian V., who was more tolerant of Steno's new faith, succeeded, that he was induced to accept the professorship of anatomy at Copenhagen. He held the appointment for only a short time, and then returned to Florence, where, in 1677, giving up the study of anatomy, he took holy orders, and was consecrated bishop of Heliopolis. Soon after, having been invited to the court of Hanover, the pope made him vicar apostolical of the churches in the north, and in this office he remained, devoting himself zealously to his religious duties till 1679, when, a Lutheran prince succeeding to the government of Hanover, he was obliged to quit the country. He retired to Münster, and there and in other parts of Germany he continued sedulously preaching till 1686, when he died at Schwerin in Mecklenburg.

Steno is now known chiefly through the results of his anatomical labours, which, considering the short period occupied in them, were neither few nor unimportant. In his inaugural dissertation, published in 1661, he described accurately the salivary glands and their ducts, and especially that of the parotid gland, which Casserius had regarded as a ligament, and which has since been commonly called Steno's duct, though it had been before his time observed by Gerard Blasius. In another small treatise Steno first described the ducts of the lachrymal gland. His principal work, 'On the Muscles and Glands,' &c., was published in 1664, and contains, among many excellent anatomical descriptions, the first good account of the course of the muscular fibres of the heart, the tongue, and the pharynx, and of the anatomy of the respiratory muscles. It includes also most of his observations on the lymph and lymphatics. In his 'Discourse on the Anatomy of the Brain,' Paris, 1679, Steno speaks of its fibrous structure, and urges the propriety of tracing more carefully than had been hitherto done the course of the nerves into its interior. He wrote also several papers in the 'Acta Hafniensia,' containing some excellent observations on the motions of the heart in living animals, on the nature of the ovaries and the ova of quadrupeds, and on the development of the chick. A brief account of his researches is published in Haller, 'Bibliotheca Anatomica,' tom. i., p. 491.

STENODA'CTYLUS. [GECKO, vol. xi., p. 103.]

STENODERMA, M. Geoffroy's name for a genus of Bats. [CHEIROPTERA, vol. vii., p. 26.]

STENOGRAPHY, or the art of short-writing, is a term compounded of two Greek words, *στενός*, contracted, and *γράφειν*, to write. The invention of stenography among the Greeks is generally assigned to Xenophon the historian; but it is said that the art was first practised by Pythagoras, and that the poet Ennius was the first who adopted a system of short writing by which a person was enabled to follow a speaker. It is said, though upon no very certain testimony, that he commenced by employing eleven hundred marks of his own invention, and increased the number as circumstances required.

There are also writers who ascribe the invention of the art to Cicero; and it was certainly practised by him on account both of its brevity and secresy. He reminds (*Ad. Att.*, xiii. 32) his friend Atticus that he wrote (*διὰ σημείων*) by signs. The art was communicated by Cicero to Tiro, his freedman, who made considerable improvements in it, and is said to have been likewise the first person who applied it to the purpose of taking down public speeches. Eusebius attributes the invention to Tiro. The oration of Cato relative to the Catilinarian conspiracy, was preserved by means of shorthand. We are informed by Plutarch, in his 'Life of Cato' (c. 23), that on the occasion of delivering that speech, 'Cicero dispersed about the senate-house several expert writers whom he had taught to make certain figures, and who did, in little and short strokes, equivalent to words, pen down all he said.' The art was subsequently improved, and stenography became a fashionable accomplishment with the Romans. There is extant a work on the shorthand (*notæ* of the Romans) attributed to Tiro and Seneca, and printed in Gruter's 'Collection of Inscriptions.' Most of the writers of that age allude to the stenographic art in their works. Horace points out its brevity; and Ovid mentions its advantages in point of secrecy. It is also commended by Ausonius, Martial, Manilius, and others. [NOTARY.] The Roman shorthand was very different from our own: the abbreviations, in general, appear to have resembled those adopted in ordinary writing, and which frequently occur in antient manuscripts, as well as in early editions of Latin works. A very large collection of MS. abbreviations is printed at the end of Göschen's edition of Gaius; and specimens of antient Roman stenography are given in Lewis's 'Historical Account of Shorthand.' Some passages in the Roman writers, which have been supposed to refer to shorthand, appear to refer to writing in cipher.

The first English treatise on Stenography was published in 1588, by Dr. Timothy Bright, and dedicated to Queen Elizabeth. It was entitled 'Characterie, or the Art of Short, Swift, and Secret Writing;' and consisted exclusively of arbitrary characters, each of which represented a word. Two years afterwards appeared 'The Writing Schoolmaster,' in three parts, by Peter Bale. This author remarks that 'Brachygraphy, or the art of writing as fast as a man speaketh treatably, may in appearance seem difficult, but it is in effect very easy, containing a many commodities under a few principles: the shortness whereof is attained by memory, the swiftness by practice, the sweetness by industry.' The system of Bale, like that of his predecessor Bright, was formed of arbitrary characters, instead of a combination of elementary marks or signs. Both systems were exceedingly crude, and difficult of attainment; requiring, as they did, for their practical application, a remarkable tenacity of memory; but they displayed great ingenuity as first attempts. The earliest effort to form a regular shorthand alphabet appears to have been made by John Willis, who, in 1602, published 'The Art of Stenographie, or Short Writing, by Spelling Characterie.' The work went through numerous editions. The alphabet was formed of the most difficult and complex characters, which were ill adapted for joining, their formation consuming treble the time required for forming the characters in any of the modern systems of moderate celebrity. Willis was followed by a host of imitators, none of whom however effected any material improvement. In 1618 appeared a treatise upon Stenography by Edmond Willis, which was followed in 1630 by that of Witt; in 1630 by that of Dix; and by a great number of others at short intervals; and, obscure as most of them were, they were ushered into the world with the utmost pomposity and eulogy. That of Rich, published in 1654, was praised by Locke. In 1753 was published the system of Mr. Thomas Gurney, which has since been so very extensively practised by various members of his family and others, in the houses of parliament, the courts of law, &c. Mr. Lewis, in his 'History of Shorthand,' observes, that it proves how the assiduous student of a bad system may outstrip the negligent pupil of a skilful master; as those by whom Gurney's system has been practised could only have attained eminence as shorthand writers by the exercise of the utmost diligence and perseverance.

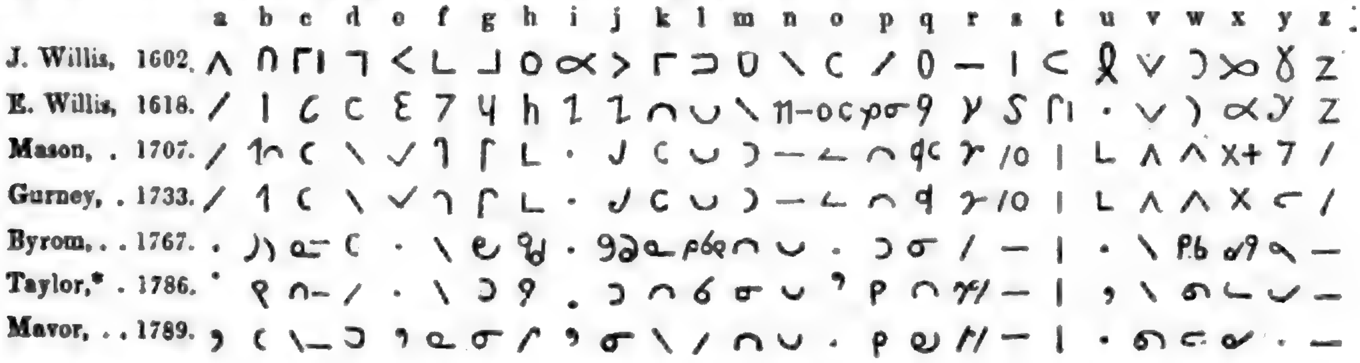
Among the more recent systems, that of Dr. Byrom deservedly occupies a very prominent position. He succeeded in forming an alphabet at once simple, precise, and practicable, as well as in rendering the general details of his theory exceedingly clear and intelligible. His system was incomparably superior to any which had preceded it. Indeed Dr. Mavor (himself the author of a deservedly popular treatise on shorthand) observes, in the introduction to his own work, that 'it is above the reach of human ingenuity to exceed his (Dr. Byrom's) general plan, which must for ever be the basis of every future rational system.' Numerous other writers have also borne their testimony to the merit of Dr. Byrom's plan. Although the treatise was completed by the year 1720, it was not published till 1767, after the author's death, who, as he depended for support principally upon private tuition, obtained an act of parliament for the security of his invention. The doctor, in 1749, printed fifty copies of his work for the use of his particular friends. Since its publication it has been edited by several persons. Mr. Thomas Molineux, of Macclesfield, published an edition which he entitled 'An Introduction to Mr. Byrom's Universal English Shorthand.' It was popular for many years; but its circulation has latterly been much diminished owing to the numerous improved systems which have appeared. Many years after the appearance of Mr. Molineux's book, Mr. William Gawtress of Leeds, then one of the proprietors of the 'Leeds Intelligencer,' published a 'Practical Introduction to Shorthand' upon the general principles of Byrom. This unpretending volume is one of the cheapest and most useful manuals of shorthand which ever appeared. It contains many improvements on the original work.

The system next deserving of notice is that of Taylor, which made its appearance in 1786, and is entitled 'An Essay intended to establish a standard for a universal System of Stenography or Shorthand Writing.' This author's system is superior to that of Byrom in several particulars; but principally in a greater brevity and simplicity of the alphabet, and the facility with which the various characters may be joined to each other; all points of the utmost value and importance. Some useful practical improvements upon Taylor's system have been made in Mr. Harding's treatise on the art.

Dr. Mavor's system, though it obtained considerable popularity, is inferior to that of Taylor, on account of his alphabet requiring a greater number of strokes of the pen, and the characters being more difficult of junction. Since the publication of Dr. Mavor's treatise, many others of various degrees of excellence have been published, most of which are utterly destitute of merit. Those of Richardson and Clive are undoubtedly very ingenious, but they are too difficult of attainment to be generally useful. This is more especially the case with reference to the former. The author claimed for it the merit of enabling a person to write more in one hour than in an hour and a half by any other system before published. His principle is totally different from that of any other writer. He accomplishes his object by means of three horizontal and two perpendicular lines, which are placed at about the same distance from each other as the lines of the musical scale. These five lines furnish him (as he observes) with twenty distinct places or situations, which are called by the names of the different letters of his alphabet; and in writing by this system, the initial letter of every word is invariably omitted; the writer placing his pen on the place which represents that initial letter, from thence proceeds to write the second and subsequent letters of the word. The great exactness necessary in the formation and position of the characters must present an insurmountable obstacle to the general adoption of the system. Where however any person can practise it with the requisite facility, it is undoubtedly the best which ever was invented for the purpose of following a speaker. Mr. Clive's system is founded on a much more moderate application of the line principle than that of Richardson.

The foregoing remarks contain a brief history of stenography in this country; but there is scarcely a country in Europe which has not paid more or less attention to its cultivation.

Those who desire further information as to the history of the art will find much valuable matter in Mr. Lewis's 'Historical Account of Shorthand.' The following alphabets will in some measure illustrate a portion of the foregoing remarks as to the improvements which have from time to time taken place:—


a b c d e f g h i j k l m n o p q r s t u v w x y z
J. Willis, 1602.
E. Willis, 1618.
Mason, . 1707.
Gurney, . 1733.
Byrom, . . 1767.
Taylor,* . 1786.
Mavor, . . 1789.

One experienced shorthand writer at least is now an indispensable auxiliary in the office of every well-conducted journal, and to shorthand writers we owe full reports of the proceedings of parliament, of public meetings, and of the courts of law. The newspaper press has given a powerful stimulus to the cultivation of the art, by affording a respectable livelihood to a numerous body of individuals. In addition to what it has done for the daily and weekly press in particular, shorthand is used for taking down sermons, scientific lectures, and public speeches both in parliament and at the bar. The publication, from the shorthand notes of Sir Henry Cavendish, a member of the 'Unreported Parliament,' as it is termed, which sat from 1768 to 1774, and from which strangers were excluded, is a valuable addition to the political history of the country, which we owe to the art of stenography. The shorthand notes written according to Gurney's system were found amongst the Egerton MSS.

By students of divinity, medicine, law, or others who may wish to preserve the whole or parts of discourses or lectures on scientific or other subjects, shorthand may be studied with great advantage. The art however is not to be acquired without the diligent application of many months, and it also requires considerable manual dexterity, though worthless treatises and travelling teachers of stenography occasionally assert the contrary. The pupil who is deluded in this manner, finding, after he has received the stipulated number of lessons, that he is unable to practise the art, distrusts either his own capabilities for learning, or the assertions of his teacher, and thus abandons the study of the art in despair or disgust.

We shall now give a brief summary of the principles of stenography, according to the system of Taylor, as improved by Harding.

Of the Alphabet.—The vowels are represented by points, a period standing for *a*, *e*, and *i*, and a comma for *o* and *u*. The single consonants of the shorthand alphabet amount only to sixteen, *c* and *z* being rejected as unnecessary, the former having both a hard and a soft sound, similar to *k* and *s*, as in the words 'command' and 'sentence;' *s* is therefore always substituted for *c*, where the letter has a soft sound, and *k* where it has a hard sound: *f* and *v*, being similar in sound, are both represented by the same character. For the same reason, *g* and *j* are represented by one character, as are also *k* and *q*. Characters are also assigned to double consonants, such as *ch*, *sh*, and *th*. These double consonants conduce to both perspicuity and expedition. The vowels are distinguished from each other by their position. For instance, should the period be placed over the top of a consonant, it signifies *a*; if placed against the side, or oppo site the centre of the consonant, it becomes *e*; if placed at the bottom, *i*. The personal pronoun *I* is represented by a mark similar to the top part of a note of admiration. The comma is *o* when placed in the same situation as the dot or period for *a*, and *u* when in the same situation as the dot for *e*. Where vowels have been generally omitted, either through the haste of transcribing remarks on any subject, or for expedition in following a speaker, they ought, where such a course is rendered necessary, to be supplied immediately afterwards, while the subject written is fresh in the recollection of the writer. In all words which have neither incipient, terminative, nor long vowels, no middle vowel should be expressed unless some peculiarity may render it expedient or necessary to deviate from this general rule. A word of more than one syllable, having a long vowel in it, must generally have that vowel expressed, because the long vowel being found in that syllable which is most distinctly heard in pronounciation, affords the greatest help in reading; at the same time, however, when a word of more than one syllable consists of several consonants, even the long vowel may be frequently omitted. The various characters of the alphabet represent, when placed by themselves, a number of small words. For example, the *a* or *an* is written by a dot; *the* and also *and* by a comma, the former being written above the line, and the latter below. The consonant b represents the word *be, by, been*; d, *do, did, done*; f, *off, of, if*; g, *God, give, go, good*; h, *have, he*; k, *know, known*; l, *Lord, all, will*, and so on throughout the alphabet. For the attainment of practical proficiency in the art, it is necessary that the alphabet should be acquired so perfectly as to be written correctly four times in a minute. It is necessary also in this place to explain that *d* and *r*, which in the alphabet appear to be precisely the same in form, are distinguished by the former, when joined to another consonant, being written downwards, and the latter upwards.

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* As improved by Harding in the positions of the vowels.

Of Prepositions and Terminations.—Prepositions and terminations are the letters or signs by which the first and last syllables of words are represented. The whole of the single and double consonants of the alphabet are employed in denoting the beginnings or endings of words; in which situations the letters are not joined to the other part of the word, but placed so close as to show their connection and prevent their being mistaken for separate and independent words. The letter *b* represents the prepositions *abs, obs*, &c.; and the terminations *ble, ible, bly*: the letter *d*, the prepositions *de* and *des*, and the terminations *dom, end, ened*, &c: the letter *f*, the preposition *for* and the termination *ful*; and the other alphabetical characters are appropriated in a similar manner. Besides the consonants, several arbitrary marks are also used to denote the endings of words. In many cases a preposition and a termination together are all that are necessary to represent a word.

Of Arbitraries.—In the system of Taylor very few arbitraries are employed. They do not exceed twenty in number, and may generally be employed with advantage, which is more than can be said of the arbitraries of several other systems. The experienced shorthand writer may readily, and with much benefit to himself, increase the number of these marks as occasion may require. For instance, the individual who acquires the art of writing shorthand for the purpose of its practical application in a court of law, may readily assign arbitrary marks for such technical terms or lengthy words as are of most frequent recurrence. In the same manner the student of medicine or divinity may also form such characters to suit their own peculiar pursuits; and those persons who practise shorthand for a variety of purposes may in like manner adapt them to the several subjects on which they may have occasion to take notes. The great capabilities of arbitrary characters in these respects have not, we believe, been pointed out as they might have been, either by Mr. Harding or any other author into whose system we have looked.

Of the mode of Spelling.—The great aim of shorthand being to represent words by the fewest simple characters possible, all letters which are not distinctly sounded in any word must be omitted, except in cases where their retention may seem necessary. If words are written as they are pronounced, every silent letter will of course be omitted. In following a speaker however it is necessary that all vowels should be omitted, or otherwise it will be impossible to take more than the substance of his remarks. Where however proper names occur, they should either have the vowels inserted or be written in longhand: the latter method is most advantageous, as the names, when so written, serve as rallying-points to the eye in deciphering shorthand notes. Where the vowels are omitted in general writing, the rule is to write such of the consonants as are sounded in the pronunciation of any word.

Of Miscellaneous Modes of Abbreviation.—As in following a speaker all the vowels require to be omitted, and the consonants only written, so all the small words in a sentence are likewise left out. In some cases however, where the speaker is deliberate and the writer is expert, nearly all the words may be expressed. In the abridgement of sentences of course the writer is guided by his own judgment and the necessities of the case. The different tenses and moods of the verbs are generally expressed in the English language by the help of other verbs, as *shall, have, had, can, could, may, must, be*, &c. These being written by their first consonant, may be joined together; but a point should be inserted over the characters, to signify that they are the first letters of words in the sentence. The radical part of a word too may often be sufficient to denote the whole word, as *exp.* for expenses, *pos.* for possible, and so forth. A mode of contraction much used in common writing is to express the first and last consonants of a word, inserting a dash in the middle to show that it is deficient. This plan may be adopted in short-hand writing, or the common letters may be occasionally used. If the characters cannot be distinguished by the plan first pointed out, the termination may be written under the first consonant. The usual abbreviations in longhand can be adopted in shorthand. If a part of a sentence is to be repeated, a line may be drawn under it, and a caret placed where the repetition should be read.

As our object is not to supply a manual by which the art of shorthand may be acquired, but rather to afford some information concerning its leading principles, we have omitted explanations of minor importance.

STENOPS, Illiger's name for a genus of *Prosimii*, his third family of his second order, *Pollicata*, of *Mammalia* including the genera *Loris* and *Nycticebus* of Geoffroy.

Mr. Bennett, in his *Gardens and Menagerie of the Zoological Society*, observes that in an early memoir on the family to which the *Slow-paced Lemur* belongs, M. Geoffroy St. Hilaire divided it for the first time into those minor groups of which it was most obviously composed. But Mr. Bennett remarks that M. Geoffroy has since carried the principle of subdivision to a still greater extent by separating the slow-paced Lemur from the slender Loris, with which he had previously associated it, in order to form from it and some other doubtful species the genus *Nycticebus*. Mr. Bennett cannot perceive any sufficient grounds for thus disuniting two animals so intimately allied to each other, and differing in no more essential characters than the somewhat greater length of the nose and of the limbs in the one than in the other. For this reason Mr. Bennett prefers M. Geoffroy's older arrangement, and proceeds in accordance therewith to describe the Slow-paced Lemur as a species of *Loris*, which he considers to be a well-marked and circumscribed natural genus, differing from the Lemurs of the same author in many highly important characters. Mr. Bennett adds, that it is to be regretted that M. Geoffroy should not have applied the latter name to the species to which it was originally given by Linnæus, and to which alone it is, in Mr. Bennett's opinion, in any degree applicable; the Madagascar animals at present comprehended under it not presenting, he observes, even one of those characters on which Linnæus himself states that his generic name is founded.

'In common with the latter group,' says Mr. Bennett in continuation, 'the genus *Loris* forms part of that division of the Quadrumanous order which is essentially distinguished by an unequal number or irregular disposition of the incisor teeth in the two jaws; terminal nostrils with sinuous openings; and a long subulate or sickle-shaped claw upon the fore-finger of the hinder hands, all the rest of the nails being flat and rounded like those of the greater part of the monkeys and of man. The Loris differs from the other genera of this family in having four incisors in the upper jaw, placed in pairs with a vacant space between, and six in the lower, directed obliquely forwards; canines of moderate size; twelve molars above and ten below; a short rounded head and little or no tail. Sometimes, it would appear, the lateral incisors of the upper jaw, which are always smaller than the others, are either entirely wanting or so minute as not to be easily seen. But M. Geoffroy was enabled to detect them in the identical specimen which Vosmaer had declared not to possess them; and it is by no means improbable that future investigators may ascertain their existence in the stuffed individuals sent from Java by M. Leschenbault, of which M. Geoffroy has made a new species, principally on account of the supposed absence of these teeth. In addition to these primary characters, the Loris are distinguished by large prominent eyes, placed in front of the head and at no great distance from each other; short ears, scarcely rising through the hair with which they are invested; a rough tongue; nostrils projecting beyond the mouth and surrounded by a naked muzzle; and thumbs widely separated from the fingers, both on the fore and hinder hands.'

The species included in the genus *Lemur* of Linnæus are *Lemur tardigradus*, *L. Mongoz*, *L. Macaco*, *L. Catta*, and *L. volans*. The locality assigned to *L. Mongoz*, *L. Macaco*, and *L. Catta*, is Madagascar.

Cuvier arranges under the *Makis* (*Lemur*, Linn.), '*Les Loris*, vulg. *Singes paresseux* (*Stenops*, Ill.) between the *Indris* [Lichanotus, Ill.] and *Galago* [Otolicnus, Ill.]. He states that the Loris have the teeth of the Makis, only that the points of the molars are sharper; a short muzzle (museau court d'un doguin); a slender body; no tail; great approximated eyes; and a rough tongue. Their nourishment, he says, consists of insects, small birds or quadrupeds, sometimes their progression is excessively slow, and their habits nocturnal. Sir Anthony Carlisle, he adds, found at the base of the arteries of the limbs, the same division into small branches as exists in the true sloths. To this part of their organization we shall presently allude more at large. Cuvier remarks, that two species are known, both from the East Indies—'*Le Loris paresseux, ou Le Paresseux de Bengale* (*Lemur tardigradus*, Linn.)' and '*Le Loris grèle* (*Lemur gracilis*);' the latter, he remarks, has the nose more raised by a projection of the intermaxillary bones, and upon this difference of the nose M. Geoffroy has made of the first-named species his genus *Nycticebus* and of the second his genus *Loris*.

M. F. Cuvier assigns the following dentition (that of the Great Galago)—Incisors $\frac{4}{6}$; canines, $\frac{2}{2}$; molars, $\frac{6-6}{5-5} =$ 36—to the small Galago, the Slender Loris, the Cingalese Loris, the Slow-paced Loris or Lemur, and the Dwarf Lemur, with hardly more than very slight exceptions, which are only manifested in the incisors and false molars.

The following are the generic characters of *Loris* and *Nycticebus*, Geoff.:—

Loris: four upper incisors; six lower incisors inclining forwards; head round, eyes very large, limbs very slender, no tail; four mammæ coming from two mammary glands only.[*] The tibia longer than the femur; ears short and hairy.

Dental Formula:—incisors $\frac{4}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{6-6}{5-5} =$ 36.

Species.—1, *Loris grèle*, *Loris gracilis*, Geoff.; *Le Loris*, Buff.; *Le Tardigradus*, Seba. 2, *Loris de Ceylan*; *Loris Ceylonicus*, Fisch.

The locality assigned to both these species is Ceylon; but, according to M. Lesson, neither Geoffroy, Desmarest, nor F. Cuvier admit the second species, regarding it as a simple variety differing hardly at all from *Loris gracilis*.

Nycticebus. Head round, muzzle short, eyes very large, ears short and hairy, a tail more or less long, extremities strong and robust.

$$\text{Dental Formula:—Incisors } \frac{2 \text{ or } 4}{6}\text{; canines } \frac{1-1}{1-1}\text{;}$$

$$\text{molars } \frac{6-6}{5-5}\text{;} = 34 \text{ or } 36.$$

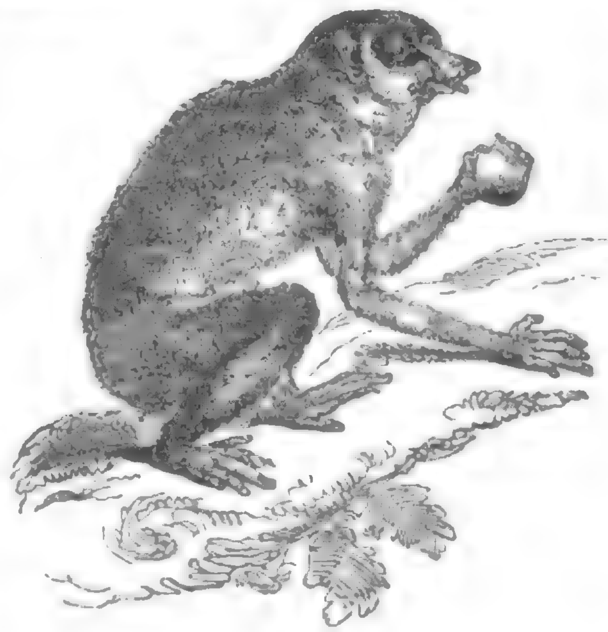
Species, *Nycticebus Bengalensis*; *N. Javanicus*; and *N. Ceylonicus:* all from the East Indies.

We here adopt Mr. Bennett's view of the subject, and take the *Slender Loris* and the *Slow-paced Loris*, or *Slow-paced Lemur*, both of which are confounded by Linnæus under the name of *Lemur tardigradus*, as examples of the genus *Loris*.

We first notice *Loris gracilis*.

Description.—Visage produced and dog-like; forehead high above the nose; ears large, thin, and rounded; body slender and weak; limbs very long and slender; thumb on each foot more distinct, and separate from the toes; on that and the three outmost toes are flat nails; on the interior toe of every foot a crooked claw; no tail; the hair on the body universally short and delicately soft; the colour on the upper part tawny, beneath whitish, space round the eyes dusky; on the head is a dark-shaped spot with the end pointing to the interval between the eyes. Length from the tip of the nose to the anus only eight inches.

Habits, &c.—Pennant, whose description we have given, states that notwithstanding the epithet (tardigradum) given in Seba, who has figured the animal (male and female) in the 35th plate of his first volume, the Slender Lemur is very active, ascending trees most nimbly, and having the actions of an ape. 'If,' says Pennant, 'we credit Seba, the male climbs the trees, and tastes the fruits before it presents them to its mate.' Seba himself observes that the epithet *tardigradum* is misapplied. Others say that it is a melancholy animal, silent and very slow, sleeping in the day and only awaking in the evening, and living on insects, fruits, and eggs.



Loris gracilis.

Loris tardigradus.—The most accurate description known to us is that given by Mr. Bennett, in the work above quoted, and which we here present to our readers in his own words.

'The Slow-paced Lemur is an animal of small size, scarcely equal to that of a cat. The largest individual yet noticed appears to be that seen by Pennant, who states its length at no less than sixteen inches from the nose to the extremity of its back. Its proportions are short and thick-set; and the apparent clumsiness of its form is much increased by the manner in which it usually contracts itself into a kind of ball. Its head is broad, flat, and rounded, with a slightly projecting and pointed muzzle, in which the nostrils are perforated laterally. Its eyes are large and perfectly orbicular, and furnished with transverse pupils capable of being entirely closed during the day, and of being very largely dilated at night; their inner canthus is situated so low towards the nose that the motion of the eyelids appears to take place in a diagonal instead of a horizontal direction. The ears are short, round, widely open, but buried in the fur; and the tail is merely a rudiment of a few lines in length. The hinder limbs are considerably longer than the fore. The whole of the body, with the exception of the muzzle and hands, is thickly invested with long close woolly hair of a deep ashy grey with something of a brownish tinge. A deep brown or chestnut band passes along the middle line of the back, and is accompanied on either side by a faint greyish stripe, expanding on the back of the head into a still lighter patch. The dark middle stripe divides on the head into two branches, each of which is again subdivided, the posterior division passing transversely across the forehead and enclosing the ear, the anterior crossing the eye obliquely and extending to the angle of the mouth. Between the two, above the outer angle of the eye, is a large white spot. Each of the eyes is surrounded by a ring of dusky black, between which a narrow white line passes from the back part of the head to the tip of the nose, which, with the exception of the naked muzzle, is also white. The latter, together with the naked parts of the hands, is of a livid flesh-colour with a tinge of black. On the under surface the fur is of a lighter grey than above.'

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[*] The glands, though apparently confluent, are actually distinct on each side and agree in number with the mammæ.

There are some parts of the *organization* of this animal that require more particular notice.

Sir Anthony Carlisle injected the arterial system of a *Lemur tardigradus*, and upon tracing the course of the vessels, so as to make a dried preparation, which is now in the Museum of the Royal College of Surgeons in London, he found that an unusual appearance of distribution was exhibited by the large trunks of the subclavian and external iliac arteries. He shows that immediately after the subclavian has penetrated the axilla, it is divided into twenty-three equal-sized cylinders, which surround the principal trunk of the artery, here diminished in size to an inconsiderable vessel. These cylindrical arteries, he observes, accompany each other, and divide with the ulnar and radial branches, being distributed in their route upon the muscles, each of which has one of these cylinders. The other branches, for example the radial and ulnar, proceed like the arteries in general, dispersing themselves upon the skin, the membranes, joints, bones, &c., in an arborescent form. The iliac artery, he tells us, divides upon the margin of the pelvis into upwards of twenty equal-sized cylinders, surrounding the main trunk, as described in the axillary artery; these vessels are also finally distributed as in the upper extremity; the cylinders wholly upon the muscles, and the arborescent branches on all the other parts. The cylindrical arteries, he adds, do not divide into equal sized cylinders, but are distributed as in the generality of animals.

Sir Anthony concludes by observing that it would be of some importance in physiology to ascertain whether the other slow-moving quadrupeds have any peculiar arrangement of the arteries of those limbs. This solitary fact, he remarks, is hardly sufficient for the foundation of any theoretical explanation of the slow movement of these muscles: if however it should be corroborated by similar circumstances in other animals, he thinks that a new light may be thrown upon muscular motion, by tracing a connection between the kind of action produced in a muscle, and the condition of its vascularity or supply of blood.

Mr. Baird, in his interesting paper in the *Magazine of Nat. Hist.*, vol. i., 1829, remarks that all the known *Mammalia* close their eyelids in a direction upwards and downwards, and, in general, the upper eyelid is the one possessing the greatest degree of motion. He found however that in his slow-paced Lemur, the eyelids were brought together in a diagonal direction, or outwards and inwards, which gave the animal at the moment of shutting its eyes a most peculiar look. It was the under or outer eyelid that had the greatest degree of motion, the upper or inner one being almost fixed; and he concludes that the *orbicularis oculi* must be very powerful. After the death of the animal, and when Mr. Baird had left this country on a second voyage to India, the eye was dissected by Dr. Knox, who found that the peculiar movement of the eyelids above described did not depend on any peculiar structure, but merely on the greater degree of strength of the orbicularis muscle.

Mr. Baird also observed another peculiarity in the species. 'Beneath the tongue proper,' says he, 'if I may so call it, which is somewhat like that of the cat, though not rough, is another tongue, white-coloured, narrow, and very sharp-pointed, which he projects along with the other one when he eats or drinks, though he has the power of retaining it within his mouth at pleasure.' Mr. Baird however had not been able to see any particular purpose to which he applied it; but he saw him use this double tongue when eating flies, of which he was exceedingly fond, snapping them up most eagerly when presented to him, and catching them himself when they were reposing in the evening upon the walls of the room.

Habits, &c.—Little or nothing certain appears to be known of the habits of the Slow Lemur of Bengal in a state of nature, except as they may be inferred from those which it exhibits in captivity. In this latter state many good observers have narrowly watched it, and have recorded their observations.

Vosmaer received one in June, 1768, and kept it in his chamber. It slept all day to the evening, not waking (it being summer) till half-past eight. It was shut up in an oblong cage, secured with iron bars, and constantly slept sitting on its hinder parts close to the bars, with its head brought forwards between its fore-feet, which were bent against its belly. In this attitude it held on strongly to the wires with its hind feet, and often by one of the anterior feet as well, which induced Vosmaer to think that the animal ordinarily slept in trees attached to the branches. When awakened, it moved very slowly, and always the same from the commencement to the end, dragging itself from bar to bar, grasping one above with its fore foot or rather hand, and not quitting its hold till it had slowly but very powerfully seized another with one of its anterior feet or hands. The same slowness marked its creeping on the ground, along which it dragged one foot after the other, as if it had been paralytic. In this mode of progression it raised its body but very little, so little, that as it dragged itself forward, the belly was frequently not more than the breadth of a finger from the ground. It was vain to attempt to drive it by putting a stick through the bars; for it would not quit its hold, and if pushed too roughly, its only defence was biting the stick. As the evening approached it awaked by degrees, like one whose sleep is broken after long watching. Its first care was to eat, for the day had been dedicated to repose. After its repast, which it dispatched with comparative celerity, the remains of its former meal were evacuated. The fæces were in small pellets like sheep's dung, and the urine had a strong disagreeable odour. The sea-captain who brought it over, stated that it fed on rice boiled very thick, and that it had never been seen to drink.

Vosmaer, impressed with the belief that his animal would not refuse a different sort of food, gave it a leafy lime-tree sprig: this it rejected. Fruits, such as pears and cherries, were more to its taste. It willingly ate dry bread and biscuit; but, if dipped in water, would touch neither. When offered water, it smelt it, but drank not. Eggs were favourite diet. 'Il aimoit à la fureur les œufs,' are the words of Vosmaer, who, concluding from its appetite for eggs that it would eat birds, gave it a live sparrow, which it instantly killed with a bite, and ate the whole very greedily. He gave it a live cockchafer, to try whether it would eat insects: it took the offering in its paw, and devoured it completely. Vosmaer afterwards gave it a chaffinch (pinçon), which it ate with much relish, and afterwards slept for the remainder of the day. He often saw it still awake at two hours past midnight; but from half-past six in the morning its sleep was so sound, that its cage might be cleaned without disturbance to its repose. If forcibly awaked during the day in order to teize it, it was vexed, and bit the stick; but with a very slow motion, repeating the cry *ai, ai, ai*, drawing out the *ai* each time into a plaintive, languid, and trembling note, in the same manner as is reported of the American sloths. When it was thus harassed for a long time, and thoroughly roused, it crawled two or three times round its cage, and then slept again.

The specimen observed by Sir William Jones was a male, as Vosmaer's appears to have been; and Sir William thus gracefully describes its habits:—'In his manners he was for the most part gentle, except in the cold season, when his temper seemed wholly changed; and his creator, who made him so sensible of cold, to which he must often have been exposed even in his native forests, gave him, probably for that reason, his thick fur, which we rarely see on animals in these tropical climates: to me, who not only constantly fed him, but bathed him twice a week in water accommodated to the seasons, and whom he clearly distinguished from others, he was at all times grateful; but when I disturbed him in winter, he was usually indignant, and seemed to reproach me with the uneasiness which he felt, though no possible precautions had been omitted to keep him in a proper degree of warmth. At all times he was pleased with being stroked on the head and throat, and frequently suffered me to touch his extremely sharp teeth; but at all times his temper was quick; and when he was unseasonably disturbed, he expressed a little resentment by an obscure murmur, like that of a squirrel, or a greater degree of displeasure by a peevish cry, especially in winter, when he was often as fierce, on being much importuned, as any beast of the woods. From half an hour after sunrise to half an hour before sunset he slept without intermission, rolled up like a hedgehog; and, as soon as he awoke, he began to prepare himself for the labours of *his* approaching day, licking and dressing himself like a cat, an operation which the flexibility of his neck and limbs enabled him to perform very completely: he was then ready for a slight breakfast, after which he commonly took a short nap; but when the sun was quite set, he recovered all his vivacity. His ordinary food was the sweet fruit of this country; plantains always, and mangoes during the season; but he refused peaches, and was not fond of mulberries, or even of guaiavas: milk he lapped eagerly, but was contented with plain water. In general he was not voracious, but never appeared satiated with grasshoppers, and passed the whole night, while the hot season lasted, in prowling for them: when a grasshopper, or any insect, alighted within his reach, his eyes, which he fixed on his prey, glowed with uncommon fire; and having drawn himself back, to spring on it with greater force, he seized his victim with both his fore-paws, but held it in one of them while he devoured it. For other purposes, and sometimes even for that of holding his food, he used all his paws, indifferently, as hands, and frequently grasped with one of them the higher part of his ample cage, while his three others were severally engaged at the bottom of it; but the posture of which he seemed fondest was to cling with all four of them to the upper wires, his body being inverted; and in the evening he usually stood erect for many minutes, playing on the wires with his fingers, and rapidly moving his body from side to side, as if he had found the utility of exercise in his unnatural state of confinement. A little before day-break, when my early hours gave me frequent opportunities of observing him, he seemed to solicit my attention; and if I presented my finger to him, he licked or nibbled it with great gentleness, but eagerly took fruit when I offered it, though he seldom ate much at his morning repast: when the *day brought back the night*, his eyes lost their lustre and strength, and he composed himself for a slumber of ten or eleven hours. . . . . My little friend was, upon the whole, very engaging; and when he was found lifeless in the same posture in which he would naturally have slept, I consoled myself with believing that he had died without pain, and lived with as much pleasure as he could have enjoyed in a state of captivity.'

Mr. Baird, in the paper above quoted, gives an account of one of these Loris (*loeris*, a clown, Dutch; name in Ceylon, according to that gentleman). Mr. Baird's specimen was a male, and was obtained at Pulo-Penang (Prince of Wales's Island). When Mr. Baird wrote, he had been in possession of the animal upwards of nine months. Its food consisted of fruit and small animals, such as birds and mice. The plantain was the fruit of which he was the most fond, and was the only food Mr. Baird saw him eat when he first got him into his possession. The necks of fresh-killed fowls formed the major part of its sustenance during the voyage. It was particularly fond of small birds: these, when put into his cage, he killed speedily, and, stripping off the feathers, soon devoured them, eating the bones as well as the flesh. Veal was preferred to all other butcher's meat, and it was fond of eggs; meat boiled, or otherwise cooked, it would not touch. Sugar appeared to be grateful to its palate, and it ate gum-arabic. 'As flesh is not always to be had quite fresh (the only state in which it is acceptable to him), he has for some time past been fed upon bread sopped in water, and sprinkled with sugar: this he eats readily, and seems to relish it much. M. Vosmaer mentions that his animal eat dry biscuit, but refused it if moistened with water; neither would it ever taste water. This is completely at variance with the habits of my animal, for he not only eats moistened bread, but laps water like a cat. When food is presented to him, if hungry, he seizes it with both hands, and, letting go with his right, holds it with his left all the time he is eating. Frequently, when feeding, he grasps the bars in the upper part of his cage with his hind paws and hangs inverted, appearing exceedingly intent upon the food he holds fast in the left hand. He is exceedingly fond of oranges;'—in this the animal resembled a domesticated *Lemur albifrons* once in our possession;—'but when they are at all hard, he seems very much puzzled how to extract the juice. I have, upon such an occasion, seen him lie all his length upon his back, in the bottom of his cage, and, firmly grasping the piece of orange with both hands, squeeze the juice into his mouth.' Mr. Baird, after noticing the cry mentioned by Vosmaer and Sir W. Jones, says, 'When the cat annoys him, which she does very frequently by leaping over him, he repeats the cry nearly a dozen times: it is always however expressive of anger. He has also another sort of cry expressive of eagerness to obtain anything: this is much gruffer in sound, not shrill nor loud, but apparently made by forcing the air out of his nostrils. He likes much to be stroked under the chin and throat, and also under the arms, turning his head round to the hand like a cat, and lifting his arm, stretching it out beyond his head. Though not a very sensible animal, he is still evidently capable of feeling kindness and showing resentment. He allows his throat and fore-arms to be stroked, but refuses to let the same liberty be taken with his lower limbs. For some time while in China, a little Chinese dog was his companion, sleeping in the same cage with him; and, with the exception of a few occasional jars, they lived very comfortably together. As the dog grew up however they were separated. A cat, the only animal in the house besides himself, has made many overtures to him, and when he is allowed to get out of his cage, he is followed up and down the room by his feline companion, who evidently wishes to make him her playfellow. Any undue familiarities however on her part are met with an immediate repulse from him; and, one time, when patting him rather incautiously with her foot, he bit her so severely, that she now, though evidently wishing to be on good terms with him, keeps at a safe distance. This same cat has, since this, become more familiar. Though not daring to approach him, she follows him wherever he goes, to his great annoyance, and renders herself an object of his abhorrence. He cries out on her approach, and is sadly tantalised by her playful trick of leaping over him. He seems to be rather a social animal notwithstanding. A large japanned tray attracts a good deal of his attention. Seeing his image reflected in it, he walks before it, and tries to grasp his own image. Finding his efforts ineffectual, he imitates the action of the child, by peeping behind it, with expectation to see the object there. Before a looking-glass he shows the same regard and curiosity.' In most respects, the rest of Mr. Baird's description agrees with those of Vosmaer and Sir W. Jones.

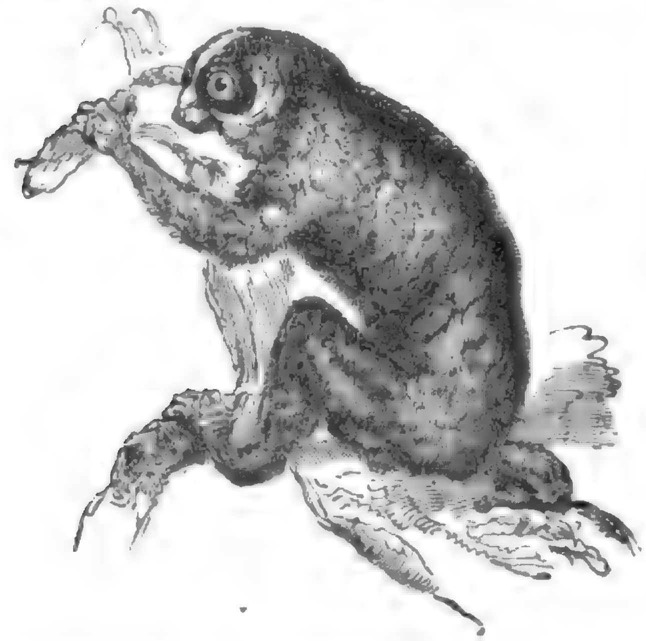
M. d'Obsonville's memoir is very interesting, but offers no differences sufficient to justify the insertion of his account of his specimen at length. The little animal, which enjoyed comparative liberty, being suffered to go at large, appeared to him to be very much attached. He used to caress it after giving it food; and the marks of sensibility upon the part of his favourite were, taking the end of his hand and pressing it to its bosom, fixing, at the same time, its half opened eyes upon his.

One that Pennant saw in London, slept holding fast to the wires of its cage with its claws, as above described, and he states that the inhabitants of Bengal call the animal *Chirmundi Billi*, or *Bashful Billy*. Sir W. Jones says of it, 'The Pandits know little or nothing of the animal: the lower Hindus of this province generally call it Lajjábánar, or the Bashful Ape; and the Mussulmans, retaining the sense of the epithet, give it the absurd appellation of a cat; but it is neither a cat nor bashful; for though a Pandit, who saw my Lemur by day-light, remarked that he was *Lajjálu*, or modest (a word which the Hindus apply to all sensitive plants), yet he only seemed bashful, while in fact he was dimsighted and drowsy; for at night, as you perceive by his figure, he had open eyes, and as much boldness as any of the *Lemures* poetical or Linnean.'

In a state of nature there can be no doubt that its habits are, for the most part, arboreal; and that it takes its prey by night, seizing that which is living, such as small birds, mice, and insects, by surprise, probably whilst they are sleeping; and varying its diet by having recourse to fruits.

Localities.—'As to his country,' says the author last quoted, 'the first of the species that I saw in India was in the district of Tipra, properly Tripura, whither it had been brought, like mine, from the Garrow Mountains; and Dr. Anderson informs me that it is found in the woods on the coast of Coromandel: another has been sent to a member of our society from one of the eastern isles; and though the Loris may be a native of Silán, yet I cannot agree with M. de Buffon that it is the minute, sociable, and docile animal mentioned by Thevenot, which it resembles neither in size nor disposition.'

It has been found in other parts of the peninsula of Hindustan; and in Java, Penang, and Ceylon.



Loris tardigradus.

STE'NOPUS. [SHRIMPS, vol. xxi., p. 425.]

STENORHYNCHUS. [SEALS, vol. xxi., p. 163.]

STEPHANO'MIA. [PHYSOGRADA, vol. xviii., p. 138.]

STE'PHANUS ATHENIENSIS (Στέφανος Ἀθηναῖος), an antient Greek physician, the author of several treatises still extant. Nothing is known of the events of his life, except that (if we may believe the titles of some manuscripts at Vienna) he was a pupil of Theophilus Protospatharius. (Lambec., *Biblioth. Vindob.*, lib. vi., p. 198, 223, 492; lib. vii., p. 352, ed. Kollar.) Neither is it known for certain when he lived, for his having Theophilus for his tutor does not at all help to decide this question, as it is equally difficult to determine the date of the master as of the pupil. G. J. Vossius (*Lib. de Philosoph.*, cap. 13, p. 109, in *Opera*, tom. iii., ed Amst.) and Fabricius (*Biblioth. Gr.*, tom. xii., p. 693) think he is the same as the author who is known by the name of *Stephanus Alexandrinus*, and who dedicated his work *De Chrysopoeia* to the emperor Heraclius (A.D. 610-641); and that he might have been called *Atheniensis* from having been born at Athens, and *Alexandrinus* from having settled at Alexandria. Probably however neither of these great scholars ever saw his works in the original; as Dietz, his editor, notices several words that occur in them, which seem to belong to the eleventh century rather than the seventh (*e.g.* *Ψυχία ἀφράτα*, *Comment in Hippocr. 'Prognost.,'* p. 87; *τζιμβλοί*, *ibid.*, p. 89; *λαγωδάτον κοιμᾶσθαι*, p. 94; *μάγκυπις*, p. 146; *ἀκανίδες*, p. 154; *κλοκίον*, p. 159). The first of his works that we possess is a Commentary on the 'Prognostics' of Hippocrates, which was first published by Dietz (who calls him 'inter Hippocratis interpretes sequioris aetatis facile princeps'), in the first volume of his *Scholia in Hippocratem et Galenum*, Regim. Pruss., 1834. There is also a commentary on the 'Aphorisms' which bears his name, and which in fact agrees word for word with that which is commonly attributed to Theophilus. Some extracts from this are inserted in the second volume of Dietz's collection. His commentary on Galen's *Ad Glauconem de Medendi Methodo*, is said by Fabricius and Choulant (*Handb. der Bücherkunde für die Aeltere Medicin*, Leipzig, 1841) to have been first published at Venice in Greek by Aldus, 1536, 8vo.; but Dietz doubts the existence of this edition. He has himself inserted the commentary in the first volume of his collection mentioned above. It had before appeared several times in a Latin translation by Augustinus Gadaldinus, Venet., 1554, 8vo., Lugd., 1555 and 1558, 8vo. Another of his works was published in a Latin translation by Casp. Wolf, with the title *Alphabetum Empiricum, sive Dioscoridis et Stephani Atheniensis de Remediis Expertis Liber, &c.*, Tiguri, 1581, 8vo. The treatise on fevers, sometimes attributed to Stephanus Atheniensis, is in fact by Palladius. [PALLADIUS, vol. xvii., p. 170.]

The work on Alchemy by Stephanus Alexandrinus consists of nine πράξεις, or *Lectures* (see Fabricius, *Biblioth. Gr.*, tom. xii., p. 695), with the title Στεφάνου Ἀλεξανδρέως, Οἰκουμενικοῦ Φιλοσόφου καὶ Διδασκάλου, Μεγάλης καὶ Ἱερᾶς ταύτης Τέχνης περὶ Χρυσοποιίας Πρᾶξις ἐν Θεῷ πρώτη. It was published in Latin, Patav., 1573, 8vo., by Dominic Pizimentus, together with Democritus, Synesius, and other writers on the same subject. The writer was a Christian, and lived (as was before noticed) in the seventh century. Reinesius (ap. Fabric., *Bibl. Gr.*, tom. xii., p. 757) speaks highly of his work, but notices that he falls into the common error of the Eastern and Greek churches of that age respecting the procession of the Holy Ghost. This was one of the works which Dietz was preparing to edit at the time of his death. (See *Schol. in Hippocr. et Gal.*, Praefat., p. xix.)

It may be mentioned that the father of Alexander Trallianus (Alex. Trall., *De Re Med.*, lib. iv., cap. 1, p. 230, ed. Guint.), and a physician of Edessa, sent by Justinian as ambassador to the Persian king (Procop., *De Bello Pers.*, lib. ii., cap. 26) must not be confounded with the two writers noticed in this article, both of whom probably lived much later.

STE'PHANUS BYZANTI'NUS, a Greek grammarian, the author of a geographical dictionary, the earliest probably ever written. Nothing is known of his life, and his age is uncertain; he is placed by Saxius (*Onomasticon*, i., 520) in the latter part of the fifth century. Of his original work nothing but an abridgement made by Hermolaus, another grammarian, who lived in the time of the emperor Justinian, has come down to us, with the exception of a fragment of the letter Δ beginning with Dyme and ending with Dodona, which was first published from the 'Bibliotheca' of Peter Seguier, by Samuel Tennulius, Amstel., 1669, 4to. A comparison of this portion of the original work with its abridgement will show how much valuable matter has been omitted by Hermolaus. Constantine Porphyrogennetus, in his book 'De Administrando Imperio,' c. 23, 24, and in that on the Themata (lib. 2, *Thema* 6, 9, 10, 12), quotes from Stephanus and gives much fuller extracts than are found in the 'Epitome,' and in one instance cites him by name (*Thema* 9, 'De Sicilia;' see 'Excerpta Constantini Peiresciana,' edit. Henr. Valesius, p. 493; and also *Etymolog. Magnum*, voc. *Σφήκεια*). In the work, as it has come down to us, much of the letter Κ, from ΚΕ to ΚΟ, is wanting, which is known to have existed, according to Scaliger, quoted by Fabricius (*Biblioth. Graec.*, iii. 51, Hamburg, 1717). The latter part is less full than the earlier; from Patræ to Σ little more than the names of places and their adjectives are given; from this letter onwards the extracts become less meagre. In Χ and Ω we have what, from the difference in style, may be considered an uncurtailed transcript of the original; the first nine articles of Χ are abridged in the 'Codex Vratisl.,' like those of the preceding letters, as if the epitomist had desisted suddenly in his undertaking. The difficulty of distinguishing the original material from the possible additions of Hermolaus prevents us from relying with any certainty on several passages in the work which have been thought to refer to Stephanus himself. Under the word Ἀνακτόρεια, he or his abridger speaks of Eugenius, a grammarian (according to Suidas) of the time of the emperor Anastasius; in the article Γότθοι occur the words, 'as has been said by me in the Byzantica;' and under Βήτλεμα (Bethlehem) are expressions, which prove the writer of them to have been a Christian. Westermann, in the preface to his edition of Stephanus (Lips., 1839, 8vo.), is inclined to apply these passages to him rather than to Hermolaus, and his reasons are apparently just. In the Burney MS. 50, 11, 254, British Museum, in a volume entitled 'Vitæ, Mores, et Dicta Patrum Sanctorum, Ordine Alphabetico disposita, ex Johannis Moschi Prato Spirituali aliisque Auctoribus collecta,' is mention of a Stephanus of Byzantium, who is described as one of the scribes or chartularii of Maurianus the General; his great fame is spoken of, and a miraculous scene at his death is described, at which the narrator and Theodosius, bishop of Babylon, are said to have been present. A Count Maurianus lived in the time of the emperor Zeno, A.D. 490 (*Chron. Paschal.*, 261; *Corpus Byzant. Script.*, Venet., 1729); and another was Comes Domesticorum in the time of Honorius (Banduri, *Comment. in Antiq. C. P.*, lib. ii., 477, ibid.), and it is possible that some future discovery may connect the Stephanus mentioned in this passage with the subject of this biography.

Westermann has adopted the title Ethnica (Ἐθνικά), on the authority of Eustathius, instead of that of Περὶ Πόλεων, prefixed to the work by Aldus and others. The editions of Stephanus are Aldi Manutii, Venet., 1502, fol.; F.o rent. ex Juntar. officin., 1521, fol.; Gesner, Basil., 1553, fol.; Xylander, Basil., 1568, fol., cum castigat.; Thomæ de Pinedo, Amstel., 1678, with a Latin translation and useful commentary, and the fragment published by Tennulius. Luc. Holsten., Lugd. Batav., 1684, with many annotations; Abraham Berkel, Lugd. Batav., 1688, fol. This edition was finished by Gronovius, 1694, who republished the fragment with a triple Latin translation in the 7th vol. of the 'Thesaurus Antiq. Græc.' (See Saxii *Onomas.*, and Fabricius, as cited above; also the edition of the latter, Helmstadt, 1774, for some additional remarks.)

The work of Stephanus contains many interesting particulars relative to history and mythology; it treats of towns, nations, and tribes, giving to each proper name its gentilitial adjective. It does not however appear, as some have supposed, that the chief object of the author was to convey grammatical information, and a title to the work, written at the end of the fragment already mentioned, and quoted as proving this, is not considered genuine. The number of authors cited in the fragment makes us the more regret the loss of so valuable a compilation as the whole work must have been. The notices of cities in the 'Epitome,' particularly of those which struck coins, are very useful in the illustration of the local history and topography of the antient world.

STEPHEN, the first Christian martyr, has been supposed, on no very sufficient grounds, to have been one of the 'seventy-two disciples.' It is more likely that he was an Hellenistic Jew, and one of the large body converted on the day of Pentecost by the preaching of St. Peter. He appears to have been a person of some reputation, and was one of the seven deacons chosen to attend to the temporal affairs of the growing church. The Jews, from the different synagogues out of Palestine, exasperated by the defection from their body of so eminent a person as Stephen, lost no opportunity of contending vehemently with him; and ultimately brought him before the Sanhedrim, to give an account of his belief and conduct. In answer, he commenced a fine oration, the object of which appears to have been to open, historically, the true design of the Jewish dispensation, and the consummation of that design in Christ. The object of this discourse has however been disputed; and it was, in fact, not fully developed by the speaker, as he was interrupted by the clamours of the mob, who 'were cut to the heart, and gnashed on him with their teeth.' He was however encouraged by a vision of 'heaven opened,' and of Christ glorified; on declaring which to the people, they rushed upon him, dragged him outside the city, and there stoned him to death, A.D. 33. With his last breath he invoked the pardon of God for his murderers. This was entirely an extrajudicial act, the effect of popular excitement; for the Sanhedrim did not convict him, and had indeed no power to inflict death.

STEPHEN I. was elected bishop of Rome after the death of Lucius, A.D. 253. He was applied to by the Christians of Gaul concerning some differences which they had with Martianus of Arles, who appears to have been unusually austere in matters of discipline. Next came the commotions among the Christians of Spain concerning the two bishops Basilides and Martialis, who were both deposed. Basilides went to Rome, and, it appears, prevailed upon Stephen to take his part; but the Spanish bishops applied to Cyprian of Carthage, who approved of the deposition of Basilides, and caused it to be confirmed by a council held in Africa. A controversy arose between Stephen and Cyprian concerning the baptism of heretics, but the authenticity of the letters of Cyprian and Firmilian concerning this dispute has been disputed by some church historians and critics. Stephen died A.D. 257, but the manner of his death is not clearly ascertained: the 'Acta S. Stephani' are not considered as genuine. Of Stephen's writings we have only fragments of epistles. (Dupin; Walch; Mosheim; Ceillier.)

STEPHEN II. was elected after Zacharias (A.D. 752), but died three days after his election, without being consecrated, for which reason he is generally omitted in the series of the popes.

STEPHEN III., a native of Rome, was elected the successor of Stephen II., and he is styled by many Stephen II. Astolphus, king of the Longobards, having shortly before driven the Byzantines out of Ravenna, and the Exarchate, and Pentapolis, marched towards Rome, in violation of the peace concluded between his predecessors and that see, and having advanced as far as Narni, sent messengers to the pope, requiring the inhabitants of Rome and its duchy to pay him a capitation tax, and acknowledge him for their liege lord, threatening to pillage Rome in case of refusal. Stephen, having applied in vain for assistance to the Eastern emperor Constantine Copronymus, who was at that time busy in breaking images and persecuting image worshippers, had recourse to Pepin, king of the Franks, whose accession to that throne in lieu of the deposed Childeric, the last nominal king of the Merovingian dynasty, had been countenanced and sanctioned by Zacharias, Stephen's predecessor. Pepin sent two legates, to endeavour to prevail upon Astolphus to desist from annoying the pope. Their remonstrations proving useless, pope Stephen determined to repair to France in company with Pepin's legates. Pepin received the pope with the greatest respect, and was crowned and anointed by him in the church of St. Denis, together with his two sons Charles and Carlomann. It was then agreed between Stephen and Pepin that Pepin should oblige Astolphus to evacuate not only the duchy of Rome, but also the Exarchate and Pentapolis, which he had taken from the Byzantines, and that those territories should be made over to St. Peter and the Roman see. Pepin, accompanied by Stephen, marched with an army into Italy, defeated Astolphus, besieged him in Pavia, and obliged him to promise to give up Ravenna with the Exarchate, which embraced the actual provinces called the Papal Legations, and the Pentapolis or present March of Ancona, including Urbino and Pesaro. Astolphus made the promise, and gave hostages to Pepin, who quickly returned to France (A.D. 754). In the following year however, Astolphus, having recruited his forces, marched straight to Rome, to which he laid siege, devastating the country around. Pope Stephen now wrote to Pepin in the most urgent manner, in the name of St. Peter: 'Petrus vocatus Apostolus à Jesu Christo Dei vivi filio: Viris excellentissimis Pipino, Carlo et Carolomanno tribus regibus,' &c., promising them and all the French people eternal life, if they would support the rights of St. Peter's see, but threatening them with eternal perdition if they neglected so to do. These remarkable letters of pope Stephen are in Baronius, Duchesne, and the Codex Carolinus. Pepin quickly repaired to Italy, again defeated Astolphus, who had been obliged to raise the siege of Rome in order to oppose him, and besieged him in Pavia. While Pepin was encamped before that city, an envoy appeared before him, sent by Constantine Copronymus, emperor of the East, who, after praising Pepin for having driven the Longobards out of the Exarchate, demanded its restitution to its former sovereign the emperor. Pepin replied that the Exarchate had belonged to the Longobards by right of conquest, and also by the will of the people, who had given themselves up to king Luitprand, in consequence of the persecution of the images ordered by the Greek emperors; and that now by the same right those provinces belonged to Pepin, who had taken them from the Longobards, and that he had thought it expedient to give them to the pope for the honour and advancement of the Catholic church, and to keep it free both from the heresies of the Greeks and from the ambition and rapacity of the Longobards. (Anastasius *in Vita Stephani III.*) Pepin, having dismissed the envoy with this answer, continued to press the siege of Pavia, and Astolphus was obliged to sue for peace. Pepin required him immediately to deliver to his commissioner Fulrad, abbot of St. Denis, the towns of the Exarchate and Pentapolis, and to cause them to be evacuated by the Longobards. This being done, Fulrad carried the keys of those towns to Rome, and deposited them on the sepulchre of the holy Apostle, together with the solemn deed of donation signed by Pepin, his two sons, and the principal barons and prelates of France. This act of donation is lost, but from some of the expressions, gathered from pope Stephen's letters, it appears that it was made to the blessed Peter, and the holy church of God, and 'to the Roman republic.' The city and duchy of Rome were therefore not included in the donation, as they had not been conquered either by the Longobards or by Pepin. The pope then entrusted the administration of the Exarchate to the archbishop of Ravenna. Some critics, especially French, and Sigonius himself, assume that Pepin gave to the pope only the 'utile dominium' of the Exarchate and Pentapolis, and retained for himself and his successors the 'jus imperii,' or sovereign rights.

Soon after this memorable transaction Astolphus died of an accident while hunting, and Desiderius, king of Tuscany, was chosen by the Longobards for their king. Ratchis, brother of Astolphus, who had formerly abdicated the crown and turned monk, left his convent and aspired again to the throne. Desiderius applied to pope Stephen, who ordered Ratchis to return to his convent. Ratchis obeyed, and Desiderius was acknowledged king. In the following year (April, 757) pope Stephen died, and was succeeded by Paul I. We have of pope Stephen's writings, besides his letters in the Codex Carolinus, his 'Responsa ad Gallos,' in Harduin's 'Concilia.'

STEPHEN IV., styled III. by some, a Sicilian by birth, was elected pope A.D. 768, more than a year after the death of Paul I., during which time one Constantine, a layman, and brother of Toto, duke of Nepi, intruded himself by force on the papal see, having obliged Gregory, bishop of Præneste, to ordain and consecrate him. At last part of the Roman clergy, supported by the Longobard duke of Spoleto, who sent an armed force to Rome, overcame the faction of Constantine, who was deposed, deprived of his eyes, and shut up in a convent, and Stephen was elected. The new pope convoked a council in the Lateran, in which all the abettors of Constantine were degraded. Shortly after, new disturbances broke out in Rome, which induced Desiderius, king of the Longobards, to go thither with some troops. He had several interviews with pope Stephen in the Vatican Basilica outside of the walls, and assisted him in quelling the insurrection, the leaders of which had their eyes put out.

King Pepin being dead, the kingdom of the Franks was divided between his two sons, Charles and Carlomann. Bertha, Pepin's widow, having made a journey into Italy, saw king Desiderius, and arranged with him a matrimonial alliance between two of his daughters and her two sons. Pope Stephen, upon hearing this, wrote to the two kings of the Franks a very violent letter, which is contained in the Codex Carolinus, dissuading them from the proposed alliance, and asserting that it would be 'arrant folly to contaminate their noble legal race with the perfidious and infected race of the Longobards, who had brought leprosy into Italy, and who did not deserve to be reckoned among nations; that having promised to St. Peter to be friends of his friends, and enemies to his enemies, they ought to shun the alliance of the Longobards, who were enemies to Rome,' adding several scriptural passages which he made to bear upon the subject: he concluded by stating that he wrote this letter upon the sepulchre of the holy Apostle, and he threatened them with excommunication if they spurned his advice. The alliance however took place, at least in part; for Charles (afterwards Charlemagne) married Hermengarda, daughter of Desiderius, whom he repudiated a year after, to marry Hildegard, a German princess.

Sergius, archbishop of Ravenna, being dead, the archdeacon Leo was elected his successor; but Mauritius, duke of Rimini, went to Ravenna with an armed force, and violently placed in the archiepiscopal see the archivist Michael, a layman. Pope Stephen refused to consecrate Michael, who, after having stripped the church and treasury of many valuables, at last retired, and made room for Leo. It is said that king Desiderius favoured Michael. Pope Stephen, in the latter part of his pontificate, was at open variance with the king of the Longobards, who kept or recovered possession of Ferrara, Comacchio, and Faenza, which formed part of the long-disputed Exarchate. Pope Stephen died at the beginning of A.D. 772, and was succeeded by Adrian I.

STEPHEN V., a native of Rome, succeeded Leo III., A.D. 816. Shortly after his consecration he went to France to confer with the emperor Louis the Pious, whom he met at Orleans, and who received him with great honour. On his return to Rome, he died in the seventh month of his pontificate. He founded at Rome the monastery of Santa Prassede, which he gave to a congregation of Greek monks, who retained their own liturgy.

STEPHEN VI., a Roman, succeeded Adrian III. in the year 885. He found, on his accession, the Lateran palace stripped of its treasures and other valuables by the relatives and attendants of the late pope, according to the practice of those times. The public granaries were also empty, and the people of Rome were suffering from famine resulting from a bad harvest and from swarms of locusts which had desolated the country. Stephen ordered the fields to be sprinkled with holy water; but at the same time he promised a bounty in money for every measure of dead locusts which the peasants should bring him, and this had the effect of clearing the country of that scourge. He also sold his own property to relieve the poor. Pope Stephen had been consecrated by John, bishop of Pavia, who was one of the Imperial 'missi;' but the emperor Charles the Fat was angry because the new pope had not waited for his approbation, and he sent some of his officers to Rome to arrest him, but Stephen having forwarded the report of his election, made according to the canonical forms, and numerous attestations of both clergy and laity, the emperor was pacified. In the year 887 Charles the Fat was deposed, and his vast monarchy parcelled out. Berengarius, duke of Friuli, was elected by a part of the Italian barons king of Italy; but he found a rival in Guy, duke of Spoleto, who overthrew Berengarius in battle, and was crowned at Rome by the pope, in February, 891, with the title of emperor, 'Wido Imperator Augustus.' Soon after this solemnity pope Stephen died, and was succeeded by Formosus. Pope Stephen is said by Gulielmus Bibliothecarius to have been a man of learning: he collected manuscripts, which he gave to the Basilica of St. Paul.

STEPHEN VII., bishop of Anagni, and a native of Rome, succeeded (A.D. 896) Benedict VI., who had not lived a month after his election, which took place on the death of Formosus. Stephen, from what motive is not clearly ascertained, persecuted with the greatest bitterness the memory of pope Formosus, caused his body to be disinterred and stripped of its pontifical garments, and thrown into a common grave among laymen. He justified himself by the fact that Formosus, before his elevation to the papacy, had been excommunicated by pope John VIII., in consequence of the frequent factious strifes which often broke out at Rome. Stephen also annulled all the acts and decrees of Formosus. This affair of Formosus gave rise to much controversy, which lasted during several successive pontificates; and a contemporary writer called Auxilius wrote in defence of the memory of Formosus, 'De Ordinatione Formosi Libri Duo.' In the year 897 an insurrection of the friends of Formosus broke out at Rome, and pope Stephen was seized, cast into prison, and strangled. He was succeeded by Romanus, who annulled all Stephen's acts as to Formosus.

STEPHEN VIII. succeeded Leo VI., A.D. 928. This was the period when Marozia, and her husband Guido, duke of Tuscany, ruled in Rome. They had put to death pope John X., and are said to have done the same to his successor Leo VI., whose pontificate lasted only seven months. The election of Stephen is supposed therefore to have been effected with their approbation; but we have no historical record concerning the particulars of his pontificate. The tenth century is the truly dark age of Italian history. Stephen VIII., styled by some VII., died in December, 930, and was succeeded by John XI., son of Marozia.

STEPHEN IX. succeeded Leo VII., A.D. 939. Rome was then governed by Alberic, son of Marozia, who assumed the title of 'prince and senator of all the Romans.' Little or nothing is known of Stephen IX.'s pontificate. Martinus Polonus alone, a chronicler of dubious authority, says he was roughly handled by the Romans in a popular tumult, and was crippled for the rest of his life. He died A.D. 942, and was succeeded by Martinus III.

STEPHEN X., styled IX. by some, Cardinal Frederic, abbot of Monte Casino, and brother of Godfrey, duke of Tuscany, succeeded Victor II., A.D. 1057. He had been legate of Leo. IX. to the court of Constantinople, and was learned in controversial divinity. His election is said to have been unanimous. By the advice of the monk Hildebrand (afterwards Gregory VII.), he sent two legates to Milan to enforce the decrees concerning the celibacy of the clergy, which the church of Milan had not yet adopted. This dispute had begun in 1021, at the council of Pavia, and it lasted for nearly half a century. Stephen issued also several bulls against simony, which was prevalent in his time. He sent for the learned Petrus Damianus, who had retired to a secluded cloister, and obliged him to come to Rome under pain of excommunication, and made him cardinal and bishop of Ostia. The pope also visited his former monastery of Monte Casino, in which he enforced a strict discipline. He also issued a bull exempting the clergy from the jurisdiction of the lay courts, and from paying tribute to laymen. From some passages of Leo Ostiensis and other chroniclers it has been surmised that he intended to make his brother Godfrey king of Italy. But the pope fell ill, and died at the beginning of 1058. On his deathbed he recommended the clergy and people to wait for the return of Hildebrand from Germany before they elected his successor, but the advice was not followed, and a schism ensued. [BENEDICT X.; NICHOLAS II.]

STEPHEN, ST., first king of Hungary, son of the Magyar chief Geysa, and Sarolta, the daughter of Gyula, a Hungarian nobleman who had been baptized in Greece, was born about 979, at Gran (*Estragan*, the antient Strigonium).

His father Geysa (Gyözö, *i.e.* Victor), whose fierce and indomitable character the Christian Sarolta had succeeded in softening, allowed Piligrin, bishop of Lorch, to preach the gospel to the Magyars; but these first attempts proved unsuccessful, and it was only at a subsequent period, when Geysa himself was converted, that a few of his countrymen followed his example. The number was however greatly increased upon the arrival in Hungary of St. Adalbert, who advised Geysa to allow Christians to settle there; and in consequence of this permission being granted, a number of Germans and Italians established themselves in the neighbourhood of the capital, Gran. The majority of the Hungarians being however still attached to their gods, persecution as well as other means of conversion were used against them. In the midst of preparations for a powerful attack against his heathen countrymen Geysa died, and Stephen succeeded him in 997.

The legend says that an angel had announced to Geysa the birth of a son, and that St. Stephen, the protomartyr, appeared to Sarolta, and bade her call her offspring after him. The name which he bore before his baptism was Vâik, according to Mailath. Great care was taken by his mother that he should receive a good education; Count Deodatus à San Severino, in Apulia, was appointed his instructor, and St. Adalbert, of Prague, baptized him in 995. Shortly after this he married Gisela, the sister of the emperor Otho III.

The dissatisfied Magyars, though they had hitherto refrained from any acts of violence against the Christians, who enjoyed the powerful protection of Geysa, now began to make open resistance. The youthful inexperience of Stephen, who had scarcely assumed the reins of government, seemed to give them hopes of succeeding in their attempts to check the progress of Christianity and restore their antient religion. Indeed it appears that when Kupan, the count of Simegh, had consented to lead the heathen Magyars, a number of those who had received Christian baptism joined his standard. In addition to this, so wavering was the faith of those who remained with Stephen, that the youthful chief could only rely upon the support of the foreigners. Kupan had assembled all his forces, and marched towards Weszprim, in the neighbourhood of which town Stephen met him. After a desperate battle, in which Kupan lost his life, the victory so decidedly leaned towards the side of the Christians, that the few remaining adherents of the party of Kupan quitted it. For the purpose of securing the possession of his throne, Stephen sent an embassy to Pope Sylvester II., at the head of which was Astricus or Anasbasius, bishop of the newly erected see of Kolotz, who was instructed to obtain the title of king for Stephen. Astricus soon returned with a crown and a deed of the pope, which gave Stephen unlimited power in the ecclesiastical affairs of his country. The coronation took place on the 15th of August, 1000. From the time of his assuming the title of king, the peaceful occupations of Stephen were only interrupted by a few warlike incursions, all of which he successfully repelled.

In 1002 Gyula, his cousin, rebelled against him, and publicly abjured Christianity. After a short campaign he was taken prisoner with his two sons, and Zóltan was appointed governor of Transylvania in his stead. The Bulgarians having assisted Gyula in his rebellion, and threatening to make an incursion into the kingdom, Stephen led an expedition against their chief Kean, and gained a decisive victory over him. The third invasion against Stephen was one conducted by Henry, the son of the emperor Conrad, who had already advanced as far as the Raab with a powerful army. The occasion of this seems to have been a misunderstanding; for after some negociations the army returned without having fought a single battle. These were the only instances in Stephen's long reign which obliged him to have recourse to arms. Indeed his court was so well known for the security which it afforded, that the two English princes Edwin and Edward, who had been exiled by Canute, came over to Hungary and lived under king Stephen's protection. The whole of his attention was given to the firm establishment of Christianity, and no means were neglected by him which could induce the few who still persevered in heathenish practices to adopt it.

He divided Hungary into ten bishoprics, which were plentifully supplied with monasteries built by Greek architects. Schools were also established, the first and best of which was that of St. Gerard, who had been tutor to prince Emeric the king's son. It was afterwards entrusted to the direction of Walter, a monk of Bákony Bél, the fifth monastery founded by Stephen. The country itself being now provided with ecclesiastical and school establishments, a monastery was built at Ravenna for the use of Magyar pilgrims on their way to Rome, where the munificent king had erected a college with a foundation for ten canons, and an inn for his subjects whom the desire of learning might lead to Rome. A large convent in the neighbourhood of Constantinople was the resting-place for Hungarian monks who wished to join their brethren at Jerusalem, and who were entirely supported by the king.

These and many other pious and charitable institutions of St. Stephen, joined to his own exemplary life and precepts, soon rooted out the last remnants of paganism. His constitution, which is undoubtedly the foundation of the present Hungarian government, but of which we have no well authenticated remains, finished the work of civilization which he had begun thirty years before.

At this period of his life, being fifty-one years of age, he lost his son Emeric, who, under the able tuition of Gerard, had all the accomplishments of his time, and was in every respect worthy of his father. Emeric was married to the daughter of Kresimir, king of Croatia, but he died without issue.

Stephen's grief for the loss of his son was increased by the treachery Gisela, who put out the eyes of Vazul, whom Stephen had designed for his successor, in order that her own son Peter might succeed to the throne. These causes of sorrow so affected Stephen's health that they brought on an illness which afflicted him till his death. About this time an attempt was made against his life by a murderer, who was incited by four of the principal men of the court. On the failure of his attempt, the miscreant fell upon his knees and confessed all. Stephen gave a general pardon to all who were concerned in the crime. He died on the 15th of August, 1038 (the day of his coronation) forty-one years after the death of his father. In 1083 his relics were enshrined by St. Ladislaus, in a rich chapel which bears his name, in the church of our Lady of Buda. The 20th of August, the day of the translation of his relics, is kept in Hungary as a festival.

St. Stephen was canonized by Benedict IX.; and pope Innocent XI., in 1686, appointed his festival to be kept on the 2nd of September, the emperor Leopold having on that day recovered Buda from the Turks. (Chartuitius, *Vita S Stephani.*)

STEPHEN II., king of Hungary, son of Koloman, whom he succeeded in 1114, at the age of fourteen. He was of a weak intellect, and unwilling to submit to the judgment of his advisers, but was accustomed to act from the impulse of the moment. This quality gave him the name of 'the Lightning, or 'the Thunderer,' and rendered him odious to his subjects. Soon after his accession to the throne he made war on the Venetians, who could not be reconciled to the loss of Dalmatia, which had been taken from them during the reign of Stephen's father. They sent a fleet, with a considerable army, under the Doge Ordelaf Faledro, who however did not recover this province, the possession of which was of the greatest importance to the republic. The hostilities, which lasted two years, ended with a treaty which secured the mainland of Dalmatia to Stephen, whilst Venice obtained the adjoining islands. This transaction was scarcely concluded, when Stephen went (1116) to meet Wladislaw, the chief of the Bohemians, for the purpose of renewing the treaties of friendship which had long existed between the two countries. Unfortunately, through the treachery of an individual whose name was Solth, the meeting terminated in a quarrel attended with bloodshed; but after a few months the traitor was executed, and the old treaty renewed. The taste for war which Stephen showed throughout his reign, and the eagerness with which he sought every opportunity of satisfying his warlike disposition, countenance the assertions of some writers, that he himself

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was a participator in this dishonourable transaction. In the two following years Stephen invaded Poland and Austria, from which expeditions he derived no material benefit. In 1119 he resolved upon an incursion into Austria, thinking that the great forces which he had assembled, and the apparent carelessness of the empire, would secure his success. But the emperor Leopold, after a decisive battle, in which the Hungarian army was completely beaten and obliged to retreat, pursued them as far as Eisenberg, and compelled Stephen to desist from his incursions.

The bad feeling which such acts had produced in the people was only checked by the great respect for kingly authority; but Stephen at last excited general indignation by filling the country with foreigners, to whom he showed a decided preference. This foolish policy was followed, in 1127, by a war with the grand-duke of Muscovy, Wladimir Monomakh. Yaroslaw, the exiled prince of Wladimir, applied to Stephen for aid. The Hungarian army marched into Russia, and advanced without opposition as far as Wladimir. At this crisis Yaroslaw died, and with his death the cause of the war ceased. But instead of returning, Stephen insisted upon storming the town; and in consequence of his obstinacy, the chief nobles of his army, with Kozma Peznan at their head, declared that if he would not immediately follow them into their own country, they would elect another king, and leave him to the mercy of the Russians. Intimidated by these threats, Stephen returned to Hungary; but his conduct compelled many of those who were concerned in the revolt to fly to Constantinople. Here they were well received by the emperor John II., who, upon Stephen's threatening to invade the empire, sent a powerful army against him, which completely defeated the Hungarians at Uj-Palanka. When peace was restored, Stephen adopted Bela, the son of his relative Amos, who had been obliged to seek protection at the court of Constantinople, and resigned in his favour in 1131. He then entered a monastery, and died at Waradin, in the thirty-first year of his age.

STEPHEN III. was crowned king of Hungary in 1161, under unfavourable circumstances, arising from the influence which the emperor of Constantinople had exercised over Hungary during the reign of his father. Although Stephen had legitimate claims to the throne, and was generally beloved by the Hungarian nobles, the emperor Manuel did not approve of his spirit of independence, and signified to the Hungarians that unless they elected Ladislaus, the brother of the late king, he would invade the country. Ladislaus had been brought up at the Byzantine court, and had the Greek interest much more at heart than the Hungarian. Terrified by the approach of a formidable army, the Hungarian nobles elected Ladislas, who however died in 1161.

STEPHEN IV. On the death of Ladislaus, Stephen IV. was forced upon the Hungarians by the emperor Manuel; but no man could be less acceptable to the Hungarians than the debauched uncle of the unfortunate Stephen III. A revolt soon compelled him to seek refuge at the court of his patron, and the lawful king, Stephen III., was unanimously re-elected. During the usurpation of his uncle, Stephen lived under the protection of the archbishop of Gran, Luke Banfi. Manuel seemed to approve of the newly elected king, and gave his daughter in marriage to Bela, the brother of Stephen, on condition that the prince should live at Constantinople. Stephen agreed to this; but upon the arrival of Bela at Constantinople, the emperor claimed his heritage, which consisted of Dalmatia. Stephen refused to admit his claim; whereupon his uncle, Stephen IV., re-appeared at the instigation of Manuel, and commenced hostilities. He was however defeated in a battle by his nephew, and obliged to fly to Semlin, where he died in 1163. Soon after his death Semlin was taken, the kingdom cleared of the partisans of the Greek cause, and in an expedition into Dalmatia, which was conducted by Stephen himself, in 1165, this province was recovered from the hands of Manuel. But whilst engaged in the western parts of his kingdom, a Greek army appeared in Hungary. Stephen went to meet it; and a decisive battle, in which the Hungarians were defeated, secured the influence of Greece in Hungary. Stephen died in 1173, and was succeeded by his brother Bela III.

STEPHEN V., king of Hungary, succeeded his father Bela in 1270, and began his reign by a war against Ottocar, king of the Bohemians, whom he defeated. A subsequent campaign against the Bulgarians was crowned with success; but the course of his victories was interrupted by his death, which occurred in 1272. This king is sometimes called Stephen IV. by those who do not recognise the usurper of that name

(Thwrocz, *Chronica Hungarorum*; Ranzanus, *Epitome rerum Hungaricarum*; Bonfinius, *Rerum Hungaricarum Decades Quatuor*; Mailáth, *Geschichte der Magyaren*.)

STEPHEN, king of England, born A.D. 1105, was the third of the four sons of Stephen, earl of Blois, by Adela, daughter of William the Conqueror; and was consequently nephew of Henry I., cousin to that king's daughter the empress Matilda, and second cousin to Matilda's son, who became king of England as Henry II. Having been early brought over to England by his uncle Henry I., that king, with whom he became a great favourite, besides bestowing upon him several valuable estates here, made him earl of Mortagne in Normandy. Dr. Lingard says that Stephen 'had earned by his valour in the field of Tenchebrai the Norman earldom of Mortoil' (*Hist. of Eng.*, i. 158). But when the battle of Tenchebrai was fought, in 1106 [HENRY I.], Stephen was only about a twelvemonth old. Henry also procured for him a marriage with Matilda, the daughter and heiress of Eustace, earl of Boulogne (younger brother of the famous Godfrey and Baldwin, kings of Jerusalem), by which he acquired that earldom, and also a new alliance with the royal families both of England and Scotland, for the mother of Matilda of Boulogne was Maria, daughter of Malcolm Canmore, and a younger sister of Henry's queen Matilda (the good queen Maud). As Stephen therefore was the nephew of Henry I., so his wife was the niece of Henry's queen; and by this match the issue of Stephen, as well as the issue of Henry, might boast of inheriting the blood of the old Saxon royal family, as being equally sprung from Malcolm's queen Margaret, the sister of Edgar Atheling, a circumstance by no means without its influence in the contentions of the two lines.

When Henry, after the loss of his son and the failure of issue by his second wife, determined upon securing the succession to the crown for his daughter the empress Matilda, the two individuals upon whom he appears to have principally relied for the support of that arrangement were his natural son Robert, earl of Gloucester, and his nephew Stephen. It is not improbable that both may have meditated the attempt which Stephen actually made, and that, if the crown upon Henry's death had not been seized by him, it might have been clutched at by Gloucester. The notions of that age were by no means so settled in favour of legitimate birth as to have prevented the son of the late king, although illegitimate, from having a fair chance in such a competition against his nephew.

Perhaps Henry himself was not without his fears of one or both. He must have felt at least that the existence of two males so nearly connected with the royal house, and distinguished both for military talent and popular manners, tended to make still more precarious the success of his novel project of a woman-king, a thing opposed to all the notions and habits of the Gothic nations, and (if we except the single instance of a wife of one of the kings of the West Saxons, who is said to have retained the government in her hands for a year after the death of her husband, and then to have been expelled with disdain by the nobles, who would not fight under a woman) unexampled either in England, or in France, or in Normandy, or in the kingdoms of Denmark and Norway, whence the Normans came. At the same time, it was obviously much better for Matilda that she should have two such near male relations than if she had had only one; seeing that, if she had to fear a rival in one of them, she might count with equal certainty upon having a defender in the other. But that which after all gave her her best chance was the circumstance of her having had the good fortune to give birth to a son a few years before her father's death. Indeed she had borne two sons to her second husband before her father died. Had it not been for these lucky accidents, it may be doubted if all her father's provident arrangements would have secured the recognition of Matilda's pretensions for a moment after the throne became vacant. But for the existence of the infant Henry of Anjou, or of his younger brother, at the time of his grandfather's death, the crown might probably have been Stephen's without striking a blow—unless there had ensued a fight for it between him and his cousin Gloucester.

In 1125, immediately after the death of her first husband the emperor Henry V. (whom she was suspected of having made away with), Henry had sent for his daughter to Normandy; and, having the next year brought her over to England, he collected all the chief persons of the realm about him at Windsor while he kept his Christmas, and, having there by presents and promises engaged those among them of greatest influence to support his views, he came to London, and, having proposed the matter in a council consisting of the archbishops, bishops, abbots, earls, and all the thanes, obtained, in the beginning of January, 1127, though not, says Malmesbury, without great and long deliberation, the unanimous promise of the assembly, that if he should die without male issue, they would receive Matilda as his successor. Every individual present who seemed to be of any note—quicunque in eodem concilio alicujus videbatur esse momenti (to adhere to Malmesbury's remarkable expression)—took a solemn oath to that effect; first the archbishop of Canterbury and the other bishops and abbots, then the king of Scotland on account of the fiefs he held of the English crown, then Stephen, earl of Boulogne and Mortagne, then the earl of Gloucester, then the other barons. 'But betwixt the earl of Boulogne and the earl of Gloucester,' says Lord Lyttelton, 'there was a dispute about precedence; not (as I apprehend) which should be foremost to show his zeal for Matilda's succession (though that might be the pretence for it), but to determine a question of the greatest consequence if she should die before the king, namely, which of the two was nearest to the throne. And its being now decided in favour of Stephen, on account of the illegitimacy of his competitor, was of no little service to him afterwards, even against Matilda herself, as he was thereby acknowledged first prince of the blood. It also removed out of the way of Stephen a very considerable obstacle to his ambition, by the discouragement it gave in the eye of the public to the earl of Gloucester's pretensions, who wanted not precedents, either in England or Normandy, to authorise his aspiring to the throne of his father in default of lawful issue male. But a solemn determination, which assigned the precedence to the nephew of the king above his natural son, was a prejudication of the right of succession in favour of the former.' A few months after this Matilda was married to Geoffrey Plantagenet, the son of the earl of Anjou; and in the year 1131, when she was in England, having already quarrelled with her husband, the oath of fealty to her was again taken by the bishops and nobility at a grand council held at Northampton. And two years after, on the birth of Matilda's first son Henry, it was once more renewed, in a council held at Oxford, both to her and to her son.

Nevertheless, as soon as Henry had expired in Normandy, 2nd December, 1135 Stephen, who, as well as Gloucester, had been for some time in attendance on the dying king, instantly set out for England, and taking ship at Whitsand, near Calais, the usual port of embarkation, landed on the coast of Kent. It appears that, foreseeing his uncle's decease, he had already secured the support of a powerful faction of the clergy and nobility, by means of his younger brother Henry, who, having also stood high in the favour of the late king, had been placed by him in the bishopric of Winchester, and had succeeded in winning over to his brother's interest the most influential subject in the kingdom, Roger, bishop of Salisbury, who, as grand justiciary, was the supreme governor of the realm during the vacancy of the throne. Of Stephen's two eldest brothers, it may be here mentioned that William, the eldest, was almost an idiot, and that the other, Theobald, had succeeded to his father's earldom of Blois; so that Stephen, in aspiring to the English crown, did not find either of them in his way. The politic and zealous management of his brother Henry had also gained for him the support of William de Pont de l'Arche, who held the castle of Winchester and the key of the royal treasures deposited there. The consequence was, that although Stephen was refused admission by the inhabitants both at Dover and at Canterbury, he was received with warm welcome by those of London and Winchester; and after Hugh Bigot, earl of Norfolk, the steward of the royal household, had, to remove the scruples, real or affected, of some of his adherents, boldly sworn that Henry on his deathbed had disinherited his daughter and her issue, and left the crown to his nephew, it was resolved by the clergy and nobility who had gathered about him that he should be crowned forthwith, and the ceremony was accordingly performed at Westminster on the 26th of December, St. Stephen's-day, by the archbishop of Canterbury, assisted by the bishops of Salisbury and Winchester. The commencement of the reign of Stephen is reckoned from that day.

At his coronation Stephen swore, 1, That on all occasions of episcopal vacancies he would appoint a new prelate within a certain time, and meanwhile would leave the temporalities of the see in the charge of some ecclesiastic; 2, That he would make no addition to the royal forests, but would, on the contrary, restore to their owners such lands as had been made forest by his predecessor; 3, That he would abolish the tax called Danegelt, which, after having been given up by the Confessor, had been restored by the Norman kings. On the other hand, the bishops tendered their allegiance only for so long as the king should maintain the privileges of the church; and the lay barons appear to have also qualified their oath by a similar condition as to his preservation of their estates and honours. Nothing like this had taken place at the commencement of any previous reign since the Conquest.

In January of the following year, 1136, after seeing the body of the late king interred at Reading, Stephen convened a great council of the bishops and the nobility at Oxford, and there signed a charter of the liberties of the church and state, in which he styled himself 'Stephen, by the grace of God, elected king of the English by assent of the clergy and the people, consecrated by William, archbishop of Canterbury and legate of the holy Roman church, and confirmed by Innocent the Pontifex of the holy Roman see.' He had shortly before this obtained a bull from pope Innocent, confirming his election. In this charter he repeated more distinctly the engagements under which he had come at his coronation, declaring besides that he would cause to be observed all the antient and just laws of the kingdom. There is also a shorter charter of Stephen's, dated at London, which seems to have preceded this, and which was probably granted at or immediately after his coronation. In that he expressly grants to his French and English subjects all the good laws and good customs which they had in the time of the Confessor, a clause which is not found in the larger charter. The confirming clause of the latter also has the qualification, 'salva regia et justa dignitate mea'—saving my royal and just dignity,—which the other is without.

Meanwhile a feeble attempt had been made by Matilda and her husband to take possession of Normandy; but the Normans themselves, without any assistance from Stephen, soon drove out the army of Angevins which had entered their country. In England at this moment not a hand or voice was lifted up for the daughter of the late king. Even the earl of Gloucester came forward with the other barons, and did homage, and took the oath of fealty, to Stephen.

After a short while, however, opposition arose in various quarters. In the spring of the year 1136, king David of Scotland, Matilda's uncle, advancing at the head of an army, overran the northern counties, and compelled the barons of those parts to swear fealty to Matilda, and to give hostages for the performance of their oath; and although he agreed to a peace when Stephen marched against him, and restored the lands and castles he had taken, he refused to do homage to the king of England for his possessions in that country. He suffered his eldest son Prince Henry however to do homage for the honour of Huntingdon, which, with the towns of Carlisle and Doncaster, was conferred upon him by Stephen. Meanwhile, during Stephen's detention on the northern borders, an insurrection in favour of Matilda broke out in Wales, which he never could effectually suppress, but was obliged to satisfy himself with merely endeavouring to prevent from extending itself beyond that quarter of the kingdom. Then, although he had obtained the investiture of the duchy of Normandy from the French king Louis, it soon appeared that his possession of the country was only to be retained by force of arms, and that while he had to keep back with the one hand the persevering attacks of the Angevins, he had an almost equally troublesome enemy to keep down with the other in the native chiefs, a large proportion of whom, sometimes arraying themselves on his side, sometimes on that of Matilda, evidently aimed at taking advantage of the contest between the two rivals, to throw off the yoke of the one as well as of the other, and to secure, if not the national independence, at least their individual emancipation from all superiority. And the same spirit quickly began to show and spread itself in England. In some districts the standard of Matilda was raised by the earl of Gloucester, and various places of strength were seized upon and garrisoned in her name; elsewhere the barons fortified their castles on their own account, and set up each as an independent chieftain. Stephen had his hands full of work with all this disorder and rebellion in the south, when the king of Scotland again appeared on the northern borders. After having ravaged Northumberland with unusual ferocity in the winter of 1137, David and his half-barbarian host retired to Roxburgh, on the approach of the English king in the beginning of the following year; but as soon as Stephen was recalled to the south, the Scots again crossed the border in the end of March, 1138. They had taken the castle of Norham, and laid siege to other fortresses, when they were met by Thurstin, archbishop of York, at the head of an army composed of the retainers of the northern English barons, and defeated by him in the famous battle of the Standard, fought on the 22nd of August, 1138, on Cutton Moor, in the neighbourhood of Northallerton. Peace however was not concluded with the Scots till the 5th of April in the following year, when Stephen found himself under the necessity of yielding up to Prince Henry the earldom of Northumberland, with the exception of the forts of Newcastle and Bamborough, for which he engaged to make over to him estates of equivalent value in the south of England.

But by this time the unfortunate English king had found another, and, as it turned out, by far his most formidable enemy. He had quarrelled with the church. Resolved to reduce the inordinate power of Roger, bishop of Salisbury, and his two nephews, Alexander and Nigel, bishops of Lincoln and Ely, he had at a council held at Oxford, in June, 1138, arrested Roger and Alexander; and although Nigel made his escape, he was eventually compelled to surrender his castle of Devizes, as his brother and his uncle had been to give up theirs of Newark, Salisbury, Sherburn, and Malmesbury. The inflammation excited in the whole ecclesiastical body by this attack was terrific. Even the king's brother, the bishop of Winchester, who had been lately made papal legate, was either carried away by the general feeling of his order, or, if he did not share in that feeling, found it would be in vain for him to resist it. He summoned his brother to answer for what he had done before a synod of bishops, which met at Winchester. Stephen complied so far as to send one of his ministers to plead for him, who, when the decision upon a preliminary question had been given against the king, appealed to Rome; on which the legate dissolved the synod, on the 1st of September, 1139. On the last day of the same month Matilda landed on the coast of Suffolk, and immediately after the earl of Gloucester unfurled his standard in the west. The war spread rapidly over the whole kingdom. At length, on the 23rd of February, 1141, Stephen, while besieging the castle of Lincoln, which was held by Ranulph, earl of Chester, was attacked by the earl of Gloucester, and being taken prisoner, was immediately, by Matilda's order, consigned in chains to the castle of Bristol.

On that day month Matilda and her brother, attended by a numerous body of barons of their party, met the legate on the open downs in the neighbourhood of Winchester, when it was solemnly agreed that Henry and the church should acknowledge her as their sovereign, on condition that he should be made her first minister, and especially that all vacant bishoprics and abbacies should be filled up on his nomination. Soon after this the archbishop of Canterbury and all the other bishops gave in their adherence. In the beginning of April the heads of the church met on the summons of the legate at his episcopal city of Winchester; and there he addressed them in a long speech, which Malmesbury, who heard it, has preserved; and in the end the meeting unanimously agreed to confirm his treaty with Matilda. A remarkable circumstance mentioned in the account of this meeting is the appearance of certain deputies from the citizens of London, who, it is stated, on account of the greatness of their city were considered as nobles in England, and who had been summoned to give their attendance by the legate, although the assembly was otherwise composed only of ecclesiastics. They at first stood up for Stephen, but were ultimately persuaded to concur with the rest of the meeting.

But the folly, rapacity, and insolence which Matilda now displayed in her triumph, were soon found to be insupportable by all parties. Taking advantage of the strong popular feeling of disgust, Stephen's queen Matilda, who had remained in arms for her husband in the county of Kent, made her appearance before London while the empress lay there awaiting her coronation; and she barely contrived, by springing from table and mounting her horse, to effect her escape to Oxford. The legate now joined his sister-in-law and the Londoners; the empress, with the king of Scots, the earl of Gloucester, and others of her principal adherents, besieged in the castle of Winchester, fled from that stronghold on the morning of Sunday, the 14th of September, when, being immediately pursued, many of the party were killed; most of the rest, including the earl of Gloucester, were taken prisoners, and Matilda herself with difficulty escaped to the castle of Devizes. Negociations were now opened, the result of which was that in the beginning of November Gloucester was exchanged for Stephen. When his brother was thus again at liberty, the legate once more summoned a clerical synod at Westminster, on the 7th of December, at which he defended his abandonment of the cause of Matilda, and as usual carried his brethren along with him in his new course of politics. Stephen himself, having appeared among them, addressed them with pathetic eloquence on the wrongs and indignities he had sustained; and they ended by resolving unanimously to excommunicate all who should adhere to 'the countess of Anjou.'

The war now recommenced after Stephen had recovered from an illness which confined him for some months, and Gloucester had returned from the Continent, whither he had gone to endeavour to persuade Matilda's husband to come over to her assistance, an attempt in which he met with no success, although Geoffrey consented to entrust his eldest son Henry to the earl's care. In the end of September, 1142, Stephen laid siege to the castle of Oxford, in which Matilda resided; but when the garrison, from want of provisions, could hold out no longer, the empress, on the 20th of December, in a severe frost, and while the ground was covered with snow, slipped out at an early hour in the morning attended by three knights, made her way through the posts, crossed the Thames on the ice, walked to Abingdon, and thence rode to Wallingford. Other sieges, battles, and skirmishes followed, and the kingdom remained subject generally in the eastern counties to Stephen, in the western to Matilda, till the death of the earl of Gloucester, the main support of the latter, in 1146, upon which she retired to Normandy. But her absence brought little more quiet to Stephen. The next two or three years of his reign were disturbed by a formidable rebellion of a confederacy of the barons headed by Ranulf, earl of Chester, and also by another quarrel with the clergy, whose hostility Stephen brought upon himself this time by his support of their old leader his brother Henry, when that intriguing and ambitious prelate, whom the pope, at the instigation of Theobald, archbishop of Canterbury, had deprived of his office of legate, sought to avenge himself on the primate by the aid of the royal authority. Matters proceeded so far that Theobald at last published a sentence of interdict, the first of which this country had ever been the object, against all the dominions of the English king; and Stephen, assailed by the cries of the alarmed people, found himself forced to yield. But his last and worst antagonist now appeared in the person of Matilda's son Henry, who, having by the death of his father, in September, 1151, become earl of Anjou, and having soon after added to his paternal dominions the territories of Poitou and Aquitaine by his marriage with Eleanor, the divorced wife of Louis VII. of France, landed at Wareham, on the 6th of January, 1153, at the head of a force of only 3000 foot and 140 knights, which however was soon augmented by the junction of considerable numbers of his mother's friends. Yet no swords were crossed by these rival claimants of the same crown. Henry having forced his way into the town of Malmesbury, lay there, while the Avon, rendered impassable by the rains, prevented Stephen from attacking him. Stephen then retired to London, on which Henry advanced to Wallingford; but when Stephen had also marched to this point, and both parties were preparing for battle, the principal persons in the two armies, at the suggestion of the earl of Arundel, interfered, and an agreement was made, by which the effusion of blood was prevented, and which was confirmed in a great council held at Winchester in November following. By this compact, Stephen, whose eldest son Eustace, fortunately for the peace of his country, died suddenly at Canterbury during the negociation, having been seized, it is said, with fever and phrenzy, while he sat at table, constituted Henry, whom he styled duke of Normandy, 'his successor in the kingdom of England, and his heir by hereditary right.' Henry in the meantime did homage and swore fealty to Stephen; Stephen's surviving son William did homage to Henry, and received from him a grant of all the lands and honours held by his father before his accession to the throne; and, lastly, the bishops and abbots, the earls and barons, and the inhabitants of all the boroughs in the kingdom, swore fealty to both the king and the duke. One of the most strenuous supporters of this arrangement was the bishop of Winchester. Stephen survived its ratification not quite a year; he died suddenly in a convent at Dover, on the 25th of October, 1154, being in the 50th year of his age, and having reigned nineteen years all but two months. [Henry II.]

England during the whole reign of Stephen was probably in a state of greater anarchy and misery than it had ever known since the first settlement of the Saxons, or has ever experienced in the worst of the intestine wars and confusions of which it has since been the theatre. Indeed the country appears to have got far back towards barbarism. 'In this king's time,' says the Saxon Chronicle, 'all was dissension, and evil, and rapine. . . . Thou mightest go a whole day's journey, and not find a man sitting in a town, nor an acre of land tilled. The poor died of hunger; and those who had been men well to do begged for bread. Never was more mischief done by heathen invaders. . . . To till the ground was to plough the sands of the sea. This lasted the nineteen years that Stephen was king, and it grew continually worse and worse.'

Yet Stephen personally appears to have had many qualities which would have adorned a throne more fortunately circumstanced. The party zeal of the old historians has given very opposite representations of his character; but his general conduct, and the best or most impartial authorities, bear out what has been said of him by Stow:—'This was a noble man and hardy, of passing comely favour and personage: he excelled in martial policy, gentleness, and liberality towards all men, especially in the beginning; and, although he had continual war, yet did he never burthen his commons with exactions.' His valour and clemency indeed, as well as the beauty of his person, are admitted on all hands, and are attested by the whole of his career, and by many remarkable incidents. He is especially spoken of in terms of the warmest eulogy by one contemporary writer, the author of the Life of St. Cuthbert, lately printed by the Surtees Society, 'Reginaldi Monachi Dunelmensis Libellus de Admirandis Beati Cuthberti Virtutibus,' 8vo., Lon., 1835. See his 64th chapter.

By his queen Matilda, who died 3rd May, 1151, Stephen had the following sons and daughters:—1, Baldwin, who died in infancy; 2, Eustace, after his father's acquisition of the crown styled earl of Boulogne, who was born in 1135, married, in 1138, Constance, daughter of Louis VI. and sister of Louis VII. of France (afterwards the wife of Raymond III., earl of Toulouse), and, as already mentioned, died 10th of August, 1153, without issue; 3, William, who married Isabel, daughter and heiress of William, earl of Warren and Surrey (afterwards the wife of Hamlyn Plantagenet, natural son of Geoffrey, earl of Anjou), became earl of Mortagne and Boulogne after the death of his elder brother, and died without issue in October, 1160; 4, Maud, who died in childhood; 5, Mary, who, after becoming a nun, and abbess of the nunnery of Ramsey in Hampshire, succeeded, on the death of her brother William, to his honours of Boulogne and Mortagne, and some years afterwards married Matthew, son of Theodoric of Alsace, earl of Flanders, with whom she lived ten years, and was then, in 1189, divorced by the pope and sent back to her convent, after having borne Theodoric two daughters, the youngest of whom, Maud, through her granddaughter Elizabeth, the wife of Albert I., duke of Brunswick, is among the ancestors of the present English royal family. Two natural sons are also attributed to Stephen: William, of whom nothing is known except the name; and Gervais, by a lady named Daneta, made by his father abbot of Westminster, which dignity he held till his death, 26th August, 1160. Stephen's younger brother Henry, the bishop of Winchester, who figures so conspicuously throughout the reign, died 6th August, 1171.

The chief contemporary chroniclers of the time of Stephen are, the writers of the 'Saxon Chronicle' the anonymous author of the 'Gesta Stephani' (published in Duchesne), Richard, prior of Hexham (Hugulstadensis), Serlo, and Ailred, abbot of Rivault (all in Twysden's 'Decem Scriptores'), William of Malmesbury, and Henry of Huntingdon. Many additional facts are also mentioned by Ralph de Diceto, Brompton, Gervas of Canterbury, and other later writers.

STEPHEN, BATHORI, one of the most remarkable individuals of the sixteenth century, and the greatest king that Poland ever had. He was born in 1533, at Shomlo in Hungary, of an old and noble family of that country. The agitated state in which his native land continued during the sixteenth century, being torn by domestic factions, and troubled by the Turks and the Austrians, presented a vast field for the display of great talents, united to a daring and adventurous character, and Stephen Bathori rose after many vicissitudes to the sovereignty of Transylvania in 1571. In 1575 he was elected to the throne of Poland, vacant by the flight of Henry of Valois (Henri III. of France); and he owed this elevation to the renown of his valour and wisdom. He took possession of the crown; married, according to the conditions of his election, the princess Anna Jaguellon, sister to the deceased king Sigismund Augustus; repressed by his vigour the party which supported his competitor Maximilian of Austria; and pacified the country by conciliatory measures.

The true test of really great men is the ability of filling the shortest possible space of time with the largest amount of great deeds, and few characters in history may lay a better claim to having fulfilled these conditions than Stephen Bathori.

After having regulated the internal affairs of the country, he settled its foreign relations in a satisfactory manner, particularly by ensuring the friendship of the sultan of Turkey. He then turned his attention towards Muscovy. This power had recently obtained an extraordinary development under the celebrated Ivan Basilovich, who invaded a part of Livonia belonging to Poland shortly after the accession of Stephen. His first care was to organise a military force adequate to encounter such a formidable enemy, and to secure at the same time the tranquillity of the borders. He formed the Cossacks of the Ukraine into a regular force, allowing them the choice of their own hetman or supreme commander, and conferring on them many advantages as a reward for the services which they were obliged to perform. The castles were repaired and provided with permanent garrisons; a formidable ordnance was created; and a body of life-guards and a regular infantry were organised.

Having completed his military preparations, he took the field in the summer of 1579 with a numerous army composed of national troops, German mercenaries, and five thousand Hungarians, commanded by Bekesh. Bekesh, a countryman of Bathori, had been his enemy and competitor for the throne of Transylvania, but finally, struck with admiration of the superior qualities of Bathori, he disclaimed his enmity, and requested the honour of serving under his command. These sentiments were fully responded to by Bathori, who placed in his former enemy an unlimited confidence, which Bekesh justified by his services.

On commencing the campaign, Bathori issued a proclamation to the people of Muscovy, declaring that he was making war against their tyrannical sovereign, and not against them, and promising protection to their lives and property. The Russian historians bear evidence that this promise was strictly fulfilled, and that this campaign was free from all those atrocities by which war was usually accompanied in those times. The Muscovites were defeated in several battles. Polotzk was taken after a desperate resistance; but the garrison and inhabitants were spared by the conqueror, who immediately granted to the town the liberties enjoyed by the cities of Poland, and the same privileges and security to the Greek church which it had enjoyed under the dominion of Moscow. Having restored that important place to Poland, from which it had been taken several years before, he obtained some other advantages during the same campaign, and returned in the winter to Warsaw to attend the diet, which received him with great enthusiasm, and willingly granted the necessary means for the continuation of the war. Bathori resumed it with great vigour in the summer of 1580; the town of Veliki Luki and several others were taken; and in the next year, 1581, the city of Plescow was besieged by Zamoyski, one of the greatest statesmen and warriors that Poland had produced [ZAMOYSKI], and to whom Bathori had entrusted the command of the army. The progress of the Polish arms was arrested, and the fruits of so many triumphs were destroyed, by the intrigue of the Jesuit Possevinus, who, deceived by the promises of the czar Ivan Basilovich to acknowledge the supremacy of the pope, induced Stephen Bathori to conclude peace with Muscovy on the 6th January, 1582, by which the Polish conquests were restored to the czar, with the exception of Polotzk and a few other towns and castles. Bathori employed the interval of peace in introducing different improvements, and was making preparations for another war with Muscovy, the dangers of which his policy could easily foresee. The pope, Sixtus V., deceived by the czar, who as soon as the danger was over thought no more about submitting to Rome, granted the Polish king a considerable subsidy. The projects of Bathori against Muscovy, which are supposed to have had for their object a change in the form of the government of that country, were cut short by his death, after a short illness at Grodno, on the 12th December, 1586, at the age of fifty-four.

The wars in which he was engaged did not prevent him from paying due attention to the civil affairs of the country, in which the following improvements were introduced during his reign. The province of Mazovia, which had hitherto been governed by a separate code, was induced by Stephen to adopt the general laws of Poland, with some few exceptions. The statute-book of Lithuania was enlarged by the addition of many new articles. The statute of Culm, by which the towns of Prussia were governed, was revised. Many salutary laws respecting the property of the crown and the privileges of the nobles were enacted. But the most important civil act of this king was the establishment of tribunals or supreme courts of justice for Poland and Lithuania. They were composed of members elected for the session by the same voters who returned the nuncios, or members of the diet. This institution, which supplanted the administration of justice by the king, and rendered it independent of the crown, continued till the dissolution of Poland. [POLAND, *Constitution of.*]

Stephen Bathori was very fond of learning and a great patron of learned men. In his early life he was imprisoned for two years in a fortress, by the emperor of Austria, which time he spent in the study of the classics, and particularly in that of the 'Commentaries' of Cæsar, which he is said to have known by heart. He is supposed to have been originally a Protestant, but to have been induced by the representations of a Roman Catholic bishop to abjure secretly his creed and to become a Roman Catholic on his accession to the crown of Poland, so that many believe that he had always conformed to the Roman Catholic church. Some learned Jesuits having gained his confidence, he became a great patron of their order, and founded for them the university of Wilna and the college of Polotzk, which he richly endowed. He was however strongly opposed to religious intolerance, and maintained evenhanded justice amongst the various denominations which prevailed in Poland. He was of a generous and forgiving disposition, as an instance of which we may quote the following anecdote:—A noble called Penkoslawski, who was a very gallant officer, violently opposed the king as a nuncio at a diet. It happened that just at that time the grant of an estate was to be made, and Stephen gave it immediately to Penkoslawski, saying, 'He is as good a soldier as he is a bad nuncio.'

He left no issue, and resigned, on his election to the throne of Poland, the principality of Transylvania to his brother Sigismund.

As a proof of his tolerant spirit and enlightened mind, we may adduce his favourite saying—'that God has reserved three things to himself; the creation of something out of nothing, the knowledge of futurity, and the government of the conscience.'

STEPHENS (French, **ETIENNE** or **ESTIENNE**; Lat., **STEPHANUS**) is the name of a family of the most illustrious scholars and printers that has ever appeared. Several of the members of this family bore the same Christian name, which has produced much confusion in the accounts that have been given of them. We shall give the lives of them in a chronological succession, and distinguish those of the same name by the epithets the first, the second, &c. The earliest among them who distinguished himself is—

HENRY STEPHENS I., who was born at Paris; the year of his birth is uncertain, though it is generally supposed that it was about 1470. He had his printing establishment at Paris, in a place which he calls 'e regione scholæ decretorum,' which is now called 'Rue de l'École de Droit.' The earliest work which is said to have been printed by him is of the year 1502, the year before that in which his son Robert was born. The works which he printed were mostly on theological, philosophical, mathematical, and medical subjects, and he published very few editions of the classical writers. On the title-page of his publications are represented two men looking at a shield which stands between them, and contains three lilies, and above them a hand holding a closed book. Above the heads of the two men is the device—'Plus olei quam vini.' At the bottom of the title-page he sometimes gives only his initials, H. S., and sometimes his full name. All the works that came from his press were very correctly printed, as he always revised the proofs. A list of his publications is given by Maittaire (*Historia Stephanorum*, ii. 1, p. 1-9, and by Renouard, vol. i.), from which we extract the following:—In 1512 he published the 'Itinerarium Antonini;' in 1519 the works of Dionysius Areopagita; in 1521 an extract of the 'Arithmetica' of Boethius. In 1522 his son Robert was engaged in the printing establishment of his father-in-law Simon de Colines, who calls himself the successor of Henry Stephens, and married his widow. From this fact we must infer that Henry Stephens died in 1521 or 1522. He left three sons, Francis, Robert, and Charles.

FRANCIS STEPHENS I., was the eldest of the three sons of Henry Stephens. He was a partner of Simon de Colines: there are very few books known to be printed by him. The earliest is a work called 'Vinetum,' printed in 1537. In 1543 he published a 'Psalterium Græcum,' in 16mo., in which the titles and the initials of the verses are printed in red. The last of his publications is the 'Andria' of Terence, in 8vo. His mark on the title-page is a tripod, which stands upon a book, and from which a vine-branch rises. The device upon the base is—*πλῖον ἐλαίου ἢ οἴνου*, with the Latin translation, 'Plus olei quam vini.' The year of his birth as well as of his death are unknown. A list of his publications is given by Maittaire, p. 31, and by Renouard, vol. i.

ROBERT STEPHENS I., the second son of Henry Stephens I., was born at Paris in 1503. In his youth he studied the Latin, Greek, and Hebrew languages, and he made such progress, that at an early period of his life he gave most extraordinary proofs of his learning, and was subsequently placed by his contemporaries above the greatest scholars that had ever lived. After the death of his father, he was for some time engaged in the printing-office of Simon de Colines, his father-in-law, and he appears, as early as his nineteenth year, to have had the entire management of the printing, correcting, and editing of several works, for in 1522 there appeared from the establishment of De Colines an edition of the New Testament (*Novum Testamentum*, Latinè, in 16mo.), which, although a copy of the Vulgate, was more correctly printed than any previous edition, and also contained some corrections by Robert Stephens. The professors of the Sorbonne, alarmed at the appearance of a new edition of a book which they wished to keep from the public, especially at a time when Protestantism was making rapid progress, inveighed in their lectures against the audacious youth, and declared that the book should be burnt. But their anger produced little effect. A short time after this he married Petronella, a daughter of the celebrated scholar and printer Jodocus Badius, a woman of great talents, who understood and spoke Latin as well as her mother-tongue. As the house of Stephens was visited by scholars and eminent men of all countries, Latin became the ordinary language of conversation; and it is said that the children and even the servants acquired some facility in speaking it. After his marriage he established a separate printing-office for himself, though he remained in the same street in which his father's office was situated. The earliest publication from his own establishment was 'Apuleii Liber de Deo Socratis,' 1525, 8vo. Others believe that he had no separate establishment till two years later, and that Cicero's 'Partitiones Oratoriæ' and 'Persii Satyræ' (1527) were the first works that issued from it. These works were followed by a great number of Roman authors, and Latin translations from the Greek and other languages, some of which were made by himself. For many years scarcely a month passed without some new publication, and if we recollect that in most of the works he acted as editor, and corrected the proofs with the most anxious care, it appears marvellous that so many works could be produced in so short a time; the mere list of his publications in Maittaire from 1527 till 1560, which is not by any means complete, fills twenty large octavo pages (p. 10-30). His device on the title-page of his publications was an olive-tree with one or more branches broken off, while new branches are engrafted on the tree, and the motto was 'Noli altum sapere,' to which he sometimes added 'sed time.' Until the year 1532 he used the same types as his father, but in this year he used a larger and more elegant type for his 'Biblia Latina,' of which he had published the first edition in 1528, under the title 'Biblia utriusque Testamenti Latina, ex veteribus MSS. exemplaribus emendata,' fol. This edition was not only in appearance the finest that had ever been printed, but that he might be able to give the text with the utmost correctness, he had examined all the libraries of Paris, St. Germain, St. Denis, and had got over from Spain at his own expense a very valuable Spanish Bible.

In the year 1531 Stephens published his first great original work: 'Dictionarium, seu Latinae Linguae Thesaurus,' fol. The second (1536) and the third or last edition (1545) of this dictionary are in two volumes, folio, and contain numerous corrections and improvements by Robert Stephens. The work has often been reprinted in other countries.

In the year 1539 Stephens was appointed printer to the king of France for Latin and Hebrew works, and henceforth he always added on the title-page of his publications, to his name, Regius Typographus, or Regius Librarius, or some other similar title. Soon after this honour was conferred upon him he received the same distinction for Greek works, whence he calls himself sometimes 'Regius Typographus in Graecis.' Stephens appears to have thought that he ought to produce his publications in a form worthy of his new rank, and it was on his suggestion that Francis I. had new Hebrew, Greek, and Roman types made by Claude Garamond. These types, which were of exquisite beauty, were afterwards known under the name of Characteres Regii. In 1540 Stephens published a new edition of the Latin Bible with various readings. On its appearance the divines of the Sorbonne renewed their attacks, but owing to the king's liberal protection he was enabled to continue his labours unmolested. The king had such a high esteem for his learned printer, that he frequently visited him in his office and on one occasion, when he found him correcting a proof sheet, he stopped behind him and waited silently Stephens had finished his task, before he began to converse with him. The first Greek book that Stephens printed in the capacity of Regius Typographus in Graecis, belongs to the same year, 1540, and bears the title *Γνῶμαι Μονόστιχοι*, sive Sententiae singulis versibus contentae juxta ordinem Literarum ex diversis Poetis, cum Interpret. Latina.' In 1543 he published a little work called 'Alphabetum Graecum,' which only contained sixteen leaves, and was afterwards frequently reprinted. This is supposed to be the first book that was printed with the Characteres Regii. In the following year Stephens edited, in one folio volume, a collection of the most eminent Greek ecclesiastical historians, under the title 'Ecclesiastica Historia Eusebii, Socratis, Theodoriti, Theodori, Sozomeni, Evagrii, Graece.' This work was soon followed by 'Eusebii Praeparatio Evangelica' in Greek. These two volumes contain the earliest specimens of the device subsequently adopted by all royal printers: a thyrsus with an olive branch and a serpent wound round it, and the motto, *βασιλεῖ τ' ἀγαθῷ κρατερῷ τ' αἰχμητῇ*. In 1545 he published a new edition of the Latin Bible, which he had been preparing for several years. It contains notes which are ascribed to Vatablus, and which are said to have been communicated to Stephens by the pupils of this theologian. But the authorship of the notes is a point which, even at the time, appears to have been the subject of much dispute. In the year following he published his first Hebrew Bible, and also a new edition of the Latin Bible in folio, with a preface which shows the immense pains that he took to give the text as correctly as possible.

These repeated editions of the Bible and the notes ascribed to Vatablus, which were in some parts supposed to savour of the reformed doctrines, to which Stephens himself was attached, involved him again in disputes with the professors of the Sorbonne. He offered publicly to acknowledge any errors which he might have committed, and to print them in an appendix to his Bible to guard the readers against them. The king several times required the professors to draw up a list of the errors or heresies, but they never did it. Their object was not to prevent the propagation of any particular errors, but to get the Bible and the commentary put into the Catalogus Librorum Prohibitorum, and thus to stop its sale altogether. The matter was constantly deferred, and all attempts to bring it to a close were fruitless. Stephens, in the meantime, regardless of the clouds which were gathering over his head, continued as active as ever. In 1547 he published the Editio princeps of the 'Antiquitates Romanae' of Dionysius of Halicarnassus, which is still highly valued as a very beautiful and correct edition. It was soon followed by the Editio princeps of Dionysius of Alexandria 'De Situ Orbis,' with the Greek scholia of Eustathius.

In this year (1547) king Francis I. died, and Stephens lost his greatest patron and protector. His successor, Henry II., was at first favourable to Stephens, and required the divines of the Sorbonne speedily to produce their 'censurae,' threatening to punish them if they made any further delay. The professors, who knew the vacillating and weak character of the king, promised obedience, but nothing was done, and new charges were brought against Stephens, and new attempts were made to suspend the sale of his Bible. At last it was agreed that Stephens and the learned divines should meet at the king's palace at Fontainebleau, where several bishops and cardinals likewise appeared. Stephens was acquitted of the charge of having printed anything that impugned the Roman Catholic faith. The divines, thus disappointed, suddenly contrived to give another turn to the matter, and to get an order from the king for a temporary suspension of the sale of Stephens's Bible, and for the matter to be investigated afresh by a commission, whose duty it was to take cognizance of cases of heresy. After eight tedious months, Stephens at last obtained from the king another order, that his case should be tried by the king's privy council only. When Stephens had thus, for a time at least, secured his tranquillity, he produced, in 1548, the Editio princeps of Dion Cassius, libri xxiii., and several other works. In this year he had occasion to travel to Lyon, and in this journey he is said to have made the subdivision of the chapters of the Bible into verses, which was subsequently adopted in nearly all editions of the Scriptures. King Henry II. happened to be at Lyon, and when Stephens, availing himself of the opportunity, presented himself before the king, and at the same time thanked Cardinal de Guise for the services he had done him, Stephens was informed, to his utter astonishment, that a change had taken place in the king's mind, in which he could not mistake the secret and intriguing workings of his adversaries: the sale of his Bibles was prohibited. Stephens, indignant at such proceedings, declared that he would leave his country; but the king requested him to retain his office of royal printer, and promised that the matter complained of (the censurae) should be speedily produced.

Stephens was persuaded to remain; but, owing to the king's vacillation, he was still subjected to various disappointments and vexations. Some of his biographers state that in this year he visited Zürich and Geneva; and if this be true, he perhaps undertook this journey with a feeling that it would soon be necessary for him to seek a refuge in a foreign country. In 1550 he published his beautiful edition of the Greek Testament, with a 'nova translatio Latina.' Stephens presented this work to bishop Du Chastel, who had hitherto pretended to be his friend, but who now courted the favour of the Sorbonne, and declared that every sort of protection which he had formerly given to Stephens had arisen from his not knowing the real character of his offences. Hereupon the Sorbonne again began to annoy Stephens; and after a tedious and ludicrous trial, held by men who found fault with the various readings in the margin of Stephens's Bible, which they took to be an heretical commentary, he was forbidden to sell his impressions of the Bible, and commanded to promise that he would print no more copies of the Scriptures without the sanction of those learned divines.

Stephens was now convinced that no reliance could be placed either on the king, his counsellors, or the great prelates, and that he must be prepared for the worst. He however made preparations for a step which his enemies did not expect. He finished the numerous works which were at the time going through the press, and at the end of the year 1551, or at the beginning of 1552, he escaped with his family to Geneva, where he hoped to find that liberty of conscience which he had so long wished for. Stephens is charged by some writers with having taken with him some of the materials belonging to the royal printing establishment, but his biographers have shown that there is not a shadow of ground for this charge. There is also a tradition, which does not seem at all improbable, that the professors of the Sorbonne vented their impotent rage by burning Stephens in effigy.

Stephens began his new career at Geneva with the publication of some books of the Old Testament, and of the whole of the New Testament in Latin and French. In 1552 he also published 'Ad Censuras Theologorum Parisiensium, quibus Biblia à Roberto Stephano, typographo regio, excusa calumniose notarunt, eiusdem Roberti Stephani responsio.' This book, which was also published in French, gives us a clear insight into the nature of his disputes with the Sorbonne, as well as into his own character. The other works which he published during a period of seven years at Geneva are almost exclusively of a theological and controversial nature, consisting of works written by Calvin, Beza, and other distinguished reformers. He retained his former device, but under it he printed, 'Oliva Roberti Stephani.' The name of Geneva seldom appears on the title-page of his books. He died on the 13th of September, 1559, leaving behind him, it is said, a numerous offspring and considerable property. But only three of his sons are known, Robert ii., Henry ii., Francis ii., and a daughter of the name of Catherine.

There is perhaps no man in modern times to whom literature and learning are more indebted than to Robert Stephens. His unbiassed contemporaries not only place him on a level with the greatest scholars, but declare that he excelled them all.

Charles Stephens appears to have been about a year younger than his brother Robert. His education was sound and classical; but he also applied himself to the physical sciences, and took his degree of doctor of medicine, which he practised for some time. He wrote several treatises on subjects connected with medicine, natural history, and agriculture, which however are less scientific than historical, for he treated his subjects chiefly in relation to antiquity. His earliest productions are abridgements of works by Lazarus Baifius, such as 'De Re Vestiaria;' 'De Vasculis;' and 'De Re Navali,' which were published by Robert Stephens (1535 and 1537). Lazarus Baifius (Lazare Baif) engaged Charles Stephens as tutor to his son, and in 1540 took him with his son to Germany, and afterwards to Italy, to which countries he was sent as ambassador of the king of France. In Italy Stephens became acquainted with Paulus Manutius, who in one of his letters (v. 17) speaks of him in high terms. On his return to Paris he appears to have continued the practice of medicine, but in 1551, when Robert removed to Geneva, the whole of his printing establishment, with the exception perhaps of the department for printing Hebrew, which appears to have been undertaken by Martinus Juvenis, passed into the hands of Charles Stephens, for the Editio princeps of 'Appiani Alexandrini Historiarum Romanarum Celtica, Libyca vel Carthaginiensia, Illyrica, Syriaca, Parthica, Mithridatica, Civilis quinque libris distincta,' which appeared at Paris in 1551, 'Cura ac Diligentia Caroli Stephani,' is probably the first book which he printed, though it had been prepared or commenced by Robert Stephens. It is a beautiful specimen of typography. There is a French translation of a treatise of Plutarch, called 'Traicté sur la Honte vicieuse,' by F. Legrand, which is by some referred to the year 1544, and is supposed to be the first book printed by Charles Stephens; but it probably belongs to the year 1554. Soon after Robert left Paris, Charles appears to have been appointed Royal Printer, for this title is mentioned on his last two publications of the year 1551. Henceforth he continued to be very active in his new sphere till the year 1561, for in these ten years there issued from his press 97 works, on a great variety of subjects, some of which he had written himself. Charles Stephens seems to have been a man who knew something of everything, but nothing very well. His character as a man has been attacked in a letter of Maumontius addressed to J. Scaliger, in which he is called a 'malus' and a 'male volens homo,' and is charged with unkind conduct towards his nephews, the sons of Robert. But as we hear of no accusations of this kind from any other quarter, the impartiality of the writer may be doubted. Charles Stephens died in the year 1564. Some say that he was persecuted for his religious opinions, and died in prison; others state that he was imprisoned for debt in the Châtelet, and that he remained there for the last three years of his life. It may be that both causes combined to bring this misery upon him; for we know that he lost a great deal of his capital in 1557, by the publication of his 'Thesaurus Ciceronianus,' which was a very expensive undertaking, and did not sell. It is also certain that during the last three years of his life no work appeared from his press. He left one daughter of the name of Nicole, who was no less celebrated for her beauty than for her talents and accomplishments.

Lists of the works which were written or printed by Charles Stephens are given by Maittaire and Renouard. We shall only mention the principal: 'De diversis Regulis Juris antiqui, Pandectarum libri quinquagesimi titulus xvii. et ultimus,' &c., Lutetiæ, 1552, reprinted in 1557: 'Dictionarium Latino-Gallicum, postrema hac editione valde locupletatum,' 1552, reprinted in 1570, fol.; 'Dictionarium Historicum ac Poeticum, omnia gentium, hominum, locorum, fluminum, ac montium, antiqua recentioraque, ad sacras ac profanas historias poetarumque fabulas intelligendas necessaria vocabula bono ordine complectens, cura ac diligentia C. Stephani.' Lutetiæ, 1553, 4to.; 'Philonis Judæi, de divinis decem Oraculis liber, Johanne Vaeuræo interprete,' 1554, 8vo.; 'Prædium Rusticum, in quo cujusuis soli vel culti vel inculti plantarum vocabula ac descriptiones, earumque conserendarum atque excolendarum instrumenta suo ordine describuntur, &c.,' auctore C. Stephano, 1554, 8vo. This work has been translated into French, Italian, German, English, and Dutch. 'De Latinis et Græcis Nominibus Arborum, Fruticum, Herbarum, Piscium, et Avium, Liber; ex Aristotele, Theophrasto, &c., cum Gallica eorum nominum appellatione,' quarta edit., 1554; 'Latinæ Linguæ cum Græcâ Collatio ex Prisciano et probatissimis quibusque Authoribus per locos communes literarum, partium orationis, constructionis ac totius Grammatices,' auctore C. Stephano, 1554, 8vo.; 'Dictionarium Latino-Græcum, in quo singulæ Dictiones ac Locutiones Latinæ Græcis vocibus ac sententiis Præmissæ magnum utriusque linguæ commercium indicant,' &c., Parisiis, 1554, 4to.; 'M. Tullii Ciceronis Opera,' Paris, 1555, 4 vols. fol.; Caroli Stephani 'Thesaurus Ciceronianus,' Par., 1557. Stephens also compiled a 'Dictionarium Historico-Geographico-Poeticum,' which was printed after his death at Geneva in 1566, 4to., and was afterwards often reprinted in folio. N. Lloyd edited in 1670 an edition of it at Oxford, and in 1686 another was published in London. All the works of C. Stephens are very beautifully printed.

Henry Stephens ii., the greatest of the whole family, was the son of Robert and grandson of Henry. He was born at Paris in 1528. Even as a child he showed most extraordinary talents. The numerous engagements of his father did not allow him to spend much time upon the education of the boy; but he carefully watched and regulated it. Latin he learnt naturally, as it was constantly spoken in the family, but before he seriously studied it the father made him learn Greek. He received his first instruction in Greek from a schoolmaster, who while reading the 'Medea' of Euripides with his boys, made it the practice to assign a part to each of them; and as soon as Henry had made sufficient progress to join them, he read this play with the greatest avidity, and soon knew it all by heart. After he had spent some time at this school, he was instructed in Greek by Petrus Danesius, who was then, next to Budæus, perhaps the ablest Greek scholar of the time; and who, on account of his intimate friendship with Robert Stephens, took great interest in the progress of his pupil. At the age of about fifteen Henry also enjoyed the instruction of Jacobus Tusanus (Jacques Toussain); and subsequently, when this scholar died (1547), that of Adrianus Turnebus, who succeeded Tusanus in the professorship of Greek in the Royal College. Although he had been chiefly instructed in Greek by these men, he did not neglect Latin; for even when a boy he is said to have known by heart the first book of Horace's 'Epistles.' He also studied mathematics; and as soon as he heard something of astrology, he conceived a strong desire to become acquainted with it, and having met with a young friend who entertained the same wish, the two boys began to take lessons. Henry did this without the knowledge of his father; but as the fees were very high, and the father, who thought that his son was taking lessons in mathematics, did not pay more than was necessary for mathematical lessons, the boy persuaded his mother to make up the deficiency. In this way he wasted much money and time, but he soon became aware of the futility of these pursuits, and gave them up altogether.

In the year 1546 Robert Stephens thought his son qualified to assist him in his printing establishment, and in this year Henry collated a MS. of Dionysius of Halicarnassus, whose works Robert was preparing for publication. In the year following, when the death of Francis I. deprived Robert of his chief patron, Henry undertook a journey to Italy, the main object of which was to search the libraries and examine the manuscripts in that country. Three years were spent in visiting the various places of Italy. In several towns his exertions were rewarded with discoveries; at Florence he found in a MS. of the Medicean library a number of Greek poems not known before, which were the 'Epitaphia Homericorum Heroum.' He afterwards printed them in his 'Florilegium Epigram. Græc.,' 1566, and also in his 'Homeri et Hesiodi Certamen,' 1573. At Naples and Venice he examined several MSS. At Rome he was very kindly received by Cardinal Sirlet, who communicated to him a MS. of Athenagoras, and corrections of several passages in Xenophon, of which he subsequently made use in his edition of Xenophon, 1561. It appears that during this journey he also made a collation of a MS. of Athenaeus in the Farnesian library, the various readings of which he communicated to I. Casaubon, who used them in his edition of Athenaeus (1597). At the same time he made the acquaintance of the most distinguished scholars of the age, such as Muretus, P. Manutius, C. Sigonius, P. Vettori, Cardinal Maffeo, and many others. On his return, in the year 1549, he brought with him the treasures which he had discovered and collected. This was just at the time when his father was finishing his folio edition of the Greek Testament, for which Henry wrote sixty Greek verses which were prefixed to it. About the same time he wrote notæ and argumenta for the edition of Horace, which Robert published in 1549. In 1550 Henry Stephens set out on a journey to England, where he was kindly received by Edward VI. His stay was not long, but he appears to have paid great attention to everything that came in his way, and turned it to good account. He himself mentions some interesting circumstances connected with his visit to England in his 'Apologia pro Herodoto,' and in the preface to his edition of the 'Poetæ Heroici Græci.' On his return from England he visited Flanders, Brabant, and the university of Louvain (Loewen). It was at Louvain, as it appears, that he met with a Greek Anthology in MS. which was in the possession of an Englishman of the name of John Clements. From this he copied some verses which were afterwards inserted in his 'Florilegium.' From the same Clements he obtained one of the two MSS. which he used in his Editio princeps of Anacreon. During his short stay in the Netherlands, he made himself master of the Spanish language. On his return to Paris towards the end of the year 1551 his father was preparing to quit France, and it is not improbable that Henry accompanied him to Geneva. This is however not quite certain, for in 1554 we find him at Paris, where he published the Editio princeps of Anacreon, in 4to., with a Latin translation and notes by himself. Whether at this time he had a printing establishment of his own, or whether he printed his book in that of his uncle Charles, is uncertain, although the latter is more probable, for in the same year he edited 'Dionysii Halicarnassei Responsio ad Cn. Pompeii Epistolam,' &c., the title-page of which expressly states that it was printed by Charles Stephens. The first indication of a printing establishment belonging to Henry Stephens occurs towards the end of the year 1556, when 'Davidis Psalmi aliquot Latino Carmine expressi à Quatuor Illustribus Poetis, quos Quatuor Regiones, Gallia, Italia, Germania, Scotia, genuerunt,' &c. appeared, with the addition, 'Ex officina Henrici Stephani.' Towards the end of the year 1554 he made a second journey to Italy, and discovered at Rome a considerable part of the historical work of Diodorus Siculus, which had not then been printed, and which he afterwards inserted in his edition of 1559. In 1555 he went from Rome to Naples in search of something which appears to have been of importance to the king of France, and to his ambassador at Venice, Odet de Selve, but it is not stated what the object of his search was. The circumstance that the king of France was then at war with the emperor Charles V. brought H. Stephens into great danger at Naples, for he was here discovered by some Italian who had met him at Venice in the house of the French ambassador, and when Stephens was on the point of being arrested, he only saved himself by insisting upon his being an Italian, and he spoke the language so well that the Italian was at last persuaded, and let him go. On his return to Venice he rendered an account of his mission to the ambassador, who was well pleased with the manner in which he had executed his instructions. At Venice Stephens made a collation of a MS. of Diogenes Laertius in the library of St. Mark, which had originally belonged to Cardinal Bessarion, and which he used for his edition of Diogenes of 1570. He also examined two MSS. of Xenophon, one of which he made use of in his edition of 1561.

During the year 1557, when Stephens was in the full possession of a printing establishment, he published seven new works, some of which had never been printed before: among them are the Editio princeps of 'Maximi Tyrii, Philosophi Platonici, Sermones, sive Disputationes XLI., Graece, nunc primum editæ,' with a Latin translation; Æschylus, with notes by P. Victorius and H. Stephens; 'Ex Ctesia, Agatharchide, Memnone excerptæ Historiæ; Appiani Iberica. Item, de Gestis Annibalis: Græce. Omnia nunc primum edita, cum H. Stephani Castigationibus;' and 'Ciceronianum Lexicon Græco-Latinum,' &c. Henry adopted the emblem (an olive-tree) and the device of his father, 'noli altum sapere,' to which is sometimes added, 'sed time.' Another device of his which sometimes occurs is, 'ut ego insererer, defracti sunt rami,' which contains an allusion to the branches which are represented as engrafted upon the olive-tree. The travels of Stephens and the printing of expensive books had embarrassed his affairs, and after the year 1557 he found himself in great difficulties, but he was assisted by Ulrich Fugger, a wealthy merchant of Augsburg, who, besides a large sum which he gave or advanced to him, gave him an annuity of 150 thalers. Stephens from gratitude for this munificent liberality, henceforth called himself Typographus Huldrici Fuggeri, or Fuggerorum Typographus, which appears on most of his publications down to the year 1568. The Fuggers assisted Stephens also in other respects; they had an excellent library and some valuable MSS., which they allowed him to use for his editions of antient works, as in that of 'Imperatorum Justiniani, Justini, Leonis, Novellæ Constitutiones,' &c., Græce, the only work that he edited in the year 1558. After a series of years the Augsburg merchants appear to have become tired of supporting the great printer. In a collection of letters of Stephens, published by Passow in 1830, there are some which show that Stephens wanted them to advance him a small sum of money which they had promised, and that at length after much correspondence they did not keep their promise. In consequence of this his connection with the Fuggers ceased in 1576.

In the year 1559 H. Stephens published his edition of Diodorus Siculus in fol., in which ten books of this historian were printed for the first time. The MS. which he used for this edition is now in the public library of Geneva. Other publications of this year are, Appian's 'Hispanica et Annibalica,' with a Latin translation by Beraldus, in 8vo., and 'Gentium et Familiarum Romanarum Stemmata,' &c., in fol. In this year his father Robert died at Geneva, and Henry was appointed executor of his will, in which he was also enjoined to take care of his brothers. Robert, one of his brothers, had been, as it appears, disinherited by the father because he would not abandon the Roman Catholic faith and follow his father to Geneva. Accordingly the printing establishment of Robert, the father, came into the hands of Henry, who continued to publish theological works and several editions of the Bible. H. Stephens appears now to have given up his establishment at Paris, and to have devoted himself to the management of that at Geneva.

In the year 1555 H. Stephens married for the first time but in 1564 or 1565 he himself states that his wife died. He afterwards married again, for the letters published by Passow show that about the year 1581 he became a widower a second time. On his death in 1598, he left a wife surviving, from which it appears that he was married thrice. By his three wives he had altogether 14 children, ten of whom died at an early age.

In 1560 he published a collection of the lyric poets of Greece with a Latin translation in 16mo., which has been often reprinted. In the year following appeared his edition of Xenophon in fol., for which he had collated a great number of MSS., and to which he added a commentary and a Latin translation. An improved edition was published in 1581. During the last two years H. Stephens was in bad health and subject to melancholy, arising from over-exertion and the heavy cares that devolved upon him after his father's death. In this state he scarcely worked at all; he almost conceived a disgust for literary occupations, and could not bear the sight of a book. But the renewed activity into which he was drawn unconsciously in 1562, restored him to health. The work which roused him to fresh exertion was a Latin translation of 'Sexti Philosophi Pyrrhoniarum Hypotyposeon Libri Tres.' The Greek original of this work was not printed until 1621. It must have been soon after his recovery that Stephens began his greatest work, the 'Thesaurus Linguæ Græcæ,' upon which he spent ten years. In 1564 he wrote and published a 'Dictionarium Medicum, vel Expositiones Vocum Græcarum Medicinalium, ad Verbum, excerptæ ex Hippocrate, Aretæo,' &c., cum Latina Interpretatione, in 8vo. In this work he received some assistance from J. M. Gesner; it was highly spoken of by contemporary scholars, with the exception of Jos. Scaliger, who censured it severely, but he appears to have had a personal pique against Stephens. In this year Stephens edited a still-useful collection of 'Fragmenta Poetarum Latinorum, quorum Opera non extant,' &c., in 8vo., and an edition of Thucydides with the Scholia, and a Latin translation by L. Valla. In 1566 he published, among other books, his 'Florilegium' of Greek Epigrams; 'Poetæ Græci Principes Heroici Carminis et alii nonnulli,' &c., in fol., which is most beautifully printed, and his edition of Herodotus with Valla's translation and his own 'Apologia pro Herodoto,' which he himself afterwards translated into French. Passing over a great number of valuable publications which appeared from 1566 till 1572, we proceed to the year 1572, in which the Greek Thesaurus was published under the title 'Thesaurus Græcæ Linguæ ab Henrico Stephano constructus. In quo præter alia plurima quæ primus præstitit (paternæ in Thesauro Latino Diligentiæ æmulus) Vocabula in certas Classes distribuit, multiplici Derivationum Serie ad Primigenia tanquam ad Radices unde pullulant revocata,' with the appendix and index, 5 vols. fol. This work made an epoch in the history of Greek philology, as well as in the life of the author, who had embarked in it nearly all his property. The price of this prodigious work was necessarily high, and accordingly it could not have many purchasers. When Scapula some years afterwards published his cheap abridgement [SCAPULA], the sale was nearly stopped, and Stephens became involved in great difficulties. It has been supposed by some that Stephens soon after published a second edition of his Thesaurus, but this opinion has merely arisen from the fact that he cancelled a number of pages of the original edition, and inserted new ones in their place. In 1745 Daniel Scott published, in 2 vols. fol., 'Appendix ad Thesaurum ab H. Stephano constructum.' A new edition of the Thesaurus was published in London (1815-1828) in 7 vols. fol., with numerous additions by Barker, which however have not increased the value of the book. A new edition is now in course of publication at Paris, which is edited by Hase, and L. and W. Dindorf.

It appears to have been owing to the pecuniary difficulties in which Stephens was involved after the publication of his Thesaurus, that, in order to divert his mind, he made various excursions in France and Germany, but he always took the opportunity of exploring libraries and comparing MSS., and thus collected vast quantities of materials for works which he was publishing or projecting. In 1573 he published an edition of all the extant works of M. Terentius Varro in 8vo., and a collection of the fragments of the philosophical poets of Greece. The year following he produced an excellent edition of Apollonius Rhodius with the antient scholia and a commentary by himself. In 1575 there appeared his collection of the Greek orators, some of which are accompanied by a Latin translation; and Arrian's 'Expeditio Alexandri Magni,' &c. with a Latin translation. In 1577 he published, among other books, an edition of Cicero's 'Epistolæ ad Familiares,' in 2 vols. 8vo.; the second volume contains the commentaries of P. Manutius, Lambinus, Sigonius, Canter, and of Stephens himself. In the year 1578 he brought out his magnificent edition of Plato's works, in 3 vols. fol.; and in the same year he wrote a little French work, 'Deux Dialogues du Nouveau Langage François, Italianizé et autrement desguizé, principalement entre les Courtisans de ce Temps,' &c. (printed without name and date). This was an attack upon the fashion, very common at the time, of introducing Italian words into French. Stephens, after the MS. had received the 'imprimatur' from the state council of Geneva, had taken the liberty of making some additions, for which he was severely reprimanded by the council. Not thinking himself quite safe, or wishing to escape the annoyance to which this affair subjected him, he went, towards the end of 1578, to Paris, where he remained during the whole of 1579. Henry III. received him very kindly, and interested himself so much on Stephens's behalf, that he demanded of the council of Geneva permission for Stephens to return, and to clear himself from the charges which were brought against him. Stephens returned to Geneva, and was placed at the bar of the consistory, where he was treated with rigour and harshness, and for some days was put into prison. When Stephens at last owned that he had acted wrong, he was set at liberty.

During the stay which H. Stephens had made at Paris in 1579, he had a conversation with the king, in which he expatiated very ingeniously on the superiority of the French language over other modern tongues; and the king, delighted with this eulogy on the French language, persuaded him to write a book on the subject. This book was published in the course of the same year, 'De la Precellence du Langage François,' Paris, 1579, 8vo. The king, pleased with the performance, ordered 3000 francs to be paid to Stephens from the public treasury, and also granted him an annual pension of 300 francs; but from the manner in which Stephens (in his 'Musa Principum Monitrix') speaks of this affair, it appears that he never received anything at all, for the treasurer at that time was a person of much more consequence in such matters than the king.

In 1581 Stephens published 'Juris Civilis Fontes et Rivi, &c., in 8vo.; and, as is commonly supposed, also 'Sigoni Fasti Consulares.' The latter he printed without the sanction of the Council of Geneva, and was in consequence fined 25 thalers. This edition of the 'Fasti' of Sigonius, if it was really published by Stephens, must have been suppressed, for there is no trace of it now. H. Stephens spent the year 1585 again at Paris, where he published an excellent edition of A. Gellius and of Macrobius, both in 8vo. The former is preceded by a very interesting letter to his son Paul, from which, besides many other things, we learn that about this time his country-house had been destroyed by an earthquake, a loss which he bore with stoical indifference. In 1588 he published an edition of the Iliad and Odyssey, with a Latin translation.

During the time that Stephens enjoyed the friendship of the king of France, he spent a great part of his time at Paris. His publications during this period greatly decreased in number, and some of them were executed by Paris printers. His own establishment at Geneva was neglected. He was constantly travelling about, and he published his works wherever he happened to be, as at Paris, Frankfort, Basel, &c. From this fact it has been erroneously supposed that he had separate printing establishments in these places. He often resolved to give up this wandering life, and was seriously exhorted by his friends to attend to his business; but the charms of a court life and the habit of travelling had now become strong, and he was dazzled by splendour and deceived by the hopes which he placed in the great. The years 1588 and 1589 he appears however to have spent at Geneva, and several works again issued from his press; but in 1590 no work came out at Geneva, and only one ('Principum Monitrix Musa') at Frankfort, where he appears to have spent some time. In this year Henry III. of France was murdered. The affairs of Stephens now grew worse and worse: his warehouses were full of books which he could not sell. In the year 1597 he left Geneva for France. He first stayed for some time at Montpellier, where Florence, one of his daughters, resided, who was married to Isaac Casaubon. Casaubon was just preparing his edition of Athenæus, and Stephens offered his assistance, which was refused. He then proceeded through various other places to Lyon, where he was taken ill; and feeling solitary and forlorn, and having no friends there, he was carried to a public hospital, where he died, in the beginning of March, 1598, at the age of nearly seventy years. Some writers say that he died out of his mind, a statement which, if true, can only apply to the last few days of his life. It is a mistake to suppose that Stephens died in poverty because he died in an hospital; for the proceeds of his books alone, which were publicly sold and fetched low prices, were sufficient to pay his creditors, and to leave something for his wife and children. Stephens died without a will; and Casaubon, who went to Geneva to receive his wife's dowry, which was still owing, together with her share of the inheritance, was generous enough to leave Henry's library, MSS., and printing establishment, in the hands of his son Paul.

There is no scholar to whom the Greek language and literature is under greater obligations than it is to Henry Stephens. He knew his superiority, and sometimes showed that he felt it. The number of books which he printed, edited, or wrote, is immense; and it is truly astonishing that, even during the rambling life of his latter years, he was continually producing new works. During the earlier part of his life he was a man of inflexible resolution, and never rested till he had effected his purpose; and he was always planning something, even to the last days of his life. He has often been censured for his alteration of passages in antient writers without being supported by the authority of MSS., and without even assigning a reason for his alterations. This has been said more especially in regard to his edition of Plutarch, which came out in the same year that he published his Thesaurus; but Wyttenbach, on examining several MSS. for his own edition, found that H. Stephens was in most cases supported by MS. authority.

Robert Stephens ii., the youngest son of Robert Stephens i., and brother of Henry Stephens ii., was born at Paris in 1530. The first time that we find him taking part in the publication of a work was in 1556, when he and Morel, who was then royal printer, published the edition of Anacreon prepared by H. Stephens. The title of royal printer was conferred upon Robert in 1561, as appears from some books printed by him in this year, at the same time that he came into possession of the printing-office of Charles Stephens. In this office he continued till his death. In activity and accurate and beautiful printing he was worthy of his father, but this is all that we know of him. As royal printer he was much employed in printing edicts and ordonnances, as may be seen from the list of his publications by Renouard. He died in 1571. Among his publications we only mention the following: a reprint of the Historical Dictionary ('Dictionarium Propriorum Nominum Virorum, Mulierum, Populorum, &c.') of Charles Stephens, 1560, 4to.; 'Josephi Scaligeri Conjectanea in M. Terent. Varronem,' 1565; and several editions of Donatus 'De Partibus Orationis.'

After his death his wife married again, and kept up the printing establishment. There are publications down to the year 1588, 'Ex officina Roberti Stephani.'

Robert Stephens iii., son of Robert Stephens ii, was educated by the poet and abbé Desportes, who inspired him with a love for poetry, and with whom he appears to have stayed at least till 1584. He did not commence printing till 1606, so that eighteen years elapsed without a publication appearing from the press of Robert Stephens. His first publication was, 'D. Gregorii Nysseni ad Eustathiam, Ambrosiam, Basilissam, Epistola, Græce. I. Casaubonus nunc primum publicavit, Latine vertit et notis illustravit,' Lutetiæ, 1606, 8vo. He probably worked in the printing establishment which had belonged to his father, and continued to print until 1631. He distinguished himself also by his Latin, Greek, and French verses, and by a French translation of the first two books of Aristotle's 'Rhetoric,' which was printed in 1630, 8vo. In his publications he generally added to his name the letters R. F. R. N., that is, Roberti Filius, Roberti Nepos, to distinguish himself from his father and grandfather. He printed a great number of books: the principal are, 'Menandri et Philistionis Sententiæ Comparatæ, Græce, ex Bibliotheca Regia; cum notis, cura N. Rigaltii,' Lutetiæ, 1613, 8vo.; 'D. Junii Juvenalis Satyrarum Libri v., Sulpiciæ Satyra, Cura Rigaltii, &c.,' Lutet., 1616; 'Dictys Cretensis, De Bello Trojano, et Dares Phrygius De Excidio Trojæ,' &c., 1618, 16mo.

There are several other members of the Stephens family of the name of Robert, but none of them were distinguished. During the last century there was a French writer of the name of Robert Stephens (Robert Etienne), who claimed a descent from the illustrious family of printers.

Paul Stephens, a son of Henry Stephens ii., by his second wife, was born at Geneva in 1566. He received his early education at home, and was then sent out by his father to visit the principal towns of Europe, and the distinguished scholars with whom his father was acquainted. Lipsius, whom he visited at Leyden, was much pleased with him, and in one of his letters calls him 'mitis adolescens.' On his return to Geneva he assisted his father in printing and editing. He afterwards made several other journeys, partly perhaps in connection with the business of his father. In 1594 he spent some time in London, where, among other distinguished men, he made the acquaintance of John Castolius. In 1595 he was at Heidelberg, and in 1596 at Frankfort, where he stayed in the house of the jurist Dionysius Gothofredus. He had married in 1589. His first literary production was, 'Pauli Stephani Versiones Epigrammatum Graecorum Anthologiae, Latinis versibus,' Genevæ, 1593, 8vo. He was always fond of making Latin verses, but his poetry is stiff and unanimated. His best is perhaps the poem on the death of his father.

After the death of his father, when the affairs of the family were settled, and Casaubon had left Geneva, Paul was placed at the head of his father's printing establishment (1599), which he conducted with great energy. He first reprinted a number of classical authors which had been edited by his father, and were then out of print, such as Virgil, Horace, the letters of Pliny, and the Latin panegyrists and others. The two works which do him most credit are, 'Euripidis Tragœdiæ quae extant, cum Lat. Guil. Canteri Interpretatione,' &c., containing the Greek scholia and commentaries of several scholars, 1602, 2 vols. 4to.; and 'Sophoclis Tragœdiæ Septem, unà cum omnibus Græcis Scholiis et Latina Viti Windemii ad verbum Interpretatione,' &c., likewise containing the Scholia, and also notes by H. Stephens. In 1619 he printed a folio edition of Herodotus, founded upon that of his father, with a Latin translation and notes by Sylburg. No other publication issued from his press till 1626, when he published a fifth edition of the lyric Greek poets: 'Pindari et ceterorum Octo Lyricorum Carmina.' This was his last publication. The inactivity in his establishment during the last years appears to have been the consequence of his want of capital, to which we may perhaps also attribute the fact that most of his works are printed on very bad paper. In 1626 or 1627 he sold his whole establishment to the brothers Clouet. It is not known what became of him after this, and the time of his death is also unknown. He had eight children, two of whom only, Anthony and Joseph, survived their father.

Francis Stephens ii., son of Robert Stephens i., and an elder brother of Henry Stephens ii., followed his father to Geneva, and is said to have been a good Greek and Latin scholar. After the death of his father he established at Geneva a printing-office of his own, which he conducted from 1562 to 1582, with an interruption however of nearly ten years. Even during the remaining ten years he printed very few books, and most of them for publishers: this appears to have been owing to his want of capital. The first work, and almost the only one that he printed on his own account, was Calvin's 'Commentaries on the Psalms,' 1563, fol. His last publication was Amyot's French translation of the 'Moralia' of Plutarch, 1581-2, 2 vols. fol. After this time he gave up printing and settled in Normandy, and we hear no more about him.

Anthony Stephens, son of Paul Stephens, was born at Geneva in 1592. He studied at Lyon, and afterwards finished his education at Paris, where he abjured Protestantism before Cardinal du Perron. In 1612 he obtained letters patent of naturalization in France, and at the same time the office of huissier de l'assemblée du clergé, with a salary of 500 franks, which he held until the year 1635. Long before this time however he had been in the possession of a printing establishment Some writers mention a work by Perron, which Anthony Stephens is said to have printed in 1605. But this cannot possibly be correct, as Anthony was then only thirteen years old. The earliest work which he printed belongs to the year 1613, and henceforth he conducted his establishment with an activity worthy of his great ancestors until the year 1664. He was also honoured with the title of royal printer, through the influence of Cardinal Perron, and he received a pension of 600 francs, but the time when he first received it is uncertain. The pension was stopped when Perron died, and Anthony after this was several times in great pecuniary difficulties. Among his numerous publications, which comprise all the works of Perron, there are several valuable editions of antient authors, such as Casaubon's edition of Strabo, 1620; of Plutarch's Works, with Xylander's translation, 1624, 2 vols. fol.; Lounclavius's edition of Xenophon, 1625; Aristotle's Works, 1629, 2 vols. fol.

For many years after the death of his patron Anthony was in very straitened circumstances, and was supported by his son Henry, who, from the year 1646, had a printing-office of his own, where, among other works, Montaigne's 'Essays' were printed. When this son died in 1661, and Anthony was deprived of his last and only support, he sank rapidly: he became infirm, and at last lost his sight. In this state he dragged on a wretched existence until the year 1674, when he died in the Hôtel-Dieu at Paris, at the age of 82. He had had six children, all of whom died before him.

Besides the members of the Stephens family, whom we have mentioned above, there are two more, who however were never engaged in printing. The one is Henry Stephens, a son of Robert Stephens II., who was treasurer of the royal palaces; the other likewise called Henry, and a son of the former, acquired some reputation as a poet, and also wrote some other works in French.

Respecting the lives of the Stephens, see Th. Jansonii ab Almeloveen, 'Dissertatio Epistolica de Vitis Stephanorum,' Amsterdam, 1685; Maittaire, 'Stephanorum Historia,' London, 1709, 2 vols in 4 parts, which contains a list, though not complete, of their publications; Greswell, 'A View of the early Parisian Greek Press, including the lives of the Stephani,' Oxford, 1833; Ant. Aug. Renouard, 'Annales de l'Imprimerie des Etienne, ou Histoire de la Famille des Etienne et de ses éditions,' Paris, 1837, 2 vols. 8vo. This last work contains in the first volume a very complete list of all the publications of the Stephens, and various interesting and important facts, derived from the public records of Paris and Geneva, which were unknown to former biographers.

STEPNEY. [MIDDLESEX.]

STEPNEY, GEORGE, descended from an antient family in Pembrokeshire, was born in the city of Westminster, in 1663. In 1676 he was sent to Westminster School, where he continued his studies till 1682, when he removed to Trinity College, Cambridge, where he distinguished himself in 1683 by a Latin ode on the marriage of the Princess Anne to Prince George of Denmark. He took the degree of M.A. in 1689. At Westminster he had formed a friendship with Charles Montague, afterwards earl of Halifax, which was continued at Cambridge. They came to London together, and were both introduced into public life by the earl of Dorset.

Stepney's life, which was short, was chiefly spent in diplomatic employments. In 1692 he was sent as envoy to the elector of Brandenburg; in 1693, to the emperor of Germany; in 1694, to the elector of Saxony. In 1695 he published a poem, dedicated to the memory of Queen Mary; in 1696 he went as envoy to the electors of Mentz and Cologne, and to the congress at Frankfort; in 1698 to Brandenburg, in 1699 to the king of Poland, in 1701 to the Emperor, and in 1706 to the States-General. He was made one of the Commissioners of Trade in 1697. He died at Chelsea in 1707, and was buried in Westminster Abbey.

Stepney's poems are few, and of little value. He was one of the 'eminent hands' who were united with Dryden in the translation of Juvenal in 1693. Johnson says 'he is a very licentious translator, and does not recompense the neglect of his author by beauties of his own.'

(Johnson's *Lives of the Poets;* &c.)

STEPPES. [PLAINS.]

STERCORA'RIUS. [LARIDÆ, vol. xiii., p. 336.]

STERCU'LIA, a genus of plants which gives its name to the natural family of Sterculiaceæ, which sometimes forms a section of the family of Byttneriaceæ. The name is derived from *sterculus*, as that from *stercus*, some of the species being remarkable for the strong and disagreeable odour of their leaves or flowers. The genus is characterised by having polygamous or monœcious flowers. Calyx 5-lobed, somewhat coriaceous. Petals wanting. Stamens monadelphous, disposed in a short sessile or stipitate urceolus. Anthers adnate, ten, fifteen, twenty, in one or two rows; solitary or ternately aggregate. Ovary stipitate or sessile. Carpels follicular, five, or fewer from abortion, distinct, 1-celled, one or many seeded, opening on the inner side; seeds disposed in two rows along the suture of the carpels; sometimes, when the carpels have opened and become spread out, the seeds appear to be arranged along the sides of a leaf-like membrane. Seeds with fleshy albumen, and flat, leafy, equal cotyledons. The species consist of various-sized trees with soft timber, which are found in the tropical parts of the world, with simple or compound leaves and axillary panicles or racemes of flowers. Many of them are of considerable use in the countries where they are indigenous. Like the family to which they belong, several species are mucilaginous; and others yield fibre, which, from its tenacity, is made into ropes. Some yield a gummy exudation resembling tragacanth, and which is sometimes substituted for it: thus the gum called tragacanth, which is sometimes imported from Sierra Leone, is said by Dr. Lindley to be yielded by a species which he calls S. Tragacantha, the S. pubescens of others. So Dr. Roxburgh states *kuteera* gum, which is often substituted for tragacanth, to be produced by S. urens, a tree of the mountains of the Coromandel Coast. Dr. Royle however states that the kuteera gum of many parts of India is yielded by Cochlospermum Gossypium. S. guttata yields a bark, from which the natives of Malabar prepare flax-like fibres, of which the natives of Wynaad make a sort of clothing. S. acuminata is a native of the tropical parts of the western coast of Africa, where its seeds are everywhere known by the name of cola or kola, and are mentioned by most travellers. They are much esteemed by the natives, who take a portion of one of them before each of their meals, as they believe that these seeds increase the flavour of anything they may subsequently eat or drink. They are about the size of a pigeon's egg, are bitter in taste, and may be supposed to have some stomachic properties. The seeds of S. macrocarpa and of S. heterophylla are also called cola on the African coast. In Asia, in the same way, the seeds of S. Balanghas, are described by Rumphius as being roasted and eaten by the natives of Amboyna, while the capsules are burned for the preparation of the colouring-matter called *cassoumba*. The seeds of S. urens and of S. fœtida are likewise eaten in India after having been roasted, as are those of S. Chicha in Brazil. Those of S. alata are also said to be used as a cheap substitute for opium in the district of Silhet; but this statement, implying the presence of narcotic principles, requires careful examination before it can be received as a fact, as we generally find an accordance rather than so great a difference in the properties of species of the same genus.

STERCULIA'CEÆ, a natural order of plants belonging to the syncarpous group of polypetalous Exogens. The plants belonging to this order are trees or shrubs, with alternate, stipulate, simple, often toothed leaves, with a variable inflorescence, and a stellate pubescence. The calyx is either naked or surrounded with an involucre, consisting of 5 sepals, with a valvular or nearly valvular æstivation; 5 petals hypogynous, often saccate at the base; stamens definite or indefinite, and monadelphous; anthers 2-celled; the pistil consists of 5 carpels, often surrounding a columnar gynophore; fruit a capsule with 3 or 5 cells; seeds often winged, sometimes woolly; albumen oily or fleshy, and embryo straight; cotyledons either flat and plaited, or rolled round the plumule.

The order thus defined includes several groups of plants, which have by many writers been made to form distinct orders. Sterculiaceæ are most nearly allied to Malvaceæ, from which they differ in the possession of 2-celled anthers. From Dipteraceæ and Tiliaceæ, to which they are allied by the valvate æstivation of the calyx, they differ in the possession of monadelphous stamens. The subdivisions of this order are marked by very evident peculiarities of structure:—

Helictereæ have an irregular calyx and corolla.

Sterculieæ, no petals, and definite stamens placed at the end of a long column.

Bombaceæ, a calyx with a ruptile dehiscence, usually woolly seeds, and the cells of the anthers anfractuose.

Dombeyæ, a part of the stamens sterile and flat well-formed petals.

Byttnerieæ, a part of the stamens sterile, and small petals bagged at the base.

Lasiopetaleæ, a petaloid calyx and rudimentary petal.

Hermannieæ, spirally twisted petals with only 5 stamens, and those opposite the petals.

Sterculiaceæ are natives of India, New Holland, the Cape of Good Hope, and South America, with the West Indies. Most of its subdivisions have however a very definite geographical range.

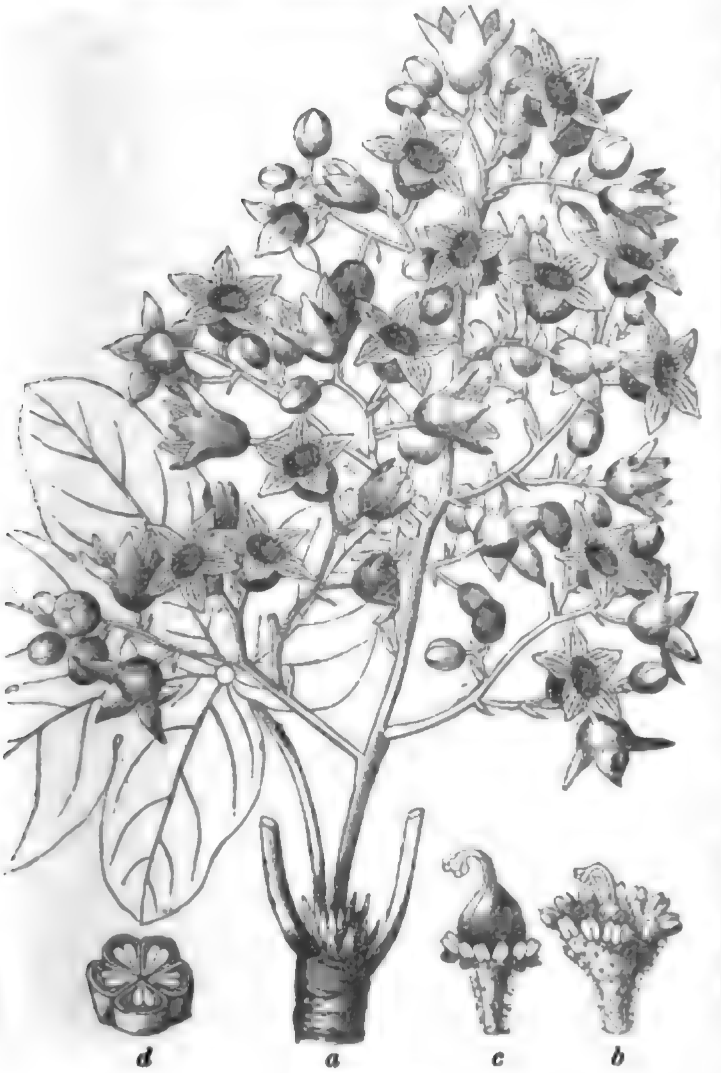
Sterculieæ are found in India and equinoctial Africa. The genus Sterculia contains many species that are used as food or medicine. [STERCULIA.]

Byttnerieæ are principally natives of South America and the West Indies; about one-seventh of the species are found in the East Indies, and the same proportion in New Holland. To this group belongs the plant that produces the cocoa [THEOBROMA] of commerce. These plants, like the whole of the order and its allies, abound with mucilage, and are often used in medicine as demulcents. The fruit of *Guazuma ulmifolia* possesses a mucilaginous pulp, and is eaten in Mexico by man, but principally employed for feeding cattle. The bark of this plant is bitter, and is said to be serviceable in the horrible disease called Elephantiasis.

Hermannieæ—two-thirds are found at the Cape of Good Hope; the remainder are natives of the East and West Indies, South America, and the islands of the Pacific. The species of *Waltheria* abound in mucilage, and are used in medicine as demulcents.

Dombeyæ are all African, East Indian, or South American. Their properties are similar to the preceding. One of the species, *Wallichia spectabilis*, forms a handsome tree, approaching the linden, and points out a relation between this order and Tiliaceæ.

Lasiopetalæ are found entirely in New Holland, and possess no remarkable properties. For further information on the properties of plants of this order see **BOMBACEÆ**, **ADANSONIA**, **STERCULIA**, **THEOBROMA**.



Sterculia chicha.

a, Branch with leaves and apetalous flowers; *b*, Monadelphous stamens surrounding pistil; *c*, Ovary, style, and stigma; *d*, Section of fruit, showing its cells.

STEREOGRAPHIC. This word, which is derived from *στερεός*, 'solid,' and *γράφειν*, 'to draw,' and which therefore ought to be applied to every method of representing a solid in a plane, has nevertheless a limited technical sense, being applied to that projection of a sphere in which the eye is at a point in the sphere, and the plane of projection is the great circle of which the eye is at the pole, or a plane parallel to it. This mode of projection was known to Hipparchus, and was first described in the work on the planisphere attributed to Ptolemy.

The stereographic projection has two remarkable properties. The first is, that all circles are projected either into straight lines or circles. Those which pass through the eye are of course projected into straight lines; in every other case the projection is the SUBCONTRARY section of a cone, which has its vertex at the eye, and the circle to be projected for its base; consequently the projection is a circle. As much of the circle as lies below the plane of projection (the eye being considered as above it) is projected inside the great circle on which projection is made; and all the rest outside: when this projection is employed in maps, it is usual to place all the part of the globe to be projected below the plane of projection.

The second property is, that the angle made by two circles which meet on the globe, is equal to the angle made, at the point of meeting, by the two circles which are the projections of those circles, the angle made by two intersecting circles on the globe being always that made by their tangents. This property is easily proved as follows: Draw through the point of intersection of the two circles (A and B) which are to be projected, two other circles (A′ and B′), which have the same tangents, and pass through the eye. Then the tangents of A′ and B′ at the eye make the same angle as those at the other point of intersection; that is, as the tangents of A and B at the point to be projected. But these tangents of A′ and B′ at the eye are parallel to the *projections* of the tangents of A and B at the point to be projected: whence the projections of these tangents of A and B make the some angle as the tangents themselves.

The first property was known to Hipparchus and Ptolemy: the history of the second is rather curious. The first writer who seems to have looked attentively for a discoverer was Delambre (*Mém. Inst.*, vol. v., p. 393), who could not find it in Clavius, Stoffler, or any of the writers of the middle ages, who have treated pretty voluminously on the astrolabe, which word, as used by them, merely meant a stereographic projection. That it was mentioned (without demonstration) in the French Mathematical Dictionary of Savérien (1753), in an article which was copied word for word into the 'Encyclopédie,' was all that Delambre could then say of its origin. He afterwards, in writing his History of Astronomy in the Middle Ages, found the proposition demonstrated in the 'Compleat System of Astronomy,' by Charles Leadbetter, London, 1728; but, judging from the rest of the work, he presumes that Leadbetter could not have been the discoverer. No claim however has been put in for any one else, and we think it somewhat of an additional presumption in favour of Leadbetter that Savérien's article, which, appearing in the 'Encyclopédie,' first called general attention to the property, can be traced to Leadbetter's work nearly. For we find that Savérien translated his article, word for word, from the second edition (1743) of Stone's 'Mathematical Dictionary.' Stone was a contemporary of Leadbetter, and several times refers to his writings. In any case, however, until another inventor can be shown, the last-named mathematician must not be deprived of his right because he does not appear to have done other things as remarkable as this one.

The consequence of Leadbetter's theorem is, that any small portion of the sphere is projected into a figure very nearly similar to itself, so that any not very large portion of the earth preserves its figure with tolerable accuracy in the map. Hence some writers have said that there is no distortion in the stereographic projection, which is not absolutely true, though nearly so of countries which bear no greater proportion to the whole earth than most of them.

The mode of laying down the stereographic projection, which we cannot here give at length, may be found in the memoir of Delambre above cited, in the work on Practical Geometry published by the Society for the Diffusion of Useful Knowledge, or in any work on the construction of maps.

After correcting the proof of the preceding, we had occasion to consult the third edition of Dr. Harris's 'Lexicon Technicum' (1716); and feeling sure, with regard to that work, that such a proposition as the one called Leadbetter's would be stated, if it were then known, we turned to the article 'Spherick Geometry,' and there we found it, with a demonstration, enunciated as follows:—'All Angles made by Circles on the Superficies of the Sphere are equal to those made by their Representatives on the Plane of the Projection.' The claim of Leadbetter is therefore overthrown In the preface, Harris says that under (among others) 'Spherical Geometry' will be found entire treatises, which if he mistakes not, are as short and plain as any extant. If this proposition had been new, he would probably have noted it here, particularly if it had been his own. We find however, finally, that the property was lately shown (*Encyc. Brit.*, 'Projection') to have been demonstrated by Halley in No. 219 of the 'Philosophical Transactions,' and is attributed by him to De Moivre or Hook.

STEREOTOMY. [Perspective.]

STEREOTYPE. The art of stereotype printing is the printing from cast plates of type-metal in lieu of moveable letters or types, and derives its name from the Greek στερεός, firm or fixed, and τύπος, a figure or type. This art is a remarkable illustration of the tendency of some inventions to return, after a long course of improvement, very near to their original simplicity. In the commencement of the art of printing, solid blocks of wood were used, containing, in one piece, all the words of which a page was composed. A great improvement upon this plan was the use of single letters or types, which might be combined into words and pages, and, after being printed from, might be distributed and re-arranged for another work. Then followed the process of type-founding, or casting the letters individually in moulds, by which they might be multiplied with facility, and, being engraved originally upon steel punches, might be executed with greater neatness. Whether the early printers employed logotypes, that is, types for printing whole syllables or words, to any material extent, is not very certain; but it is well known that many persons have proposed, since the introduction of moveable types, the use of such logotypes for the purpose of facilitating the operation of printing; while others have adopted processes which approach more nearly to the old plan of printing from page-blocks, either by fusing the types composing a page into a solid mass, or, as in the modern art of stereotyping, by taking a mould from the page or *form* of moveable types, and using it as the matrix in which to make a solid cast or plate of metal. The face of such a cast is a fac-simile of the types from which the mould is taken, and may be printed from in the same manner as the original form or page.

Many of the accounts of the various projects which bear an affinity to the art of stereotyping, as practised by modern printers, are very indistinct; and the claims of some of the projectors are exceedingly perplexing. Those readers who desire minute information may consult works which enter at length into the history of printing, and especially a very interesting 'Essay on the Origin and Progress of Stereotype Printing,' published in 1820 by Mr. Hodgson, of Newcastle. The subject is also treated at considerable length in Hansard's 'Typographia;' but much of the history contained in that work is derived from the volume before mentioned.

One of the earliest schemes which claims notice in this brief sketch is that which was tried at the beginning of the last century by a Dutchman named Van der Mey. The booksellers Luchtmans, of Leyden, in a letter dated 1801, which was printed by M. Camus, in his 'Histoire et Procédés du Polytypage et de la Stéréotypie,' described some plates or blocks formed by Van der Mey, which had been used in their establishment ever since 1711. These were the forms for a quarto Bible; but a few other works were executed in the same way. They were not cast solid, but consisted of ordinary types, which, after being set up in the usual way, were converted into a solid mass by soldering them together at the back. The great expense of forms prepared in this way, as well as their inconvenient weight and bulk, is quite sufficient to account for the plan having fallen into disuse. It was indeed only applicable in those very rare cases in which it was desirable, in order to meet a constant demand, to keep the forms of type standing; and was preferable to that practice only inasmuch as it avoided the risk of some of the letters being accidentally loosened and misplaced.

William Ged, a goldsmith of Edinburgh, if not absolutely the first, was one of the first to practise stereotyping, according to the common acceptation of the word. His claim to this honour is recorded in a rare pamphlet published by Nichols in 1781, and reprinted in 1819 by Hodgson of Newcastle, entitled 'Biographical Memoirs of William Ged, including a particular account of his progress in the art of Block-printing.' From this work it appears that Ged invented a process for casting whole pages about the year 1725, and that a few years afterwards he and others who were associated with him attempted to apply his invention to the production of bibles and prayer-books for the University of Cambridge. One of the difficulties to be encountered in the introduction of this innovation was the prejudice and opposition of the compositors, who, by the artful production of errors in the forms of type, rendered the casts so incorrect as to bring them into discredit. The scheme was abandoned by the University, and most of the plates were destroyed. A battered and otherwise imperfect specimen which escaped the melting-pot is printed in Hansard's 'Typographia.' Ged cast plates for a few other works; one of which was an edition of Sallust, in 18mo., which, according to his son and daughter, was executed in 1736, though Hodgson says that he never saw a copy dated earlier than 1739, and that the edition commonly bears the date 1744. In Hodgson's Essay a page of this work is reprinted, which is a far better specimen of stereotyping than that given by Hansard. This plate, which had been previously printed in the tenth volume of the 'Philosophical Magazine,' is about a quarter of an inch thick.

About the year 1780, Mr. Tilloch, editor of the 'Philosophical Magazine,' conceived the possibility of founding whole pages; he being, at that time, unacquainted with the prior experiments of Ged. He communicated his idea to Foulis, printer to the university of Glasgow; and they jointly produced several works; some of which were circulated without any intimation of the process by which they were printed. Hodgson gives very good specimens of their work. Finding some inconvenience in the use of blocks of wood for mounting the plates, in order to raise them to the same height as type, these experimentalists tried blocks of brass, having slits through which small screws might pass to secure the stereotype plates; the screws being fastened by nuts on the under side of the brass mounts. In order to bed the plates as evenly as possible, whether the mount were of brass or wood, they interposed a layer of cement between the plate and the mount. In the latter case the thickness and level were adjusted by planing the back or under side of the wood; and in the former by warming the mount, and then placing it, with the plate, into a press, and squeezing out the superfluous cement. An account of the experiments of Tilloch and Foulis was published in the tenth volume of the 'Philosophical Magazine.' Satisfactory as they were, they did not immediately lead to the adoption of stereotype printing.

Towards the latter end of the eighteenth century, many projects were brought forward in France for multiplying engraved blocks or forms of type by processes more or less resembling that of stereotyping, under the names of polytype, stereotype, &c. In some of these the form was imitated by striking upon a mass of soft metal in a state intermediate between perfect fusion and perfect solidity, on the principle of the process now practised in France under the name of *clichage*. The extensive issues of assignats by the revolutionary government gave an impulse to such schemes, of which many were devised, and some were brought into operation, in order to render the assignats more difficult of imitation. In 1798 a stereotype edition of Virgil was published by the Didots and M. Herman; and it appears from Hodgson that, before the close of the century, the wood-engravers of Paris sold metal casts of their wood-cuts.

Some of the early experiments of Senefelder, the inventor of lithography [Senefelder, vol. xxi., p. 229] were directed to the discovery of a means of stereotyping by which he might be enabled to print his own works with a very small stock of type. He formed a composition of clay, fine sand, flour, and pulverised charcoal, mixed with a little water, and kneaded as stiff as possible; and with this paste he made a mould from a page of types, which became, in a quarter of an hour, so hard that he could take a very perfect cast from it in melted sealing-wax, by means of a hand-press. He states that, by mixing a little pulverised plaster of Paris with the sealing-wax, the stereotype plates thus produced were much harder than the common type-metal of lead and antimony. The want of pecuniary means for carrying on this project led him to abandon it, and to contrive a plan for printing from stone. Another ingenious proposal which may be here mentioned, is that of Professor Wilson, of Glasgow, who, in 1737, devised a method of multiplying engraved blocks or plates by stereotype or rather polytype impressions in glass or enamel, which, it was anticipated, would prove very durable, and might be applied with advantage to the prevention of forgery. Hodgson gives specimens of two casts of small wood-cuts produced in this manner.

The revival and introduction into common use of the stereotyping process is, in a great measure, due to the exertions of Earl Stanhope, about the commencement of the present century. Mr. Tilloch communicated to him the result of his experiments, and Foulis, who, as before stated, had been associated with Tilloch, assisted in the trials made at his lordship's seat at Chevening, in Kent. Andrew Wilson also was connected with these operations, and exerted himself much to introduce the process. The latter individual, who received a gold medal from the Society of Arts in 1810, for his 'great skill and exertions in stereotype printing,' produced several important stereotyped works, of which Hodgson considers his edition of Walker's 'Pronouncing Dictionary,' executed in 1809, to be the best. A specimen of his work, which was printed in the twenty-eighth volume of the 'Transactions' of the Society of Arts (pp. 323-4), shows that he was then able to produce very good casting from type as small as Nonpareil and Pearl. In 1803 or 1804 the process which had been perfected at Chevening was communicated to the university of Cambridge, and shortly afterwards to that of Oxford; but the first work printed in this way at the former place did not appear until 1807, and 1809 is the date of the earliest stereotyped book issued at Oxford.

In setting-up a form intended for stereotyping from, the *spaces*, or short pieces of metal by which the words are separated from each other, and the *quadrats*, or larger spaces by which blank lines are filled up, are cast higher than usual. The types are set up and formed into pages in the usual manner, with the illustrative wood-cuts, if there be any; but, instead of these pages being arranged into a form of sufficient size to print a whole sheet, each page, if large, or every two or four pages, if small, is separately locked up in a small frame or *chase;* the pages being surrounded by fillets of wood or metal, which serve in the cast to form a border for attaching the plate to its mount. The face of the types is then moistened with oil, to prevent the mould from adhering to them. A brass frame, rather larger than the page, is laid upon the chase, in order to retain the plaster while in a fluid state, and to regulate the thickness of the mould. The plaster is then poured on the types, and it soon sets into a solid mass, which must be removed from the types with great care, trimmed on the edges with a knife. The plaster moulds are, in the next place, baked in an oven heated to about 400° Fahrenheit, until they are thoroughly dry and hard. They are placed upright in a rack, and are usually dried in about two hours. Great care is required in this process, especially when the moulds are large, to prevent them from warping.

After being baked, the mould is placed, with its face downwards, upon a smooth plate of iron, called a *floating-plate*, which lies at the bottom of a cast-iron box rather larger than the mould. The box is then covered in by a lid, the under surface of which is made perfectly flat, and which has the corners cut off, to allow the melted metal to enter the box. The cover is firmly held down by a screw, which is attached to an apparatus by which the box is suspended from a crane. It should be observed that the casting-box and plate are heated to the same temperature as the mould, before it is inserted. The box is then swung by the crane over the metal-pit, which is an open iron vessel containing a large quantity of melted metal, resembling in its composition that used for casting types; and it is lowered into the metal in a nearly horizontal position, being a very little inclined, to facilitate the escape of air from the mould and box. The melted metal runs in at the corners of the box; and, by its greater specific gravity, floats up the plate with the mould, forcing the latter tightly against the lid of the box. By this contrivance the metal is forced, by hydrostatic pressure, into every part of the mould, in the margin of which notches are cut to allow free passage for the metal between it and the floating-plate. After remaining immersed in the metal for about ten minutes, the box is gently raised, and removed by the crane to a trough in which its lower part is rapidly cooled by contact with cold water. While the box is cooling, the caster pours in a little metal at the corners, to fill the space left by the contraction of the metal, and so to keep up the necessary pressure upon the cast. When cold, the contents of the box are removed in a mass, from which the superfluous metal is broken off by blows from a mallet. The plaster mould is then broken away from the cast, the face of which is a fac-simile of the types and engravings from which the mould was taken. As the mould is destroyed by this process, it is necessary, when several stereotype plates of the same page are required, to take a distinct plaster mould for each.

The above is the mode of casting usually practised in England; but a different plan has been successfully adopted by Mr. Allen of Edinburgh. The pages of the seventh edition of the 'Encyclopædia Britannica' are stereotyped by the new process alluded to, which is minutely described in the article 'Printing' in that work. The casting-box is, in this case, of sufficient depth to receive several moulds in a vertical position, so that, of the work just alluded to, five pages are cast simultaneously. Another plan, which has been tried for the production of stereotype plates too large for casting in the ordinary way, but which we believe has not proved very successful, is to place the mould in a flat iron box, having a trough-shaped mouth at one end, and to pour in the metal with the mould-box, which must be previously heated, in an inclined position. The method of striking the moulds, and from them the plates themselves, by letting the original or pattern types or blocks fall upon a mass of soft metal in a half-melted state, is practised in France, and has been repeatedly tried in this country: it is especially adapted for the production of copies of wood engravings, but it is very liable to injure a delicately engraved block. In this, as in the ordinary casting process, the original engraved blocks should be smeared with some substance that may prevent the cast from adhering to them. In the 'Treatise on Wood Engraving' by Messrs. Chatto and Jackson, a composition of common yellow soap and red ochre is recommended for this purpose.

The alloys used for various kinds of stereotyping differ slightly in their composition, but generally consist of type metal. [TYPE FOUNDING.]

In the year 1820 Mr. (now Sir M. I.) Brunel patented a method of stereotyping intended chiefly for newspaper work, which, though not brought into operation, may afford a useful hint. He proposed to form a mould of a composition of pipe-clay, chalk or burnt clay, finely powdered, and starch, mixed up with water into a stiff paste, and spread upon a thin and flexible plate of steel. The paste was then to be covered with several thicknesses of fine calico, and a skin of wet parchment, and pressed upon the types, to squeeze it into the general form. After this the calico and parchment were to be removed, and two sheets of paper placed in their stead; the mould then received another pressure, by which it was rendered more like the face of the types. Finally, the papers were to be removed, and the impression perfected by pressing the mould immediately upon the surface of the types, which should then be smeared with oil From this mould a cast was to be taken in metal for printing from. By the proposed application of this process to newspaper printing it was conceived that time might be saved by printing in duplicate, or by bending the plates on to the surface of a cylinder, by which means they might be printed from more rapidly than when flat. By another plan mentioned in the same patent, a kind of stereotype plate was to be formed of shell-lac, spread upon a plate of iron, and coated with a thin film of type-metal. These plans are more fully described in Hansard's 'Typographia.'

Stereotype-plates need careful examination and *picking*, to remove the imperfections in the casting. Small hollows, such as the loops of an a, an e, or an o, are liable to be filled up with metal, owing to blebs of air in the mould, and the fine white lines in wood-engravings are sometimes filled up. Such matters should be corrected by the picker, who should also cut down, with suitable tools, such blank spaces as might be liable to soil in printing. Before printing, also, defective letters or words which cannot be corrected by the picker should be cut away, and types inserted in their place. These types are soldered into holes drilled through the plate; their stems being sawn off flush with the back.

Although the plates are cast of as equal a thickness as possible, they require, before printing from, to be accurately flattened at the back by means of a peculiar kind of lathe, in which a steel cutter, or *knife*, mounted in a slide-rest, shaves off the metal from the back of the plate in concentric circles, until it is made perfectly even. They are then mounted upon blocks of wood or metal, to raise them to the same height as common types. The tendency of wood to warp when exposed to changes of temperature, or to occasional wetting, has led to many projects for mounting stereotype-plates upon blocks of cement, or upon metallic mounts which might be applicable to plates of various sizes. When wooden blocks are used, the plates are usually secured to them by clips at the edges, and sometimes by screws.

The process of stereotyping is one of the most important means by which the production of cheap books has been facilitated of late years. For a work of limited and temporary demand it is unnecessary; but where the demand is very great, and likely to last for several years, it is all-important, since it enables the publisher to keep up the supply without the expense of having a very large edition printed at once. In most cases where the demand is uncertain, and in almost all where the demand is sure to be large, it is desirable to resort to stereotyping, because, although it increases the first cost of production, it enables the publisher to avoid, on the one hand, the risk of printing a great number of copies which may prove unsaleable, and, on the other, the outlay necessary for the re-composition of the types, in case the demand should exceed the number of copies first printed. For instance, for a work now preparing for publication in demy octavo, the estimate stands as follows:—

Composing, per sheet . .	£3 10 0
Corrections, per sheet . .	2 0 0
	£5 10 0

The extent of the sale is very uncertain, so that, without the aid of stereotyping, the publisher must either run the risk of printing a long number, or incur the repetition of this expense of 5*l.* 10*s.* per sheet, if the sale should outrun the first edition. In case of reprinting, the same difficulty would occur as to the number which might be required, as the forms of type must be immediately distributed, and therefore the extent of the impression must again be a matter of hazard. All this uncertainty may be avoided by stereotyping the forms, which will occasion an increased outlay, in the first instance, of 2*l.* 2*s.* per sheet. A small number of copies may then be printed, and, if the demand should continue, re-issues of a few hundreds each may be made at the mere cost of paper and press-work, and without the delay and risk of error consequent upon re-composition. The 'Library of Useful Knowledge,' and several other works of the Society for the Diffusion of Useful Knowledge, present striking examples of the advantages alluded to, since, although the demand has been very large and long-continued, and the number of copies sold of some works has greatly exceeded that of others of the same series, the supply has never been interrupted, nor has the expense of re-composition ever been incurred. In cases where great numbers are required at once, stereotyping has been found very useful, since two or more sets of plates may be made, and printed from simultaneously. Its advantages have been particularly felt in the production of the 'Penny Magazine,' and similar works. (See *Penny Magazine*, No. 107, for a fuller enumeration of them.) 'Chambers's Edinburgh Journal' is another remarkable instance of the utility of this process; since it enables the publishers to print their London edition in London, by merely sending eight stereotype plates from Edinburgh every week, instead of having to send many thousand printed copies, at a much greater expense.

It has often been urged as an objection to stereotype printing that it tends to perpetuate errors; but the fallacy of such a statement may be easily shown. In re-composition new typographical errors are pretty sure to arise, while the expurgation of old ones is by no means certain; but in stereotype plates the occurrence of new errors (excepting by the breaking off of a letter or figure) is impossible, and original errors may be altered whenever they are discovered. Such alterations are not necessarily confined to the insertion of a letter or a word; for whole sentences and paragraphs may be altered in like way, provided that the new matter be made the same in extent as that which is cut away. Hence a stereotyped work may be gradually rendered almost immaculate; and an error which would otherwise have run through the whole edition, may be corrected when only a few hundred copies have been circulated.

The multiplication of engravings is an object of little less importance than that for which stereotyping is more extensively used. By the help of this art copies of the wood-cuts in the 'Penny Magazine' and other works are supplied, at a very moderate cost, to publishers in America and on the Continent. This diffusion of engravings has been carried to such an extent, that casts of some illustrations executed for British periodicals have been transmitted to as many as seventeen different countries, for use in similar works.

STERLING, a word applied to all lawful money of Great Britain. In Ruding's work on 'Coinage,' vol. i., p. 13, 4to. edit., the various supposed derivations of the word are given, with a list of the old writers who have adopted each. Ruding himself, after an elaborate examination, says, 'its origin and derivation are still unsettled;' but he inclines, with the majority of the authorities, to attribute it to an abbreviation of Esterlings, people of the north-east of Europe, some of whom were employed in the twelfth century in regulating the coinage of England. The word was not in use before the Conquest, though some have given it a Saxon derivation. In the twelfth century its use was common, and in the following century a writer ascribes its origin to the Esterlings. From the twelfth century English money was designated all over Europe as sterling. By the statute called the Assize of Weights and Measures which is attributed, in some copies, to the reign of Henry III. (1216-1272), in others to that of Edward I. (1272-1307), 'the king's measure was made so that an English penny, which is called the sterling, shall weigh thirty-two grains of wheat dry in the midst of the ear.' This is the origin of the pennyweight, though it now weighs twenty-four grains.

STERN. [SHIP.]

STERNA. [TERN.]

STERNASPIS. [TESTUDINATA.]

STERNE, LAURENCE, was the great-grandson of Dr. Richard Sterne, who died archbishop of York in 1683. His father, Roger Sterne, second son of Simon Sterne of Elvington and Halifax, having entered the army, became a lieutenant in Handaside's regiment, and on the 25th of September, 1711, O.S., married in Flanders, Agnes, the widow of Captain Hebert, and stepdaughter of a person of the name of Nuttle, whom Sterne himself, in a memoir written for the information of his daughter a short time before his death, describes as 'a noted sutler in Flanders in Queen Anne's wars.' His mother's own family name he professes to have forgotten. Roger's first child, born at Lisle, in July, 1712, was a daughter, Mary, who grew up to be a very beautiful woman, but made an unfortunate marriage, and died early of a broken heart: Laurence was brought into the world, on the 24th of November, 1713, at Clonmel in Ireland, where his father and mother had arrived with the regiment from Dunkirk only a few days before. 'My birthday,' says Sterne, 'was ominous to my poor father, who was, the day after our arrival, with many other brave officers, broke, and sent adrift into the world, with a wife and two children.' The lieutenant upon this betook himself with his wife and family to the family seat at Elvington, near York, where his mother, who had inherited the property from her father, Sir Roger Jaques, resided, her husband having died ten years before; here they all sojourned for about ten months, after which, the regiment being re-established, they set out to join it at Dublin, whence, lieutenant Sterne being within a month ordered to Exeter, his wife and her two infants followed him thither. They remained a twelvemonth in England, and then the lieutenant, with his family increased by another boy, born at Plymouth, was forced once more to turn his face to Ireland. This must have been about the end of the year 1715, if the chronology of the account is to be depended upon. Having got to Dublin, they continued there till the year 1719, which however would be for above three years, instead of only a year and a half, as Sterne seems to state. In that year, he says, 'all unhinged again.' The regiment was ordered to the Isle of Wight, to embark for Spain on the Vigo expedition. On their journey thither from Bristol the younger boy died, but his place was supplied by a girl (who died however in childhood) born in September, 1719, in the Isle of Wight, where the lieutenant left his wife and children till the regiment got back to Wicklow, in Ireland, whither he then sent for them. They lived a year in the barracks at Wicklow, where Mrs. Sterne gave birth to another boy; and then they spent six months with a relation of hers, a Mr. Fetherston, parson of a place called Animo, about seven miles from Wicklow. 'It was in this parish,' says Sterne, 'during our stay, that I had that wonderful escape, in falling through a mill-race whilst the mill was going, and being taken up unhurt; the story is incredible, but known for truth in all that part of Ireland, where hundreds of the common people flocked to see me.' The incident, it seems, is still traditionally remembered in the district

After this they were in barracks for another year in Dublin—the year 1721—in which, Sterne tells us, he learned to write. The regiment was next ordered to Mullingar, where a collateral descendant of archbishop Sterne found out his relations, or was found out by them, and, taking them all to his 'castle,' entertained them kindly for a year, and then sent them after the regiment to Carrickfergus. On the journey thither, which took six or seven days, and is described as 'most rueful and tedious,' the youngest boy died, and also another infant, a girl, which had been born when they were last in Dublin. In the autumn of this year (1723), or the spring of the next, the subject of the present article, now ten years old, was sent over to England, and put to school, near Halifax, 'with an able master,' says he, 'with whom I stayed some time, till, by God's care of me, my cousin Sterne of Elvington became a father to me, and sent me to the University.' It will be perceived from this detail, that, although Sterne was of English descent and parentage, he was not only by accident a native of Ireland, but spent in that country a considerable part of his early boyhood. No doubt some effect was produced upon his opening powers of thought and observation, by his having been allowed to run wild, as it were, in that land of wit and whim from his seventh to his tenth year.

His father next followed his regiment to Londonderry, 'where,' says the autobiographical sketch, 'another sister was brought forth, Catherine, still living, but most unhappily estranged from me by my uncle's wickedness and her own folly.' From Londonderry the regiment was sent out to defend Gibraltar at the siege (in 1727), where Lieutenant Sterne was run through the body by a brother officer in a duel, and only recovered with much difficulty, and with so shattered a constitution, that when, shortly after, he was sent out to Jamaica, he speedily fell a prey to the country fever, dying at Port Antonio, in March, 1731. 'My father,' says Sterne, 'was a little smart man—active to the last degree in all exercises—most patient of fatigue and disappointments, of which it pleased God to give him full measure; he was in his temper somewhat rapid and hasty, but of a kindly, sweet disposition, void of all design, and so innocent in his own intentions, that he suspected no one; so that you might have cheated him ten times in a day, if nine had not been sufficient for your purpose.'

Meanwhile Sterne remained with his master at Halifax, to whom, from an anecdote which he relates, his dawning genius seems to have been already clearly discernible, till he was sent by his kinsman to the University of Cambridge in 1733. He was admitted of Jesus College on the 6th of July in that year; and he took the degree of B.A. in January, 1736; and that of M.A. at the commencement in 1740. On leaving the university, in what year has not been stated, he took orders, and his uncle, the Rev. Jaques Sterne, LL.D., a younger brother of his father's, and a well-beneficed clergyman, being a prebendary of Durham and of York, and rector of Rise and of Hornsea cum Riston, procured him the living of Sutton, in Yorkshire. It was in the city of York that he met with the lady whom he married in 1741, after having courted her, as he tells us, for two years. Her name is not known; all that appears is that her Christian name began with L., being probably Lydia, like that of her daughter. She brought him some fortune, but probably of no great amount. Sterne's uncle now procured him a prebend in York cathedral; 'but he quarrelled with me afterwards,' says Sterne,' 'because I would not write paragraphs in the newspapers: though he was a party man, I was not, and detested such dirty work, thinking it beneath me: from that period he became my bitterest enemy.' Notwithstanding all this virtuous indignation however, Sterne appears to have gone on doing this 'dirty work' for his uncle for a very considerable length of time—not much less than twenty years. In a letter to a Mrs. F——, written in November, 1759, on the eve of the publication of the first two volumes of his 'Tristram Shandy,' he says, in reply to an inquiry his correspondent had made as to the reason of his turning author, 'Why truly, I am tired of employing my brains for other people's advantage. 'Tis a foolish sacrifice I have made for some years to an ungrateful person.' It has been asserted that he wrote, or conducted for some time, a periodical electioneering paper published at York in the Whig interest. Soon after his marriage, a friend of his wife's presented him with the living of Stillington, also in Yorkshire; and he tells us he remained near twenty years at Sutton doing duty at both places, which seem to have been within a mile and a half of each other 'I had then, he says, 'very good health: books, painting, fiddling, and shooting were my amusements.' During all this space, his only publications, or all at least to which he put his name, were two sermons: the first, entitled 'The Case of Elijah and the Widow of Zarephath considered,' in 1747; the second, entitled 'The Abuses of Conscience,' in 1750. This latter is the same which he afterwards introduced in the second volume of his 'Tristram Shandy' as a Sermon of Yorick's: in the preface to the two first volumes of his collected sermons, which appeared the following year, he says 'I suppose it is needless to inform the public that the reason of printing these sermons arises altogether from the favourable reception which the sermon given as a sample of them in "Tristram Shandy" met with from the world:—that sermon was printed by itself some years ago, but could find neither purchasers nor readers.' Both sermons were republished in the collection.

The first two volumes of 'Tristram Shandy' were originally published at York, towards the end of the year 1759, and were reprinted at London early in 1760. Although anonymous, the work seems to have been known to be Sterne's from the first; and it raised him at once from obscurity to universal notoriety and high literary fame. This and his subsequent publications—two volumes of Sermons in 1760, vols. 3 and 4 of 'Tristram Shandy' in 1761, vols. 5 and 6 in 1762, vols. 7 and 8 in 1765, two more vols. of Sermons in 1766, the 9th vol. of 'Tristram Shandy' in 1767, and the 'Sentimental Journey' in 1768—probably also brought him a good deal of money; and his circumstances were further improved by his being presented by Lord Falconbridge, in 1760, with the curacy of Coxwold (also, we suppose, in Yorkshire), which he calls 'a sweet retirement, in comparison of Sutton.' His celebrity also, it is to be feared, introduced the Yorkshire parson to new habits of life, and to some kinds of dissipation not quite so innocent as 'fiddling and shooting.' In 1760 he took a house at York for his wife and his only child, a daughter; but his own time he seems from this date to have spent mostly either in London or on the Continent. In 1762, before the conclusion of the peace, he went to France, whither he was soon after followed by his wife and daughter. Leaving them both in that country, he seems to have in the first instance returned to England, whence, in 1764, he proceeded to Italy, with a view to the recovery of his health, now greatly impaired. He returned to England in the earlier part of 1767, and, having after some time persuaded his wife to come over to him with their daughter, he remained at York till he had written all that we have of his 'Sentimental Journey,' the first part, which he then brought up with him to the metropolis, and published, as has been already stated, in the beginning of the following year. He lived merely to see the work brought out; having died, at his lodgings in Bond-street, on the 18th of March, 1768 (not the 13th of September, as is stated on his monument erected some years after in the burying-ground of St. George's, Hanover-square, where he was interred). He had saved nothing, if he did not die in debt; but it is said that, soon after, his wife and daughter being at York during the races, a collection which amounted to a thousand pounds was made for them by some gentlemen there; and they also received a liberal subscription for three more volumes of his Sermons, which were afterwards published. In 1775, after her mother's death, Sterne's daughter, who calls herself, at the end of the dedication to Garrick, Lydia Sterne de Medalle (having been married to a person of the latter name), published three small volumes of his Letters to his Friends, along with the short autobiographical memoir from which many of the above facts have been taken. Some of the letters in this collection are of a very extraordinary character to have been either published by a daughter, or left for publication, as we are assured they were, by a wife. The same year there appeared, under the title of 'Letters to Eliza,' ten letters addressed by Sterne, in March and April, 1767, to an East Indian lady, who is described by the editor as a 'Mrs. Elizabeth Draper, wife of Daniel Draper, Esq., counsellor at Bombay, and at present chief of the factory at Surat.' Having come to England for the recovery of her health, she and Sterne became acquainted and were greatly taken with each other. Sterne's letters however certainly do not warrant us in concluding that they were attached by any other feelings than those of a very warm friendship. The lady had been dead some years, as well as Sterne himself, when his letters to her were published; and the latter part of her life, the editor tells us, had been attended with circumstances which were 'generally said to have reflected no credit either on her prudence or discretion.' But whether there is any real ground for this slander we greatly doubt. Mrs. Draper returned to her husband in India after her correspondence with Sterne, and, then making a second visit to England, died at Bristol, and was interred in the cathedral, where there is a marble monument erected to her memory. With the exception of one or two fragments, the only other remains of Sterne that have been printed consist of a second collection of letters, in one volume, which also appeared in 1775; with the addition of a piece of humourous satire entitled 'The History of a Watchcoat,' which however had been published separately about seven years before.

In 1793 Dr. Ferriar, of Manchester, published an Essay in the third volume of the 'Memoirs of the Manchester Literary and Philosophical Society,' afterwards enlarged and published separately in 1798, and again in 1802, under the title of 'Illustrations of Sterne,' with the view of showing that many passages in his writings were suggested by or imitated from various old and commonly neglected authors, especially Rabelais and Burton's 'Anatomy of Melancholy.' In a literal sense, the charge is sufficiently established; there are some passages in Sterne which may be fairly said to be copied from Burton, Rabelais, and others; and the germs of a good many of his thoughts and expressions may be found in their pages. Of course also the general spirit of his wit and turn of writing must have taken something from the sources with which he is thus proved to have been familiar. But however these detections may affect Sterne's reputation for honesty, the question of the originality of his genius is not touched by them. A writer of original genius, under the pressure of haste or indolence, may, if not a scrupulous man, borrow or steal occasionally, as well as the most common-place writer. Sterne, we know, was the reverse of scrupulous; but he may also have had no very felonious intention in the appropriations that are laid to his charge; it will be admitted that he has for the most part really put a new life into what he has thus resuscitated; and he probably thought that in all such cases he gave more than he took. The nature of his writings, it is to be remembered, precluded him from making any formal acknowledgement of his obligations; he could not finish off a chapter in 'Tristram Shandy' with a list of references such as might be appended to an article in a dictionary. Beyond all controversy, he is, in his conceptions and delineations separately considered, as well as in his general spirit and manner, one of the most original of writers. His humour is quite as much *sui generis* as that of either Rabelais or Cervantes or Swift. Whatever he may have in common with any or all of these, he has much more in which he differs from them, and that is wholly his own. He is, of all English humourists at least, the airiest and most buoyant. And it is wonderful what a truth and real humanity there is even in his most startling and eccentric creations; how perfectly unity of character and every artistic probability is preserved in each of them; how they all draw our sympathies towards them; how they live like actual existences in our memories and our hearts. It is rather a simple fact than an opinion that the first class of Sterne's *dramatis personæ*, his Uncle Tobys, his Corporal Trims, his Yoricks, rank in that department of our literature next to the Launces and Touchstones, the Malvolios and Justice Shallows, of Shakspere, and far apart from all else of the same kind in the language. In the mere art of writing also, his execution, amid much apparent extravagance, is singularly careful and perfect; it will be found that every touch has been well considered, has its proper purpose and meaning, and performs its part in producing the effect; but the art of arts, the *ars celare artem*, never was possessed in a higher degree by any writer than by Sterne. His greatest work, out of all comparison, is undoubtedly his 'Tristram Shandy;' although, among foreigners, the 'Sentimental Journey' seems to stand in the highest estimation. But that will hardly be the judgment of any Englishman,—though it may be of some English women.

STERNHOLD, THOMAS, was a native of Hampshire. The date of his birth is not known. He was educated at Oxford. He was groom of the robes to Henry VIII., and retained the same office under Edward VI., in whose reign he died, August, 1549

Sternhold's only claim to distinction is, that he was the principal author of the first English metrical version of the Psalms attached to the Book of Common Prayer. He had undertaken to versify the whole of the Psalms, but completed only fifty-one: the rest were translated by John Hopkins and others. Sternhold's version was not published till after his death: 'All such Psalms of David as Thomas Sternholde did in his Lyfe drawe into English Metre,' London, 1549, 8vo. He was also the author of 'Certain Chapters of the Proverbs of Solomon, drawen into Metre,' London, 1549, 8vo. The complete version of the Psalms by Sternhold and Hopkins was not published till 1562, when it was first annexed to the Book of Common Prayer, with the title of 'The whole Booke of Psalmes, collected into English Metre, by T. Sternhold, J. Hopkins, and others, conferred with the Ebrue, with apt Notes to sing withal.' The printing was in black letter, and the music consisted of the melodies only, without base or other part. Many of the best melodies were adaptations from the German and French. [PSALMODY.]

The Reformation introduced metrical versions of the Psalms. The Earl of Surrey, who was beheaded Jan. 19, 1546-7, translated some of the Psalms and Ecclesiastes into verse, which, together with a few poems, were printed by Dr. Percy, but never published, the whole impression having been consumed in the fire which destroyed the printing-office of Mr. Nichols in 1808. Sir Thomas Wyatt also published 'Certayne Psalmes, chosen out of the Psalmes of Dauid, commonly called vij. Penytentiall Psalmes, drawn into Englishe Metre; whereunto is added a Prolog of the Aucthore before euery Psalme, very plesant and profettable to the godly Reader,' London, 1549, 8vo. In the same year was published 'The Psalter of Dauid, newly translated in Englyshe Metre, in such sort that it may more decently and with more delight of the mynd be reade and songe of al men; whereunto is added a Note of four parts, wyth other thynges,' &c., London, 1549.

Campbell, in his 'Specimens of English Poetry' (vol. i., 'Essay on English Poetry') observes, that 'in the reign of Edward VI. the effects of the Reformation became visible in our poetry, by blending religious with poetical enthusiasm, or rather by substituting the one for the other. The national muse became puritanical, and was not improved by the change. Then flourished Sternhold and Hopkins, who, with the best intentions and the worst taste, degraded the spirit of Hebrew Psalmody by flat and homely phraseology; and mistaking vulgarity for simplicity, turned into bathos what they found sublime. Such was the love of versifying holy writ at that period, that the Acts of the Apostles were rhymed and set to music by Christopher Tye.' Tye's book is entitled 'The Actes of the Apostles; translated into Englyshe Metre, and dedicated to the Kynge's moste excellent Majestye, by Cristofer Tye, Doctor in Musyke and one of the Gentylmen of his Grace's most honorable Chappell; wyth Notes to eche Chapter, to synge and also to playe upon the Lute, very necessarye for Studentes after theyr studye to fyle theyr wyttes, and also for all Christians that cannot synge to read the good and godlie storyes of the Liues of Christ hys Apostles,' Lond., 1553, sm. 8vo.

(Watt's *Bibliotheca Britannica*, &c.)

STERNOTHE'RUS. [TESTUDINATA.]

STERNUM. [SKELETON.]

STERNUTORIES, called also Ptarmics, agents which cause sneezing. The most familiar are snuffs of different kinds, many of which cause likewise a flow of the natural secretion from the nose, when they are termed errhines. [ERRHINES.] Sternutories are chiefly employed to occasion a violent succussion of the frame, either to restore suspended respiration, as in some cases of fainting, or to dislodge some foreign body from the nasal passages or windpipe, or more rarely to cause the bursting of abscesses in the tonsils. They are also used to avert impending fits of hysteria or epilepsy, or to terminate prolonged hiccup. Their use requires caution in individuals disposed to apoplexy or affected with rupture. They are generally improper for pregnant women and young children. They occasionally excite too violent and continued sneezing, which may be controlled by creasote, breathing diluted carbonic acid, or putting a sinapism round the throat.

STESI'CHORUS, one of the earliest and most celebrated lyric poets of antient Greece. The few and fragmentary accounts which we have of him, are not only in direct contradiction to one another, but are manifestly interwoven with various mythical elements. All accounts however agree that he was a native of Himera in Sicily, and son of Euphomus. (Plat., *Phaedr.*, p. 244; Steph. Byz., *s. v.* Ματαυρός.) Among the various statements of the date of his birth, the most probable is, that it was about B.C. 643. He lived to the age of 83, his death having probably taken place in 560 B.C. In his later years therefore he witnessed the tyranny of Phalaris, against whom he is said to have cautioned his fellow-citizens in an apologue called the 'Horse and the Stag.' (Aristot., *Rhet.*, ii. 20; Conon, *Narrat.*, 42; comp. Horat., *Epist.*, i. 10, 34, &c.) The population of Himera consisted of Zanclæans and Syracusans, but the family of Stesichorus had come to the colony from Metaurus. He is said to have been blind for some time, and according to the story this punishment was inflicted on him for having offended by his poems the shade of Helen. His original name was, according to Suidas (*s. v.* Στησίχορος), Tisias, and he assumed the name of Stesichorus as indicating the art to which he mainly devoted his life, that is, the art of training and directing the solemn choruses at the religious festivals. This art appears to have been hereditary in his family, which may be inferred from the fact, that, according to some writers, he was descended from Hesiod, and that after his death there occur two Himeraeans of the same name, who were likewise distinguished in this art. (Marm. Par., *Ep.* 50 and 73.) But Stesichorus Tisias was the most celebrated of the family. It was he who gave to the choral songs the artistic form which was subsequently brought to perfection by Pindar. Before his time a chorus simply consisted of strophes and antistrophes. Stesichorus added the epode, during the recitation of which the choruses stood still. The movements and arrangement of the chorus-dancers were likewise settled by him in a manner which was afterwards observed by other teachers of the chorus and poets, and lastly he introduced a greater variety of characteristic metres than had been hitherto used in the composition of choruses, and had them accompanied by the cithara. In short Stesichorus was regarded by the antients as the creator of the perfect form of this species of poetry, although his choruses were much more simple than those of later times, and bore greater resemblance to epic poetry. The dialect which he used was that of the Epos, interpersed with Dorisms. The subjects of his poetry were all taken from the mythical and heroic ages of Greece, as Quinctilian (x. i. 62) states, and as is clear from the titles and fragments still extant. Some of these epico-lyrical choruses were very long: thus the 'Oresteia' is said to have consisted of two books, and the series of scenes representing the taking of Troy, on the so-called Iliac Table, was taken from this poem. The greater part of these choruses must have consisted of epic narrative; but owing to the solemn character of choral poetry in general, the tone of the narrative is more exalted than in an ordinary epic poem. Quinctilian says that he represented his heroes with their appropriate dignity, and that he might have rivalled Homer himself if he had kept within bounds, and not indulged in an exuberance of words, and not given the reins too much to his imagination. This censure is perfectly justified by the extant fragments.

Besides his choruses Stesichorus composed paeans and hymns which were of a more purely lyrical character. He is also the first Greek poet who wrote erotic poems containing celebrated love stories. The bucolic poetry of Sicily was likewise indebted to him, as he raised it from a rude and unpolished state to classical perfection.

Stesichorus, whom the antients always mention with high admiration, is as a lyric poet totally different from what we usually understand by this term, for his works did not contain any effusions of his own feelings and thoughts, nor did they even, as it would appear, bear any relation to the time and circumstances in which he lived; the subjects were stories belonging to past ages, and taken either from the early traditions of Greece, or from the legends current among the Sicilian peasantry.

After his death the Himeraeans erected a statue, which represented him as a man weighed down by old age, with a book in his hand. (Cic., *c. Verr.*, ii. 35.) Catana disputed with Himera the honour of possessing the tomb of Stesichorus, and magnificent monuments in honour of him were erected in both places.

The fragments of Stesichorus have been collected by J. A. Suchfort, Göttingen, 1771, 4to., and by Blomfield, in the 'Mus. Crit.,' No. 6. The best collection however is that by Kleine, which was published at Berlin, 1828, 8vo., under the title, 'Stesichori Himerensis Fragmenta collegit, Dissertationem de Vitâ et Poesi Auctoris praemisit, C. Fr. Kleine. They are also contained in Gaisford's 'Poet. Graec. Minor.

(Müller, *Hist. of the Lit. of Ant. Gr.*, i., p. 197-203; Bode, *Gesch. der Lyrischen Dichtkunst der Hellenen*, ii., p. 40-85.)

STETHOSCOPE. [AUSCULTATION; LAENNEC.]

STETTIN, one of the three governments of the Prussian province of Pomerania, is situated between 52° and 54° 10′ N. lat. and between 13° and 16° E. long. It is bounded on the north by the government of Stralsund and the Baltic; on the east by Koeslin; on the south by Brandenburg; and on the west by Mecklenburg. The area is about 6000 square miles. The population in 1837 was 464,440. The great majority of the inhabitants are Protestants, there being only about 3000 Roman Catholics and 1500 Jews. The government is divided into 21 circles. [POMERANIA.]

STETTIN, the capital of the whole province of Pomerania, as well as of the government of the same name and of the circle of Randow, is one of the most flourishing commercial towns and one of the strongest fortresses in the Prussian monarchy. It is situated in 53° 26′ N. lat. and 14° 45′ E. long., on an eminence on the left bank of the Oder, which divides into four branches, viz. the Oder, or the main stream, the Parnitz, and the Great and the Little Regelitz. The principal and most strongly fortified part of the town is on the left bank of the Oder, and is connected by two wooden bridges, each about 400 feet in length, with the suburb of Lastadie, which extends along the right bank, and is likewise fortified, being protected by ramparts, by the Parnitz, and some marshes. There is another wooden bridge, 380 feet in length, across the Parnitz, one of 120 feet on the Little Regelitz, and one of 630 feet in length on the Great Regelitz. The suburbs Ober- and Unter-Wieck, and of Alt and Neu Torney, are not included in the fortifications. The two latter consist chiefly of farm-houses, inns, and other establishments. The proper citadel is called Fort Prussia, besides which there are forts William and Leopold. The town has five principal gates and eight posterns. There are several squares. Being the capital of Pomerania, as well as of the government of Stettin, it contains all the principal government-offices. Of the public buildings, the most remarkable are—the palace, formerly the residence of the last dukes of Pomerania, the government-house, the arsenal, the house of the provincial estates, with a considerable library, the great barracks, the three hospitals, and the theatre. There are five churches and a Roman Catholic chapel. The above-mentioned library is one of the most complete in Pomerania, and contains many valuable MSS. relative to the history and constitution of the duchy. Besides the gymnasium, to which an observatory is attached, there are a school for training teachers, a school of industry for boys, and a school of navigation, and many others. The charitable institutions are very numerous and well supported. Stettin is the residence of a Protestant bishop and of the French Protestant consistory. The population is 34,000, including the garrison, which is very numerous. The manufactures are woollens, linen, cotton, leather, hats, stockings, ribands, sail cloth, soap, and tobacco. Boats and ships are built here, and the ships' anchors for all the ships of the Prussian states are manufactured here. The trade of Stettin is very considerable, it being the chief port for the manufactures and produce of Silesia, and for the importation of all kinds of foreign goods, especially colonial produce, for the supply of Silesia, Berlin, and other places. A railway is at present constructing between Stettin and Berlin. The Sound duty makes the conveyance of goods more expensive, and the ships have not always return cargoes. Thus many goods which would naturally be exported from Stettin are sent to Hamburg, which is not subject to the same disadvantage. Another disadvantage is the difficult navigation of the Oder, ships drawing more than seven feet water being obliged to stop at Swinemunde on the Saine, one of the channels by which the Oder empties itself into the Baltic. The channel was however deepened in 1827. The number of ships that arrive here annually is about 1000, of which perhaps a fourth may belong to the merchants of Stettin. There are resident consuls of England, France, Russia, Sweden, the Netherlands, Denmark, Hanover, Portugal, and North America.

Among the remarkable persons born at Stettin, was the most extraordinary woman of her age, Sophia Augusta Frederica, princess of Anhalt-Zerbst, afterwards the empress Catherine II. of Russia, and Sophia Dorothea, princess of Würtemberg, mother of the reigning emperor of Russia. The fathers of the two empresses were governors of Stettin. The magistrates having complimented Catherine on her accession to the throne, she ordered that one copy of every gold medal struck in Russia should be given to the city, which has between 90 and 100 of these medals.

(Müller, *Handbuch*; Hörschelman; Hassel; Stein.)

STEUART, SIR JAMES, born at Edinburgh, October 21, 1712, was the only son of Sir James Steuart, solicitor-general for Scotland, under Queen Anne and George I. After being admitted at the Scotch bar at the age of 24, he proceeded to the Continent, where he spent several years, and at Rome was introduced to the young Pretender. He was unfortunately called to Edinburgh by the illness of his wife at the period of the rebellion of 1745, where his intercourse with Charles Edward was resumed, though he took no part in promoting his designs. After the battle of Culloden he found it prudent to retire to the Continent, where he remained for the next seventeen years. In 1763 he was permitted to return to his native country on the understanding that he would not be molested so long as he remained quiet, but it was not until 1771 that he received a free pardon. Having settled at Coltness, the seat of his family, in the county of Lanark, he finished the most important of his works, on which he had been engaged during his long exile. It was purchased by Andrew Miller, the bookseller, for 500*l*., and appeared in London in 1767, in two quarto volumes, entitled 'An Inquiry into the Principles of Political Economy.' As the British law of copyright did not extend to Ireland, an edition in three volumes octavo was published in Dublin in 1770, which is said to have been circulated rather extensively in the British colonies; and in 1770 a second edition of the work was called for in England. He wrote also on the coinage of Bengal; on a plan of uniform weights and measures; and while on the Continent published in French a 'Vindication of Sir Isaac Newton's Chronology;' and he was also the author of several metaphysical disquisitions, the two principal ones being on Beattie's 'Essay on Truth,' and Mirabaud's 'System of Nature.' He died in November, 1780, aged 67. His only son, General Sir James Steuart, erected a monument to his memory in Westminster Abbey, and in 1805 he published a complete edition of his father's works, in six volumes octavo.

It is remarkable that Adam Smith, whose work on the same subject appeared nine years after Steuart's, has not once referred to his predecessor. He is stated to have said that he understood Sir James's system better from his conversation than his volumes (*Life of Sir J. Steuart*); and Mr. M'Culloch remarks, that his statements and reasonings are 'singularly perplexing, tedious, and inconclusive,' though he adds that his work 'is by no means destitute of enlarged and ingenious views.' The first book treats of population and agriculture; the second, of trade and industry; the third, of money and coin, the fourth, of credit and debts, and incidentally of interest and banks; and the fifth book relates to taxes. At the end of each book there is a useful resumé of the argument. The first book has the merit of placing the theory of population in nearly the same light as that in which it is now generally viewed. The author's want of confidence in the efficacy of the commercial principle is in striking contrast with the views of Adam Smith. He proposed that granaries should be established for the purpose of collecting stores of corn in cheap years and selling them in dear years. But the work is now entirely superseded, and is interesting chiefly in connection with the history of political economy.

STEVENAGE. [HERTFORDSHIRE.]

STEVENS, GEORGE ALEXANDER, was born in London, and brought up to a trade, which he deserted at an early age for the profession of a strolling player, in which he continued several years, chiefly in the Lincoln company. In 1751 he had an attack of illness, and published a poem entitled 'Religion, or the Libertine Repentant.' In 1752 the Libertine had ceased to be repentant, and obtained an engagement at one of the Dublin theatres, where he produced a burlesque tragedy, called 'Distress upon Distress.' In 1753 he was engaged for Covent Garden Theatre, and came to London. Stevens was not a good actor, but he wrote songs which he sang at convivial societies, where he and his songs were much admired. He led a life of dissipation, was generally necessitous, and always extravagant. In 1760 he published a novel, 'The History of Tom Fool,' 2 vols. 12mo.

The first sketch of the work by which Stevens is chiefly known, the 'Lecture on Heads,' was intended for Shuter the actor, to be used at his benefit; but he did not avail himself of it. Stevens then enlarged the plan and improved the details, and having furnished himself with the necessary apparatus of heads, &c., in 1763, or thereabouts, he began to perform it in the principal towns of England and Scotland, with great success and a large profit. He afterwards went to North America, where he was not less successful than he had been in England. After a stay of about two years he returned, and then proceeded to Ireland. In a few years he realised about 10,000*l*. In 1766 he produced a 'Supplement; being a New Lecture upon Heads.' It was only performed six nights. In 1770 he brought out a burletta, 'The Court of Alexander,' which was set to music by Dr. Fisher, but added nothing to the fame of either author or composer. In 1772 he published his 'Songs, Comic and Satirical,' Oxford, 12mo. In 1773 he exhibited 'A Trip to Portsmouth.' After giving his 'Lecture' a few times more, he sold it to Lee Lewis, who, with the assistance of Mr. Pilon, made some improvements, and continued to perform it with tolerable success for some years. Meanwhile Stevens's faculties began to fail, and he sank into a state of fatuity, in which he continued several years, till his death, which took place September 6, 1784, at Biggleswade, in Bedfordshire. (The 'Biographie Universelle' says at Baldock in Hertfordshire, we believe erroneously.) After Stevens's death was published, in 1788, 'The Adventures of a Speculist; compiled from the Papers of G. A. Stevens: with his Life, a Preface, and Notes, by the Editor.'

Stevens's 'Lecture on Heads' has a thin sprinkling of wit, many bad puns, much caricature, and a good deal of satire more extravagant than forcible; but the absurdities of dress, manners, modes of speaking, and other peculiarities of the day, were exhibited with so much liveliness, if not truth, as to render the performance exceedingly attractive. One of the best bits is perhaps the report of the trial, 'Bullum *versus* Boatum.' 'Daniel *versus* Dishclout' is not so good. Stevens's 'Songs, Comic and Satirical,' amount to more than a hundred. They were considered classical by the Choice Spirits of that time, being filled with heathen deities, Venus, Cupid, Mars, Bacchus, and so forth, together with personifications of the virtues and vices. They are chiefly bacchanalian and amatory, several are satirical, a few licentious, but not one 'comic.' Only one has retained its popularity, 'The Storm,' which is indeed the only one which deserves to be popular. It appears in Stevens's Songs as 'The Marine Medley.' It has been since altered; some of the worst lines have been omitted, and others more suitable substituted, the versification of the stanzas made uniform, and indeed the song as a whole is improved. Still there are bad lines, as, for instance, the first, 'Cease, rude Boreas, blustering railer,' but this line is not in the original song. With all its defects however there is so much animation and truth of description, and the scene with all its circumstances is exhibited by the supposed narrator with such natural earnestness and energy, as to render the song, in its kind, perhaps one of the best in the language.

(*Life*, attached to Stevens's *Works*; Baker's *Biographia Dramatica*; Watt's *Bibliotheca Britannica*; *Biographie Universelle*.)

STEVENS, RICHARD JAMES SAMUEL, a composer of numerous glees, many of which display the most brilliant traits of genius, was born in London, about the year 1753, and educated in St. Paul's cathedral, under Richard Savage, almoner and master of the choristers. His first appointment was as organist to the Temple church. In 1795 he succeeded Mr. Jones in the office of organist of the Charter-house; and in 1801, on the death of Dr. Aylward, was elected professor of music to Gresham college. In 1782 he gained the prize-medal from the Catch Club for a serious glee, and another in 1786 for a cheerful glee. These, with many more compositions of the same class, particularly his five-voiced glee, from Ossian, 'Some of my heroes are low,' in which the poetry and science of music are equally blended, speedily and most deservedly obtained the stamp of public approbation, which they will never lose so long as vocal harmony shall be admired.

Mr. Stevens published three sets of glees and some songs, and edited a useful collection of anthems, &c. in three folio volumes. He died in 1837, leaving one son.

STEVIN, SIMON, a celebrated Flemish mathematician, was born about the middle of the sixteenth century, at Bruges: it has been ascertained that he went to reside in Holland, where he obtained the title of mathematician to Prince Maurice of Nassau, and that he was made civil-engineer to the States, the charge of constructing and repairing the dykes being confided to him. It is to be regretted that no other particulars concerning his life have been preserved: even the year of his death is unknown.

He wrote a treatise on arithmetic, which was printed at Antwerp in 1585; and in the same year he published a collection of geometrical problems in five books. He appears to have studied algebra with great attention, and to have made in that branch of science several improvements. The principal of these consist in the employment of fractional indices, as exponents of the roots of quantities (the use of integers as the exponent of powers had previously been introduced by Stifel), and in a general but laborious method of approximating in numbers to the root of any equation. He represented the unknown quantity by a small circle; and a number, either integral or fractional, contained within the circle, indicated a power or root of that quantity.

In 1586 Stevin published in quarto, and in the Dutch language, his tract on statics and hydrostatics, in the preface of which he endeavours to prove that the Dutch language is more antient than any other; and in the same year he published, also in Dutch, his 'New System of Fortification.' In 1589 he brought out a tract entitled 'De Motu Cœli;' and ten years afterwards, in Dutch, a treatise on navigation: the latter was translated into Latin by Grotius, and published at Leyden in 1624.

In 1605 W Snell translated into Latin, and published in two volumes, folio, the greater part of the works of Stevin, but he did not live to complete the undertaking. In 1634 however Albert Girard published, at Leyden, the whole of the works in French: this edition contains the treatise on arithmetic; the six books of the algebra of Diophantus (the four first books were translated from the Greek by Stevin, and the others by Girard), and an explanation of the tenth book of Euclid; tracts on cosmography, geography, and astronomy, the practice of geometry, statics, optics, castrametation, a new system of fortification, and a method of fortifying places in which manœuvres of water, by means of sluices, were to contribute to the defence.

The work on statics contains a simplification of the demonstration of Archimedes relating to the fundamental property of the lever. Stevin represented the two weights at the extremities of the lever by parallelopipeds suspended horizontally by strings applied at their middle points: the breadths and depths of these parallelopipeds were equal, but the length of each was double the distance from the fulcrum of the lever to the point from which the other was suspended. When the parallelopipeds were placed end to end, the middle of the whole was vertically under the fulcrum of the lever, and therefore the latter was necessarily in equilibrio, while the weights of the separate parallelopipeds were inversely proportional to the lengths of the arms from whose extremities they were suspended.

In order to exhibit the conditions under which a body is in equilibrio on an inclined plane, Stevinus supposes a triangular prism to be placed with one side parallel to the horizon, so that the other sides may form a double inclined plane; and he imagines a string, on which are placed a number of equal weights, at equal distances from one another, to be laid on those sides across the upper edge of the prism: each part of the string of weights extends from the edge to the base of the prism; or the two extremities of the string are at equal distances below that base. He concludes that the string so placed would be at rest on the two planes, because if it were to begin to move (the string of weights being of infinite length), it would move for ever, which he supposed to be absurd, so that the tendency of the weights to descend on one side must exactly counterbalance the like tendency of those on the other side; and evidently the sum of the weights lying on one plane is to the sum of the weights lying on the other, in the same proportion as the lengths of those planes respectively, the lengths being measured in directions perpendicular to the edge of the prism. Hence he infers that the same power is required to support different bodies on single inclined planes of equal heights, when the weights of the bodies are proportional to the lengths of the planes. If one side of the prism is in a vertical position, the tendency to descend is evidently equal to the weight; and hence, on every inclined plane, the sustaining power, in a direction parallel to the plane, is to the weight of a body, as the height of the plane is to its length.

From this theory, also, Stevin discovered that an equilibrium between three forces acting at one point in a body, takes place when the forces are parallel and proportional to the three sides of a triangle. His demonstration however extends only to the case in which the directions of two of the forces are at right angles to one another; for he states that when a body is supported on an inclined plane, and retained by a force acting parallel to the plane, it is in the same circumstances as if it were suspended by two strings, one perpendicular, and the other parallel to the plane: and he concludes that the ratio of the weight of the body, to a force parallel to the plane, is as the hypotenuse to the base of a right-angled triangle formed by three lines, one in a vertical direction, another perpendicular to the plane, and the base or third side being in a horizontal position.

Stevin is said to have contrived a car which moved by means of sails, on the flats of Holland, with more rapidity than any carriage drawn by horses.

STEWARD, LORD HIGH, OF ENGLAND, one of the antient great officers of state. Under the Norman kings and the early kings of the Plantagenet line it seems to have been an hereditary office. Hugh Grentmesnell held the office in the reign of Henry II., and it passed with his daughter and co-heir in marriage to Robert de Bellomont, who was earl of Leicester. Robert's son held it, on whose death without issue it passed to the husband of his sister, the elder Simon de Montfort, who had also the dignity of earl of Leicester. From him it passed to his son, the second Simon de Montfort, who was slain at the battle of Evesham in 1265. This high dignity then reverted to the crown, but was immediately granted to Edmund, king Henry the Third's younger son, together with Montfort's earldom of Leicester, in whose descendants, the earls of Lancaster and Leicester, it continued, and in the person of Henry the Fourth, who was duke of Lancaster, was absorbed into the regal dignity.

From this time no person has been invested with this high dignity as an heritable possession, or even for his own life, or *quamdiu se bene gesserit*; but only for some special occasion, the office to cease when the business which required it was ended; and this occasion has usually been when a person was to be tried before the House of Peers. On this occasion there is a lord high steward created, who presides, and when the proceedings are closed, breaks his wand, and dissolves the court; but if the trial take place during the session of parliament, though a lord steward is appointed, it is not considered as his court, he having none of the functions of the judge, only voting with the rest as a peer, although he presides.

STEWART, MATTHEW, D.D., a mathematician of North Britain, who attained great distinction by his researches in the higher branches of science, and the success with which he cultivated the antient geometry. He was born at Rothsay, in the Isle of Bute, in 1717; and having received the best education which a grammar-school afforded, he prosecuted his studies in philosophy and theology at the University of Glasgow, into which he was admitted in 1734. Dr. Simson, who then occupied the chair of mathematics in that university, is said to have early discerned the predilection of Stewart for mathematical researches; and his lectures appear to have given his pupil that decided preference for the antient over the modern analysis, which he retained to his death.

On going to reside in Edinburgh, Mr. Stewart attended the lectures of Maclaurin, till, having adopted the church as a profession, he was appointed to the living of Roseneath, in the west of Scotland. In 1747 however, on the death of that mathematician, he was elected to succeed him; and he held the post of mathematical professor in the University till 1772, when his health began to decline. His son, the late Dr. Dugald Stewart, from that time began to assist him by occasionally delivering lectures; and three years afterwards the young mathematician and philosopher was appointed joint professor with his father. In 1775 he retired to an estate in Ayrshire, where he spent nearly all the rest of his life in cultivating science as an amusement. He was elected a Fellow of the Royal Society in 1764; and he died in 1785, being they sixty-eight years of age.

The first efforts of Dr. Stewart in science were to extend the subject of what is called the 'locus ad quatuor rectas' to the powers of any number of perpendiculars drawn to an equal number of lines. While engaged in this pursuit, after his retirement to Roseneath, he discovered most of those propositions which, in 1746, he published under the title of 'Geometrical Theorems.' These, which are mostly porisms, are sixty-nine in number, but five only of them are accompanied by demonstrations. Dr. Stewart is said to have suppressed, for the sake of brevity, the proofs of the others; but several of the theorems were afterwards demonstrated by Dr. Small, and Mr. Lowry has given, in Leybourne's 'Mathematical Repository,' demonstrations of all those which admit of investigation by the processes of the antient geometry.

In the first volume of the 'Essays of the Philosophical Society of Edinburgh,' there is a paper by Stewart containing some propositions founded on a theorem in the fourth book of Pappus; and, in the second volume of the same work, he gave a solution of 'Kepler's problem,' in accordance with the methods of the antients. This he accomplished by the application of a property of curves, from which the approximations may be carried to any degree of accuracy in a series of rapidly converging results.

In 1761 he published his 'Four Tracts, Physical and Mathematical,' in which there is an attempt to investigate the higher parts of mixed mathematics in a manner conformable to the spirit of the Greek geometry. The first tract contains the theory of centripetal forces in a series of propositions, which, admitting the quadrature of curves, are rigorous; and in the remainder of the work Dr. Stewart considers the intricate subject of the perturbations. His design was to carry on the approximations for determining the elements of the orbits according to the method in which Newton, Machin, Walmsley, and other eminent mathematicians had begun the investigations; but the work stops far short of the ends now proposed in the researches of physical astronomy.

In the following year he published a series of geometrical propositions, which are investigated analytically, and afterwards demonstrated by synthetical processes: they are entitled, 'Propositiones More Veterum demonstratæ,' and this designation is said to have been given to them by Dr. Simson. His last work was an 'Essay on the Sun's Distance;' and this problem he endeavoured to treat according to the method of the antients, but the subject is too intricate to admit of their analysis being applied to it, though the work exhibits all the ingenuity which might be expected from the learned author. Making use of the movement of the moon's apsides as an effect of solar perturbation, he determined the parallax of the sun to be 6·9″, and it is now known to be about 8″. Being obliged, in order to diminish the complexity of the investigation, to reject quantities which were supposed to have but small influence on the result, considerable errors exist in the steps; and, except that compensations occurred, the parallax might have appeared to be three times as great as it is in reality. The 'Essay' was much animadverted on by Dawson and Landen during the life of the writer; and since the true parallax of the sun has been ascertained from the transit of Venus, in 1769, it is admitted that no reliance can be placed on the determination of such an element by inductions drawn from the effects of the mutual attractions exercised by the bodies of the solar system.

STEWART, DUGALD, the son of Dr. Matthew Stewart, was born in Edinburgh, on the 22nd of November, 1753. He was educated at the high school of Edinburgh, and the progress he made in classical and mathematical attainments was such as to excite the warmest expectations of future success. In the winter of 1772, having that year attended the course of lectures delivered by Dr. Reid at Glasgow, his love for metaphysical speculation was roused, and he wrote and read to a literary association an 'Essay on Dreaming,' which he afterwards incorporated in his 'Elements of the Philosophy of the Human Mind' (vol. i., chap. v., § 5). He was then in his nineteenth year. But still more decisive was the fulfilment of his early promise a short time afterwards, when, having completed his Glasgow studies, he assumed the charge of the mathematical classes hitherto taught by his father in the university of Edinburgh (Chalmers's *Biog. Dict.*), and on coming of age he was appointed mathematical professor.

He taught with great success until his five and twentieth year, when an occasion presented itself for his resuming his favourite studies under the most advantageous position. Dr. Ferguson, the then professor of moral philosophy at Edinburgh, having been sent as secretary to the commissioners to conclude peace with North America, Dugald Stewart was called upon to fill his place during his absence, which he accepted, and during the session 1778-9, besides teaching his own classes of mathematics, and one on astronomy, he lectured on ethics for Dr. Ferguson; thinking over every morning the subject of lecture for the day, and addressing his pupils extempore. His amiable and elegant manner was much relished, and his lectures gave so much satisfaction, that on the retirement of Dr. Ferguson, in 1785, he was appointed his successor. He had previously had the care of a few private pupils of rank whom he received into his family. He was thirty-two years of age when he entered upon his new professorship. His mind had become enlarged and enriched with a discursive, desultory, but valuable erudition, his opinions had become fixed, and the habitual grace and mildness of his manner had become still more winning from his increasing confidence and facility of exposition. He became very popular. His lecture-room was crowded, his fame spread over Great Britain before he had published anything, and, as Sir James Mackintosh truly remarks, 'without derogation from his writings it may be said that his disciples were among his best works.' His first work therefore came heralded by fame, and it scarcely disappointed. It was the first volume of his 'Elements of the Philosophy of the Human Mind,' which appeared in 1792. The subject was treated with an elegance and eloquence of diction and a richness of illustration which more than compensated the majority of readers for its deficiencies in profundity and logical sequence of ideas; indeed its very faults were helps to its popularity, because it satisfied the current tendency to reaction against the sensualist school, and at the same time made no great demand on the speculative faculty of its reader. The philsophy was that of Reid, but rendered attractive by those arts of composition to which Dugald Stewart paid such fastidious attention; yet of this philosophy, and of Dugald Stewart's works generally, we may say with Professor Cousin, 'it was an honourable protestation of common sense against the extravagancies and extreme consequences of sensualism. But it proceeded no further in its path than did Locke in his. The Scotch philosophy limited itself to the re-establishment of some of the forgotten elements of human nature, and some of the fundamental ideas of reason, which it described such as they now incontestibly appear; but it did not attempt to account for them, nor to ascend to their origin, nor to follow them in their legitimate applications; it had a commencement of psychology, but no regular logic; it had neither a metaphysic, nor a theodicea, nor a cosmology; it had a little of morals and politics, but no system. The merits of the Scotch, as of Locke, are clearness and good sense; their faults are the absence of any speculative ability, the want of comprehensiveness and of rigorous precision.' (*Cours de Philosophie, Intro. à l'Hist. de Phil., Leçon XII.*)

In the following year (1793) Dugald Stewart published his 'Outlines of Moral Philosophy,' a text-book for his pupils; and the 'Life of Adam Smith,' which appeared in the 'Transactions' of the Royal Society of Edinburgh; and which was followed by the 'Life of Dr. Robertson' in 1796, and the 'Life of Dr. Reid' in 1802. They have been subsequently reprinted. His activity was unceasing; and in 1800 he added a series of 'Lectures on Political Economy' to his heavy professional duties, but they were not continued. On several occasions when his colleagues were ill, he gave temporary lectures for them on natural philosophy, logic, and rhetoric. In the winter of 1808-9, from grief at the loss of his younger son, which brought on a severe indisposition, he was obliged to have a deputy to discharge his duties. In the following session, seeing little prospect of recovering his health, he resigned altogether; and in May, 1810, Dr. Thomas Brown, his late assistant, was appointed in his place. Dugald Stewart, having now retired from public life, lived constantly at Kinneill House, on the Frith of Forth, about twenty miles west from Edinburgh, where he devoted himself to the prosecution of his favourite studies. The fruits of his retirement were not slow in manifesting themselves: in 1810 appeared his first volume of 'Philosophical Essays,' in the preface to which he says, 'The state of my health having interrupted, for many months past, the continuation of my work on the human mind, I was induced to attempt, in the mean time, the easier task of preparing for the press a volume of Essays.' Yet it is in this work, which he considered the 'easier task,' that he has best proved his claim to the title of a metaphysician, which is noticed both by Sir James Mackintosh and Professor Cousin (*Fragmens Philosophiques*, p. 78); indeed his chief work, as he frankly owns, is rather a collection of such theories pointing towards the common end of throwing light on the structure and functions of the mind, than a systematic treatise, such as might be expected from the title of elements. 'It is in essays of this kind,' says Mackintosh, 'that he has most surpassed other cultivators of mental philosophy. His remarks on the effect of casual associations may be quoted as a specimen of the most original and just thoughts, conveyed in the best manner.' (*Dissertation prefixed to Ency. Britan.*, p. 329.) The 'Philosophical Essays' reached three editions in seven years: the contents of the volume are various and interesting,—on Locke, Berkeley, Influence of Locke on the Philosophy of France; Metaphysical Theories of Hartley, Priestley, and Darwin; on Philological Speculations; on the Beautiful, Sublime, Taste, and Culture of Intellectual Habits. In 1814 the second volume of his 'Elements of the Philosophy of the Human Mind' appeared; but was not so well received, and never, we believe, reached a second edition. In 1815 appeared his celebrated Preliminary Dissertation to the Supplement of the 'Encyclopædia Britannica,' entitled 'A General View of the Progress of Metaphysical, Ethical, and Political Science since the Revival of Letters;' a work for which his discursive reading well fitted him. It enjoys considerable popularity, and chiefly owing to these very qualities, for as a philosophical view of the progress of the metaphysical sciences it is almost worthless. He never once rises to any comprehensive principle. There is no unity in that mass of writing, of criticism, and notes. He never attempts to seize the spirit of each age, and to show how it influenced others. All is isolated. Pleasant and clever as the *adversaria* of some student, but very inefficient if looked on as a treatise or consulted as a history. As a specimen of his carelessness, we may mention the entire omission of Spinoza, a man whose influence on speculative philosophy has been only second to that of his master Des Cartes. His extreme carelessness as to any systematic comprehension of what he was to perform, and his neglect as to arrangement of materials, are, as is remarked by a writer in the 'Quarterly Review,' shown in the author's 'advertisement,' wherein we are told that his original design (as is well known to his friends) was to comprise in ten or twelve sheets all the preliminary matter which he was to contribute to the 'Supplement.' It has now extended to six times this length, and we are informed that he has only discussed one of the three divisions under which he had projected to arrange his subject. We cannot but observe that this fact sufficiently justifies all that we had ventured to say on the desultory and unpremeditated manner in which the work must have been prepared. Yet in the face of this, and of the internal evidence of its desultory nature, Sir James Mackintosh declares this discourse to be 'the most splendid of Mr. Stewart's works.' (*Edin. Review*, Sept., 1816, p. 191. See also a second article by the same hand on this Discourse, *Edin. Rev.*, Oct., 1821, pp. 220-267.)

He remained silent from this period till 1821, when the second part of his 'Discourse' was published, and attracted as much attention as the former, and more hostility, because it was principally occupied with a weak and cavilling attack on Locke and his school. The following year he suffered from palsy, which interrupted his labours till 1827, when he published the third volume of his 'Elements.' In 1828, a few weeks before his death, he published his 'View of the Active and Moral Powers,' by far the least exceptionable of his works. It is more systematic, and contains more new truths than any of his metaphysical writings, and his long acquaintance with the world and with letters enabled him to suggest many obvious but overlooked analyses. It is not a profound, but it is an agreeable book.

Dugald Stewart died on the 11th of June, 1828, in the 75th year of his age, and was buried in the Cannongate churchyard, Edinburgh.

We have also to add to the list of his philosophical writings, an interesting 'Account of a Boy born blind and deaf,' to which no date is affixed.

The admirers of Dugald Stewart style him the Plato of the Scotch School, to which title he has undoubtedly as much claim as Reid has to that of Socrates. But without having himself discovered any important elements which others had overlooked, without even reducing to a system the discoveries of his predecessors, it cannot be denied that his influence was a beneficial one, for he not only strengthened the weaker parts of the ethical doctrines of Ferguson and Reid (Victor Cousin, *Fragmens Philosophiques*, p. 78), and rendered the metaphysical doctrines of Reid less objectionable and confused, by substituting the 'laws of human thought or belief' for the absurd 'common sense' or 'instinct' which were by Reid assumed as final arbiters, but he also adorned the school by every charm of mild enthusiasm and elegance of diction, and rendered the study attractive, by enlisting in its cause the aid of much elegant literature and an exquisite taste, at least such as was in those days regarded as exquisite, when an exclusive regard to diction was the exercise of the most refined taste. 'Few writers,' remarks his friendly critic, 'rise with more grace from a plain groundwork to the passages which require greater animation or embellishment. He gives to narrative, according to the precept of Bacon, the colour of the time, by a selection of happy expressions from original writers. Among the secret arts by which he diffuses elegance over his diction, may be remarked the skill which, by deepening or brightening a shade in a secondary term, by opening partial or preparatory glimpses of a thought to be afterwards unfolded, unobservedly heightens the import of a word, and gives it a new meaning without offence against old use.' (*Edin. Rev.*, 1816.) Sir James Mackintosh afterwards repeated this verbatim in his 'Preliminary Dissertation,' p. 321; so that it may be regarded as his deliberate judgment. A want of depth, indeed of speculative power, is everywhere manifested in Stewart's writings, and the most glaring contradictions to his own principles impeach his logical rigour; but the style and his calm earnestness always render his works interesting to students.

(*Ency. Brit.*, art. 'Stewart;' Sir J. Mackintosh's *Preliminary Diss. to Ency. Brit.*)

STEWARTON, a town in Ayrshire, 18 miles south-south-west from Glasgow, on the road to Kilmarnock, from which it is distant five miles. The parish is in the district of Cunningham; and extends ten miles in length from north-east to south-west, and from three to four in breadth. The area is about 10,145 acres. There are no lofty hills; but the land slopes from north-east to south-west, in which direction the Annock-water, which drains the parish, flows. Freestone and limestone are dug, but there is no coal. The population in 1831 was 4503, viz. 2234 in the town, 735 in the suburbs, and 1534 in the rural district; a later calculation (1836) makes the population 4562. The town of Stewarton is on the north bank of the Annock-water: it has risen to importance only since the extension of manufactures of late years: it has however long had a manufacture of Highland bonnets, of which it is now the chief seat, and in connection with which are mills for carding and spinning wool. The manufacture of carpets has also been introduced, as well as the weaving of silks, muslins, linens, and damasks. The market is on Thursday, and there are six yearly fairs. The church is in the centre of the town: it has sittings for 1400 persons. There are meeting-houses for the dissenters of the United Secession Church and for Burghers. A small Independent congregation meets in the town-house. The parish is in the synod of Irvine and presbytery of Glasgow and Ayr. There were in 1834 ten schools in the parish, viz. the parish school, with an average attendance of about 27, viz. about 14 boys and 13 girls, and nine others: the whole number of children under 15 years, who had learned or were learning to read, was 316; to write, 275.

(Chambers's *Gazetteer of Scotland; Parliamentary Papers.*)

STEYER, the capital of the circle of the Traun, in Upper Austria, is situated at the conflux of the Steyer and the Enns, in a beautiful valley, surrounded with hills and lofty mountains. It is situated in 48° 4′ 15″ N. lat. and 14° 20′ E. long., 92 miles south of Vienna, and 16 miles south-south-east of Linz.

Steyer has nine suburbs and five gates. The town is on the left bank of the Enns, which separates it from the suburb Ennsdorf, as the Steyer does from Steyerdorf, with which two suburbs it is connected by two bridges. From the latter suburb, almost at the confluence of the two rivers, there is a most delightful prospect. On a steep rock, on the right bank of the Steyer, the castle of Prince Lamberg stands on the site of the old castle, which was built between 980 and 990, and was for many centuries the residence of the princes of Styria, till they removed to Grätz. Steyer is a neat and a pretty large town, with above 10,000 inhabitants. Many of the streets are narrow and crooked. There are three squares; the principal square is very large and ornamented with two fountains. Many of the houses are built in the Italian style, with flat roofs, galleries, and statues, especially in the great square. Among the public buildings the most worthy of note are the church of the Dominicans (in the great square), with antient painted glass windows; the antient parish church, a massy Gothic edifice, with a lofty tower, from which there is a fine prospect over the town and the country, to the distant summits of the Alps; the old and the new town-house, St. Michael's church, formerly belonging to the Jesuits; the theatre, the barracks, and four hospitals. Steyer is the seat of the court of justice of the circle of the Traun, and of a superior mining-court. There are a normal and four other schools. Steyer has some woollen and cotton manufactures, but it is chiefly remarkable for those of iron, which employ above 12,000 workmen in the town and neighbouring country. The principal establishment is a manufactory of fire-arms on account of government: of the numerous other articles the chief are sword-blades, daggers, bayonets, files, razors, awls, to which some writers add scythes, and kitchen utensils of all kinds; but Mr. Jenny (who, in his description of the town, includes them in his list) gives a note at the end of his work, in which he says that no such articles are manufactured here. Steyer is one of the most important and flourishing manufacturing towns in Austria, and has a very extensive trade, especially to Turkey and the Levant. In the sixteenth century Steyer was the richest town in Austria next to Vienna. It has several times suffered severely by fire.

(Blumenbach, *Oesterreichische Monarchie;* Jenny, *Handbuch für Reisende in dem Oesterreichischen Kaiserstaate; Oesterreichische National Encyclopädie;* Cannabich; Stein; &c.)

STEYERMARK. [STYRIA.]

STEYNING. [SUSSEX.]

STICKLEBACK, the common name in this country for certain small fishes which constitute the genus *Gasterosteus* of Linnæus. This genus is arranged by Cuvier with the mail-cheeked Acanthropterygians (*Loricati*), and is distinguished by the following characters:—Anterior dorsal represented only by free spines; body generally scaleless, but protected more or less at the sides by shield-like plates; ventrals reduced to a single spine; head without spines or tubercles; branchiostegous membrane with three rays.

Several species of stickleback are found in the ponds and streams of this country, and one species is found in the salt water; they are very active and voracious, and live upon aquatic insects and worms.

The most common species is the three-spined stickleback (*Gasterosteus aculeatus*, Linn.), which is distinguished by the body being protected at the sides with shield-like plates, and the possession of three spines on the back. It is of an olive colour above and silvery white beneath, and varies from two to three inches in length. In the breeding season the males assume a pink hue on the under parts of the body, and the general colouring of the upper parts is brighter, and often green. According to Bloch, this species spawns in April and June; and according to Cuvier, in July and August.

The number of scaly plates varies in the sides of the body, and is supposed by some authors of high authority to afford specific characters. The following are the principal varieties or species established by Cuvier and Yarrell chiefly upon this character.

G. trachurus, rough-tailed stickleback (Yarrell, *Brit. Fishes*, vol. i., p. 76). The scaly plates extending the whole length of the sides; in number about thirty.

G. semiarmatus, half-armed stickleback, Yarrell. Lateral plates extending to a vertical line joining the vent and commencement of the soft dorsal; in number from twelve to fifteen.

G. leiurus, smooth-tailed stickleback, Yarrell. Lateral plates extending only as far as the ends of the rays of the pectoral fins, where these last are laid back.

G. brachycentrus, short-spined stickleback, Yarrell. Lateral plates not extending beyond the pectorals; dorsal and ventral spines very short.

The above are regarded as varieties of the *Gasterosteus aculeatus*, Linn., by Mr. Jenyns, who observes that that species 'is subject to great variation, not only in the number of lateral plates, but in several other less obvious respects. The former may occasionally be found of every intermediate number between that which characterises the *G. leiurus*, Cuv., and that which appears in the *G. trachurus* of the same author. This number moreover is sometimes found constant in specimens which differ remarkably in other respects; at other times varying, when all other characters remain the same. From these circumstances combined, I feel satisfied that the above are mere varieties, notwithstanding the high authorities on which they stand recorded as distinct species.' (*Manual of British Vertebrate Animals*, p. 349.)

A writer in the 'Magazine of Natural History,' vol. iii., p. 329, relates some interesting observations illustrative of the habits of these little fishes whilst in confinement in a tub. 'When a few are first turned in, they swim about in a shoal, apparently exploring their new habitation. Suddenly one will take possession of a particular corner of the tub, or, as it will sometimes happen, of the bottom, and will instantly commence an attack upon his companions; and if any one of them ventures to oppose his sway, a regular and most furious battle ensues: the two combatants swim round and round each other with the greatest rapidity, biting and endeavouring to pierce each other with their spines, which on these occasions are projected. I have witnessed a battle of this sort which lasted several minutes before either would give way; and when one does submit, imagination can hardly conceive the vindictive fury of the conqueror, who, in the most persevering and unrelenting way, chases his rival from one part of the tub to another, until fairly exhausted with fatigue. They also use their spines with such fatal effect, that, incredible as it may appear, I have seen one during a battle absolutely rip his opponent quite open, so that he sank to the bottom and died. I have occasionally known three or four parts of the tub taken possession of by as many other little tyrants, who guard their territories with the strictest vigilance; and the slightest invasion invariably brings on a battle. These are the habits of the male fish alone; the females are quite pacific; appear fat, as if full of roe; never assume the brilliant colours of the male, by whom, as far as I have observed, they are unmolested.'

Dr. James Stark discovered near Edinburgh a new species of the present genus, which greatly resembles the common species, but is rather smaller, and has four spines on the back. It is the *G. spinulosus* (four-spined stickleback) of Yarrell and Jenyns.

A still smaller species—the ten-spined stickleback (*G. pungitius*, Linn.)—is distinguished, as its English name implies, by the possession of ten spines on the back, and these are short and of equal length.

This, as well as the other species of the genus, is occasionally found in the salt-water. It appears to be pretty generally distributed throughout England.

Lastly may be noticed the fifteen spined stickleback (*G. spinachia*, Linn.), which is also found in England, a comparatively large species, being five or six inches in length, of an elongated and slender form, and having the snout much produced. The fifteen spines on the back are small and short; the fins are proportionally large.

This species appears to be confined to the salt-water, and feeds upon small crustacea, as well as the eggs and fry of other fishes. It constitutes the subgenus *Spinachia*, and is the *Spinachia vulgaris* of Fleming.

STIFEL, or STIFE'LIUS, MICHAEL, a celebrated German algebraist of the sixteenth century, was born at Eslingen, in Saxony; the year of his birth is not known with certainty, but, according to Vossius, it was in 1509. He was a Lutheran clergyman, and a contemporary of Cardan; and it may be mentioned as a remarkable circumstance, that algebra should at the same time have been diligently studied both in the north and south of Europe, apparently without any intercourse being maintained among the persons who were engaged in the pursuit. Of the men who distinguished themselves in the north may be mentioned Rudolph, Stifel, Scheubel, and Stevin; and among those of the south were Ferreus, Cardan, Tartaglia, and Ferrari. The notation employed in Germany differed in some respects from that which was used in Italy; and from this circumstance it has been imagined that the ma thematicians of the two countries obtained the first principles of the science from distinct sources.

Stifel's first publication was a treatise on algebra, in German; but in 1544, that is, a year before Cardan's rule concerning cubic equations came out, he published at Nuremberg, in Latin, the 'Arithmetica Integra,' which is his principal work. It is divided into three books, of which the first is a treatise on arithmetic; the second, a commentary on Euclid's tenth book; and the third, a treatise on algebra. He appears to have been the first who used the signs + and − between quantities, in order to indicate addition and subtraction: the first power of the 'res' (the unknown quantity) in an equation he designates the root of the equation, and represents it by a letter of the alphabet: he employs the initial letters of the words, and also the numbers 2, 3, &c., both positive and negative, to denote the corresponding powers of the quantities to which they are affixed, and he calls the numbers so applied the exponents of the powers, as they are called at present. He uses the radical sign to designate a root, but he has no mark to denote equality, the word itself being employed for that purpose.

In one of the chapters he demonstrates, from the nature of arithmetical and geometrical progressions, that the addition and subtraction of the exponents of powers correspond to the multiplication and division of the numbers whose powers they indicate; and this may be considered as one step towards the discovery of logarithms: but in expressing the exponents of the higher powers of quantities, he combines those of the lower powers by multiplication instead of addition: this last method was that of Diophantus. Thus, in order to denote the sixth power of any quantity, he uses terms indicating the square of the cube, instead of terms expressing the sum of two third powers. His method of resolving quadratic equations is by completing the square, as is done at present.

He treats at some length of what are called triangular numbers, that is, of adjacent columns of numbers constituting various progressions: thus the numbers in the first column may form an arithmetical progression beginning with 1, and having unity for the common difference; the second column may begin with 3, and the successive differences of the numbers may be 3, 4, 5, &c.; the third column may begin with 10, and the successive differences may be 10, 15, 20, &c., and so on, the head of each column being opposite to the like number in the adjacent column preceding it. He explains the use of the table in discovering the coefficients of the several terms in any powers of a binomial quantity, and in extracting the roots of numbers; and it may be observed that such tables have since been made to serve several other useful purposes in mathematics.

Stifel wrote also a treatise on the calendar, and a tract on 'magic squares.' Like many other learned men of that century, he appears to have spent much time in studying the 'Apocalypse,' and he is said to have predicted that the end of the world would take place in the year 1553. One of his countrymen, also a mathematician, had previously assigned for the time of that event the year 1524; and in Britain, the celebrated Napier found out that it would occur between the years 1688 and 1700.

Stifel died at Jena, in 1567.

STIGAND, a Saxon prelate, in great favour with Edward the Confessor, who made him bishop of Elmham, or more properly of the East Angles, the seat of which bishopric is now at Norwich. This was in A.D. 1043. Four years after he was translated to Winchester; and in 1052 the archbishop of Canterbury, Robert 'Gemeticensis,' being driven into exile, but not formally deposed, Stigand was made archbishop. This was considered an intrusion and irregularity; but the scandal was the greater, inasmuch as Stigand retained his bishopric of Winchester, holding at the same time both those high dignities. He is charged, in consequence of this, with having been inordinately avaricious and ambitious; but this defence has been made for him, that his hold was firmer on the bishopric of Winchester than on the archbishopric, from which he might have been removed had Robert returned. It is said to have been by a stratagem, of which he was the contriver, that the people of Kent obtained from the Conqueror a ratification of some of their antient customs. The Conqueror disliked him; refused to allow him to place the crown on his head; and forced him to accompany him when he returned to Normandy. Finally, the king prevailed upon the pope to send three cardinals to England to inquire into the conduct of Stigand; and several things being proved against him, he was deprived of his dignities and degraded from the clerical order. He was also condemned to perpetual imprisonment; but soon died, being, as is said, starved to death, either by the cruelty of others or by his own voluntary act. He died at Winchester, and was buried there. Lanfranc succeeded him.

STIGMA, in Botany, one of the three parts into which the central organs of the flowers called carpels are divided. The term pistil is applied to these organs, whether there is but one or many of them, or whether they are united or separate. The carpel consists of three parts: the *ovary* or germen, generally of a spherical form, and hollow, containing the ovules; the *style*, an elongated organ, formed of a continuation of the tissue of the ovary, possessing a canal in communication with the interior of the ovary; and the *stigma*, which is the point or summit of the style. The carpels, like all other parts of the flower, are modifications of the leaf, and examples of their reversion to their normal form are not unfrequent. This is well seen in the double cherry, in which the pistil often appears as a little leaf in the centre of the flower. The blade of the leaf corresponds to the ovary of the carpel; the midrib, which is elongated, to the style; and the stigma is nothing more than a secreting surface at the point of the style, communicating with the interior of the ovarial leaf. The carpel presents two sutures, called *dorsal* and *ventral*. The first of these corresponds with the midrib of the leaf, and the latter with the folded margins. The ventral suture is always opposite the axis of the plant, and is the point from which the *placenta* is developed, to which the young ovules are attached.

When there is only one carpel in the flower, it is called a simple pistil; but when there are several carpels, they are called a compound pistil. The carpels of a compound pistil may be either united or separate. When they are united, they are called by Lindley *syncarpous*. This union may occur between the ovaries only, leaving the styles distinct, as in *Nigella damascena;* or the ovaries, styles, stigmas, and all may be united, forming one body, as in the tulip. When the carpels are all separate, as is seen in Caltha, Ranunculus, &c., the pistil is said to be *apocarpous*.

The *style* is not at all essential to the existence of the carpel, and is frequently absent. When present, it is composed of just the same tissues as the ovary, which in most cases consist of vascular surrounded by cellular tissue. The style varies in form and size; sometimes it is flat, as in the Iris and Canna, but is mostly cylindrical and filiform. It generally proceeds from the apex of the ovary, but in some cases, from an alteration in the position of the ovary, it proceeds from other parts besides the apparent apex, as from the side in Alchemilla, and from the base in Lamiaceæ and Boraginaceæ. The length of the style varies very much; in some plants, as in Colchicum, it is seven or eight inches long, whilst in the Nymphæaceæ and Papaveraceæ it can hardly be said to exist at all. The canal of the style was first discovered by Malpighi. It is a continuation of the cavity of the ovary, and terminates in the surface of the stigma. This canal varies in extent in different plants, in some being very narrow, and in others very wide. It is lined with a peculiar kind of cellular tissue, having a papillary character, and is covered with a viscous secretion. It is called by Brongniart *tissu conducteur*, or conducting tissue, on account of its supposed office in conducting the pollen tubes from the stigma to the ovule.

The style is often covered with hairs, which, on account of their supposed office of clearing the pollen from the cells of the anthers, have been called *collectors*. Sometimes these hairs are united together into a kind of cup around the stigma, as in Goodeniaceæ, when they form what is called an *indusium*.

The stigma is composed of the same kind of tissue as the interior of the canal of the style, but has a more spongy appearance. Its papillary character also is more evident, and the little swellings on its surface are often called papillæ. These papillæ become less evident as the canal of the style approaches the ovary. The stigma assumes a variety of forms, the distinction of which is often of importance in systematic botany. These forms depend principally upon the tissue of which its surface is composed. Sometimes the papillæ are developed into little hairs, as is seen in the stigma of *Urtica urens*. In other cases it is perfectly smooth, as in Nymphæaceæ. In rhubarb it is composed of three flat orbicular disks. In grasses it is in the form of a tufted hairy body like a little brush. In Mimulus it has two lips which have the power of contracting, and in Clarkia it consists of four broad lobes. In Orchidaceæ it has a structure in accordance with the anomalous character of all the parts of the flower in these plants; it consists of an oval humid space which occupies the middle of the central column, and is covered with a thick viscous secretion. In some cases however the stigma is not distinguishable from the style, as in Asclepias and Tupistra.

The position of the stigma is sometimes anomalous. As it forms the apex or point of the carpellary leaf, it ought always to be alternate with the placentæ, which are formed at the margins of the leaf, but in Cruciferæ the stigmata are opposite the placentæ. This may be explained in two ways. Dr. Lindley supposes that in this order there are originally four carpels, two of which being abortive, the stigmata are left opposite the placentæ. Brown on the contrary supposes that the stigmata are originally two-lobed, and that the lobes have united on each side, and thus obtained their abnormal position.

For the function of the stigma see IMPREGNATION, and POLLEN.

STILAGINA'CEÆ, a small natural order of plants belonging to the rectembryose group of apetalous Exogens. They are trees or shrubs, with alternate, simple, stipulate leaves, the stipules being deciduous. The flowers are unisexual, mostly seated on amentiform spikes or racemes. Calyx 3-5 parted; stamens 2 or more, arising from an enlarged receptacle with capillary filaments and 2-lobed anthers dehiscing transversely; ovary superior, stigma sessile; fruit a drupe with one seed, which is pendulous; the embryo is green, lying in the midst of fleshy albumen.

The species of this order are all of them natives of the East. In its relations this order is obscure. It has some resemblance to Urticaceæ, from which it is distinguished by its enlarged disk, its peculiar anthers, and unelastic filaments. In these characters it resembles Hensloviaceæ, but they differ from this order in having but one carpel and a single seed. Many of the fruits of this order have a pleasant subacid flavour, and are eaten by the natives of the East Indies.

STILA'GO, a genus of trees sometimes united with, at other times separated from, the genus Antidesma, belonging to the natural family of Antidesmeæ, which by some botanists is called Stilaginaceæ. The species are few in number, forming shrubs and moderate-sized trees, which are found in Madagascar and Mauritius, as well as in some of the Indian islands, and in India, where the species extend even to northern parts. The genus is characterised by having diœcious flowers, the male having a 3- or 5-parted perianth. Stamens 2, 3, or 5, inserted in an annular disk with the rudiment of an ovary. The female flower has the perianth of the male, and the disk surrounding the base of the ovate single-celled ovary. Ovules 2, pendulous from the apex of the cell. Stigma sessile, 3 to 5-rayed. Drupe one-seeded, crowned by the stigma, with the nut rugose both inside and out. Albumen fleshy, scrobiculate. Cotyledons foliaceous. Embryo inverse. The flowers are arranged in axillary catkin-like spikes. The leaves of Antidesma alexiteria are employed in the Isle of France as an antidote against snake-bites. Cordage is made with its bark, as well as with that of A. zeylanica in Ceylon. The small fruits of both species are eaten and preserved: the fruits of A. pubescens (Stilago), Bunias, and Diandra are eaten by the natives of India.

STILBA'CEÆ, a small natural order of plants belonging to the nucamentose group of monopetalous Exogens. They are small shrubs, with the habit of a Phylica or a fir, having whorled close narrow entire leathery rigid leaves, articulated at the base and without stipules. The flowers are arranged in dense spikes at the points of the branches; they are sessile, each having three bracts at its base. They differ but little from Selaginaceæ except in their 2-celled anthers, their erect ovules, and in the want of an hypogynous disk. Kunth, who formed this order, points out also its relation to Globulariaceæ, and places it intermediate between that order and Selaginaceæ. The order consists of only two genera, *Stilbe* and *Campylostachys*, both of which are natives of the Cape of Good Hope. Their properties are not known.

STI'LICHO, FLAVIUS, was of Vandal origin, and his father had been a military officer in the reign of Valens. Concerning his early life and youth we know nothing beyond the vague eulogies of Claudian (*De Laud. Stilich.*, i 42, &c.). According to the poet's account he distinguished himself in early life in a manner which announced his future greatness. He was of an unusually tall stature, and his appearance commanded respect. When he had scarcely arrived at the age of manhood, he was sent by the emperor Theodosius to negotiate a treaty with Persia. He discharged his duties as ambassador, and maintained the dignity of the Roman empire; and after his return the emperor rewarded him with the hand of Serena, his niece, whom he had adopted as his daughter. (Claud., *Laus. Seren.*, *De Laud. Stilich.*, i. 71, &c.) Stilicho was raised from one high office to another, until at last he became master-general of all the cavalry and infantry of the Western empire. In all his military undertakings he set a noble example of honesty, integrity, and valour, combined with wisdom. Even his enemies owned that he was inaccessible to bribes. The distinctions which were conferred upon him excited the envy and hatred of Rufinus, to whom Theodosius had entrusted the administration of the East, and Stilicho would perhaps have fallen a victim to his intrigues, if Serena had not protected her husband at the court while he was at the head of the armies of Rome.

In the year A.D. 393, when Theodosius made war upon Eugenius, who with an army of Franks and Alemanni occupied the passes in the Alps between Pannonia and Italy, he placed Stilicho and Timasius at the head of the Roman forces. Eugenius was defeated and slain in the year following in a battle near Aquileia. (Oros., vii. 35; Gregor. Turon., ii. 9.) Before his death Theodosius divided the empire between his two sons, Arcadius and Honorius, the former of whom, then eighteen years old, was to govern over the East under the guidance of Rufinus; and the latter, only eleven years old, over the West, under the guardianship of Stilicho. According to the flattering account of Claudian, the emperor entrusted to Stilicho alone the care of his two sons and of the empire. (Zosim., v. 1.) Young Honorius trifled away his time in the palace of Milan, and Stilicho was in reality the sovereign of the Western empire. Stilicho has been blamed for having neglected the education of Honorius, but there is not the slightest evidence of any talent or intellectual capacity in the prince. After the death of Theodosius, Stilicho hastened through Rhaetia and down the Rhine, inspected the country and the garrisons, and renewed the treaties with the Alemanni and Franks. With the exception of Count Gildo in Africa, who even during the last years of the reign of Theodosius had endeavoured to make himself independent in his province, the whole of the Western world acquiesced in Stilicho's authority. Rufinus was the enemy from whom Stilicho had to fear most. Great numbers of the troops who had been employed in the war against Eugenius, were still in Italy, and Rufinus, anxious that they should be withdrawn from that country, is said to have invited Alaric, king of the Visigoths, to invade Thrace and Moesia, which would oblige Stilicho to send these troops to the East. Stilicho appears to have entertained the design of uniting the two empires again, and he determined to lead the troops to Constantinople himself. But Rufinus, alarmed at the approach of his rival at the head of an army, induced the emperor Arcadius to declare that Stilicho should be considered an enemy of the empire if he advanced any farther. Stilicho retired, but secretly he determined to revenge himself upon Rufinus. His soldiers were attached to him, and he could place full confidence in them; he left the command to Gaina, a Gothic prince, and at the same time gave him instructions to seize Rufinus, and to put him to death. The soldiers were easily persuaded to lend their assistance in the execution of this design. When Gaina and his army had reached Constantinople, and Rufinus with the emperor was reviewing the troops, he was surrounded by the soldiers and cut down on the spot (November, 395). The people of Constantinople rejoiced at their deliverance from the oppressor. Stilicho thus got rid of his mortal enemy at Constantinople, but a new one sprang up in his place. Eutropius, a eunuch, gained the unlimited confidence of Arcadius, and Gaina, the faithless barbarian, also deserted the cause of Stilicho, and was rewarded for it with a high office in the Eastern empire. These two new enemies of Stilicho, as long as they were united, left no means untried to deprive their adversary of the confidence of Honorius, and of the attachment of the subjects of the Western empire. His life was repeatedly endangered by assassins, and a decree was issued by the senate of Constantinople, by which he was declared an enemy of the empire. Stilicho was wise and moderate enough not to involve the two empires in a civil war on this account.

Alaric, who had in the meanwhile invaded, ravaged, and plundered Greece, had penetrated as far as Peloponnesus in A.D. 396. Stilicho went with a fleet to Peloponnesus; but Alaric escaped with his Goths, was received by Arcadius into the service of the East, and made commander of all the forces of Illyricum, as far as it belonged to the Eastern empire. (Zosim., v., 7; Claudian, *De Bell. Get.*) On his return to Italy, Stilicho began, in 397 A.D., his preparations for the war against Gildo in Africa. Thinking that his presence was necessary in Italy, partly to protect the northern and eastern frontiers, and partly to provide Italy with supplies of corn, he entrusted the command to Gildo's own brother Mascezil, who was the bitterest enemy of his brother. The army of Mascezil amounted to about 5000 men, but they were mostly veterans who had served under Eugenius. Gildo had assembled a numerous undisciplined body to repel the attack, but it was routed, and Mascezil gained an almost bloodless victory. Gildo was seized, and sentenced to death, with a great number of his adherents. (Oros., vii., 36; Claudian, *De Bell. Gildonico.*) This important campaign was completed in one winter. Soon after his return to Milan, Mascezil, while riding by the side of Stilicho, was thrown from his horse into the river and drowned, and the enemies of Stilicho spread the report that by a peculiar look he had prevented the attendants from saving the unfortunate prince. According to other accounts, Mascezil was put to death for having violated the sacred character of a church. Soon after these events Honorius was married to Maria, the daughter of Stilicho and Serena. (Claudian, *De Nupt. Honor. et Mariæ.*)

Alaric had availed himself of his position in Illyricum to strengthen himself, and secretly matured his designs, while externally he kept up a good understanding with the courts of the East and of the West. At length, in A.D. 400, he set out on his march against Italy. The immediate cause of this invasion is not known. When Alaric advanced towards Aquileia, all Italy was in consternation, and the counsellors of Honorius advised him to seek a refuge in some foreign land. Stilicho alone did not share their despair. But the difficulty was to raise an army, as most of the troops were engaged in Rhaetia. Stilicho hastened thither, and was soon enabled to send the troops from Rhaetia to Italy. He also drew reinforcements from Gaul and other parts of the empire, and engaged some of the nations with whom he made peace to assist Honorius. Alaric appears to have been checked in his progress by the siege of Aquileia, and to have withdrawn towards the Danube to reinforce himself; but before Stilicho returned from his expedition, in which he assembled his forces, Alaric, in 402, advanced towards the imperial residence of Milan. Honorius fled to Asta in Liguria, where he was besieged by the Goths, and would have fallen into their hands if Stilicho had not arrived just at the critical moment with his army. He forced his way through the camp of the enemy, and saved his sovereign. The Goths withdrew, and pitched their camp near Polentia, and while they were engaged here in celebrating the feast of Easter, Stilicho attacked them unexpectedly in their camp. A bloody struggle ensued, in which the barbarians were defeated (403). The whole camp of Alaric, and even his wife, fell into the hands of the Romans. Claudian (*De Bell. Get.*) compares this victory with that of Marius over the Cimbri, although from other sources we learn that Stilicho gained the victory with great loss, while some authors even state that he was defeated. These latter accounts are the more probable, as Alaric marched from Polentia towards the Apennines to attack Etruria and Rome. This induced Stilicho, according to Claudian, to enter into negociations for peace with Alaric, as he was unwilling to stake the existence of the empire on another battle. A peace was concluded, and Alaric retreated across the river Po. Stilicho however, mistrusting the Goth, sent a small corps of observation after him, and appears to have carried on a secret correspondence with some of the Gothic chiefs in Alaric's army, so that he was informed of all that was going on. Alaric intended on his march to make himself master of Verona, but when he approached this city he found himself suddenly surrounded by the imperial troops whom Stilicho had sent thither. Alaric is said to have lost here as many of his men as at Polentia, and he himself was nearly made a prisoner. Stilicho concluded a fresh treaty with him, and allowed him to depart from Italy.

After the delivery of Italy, Honorius and Stilicho solemnized a triumph at Rome with great pomp and splendid games. The hostile machinations against Stilicho were still going on at the court of Constantinople, and he saw no better way to secure himself against them than by entering into an alliance with Alaric and engaging Honorius in a war with his brother. Stilicho intended to acquire for his sovereign possession of the eastern part of Illyricum, and Alaric was to assist him in carrying out this design, on condition that he should receive certain subsidies. (Zosim., v. 26.) The execution of these plans was interrupted, in A.D. 405, by the invasion of Radagaisus, who entered Italy at the head of several Germanic tribes, which formed an army of above 200,000 men. The safety of Italy rested again in the sword and the wisdom of Stilicho; he again drew all the military forces from the provinces to Italy, and reinforced their numbers by fresh levies. But with all his exertions he could not raise more than 40,000 men, exclusive of some foreign auxiliaries consisting of Huns under Uldin and Goths under Sarus. Radagaisus and his hordes crossed the Po and the Apennines, and marched into Etruria. Stilicho assembled his forces in the neighbourhood of Pavia. Many cities were pillaged and destroyed by the barbarians, but the siege of Florence checked their progress towards Rome. At the moment when Florence was on the point of being reduced, Stilicho surrounded the barbarians, who were encamped on the heights of Fæsulæ, with strong lines of circumvallation, while plentiful supplies were introduced into Florence. The enemy was finally reduced by famine, thirst, and disease. Radagaisus fell into the hands of Stilicho, and was put to death, and his barbarians were sold as slaves. (Oros., vii. 37; Zosim., v. 26; Augustin., *Serm.* cv., 10; *De Civit. Dei*, v. 23; Marcellin. *ad A.*, 406.)

The province of Gaul, from which Stilicho had been obliged to withdraw the garrisons, was invaded and ravaged, about the end of A.D. 406 and the beginning of 407, by Vandals, Alani, Suevi, Burgundians, and other Germanic tribes. In Gaul these barbarians were opposed by Constantine, a man who had shortly before been raised from the condition of a common soldier to the rank of emperor by the soldiers in Britain, and now made himself master of Gaul and Spain by entering into a league with some of the barbarians. Stilicho indeed sent Sarus, the Goth, to Gaul, but without success, and Honorius was for a time obliged to leave the rebel in the undisturbed possession of his conquests.

Alaric in the mean time became impatient, and having advanced with his army as far as Aemona on the frontiers of Italy, he sent ambassadors to Ravenna to demand the promised subsidies. When the ambassadors arrived, Stilicho left them at Ravenna and went to Rome, where Honorius was then staying. Stilicho, who was convinced that it was dangerous to make such a formidable neighbour as Alaric an enemy, was willing to continue the peace with him, and to grant his requests. He laid the matter before the Roman senate, which, with a spirit not unworthy of antient Rome, declared that the demands of the Goth should not be complied with, and that destruction would be preferable to such disgrace. The influence however of Stilicho and his party, whose object only was to preserve Italy from new devastations at a moment when Gaul was in the hands of a rebel and of barbarians who might easily be induced to march southward, was so great, that nearly all the senators at length were obliged to give way, and 4000 pounds of gold were granted to Alaric under the name of a subsidy. (Zosim., v. 29.) The desire of Stilicho to maintain peace with Alaric was interpreted by his enemies as a treacherous partiality for the enemy of the empire, and all the calamities under which Italy had been suffering were imputed to Stilicho. Even Honorius now began to fear and suspect his minister; and this feeling was fostered by a cunning hypocrite of the name of Olympius, whom Stilicho himself had introduced to the court, and who had gained the confidence of the emperor.

In May, 408, Arcadius died, leaving a son, Theodosius, eight years old. Honorius proposed a journey to the East to regulate the administration. Stilicho represented to him the difficulties and dangers of such an undertaking, and in consequence it was determined that Stilicho should go to Constantinople. An army, which was to march against Constantine, was assembled near Pavia, and Honorius went thither to inspect it, while Stilicho was making preparations at Bologna for his departure. The eunuch Olympius represented to the emperor that Stilicho was conspiring with Alaric, that he intended with his assistance to raise his son Eucherius to the throne, and that it formed part of their design to restore paganism in the empire. (Olympiodorus, *ap. Phot. Cod.*, 80.) He also contrived to influence the soldiers at Pavia, who revolted, and on a given signal killed several of their principal officers, who were represented to them as the friends of Stilicho. As soon as the intelligence of the revolt at Pavia had arrived, Stilicho's friends advised him to march against his enemies; but he hesitated till it was too late. His friends, for the most part barbarians, left him with indignation at his want of resolution. At midnight, Sarus, the faithless Goth, made an attack upon Stilicho's tent, and cut down his guards. Stilicho escaped to Ravenna, and took refuge in a church. He was treacherously induced to come out, and as soon as he had left the threshold he was put to death by Count Heraclian, who was waiting for him with a band of soldiers, on the 23rd of August, 408. His family and his friends were persecuted, and many of them put to death. (Zosim., v. 34.)

The history of Stilicho has come down to us in a manner which scarcely enables us to choose a due medium between the extravagant praise of Claudian and the charges of his enemies, or of such writers as were obliged to join in the general clamour that was raised against him after his fall.

(Mascow, *History of the Antient Germans*, vol. i., book viii., sect. 2, 19, English translation; Gibbon, *History of the Decline and Fall of the Roman Empire*, chap. 29 and 30; C. F. Schultz, *Flavius Stilicho, ein Wallenstein der Vorwelt, ein Beitrag zum letzten Theile der Röm. Geschichte*, Altenburg, 1805, 8vo.)

STILL. [DISTILLATION.]

STILLING, JUNG JOHANN HEINRICH, a celebrated German Pietist, born at Gründ, in Westphalia, 1740. His father Wilhelm Jung was a charcoal-burner, to which trade he was also destined, but circumstances favouring his becoming a tailor, he chose that business, though he soon relinquished it for a situation as teacher at a school. Dissatisfied with this, he returned to tailoring, and continued it till several of the gentry befriended him, and took him as private tutor to their children. He contrived to save a little money, which enabled him to pursue his studies, and went in consequence to Strassburg, and studied medicine there. It was here he became acquainted with Göthe, who took a great liking to him, and has sketched his character with great fondness in several passages of the 'Dichtung und Wahrheit' (books ix. and x.). It was at Göthe's suggestion that he wrote his interesting autobiography (*Lebensgeschichte*), to whom he had often related it. Stilling practised as physician for some time in Eberfeld, and in 1778 was appointed professor at the Kameralschule of Lautern, and in 1787 at that of Marburg, and in 1803 at that of Heidelberg. He died in Karlsruhe, 1817.

As a physician, Stilling's great talent was in diseases of the eye, and he is said to have restored upwards of 2000 persons to better sight. As a writer, he was very popular, and the sect of Pietists in Germany (somewhat similar to our Methodists) look up to him with great affection. 'The great element of his character was an invincible and intense faith in God and an immediate providence, ever at hand in the time of trouble, and which momently preserved man from evil.' The most celebrated of all his works is the 'Theorie der Geisterkunde,' which we believe has been translated into English. A complete edition of his works was published at Leipzig, in 1835, in 13 vols. 8vo., edited by Dr. J. Grollmann.

(Stilling's *Lebensgeschichte*; Göthe's *Dicht. und Wahrheit*; *Conversations Lexicon*.)

STILLINGFLEET, EDWARD, son of Samuel Stillingfleet, was born at Cranbourn, in Dorset, on the 17th of April, 1635. He was educated at the grammar-schools of Cranbourn and Ringwood, and at St. John's, Cambridge. He entered the college in 1648, and obtained a fellowship in 1653. After taking his degree of M.A. he was private tutor successively in the families of Sir Roger Burgoin, at Wroxhall, in Warwickshire, and of the Hon. Francis Pierrepoint, of Nottingham. Here he began his 'Irenicum.' In 1657 he was presented to the rectory of Sutton by Sir R. Burgoin.

Stillingfleet commenced his public life as the advocate of moderate, almost of latitudinarian opinions on ecclesiastical affairs. In the year 1659 he published his first work, which was entitled 'Irenicum, or the Divine Right of particular Forms of Church Government examined.' A second edition appeared in 1662, with an appendix on the Power of Excommunication. This work, which was intended to prove that no particular form of church government is appointed in the New Testament, was thought by the high church party to savour of Presbyterianism; and in deference to them, according to Bishop Burnet, Stillingfleet afterwards retracted it. Stillingfleet himself says that 'there are many things in it which, if he were to write again, he would not say; some which show his youth and want of due consideration; others which he yielded too far, in hopes of gaining the dissenting parties to the Church of England.' (Quotation in Orme's *Life of Baxter*, p. 628; and in Stillingfleet's *Life*, p. 12.)

The work on which his reputation mainly rests is his 'Origines Sacræ, or Rational Account of the Christian Faith as to the Truth and Divine Authority of the Scriptures,' which was published in 1662. He meant to have continued it, but died before he could do so. The additions to the folio edition, published after his death, are of little value. This work is still one of the most valuable defences of the truth of the Scriptures, though it is more adapted to the theologian than to the general reader.

Stillingfleet was a fierce and indefatigable polemic. During the greater part of his life, he had his hands full of controversy, with the Romanists on the one side, and the Nonconformists on the other. In the year 1664 he engaged, at the request of Dr. Henchman, bishop of London, in the defence of the views maintained by Laud in his conference with Fisher the Jesuit. A work having been published on this subject in Paris, entitled 'Labyrinthus Cantuariensis,' with the design of proving the Church of England to be schismatical in her separation from Rome, Stillingfleet defended the Church of England, and retorted upon Rome the charge of schism in 'A rational Account of the Grounds of the Protestant Religion,' which was received with great favour by Protestants.

In 1665 he was presented by the earl of Southampton to the rectory of St. Andrews, Holborn, having been already appointed preacher at the Rolls chapel. This preferment was speedily followed by his appointment as lecturer to the Temple, and also as chaplain in ordinary to Charles II. In 1668 he took the degree of D.D., and was nominated by Charles, in 1670, canon residentiary of St. Paul's, and in 1678 dean of the same cathedral. In the meantime he published his 'Discourse concerning the Idolatry practised in the Church of Rome, and the Hazard of Salvation in its Communion,' 1671; and other tracts against the Roman Catholics, and also against the Socinians, as well as 'A Letter of Resolution to a person unsatisfied about the Truth and Authority of the Scriptures.'

In the year 1680 he plunged into a new controversy, by preaching before the lord mayor a sermon, on *Philipp.* iii., 16, which he afterwards published, entitled 'The Mischief of Separation.' This sermon consisted of a violent attack on the Nonconformists, which was little expected from the author of the 'Irenicum.' Mr. Orme justly observes that 'the rector of Sutton, who wrote the "Irenicum" when the Church of England was but a sect among other sects, was a very different person from the dean of St. Paul's exposing the unreasonableness of separation from an apostolic church in all its glory. The one publication breathes a spirit of moderation, and uses the language of entreaty; the other is stern, severe, and uncompromising.' (Orme's *Life of Baxter*, p. 632.) In this discourse Stillingfleet maintains the curious position that 'though the really conscientious Nonconformist is justified in not worshipping after the prescribed forms of the Church of England, or rather, would be criminal if he did so, yet he is not less criminal in setting up a separate assembly.' The sermon was replied to by Owen, Baxter, Howe, and other eminent Nonconformists. Howe directed his attention chiefly to the above position, and added some remarks concerning Stillingfleet himself, giving him such full credit for piety, purity of motive, and general moderation, that the dean confessed 'that Howe had discoursed gravely and piously, more like a gentleman than a divine.' (Rogers's *Life of Howe*, p. 251-266.) Stillingfleet replied to his opponents in a large quarto volume, entitled 'The Unreasonableness of Separation,' 1681, in which he traces the history of Nonconformity; and Baxter rejoined in 'A second true Defence of the mere Nonconformists, against the untrue Accusations, Reasonings, and History of Dr.

Edward Stillingfleet,' 1681, to which the dean made no reply, though several writers carried on his side of the argument. A full account of this controversy is given by Mr. Orme in his 'Lives of Owen and Baxter.'

In 1685 Stillingfleet published his 'Origines Britannicae, or Antiquities of the British Churches,' which gives a full account of the early ecclesiastical history of Britain, from the first introduction of Christianity to the conversion of the Saxons. He rejects many of the traditions respecting the British churches, but is disposed to believe in the alleged visit of Paul to Britain.

When James II. revived the court of ecclesiastical commission, Stillingfleet refused to be a member of it; and after the Revolution he published 'A Discourse concerning the Illegality of the Ecclesiastical Commission, in answer to the Vindication and Defence of it,' 1689. Under Charles and James he was prolocutor of the convocation.

After the Revolution of 1688, Stillingfleet's services to the Protestant cause were rewarded with the bishopric of Worcester, to which he was consecrated in 1689. He immediately addressed himself, with his usual ardour, to correct the irregularities which had arisen in the diocese; he appeared with distinction in the House of Lords; and he still found leisure for polemics. In 'A Vindication of the Trinity, with an Answer to the late Objections against it from Scripture, Antiquity, and Reason,' he made some objections to Locke's definition of substance, and to his theory of ideas in general, which gave rise to a sharp contest between him and Locke.

Stillingfleet died of gout, at Westminster, March 27, 1699. His remains were interred in the cathedral of Worcester, where a monument was erected to him by his son, with a long and highly eulogistic Latin epitaph by Bentley, who was his chaplain.

The character of Bishop Stillingfleet has always commanded the praise even of his opponents, and perhaps many will find a more genuine expression of his worth in Howe's testimony than in Bentley's epitaph. His works prove his industry and learning. Besides the works noticed above, he wrote several theological pamphlets, and a very able defence of the jurisdiction of the bishops as peers in capital cases. His works were printed in 1710, in 6 vols. folio, and a volume of his miscellaneous works was published in 1735 by his son, the Rev. James Stillingfleet, canon of Worcester.

Stillingfleet had collected a splendid library, which Dr. Marsh, archbishop of Armagh, purchased, in order to throw it open to the public in Dublin. The MSS. were bought by the earl of Oxford, and are now in the Bodleian library.

('Life of Dr. Edward Stillingfleet, late Lord Bishop of Worcester,' &c., London, 1710, 1735.)

STILLINGFLEET, BENJAMIN, grandson of Dr. Stillingfleet, bishop of Worcester, was born in the year 1702. His father, originally a physician, and one of the professors at Gresham College, afterwards entered into holy orders, and held the livings of Wood Norton and Swanton, in Norfolk, at the time of his death in 1708. His widow was left with four children in very straitened circumstances, but Benjamin was so fortunate as to obtain a good education at Norwich grammar-school, where he made considerable proficiency. In April, 1720, he entered as subsizar at Trinity college, Cambridge, where he took the degree of B.A. in 1723. Soon afterwards he quitted the University, and became tutor to the son of Mr. Wyndham of Felbrig, in whose family he remained till 1726, when he became a candidate for a vacant fellowship in his own college, but was not successful, owing, as he believed, to the opposition of Dr. Bentley.

After this disappointment he spent many years at Felbrig, and in 1737 accompanied the son of Mr. Wyndham to the Continent. On his return to England the father of his old pupil settled on him an annuity of 100*l*., on which sum and the produce of his literary labours he subsisted for three years. The friendship of Mr. Price, whose acquaintance he had made when at Rome, now enabled him to take up his abode in a small cottage near that gentleman's seat at Foxley, in Hertfordshire. An indifferent state of health first led him to pay attention to natural history, which he afterwards cultivated with great success. In 1759 he published a collection of 'Miscellaneous Tracts on Natural History,' which consisted of translations from the writings of Linnæus and his pupils, calculated to develop the principles of that great botanist. Mr. Stillingfleet's preface to this work did much towards rendering the Linnæan system popular in this country, and constitutes his chief scientific merit.

'A Treatise on the Principles and Power of Harmony,' published in 1771, which is an abridgement of Tartini's 'Trattato di Musica,' was the only other work which appeared during his life; but he left at his death six volumes in manuscript, of a collection towards a General History of Husbandry, of which an analysis is given in his biography by Mr. Coxe. Mr. Stillingfleet died in London, on December 15, 1771, leaving behind him, besides his scientific reputation, the character of an excellent scholar, an elegant poet and musician, and a most amiable and estimable man.

For further information concerning him the reader may consult Mr. Coxe's very interesting work, 'The Literary Life and Select Works of Benjamin Stillingfleet,' London, 1811.

STILLI'NGIA, a genus of plants of the natural family of Euphorbiaceæ, so named in compliment to Dr. Stillingfleet, known as an English botanist. The genus now includes the species of Sapium, and is distinguished by one of its species being the famous tallow-tree of China. The generic character of Stillingia is:—Flowers monœcious. Males aggregate. Calyx cup-shaped, crenulate, or bifid. Stamens two, inserted; filaments united at the base; anthers opening outwards. Female flowers solitary. Calyx tridentate or trifid. Ovary sessile, 3-celled; each cell with a single ovule. Style short, thick. Stigmas three, simple, spreading. Capsule, globose, tricoccous. Cocci single-seeded. The species consist of milky trees or shrubs, found in the tropical parts of Asia and America, and likewise in Bourbon and Mauritius. The leaves are alternate, petiolate; petiols biglandular at the apex. Male flowers usually crowded in terminal spikes, supported at the base by a bi-glandular bract. The female flower is commonly below the spike; sometimes subsolitary on another branch.

Stillingia sebifera, or the tallow-tree of China, at one time attracted considerable attention, and was introduced into various European colonies in the East and West Indies. It may be met with in our hothouses. Dr. Roxburgh describes the plant as common in his time about Calcutta, but that it did not yield any useful product, and was therefore only an ornamental tree, being in flower and fruit most parts of the year. It is found in China on the borders of rivulets, and is also cultivated. It grows to the height of a pear-tree, having a trunk and branches like the cherry, and foliage like the black poplar, but which turns red in autumn. It was met with in Chusan by the late expedition, and seeds sent home by Dr. Cantor, which have been sown in the Horticultural Society's Garden at Chiswick. The fruit of this tree furnishes the Chinese with candles, and oil for their lamps. The seed-vessels and seeds are bruised, and then boiled in water. The fatty particles rising to the surface are skimmed off, and on cooling condense into tallow. To give it greater consistence some wax is added, together with linseed-oil, in the proportion of three parts to ten of the tallow. The candles made with it are beautifully white. Sometimes they are coloured red by the addition of vermilion. These candles are sometimes said to be coated with wax procured from another Chinese tree (probably Ligustrum lucidum), which forms an external crust and prevents them running. This tallow is also employed in medicine instead of lard.

STILPO (Στιλπων), a native of Megara, was a philosopher of the Megarian school, who lived about the year before Christ 300. Respecting his life we know very little. He appears to have enjoyed the highest estimation among his countrymen both as a man and a philosopher. Ptolemæus Soter, when he was at Megara, endeavoured to persuade him to come to Egypt, but Stilpo refused, and withdrew to Ægina until Ptolemæus had left Megara. When Demetrius Poliorcetes took Megara, he commanded his soldiers to spare the habitation of the philosopher, who, in his eyes, was the wisest of all the Greeks living. Cicero (*De Fato*, 5), apparently on good authority, states that Stilpo, who was naturally fond of wine and women, exercised such control over his passions, that no one ever saw in him any sign of indulgence in sensual pleasures.

As a philosopher, Stilpo, on the whole, followed the doctrines of the Megarian school, but he went further, and denied the objective reality of the ideas of species and genera. He asserted that the character of a philosopher consisted in perfect freedom from passions; and in this theory he was followed by his disciple Zeno, the founder of the Stoic school of philosophy. Diogenes Laertius, in his account of Stilpo (ii., c. 12), states that he wrote nine dialogues, which he characterises by the epithet 'frigid' (ψυχροὶ); no part of them is now extant.

(G. L. Spalding, *Vindiciæ Philosophorum Megaricorum*, p. 20, &c.; Ritter and Preller, *Hist. Philos.*, p. 181, &c.)

STILT-PLOVER. [PLOVERS, vol. xviii., p. 285.]

STILTON. [HUNTINGDONSHIRE.]

STIMULANTS or *Excitants* (in medicine), agents which increase vital action, first in the part to which they are applied, then of the system generally, and perhaps ultimately of some particular organ; and when this organ is a gland or secreting organ, a renewed or augmented secretion is observed. The nervous system seems to be the part which they chiefly influence, and through it the vascular, and in many cases the muscular. This is well seen in the simple effect following the employment of ammonia in a fainting fit, where the application of the vapour of ammonia, or its carbonate (smelling salts), to the nostrils, stimulates the brain, and so restores the heart's action, by which the circulation is resumed, and all parts dependent on it vivified. Aromatic vinegar, electricity, galvanism, and the sudden application of cold, have a like effect.

The agents which constitute this class, though often confounded with others, are perfectly distinct; differing from all by their sensible qualities, their chemical composition, the nature of their physiological effects, and of the therapeutic indications they are calculated to fulfil. They are often confounded with tonics [ANALEPTICS], antispasmodics, and even narcotics, to all of which they have relations of affinity, but are not identical with any. In so far as they both act on the nervous system, they have most affinity with antispasmodics [ANTISPASMODICS], but differ from them in as much as stimulants increase the actions which are natural to the different organs of the body; while antispasmodics allay or diminish inordinate or abnormal action. Nearly the same may be said of the distinctions between them and narcotics [NARCOTICS], for though the increased action excited by an agent of this class, if extreme or long continued, is followed by a greater or less degree of collapse, still this is very different from that which follows the employment of a narcotic, which is much greater, as well as more speedy. Certain articles, such as opium and alcohol, may be made to act in either way; but while opium is not unfrequently used to stimulate, alcohol is never used medically as a narcotic, though the coma and stupor which ensue from an excessive dose of it, are as profound, and often as fatal, as from an overdose of opium.

Above all, stimulants are most frequently confounded with tonics; but independently of the consideration that stimulants operate directly on the nervous system, while tonics affect the muscular and sanguiferous systems, their operation, as well as the nature of their effects, are entirely different. Stimulants render the movements generally more frequent; tonics render them stronger: stimulants, too freely or too often used, exhaust the excitability; tonics, within a certain limit, maintain it. The action of the one is immediate and transient; that of the other slow, scarcely perceptible, and progressive, but permanent. This is best seen in their effects on the stomach. Tonics render the digestion more perfect; stimulants quicken it: moreover, most tonics must be themselves digested before the system can benefit by them; while stimulants display their effects as soon as they touch the lips or reach the stomach. In many fevers cinchona bark produces no abatement of the symptoms for which it is usually prescribed, as the stomach is too weak to digest it; but capsicum or cayenne pepper given along with it, so rouses the stomach, that the febrifuge power of the bark is then manifested.

Stimulants are of two classes: the former comprise medicinal substances; the latter, warmth, cold, electricity, galvanism, and mental agents, such as music (when lively), joy, hope, &c. Many of the latter class have been already treated of [BATHING; ELECTRICITY; GALVANISM]; of the others, the effects are too familiar to require notice, except to recommend the practice of encouraging the hope of a favourable issue to his complaint in the mind of a patient, in all cases not desperate, as cherishing this feeling greatly increases the chance of recovery. The former class are divided into permanent stimulants and diffusible stimulants, the effect of the permanent being slower but more lasting, that of the others quick but transient. The first are used where a considerable and enduring power is wished to be imparted to the system, as in the convalescence from acute diseases, the other where some great and impending danger is to be obviated, as in cases of fainting, fits, or when sedative poisons are to be antagonised. In these latter instances, ammonia, alcohol in some form, or sulphuric æther, are commonly had recourse to. Permanent stimulants are generally volatile or essential oils, pure, or in the combinations in which they exist in roots, barks, or flowers, and are often highly aromatic; malt liquors may also be classed with permanent stimulants. The precise stage in the progress of fevers and other acute diseases, when antiphlogistic or reducing measures should be abandoned, and stimulants substituted, is the nicest point that a medical attendant is ever called upon to decide; and nothing more clearly distinguishes the judicious practitioner than his correct determination of this point. It may be safely asserted that more cases are lost by a premature use of them, than by delay, as the numerous relapses in fever testify. All persons recovering from severe diseases are almost in the condition of newly born children, in whom the irritability and excitability are very great. These should not be violently acted upon, but on the contrary they should be treated with the utmost gentleness and care. Sleep is a more useful restorative than any other. Stimulants are more necessary during the night than during the day, and as more persons die during that period, the use of stimulants becomes more urgent at that time. But the best and most harmless is a very strong infusion of tea, especially green, given in small quantities, every hour or two, as the danger of the case may point out.

STINGS, in Botany, a kind of hair with which many plants are furnished, which secretes a poisonous fluid, which when introduced under the skin of animals produces inflammation. Many plants are endowed with this kind of protection, the most common example of which is seen in the stinging nettles. In these plants the sting consists of a delicately elongated tube of cellular tissue, which is seated upon a gland formed of the same tissue. The poisonous fluid is secreted in this gland, and when any pressure is made upon the gland, the fluid passes into the tube, just in the same manner as the venom passes up the fang of a serpent's tooth.

In several species of the order Malpighiaceæ, the hairs, which are of a peculiar stellate form, possess a poisonous gland, with which they communicate. The genus Loasa and several others are provided with this kind of armature. De Candolle remarks that in all cases where hairs are provided with secretory glands, the fluid secreted is of an acrid nature, and that this fluid is never discharged but when some foreign body presses on the point of the hair.

The poisonous secretion of the glandular hairs, like most other secretions of plants, are more powerfully developed in tropical climates. Leschenault de la Tour gives the following account of the effects of touching the *Urtica crenulata*, which was growing in the Botanic Garden at Calcutta: 'One of the leaves slightly touched the first three fingers of my left hand; at the time I only perceived a slight pricking, to which I paid no attention. This was at seven in the morning. The pain continued to increase: in an hour it became intolerable; it seemed as if some one was rubbing my fingers with a hot iron. Nevertheless there was no remarkable appearance; neither swelling, nor pustule, nor inflammation. The pain rapidly spread along the arm as far as the armpit. I was then seized with frequent sneezing, and with a copious running at the nose, as if I had caught a violent cold in the head. About noon I experienced a painful contraction of the back of the jaws, which made me fear an attack of tetanus. I then went to bed, hoping that repose would alleviate my suffering; but it did not abate; on the contrary it continued nearly the whole of the following night; but I lost the contraction of the jaws about seven in the evening. The next morning the pain began to leave me, and I fell asleep. I continued to suffer for two days; and the pain returned in full force when I put my hand into water. I did not finally lose it for nine days.' (Lindley, *Nat. Syst.*, p. 176.) These effects, though violent, are not so severe as those produced by another nettle, known in the East by the name of Devil's Leaf, which is said sometimes to produce death.

STINT. [TRINGA.]

STIPES, in Botany, a term applied to almost all parts of a plant performing the functions of a stalk, with the exception of the petiole and flower-stalk. It is frequently used to express the whole stem of a plant. The organ which supports the pistil in some plants, as in *Capparis*, *Lunaria*, and *Colutea*, is called *stipes pistilli* by some writers, and by others Gynophorum and Gynopodium. Stipes is also applied to the setæ of some Mosses, as those of Sphagnum and Andreaceæ. The stalk that supports the pileus or cap in the higher forms of Fungi, as well as the part that supports the organs of reproduction in such Lichens as *Calicium*, *Coniocybe*, and *Bæomyces*, is called stipes. The same term has been applied, though with much less propriety, to the petioles of the leaves of ferns.

STIPPLE. [Engraving.]

STIPULES, in Botany, are those organs which are found at the base and on each side of the axils of the leaves of plants. They are not of constant occurrence, not being found in all plants, but where they occur they frequently characterise a whole family, as in Leguminosæ, Rosaceæ, Malvaceæ, &c. These organs are frequently very like leaves, and present themselves in the various forms in which leaves are found. But they are always to be distinguished from leaves by their position at the base of the leaf-stalk. In many cases they are green, like the leaf; they sometimes have petioles, and are sometimes sessile and cut into teeth, lobes, &c. In the Mimosas the stipules frequently degenerate into hardened spines. In the family of Polygonaceæ they are membranous, and being united together they form a sheath around the stem, which is called an *ochrea*. The stipules in Cucurbitaceæ assume the character of tendrils, and in *Trapa natans* they appear under the form of elongated filamentous bodies.

The size of the stipules varies greatly: sometimes they are very diminutive, and occupy but little space compared with the leaf, as is seen in the little bristle-like stipules of the bird-cherry and the withered scale-like character they present in the buckthorn; whilst in other plants they are very large, as in the hearts-ease, and sometimes they seem to develop at the expense of the leaf, and perform its functions, as in the *Lathyrus aphaca*.

The duration of stipules varies. In some cases they drop off very early, so as sometimes to lead to the supposition that they never existed. This occurs in the Amentaceæ. In many plants they continue on after the fall of the leaf, and this is especially the case in those with spiny stipules; it is also seen in many of the Rubiaceæ, &c.

The character of the stipules is frequently much altered by the adhesions that take place between them. In Magnolia they adhere together by their upper ends, and form a kind of sheath for the protection of the young buds. In some species of Astragalus the stipules of opposite sides meet, and form apparently one stipule with two teeth. This form of stipule is called *synochreate*. In *Melianthus major* the lateral stipules are united through the axil of the leaf, and thus form an intra-axillary stipule and De Candolle supposes that the occurrence of all intra-axillary stipules may be accounted for in this way. In those Geraniaceæ the leaves of which are opposite, the stipules of each side unite, apparently forming but two stipules where there are really four. In Cinchonaceæ, which possess opposite leaves, they adhere sometimes by one edge and sometimes by another; but in most instances the stipules of opposite sides grow together, forming what is called an interpetiolar stipule.

The stipules appear to be modifications of the leaves, but may always be distinguished from these organs by their being placed at the base of the leaf-stalk. Another distinction would also be found in their not possessing buds in their axils. This law however is subject to some exceptions, as stipules are sometimes found with buds in their axils, thus proving their theoretical identity with the leaf.

The function of the stipules generally is not very obvious, but in many cases there can be no doubt that they act as a protection to the young bud, as is seen in Magnolia, and more particularly in the tulip-tree (Liriodendron), where they embrace the young bud in the form of two little valves. In compound leaves the leaflets are often furnished with smaller stipules. These have been called by De Candolle *stipels*. Examples of these may be seen in the species of *Hedysarum*.

STIRIA. [Styria.]

STIRLING, WILLIAM, EARL OF, the son of Alexander Alexander of Menstrie, is generally stated to have been born about the year 1580. The only ground however upon which this opinion rests is the inscription 'ætatis suæ 57' on the portrait prefixed to one copy of the edition of his poetical works, published in 1637. His father died in 1594. William succeeded, at his death, to landed property in the counties of Clackmannan and Perth, and accompanied Archibald, seventh earl of Argyle, in his travels on the Continent. Between 1603 and 1614 he published several poems. The tragedy of 'Darius' was printed at Edinburgh in 1603: it was reprinted at London in 1604, with the addition of the tragedy of 'Croesus,' a 'Paraenesis' addressed to Prince Henry, and 'Aurora,' containing the 'first fancies' of the author, and two short pieces, 'Some Verses, written by the author to his majestie, by the author, at the time of his majestie's first entering into England,' and 'Some Verses written shortly thereafter, by reason of an Inundation of Dovan, a water neere unto the author's house, whereupon his majesty was sometimes wont to hawke.' The two tragedies were again printed at London, with the addition of the 'Alexandraean Tragedy,' and 'Julius Cæsar,' in 1607. 'An Elegie on the Death of Prince Henry' was published at Edinburgh in 1612, along with 'Some verses to his Majestie,' and 'A Short View of the State of Man.' The earliest edition of 'Domesday, or the Great Day of the Lordes Judgment,' is that of Edinburgh, 1614. With the exception of two books of an unfinished poem, 'Jonathan,' Alexander published no poetry after 1614, but a pocket edition of the tragedies appeared in 1616, and 'Recreations with the Muses,' a collection of his principal poems, was published in 1637. His poetry is diffuse, deficient in point, and fails to carry the reader along with it; but the versification, though unequal, is often stately and musical, there is a vein of elevated sentiment running through the whole, and the thoughts are those of a man of learning and sound judgment. The 'first fancies' are of course sonnets to his mistress's eyebrow, but the rest are all of a didactic tendency. The opening soliloquy put into the mouth of the ghost of Alexander the Great, in the 'Alexandraean Tragedy,' contains a mixture of lofty ideas, some of them not unworthy of Lucian, which, had the diction been more condensed, must have produced a deep and startling impression. The 'Paraenesis' is curious, inasmuch as the ambitious disposition and habitual train of thought which prompted the colonising speculations of his after-life, may there be traced in their first germ. He was among the first Scotchmen who wrote English: he was Drummond's senior, and was occasionally consulted by him regarding style and rhythm. After all however the poems of Alexander seem to have been less the result of a single-minded love of song, than of a desire to attract notice and open a public career for himself. In this he was successful. Lithgow apostrophised him as 'grave Menstrie, true Castalian fire.' Drayton called him 'my Alexander,' and king James 'his philosophical poet.' His first patron was Prince Henry. On the death of that prince he transferred his services to his brother Charles, whose gentleman-usher he was sworn in 1613. In 1614 the king knighted him, and appointed him master of requests. In 1621, king James granted the territory of Nova Scotia to Sir William Alexander, by a charter dated the 10th of September. The jealousies which disturbed the latter years of James's reign prevented the further progress of Alexander's scheme of colonization till after his death. On the accession of Charles I, Sir William developed his scheme of colonization in a pamphlet entitled 'An Encouragement to Colonies,' published in 1625. An improved edition was published in 1630, under the title of 'The Map and Delineation of New England, together with a Discourse of Plantations and Colonies.' The king was so won by the project, that he made Sir William Alexander lieutenant of New Scotland, and founded, in connection with that colony, the order of knights-baronets in Scotland. The territory was to be divided into parcels not exceeding one hundred and fifty; and Sir William was entitled to dispose of them, with the title of baronet, to the purchasers, for the improvement of the colony. Alexander's idea seems to have been to establish a feudal state, of which he was to be the head, under the *suzeraineté* of the king of England. He is said to have received 200*l*. sterling from each purchaser, and the patents were ratified by parliament, and registered by the lord Lyon king-at-arms. Ultimately however Alexander was induced to cede his claims to the French; but the allegation that he was paid for doing so seems destitute of foundation. The purchasers retained their titles, which were hereditary, and gave them precedence in Scotland of all knights and minor barons. This transaction gave rise to severe reflections on Alexander. There is every reason however to believe that he was more ambitious of founding a colony than anxious to obtain money, though nowise averse to the latter. He obtained from the king a charter of the lordship of Canada in 1628, and from the council of New England a grant of all that part of New England between the rivers Kennebeck and St. Croix, and of the island of Stirling (now Long Island, in the state of New York), in 1635. He made vigorous efforts to settle this island, and his eldest son contracted the disease which carried him to his grave before his father, by the excessive hardships he underwent in trying to found a settlement on the St. Lawrence. What property Alexander did accumulate seems to have been dissipated in these attempts; for the family estates in Scotland were snatched by his creditors from his third son. It is however pretty clear that he contrived to obtain large grants both of property and honours through the royal favour, and the temper of the times he lived in was not such as to allow such acquisitions to pass without criticism. While busied with the Nova Scotian project, he obtained the privilege of coining for Scotland a sort of base copper-money, called 'turners.' Douglas mentions, in his 'Peerage,' that Alexander having built about this time a large house in the town of Stirling, on which he inscribed his motto, 'Per mare, per terras,' his countrymen travestied it into 'per metre et turners,' in allusion to his making money by poetry and copper-coining. Besides the large grants of land in America, the king granted to him charters of the barony of Menstries, 1628; of the baronies of Largis and Tullibody, 1629; of the barony of Tullicultre, 1634; of the barony of Gartmore, 1636. He was sworn a privy-counsellor, and appointed secretary of state for Scotland in 1626; made keeper of the signet, 1627; a commissioner of Exchequer, 1628; and an extraordinary lord of session in 1631. He was created Viscount Stirling and Lord Alexander of Tullibody, by charter, dated Windsor, 4th September, 1630, and Earl of Stirling, Viscount Canada, and Lord Alexander of Tullibody, by patent, dated at Dalkeith, 14th June, 1633. William earl of Stirling died on the 12th of February, 1640. By his wife Janet, daughter of Sir William Erskine, commendator of the bishopric of Glasgow, he had seven sons and two daughters. The last of his male descendants, Henry, the fifth earl, died without issue in 1739. The earl of Stirling, who held a command in the revolutionary army of America (whose representative still votes under protest at each election of Scottish peers), claimed the title as descendant of Andrew Alexander, younger brother of the great-grandfather of the first earl, the title having been granted to 'heirs-male of the name of Alexander.'

Kippis's *Biographia Britannica*; Horace Walpole's *Catalogue of Royal and Noble Authors*, Park's edition; Douglas's *Scottish Peerage*, Wood's edition; The Earl of Stirline's *Recreations with the Muses*.)

STIRLING, JAMES, an English mathematician of considerable eminence, but of whom, except the works which he published, scarcely any thing is known. He must have been born near the end of the seventeenth century, and he was a student in the university of Oxford; in 1726 he was elected a fellow of the Royal Society, and his death must have taken place subsequently to the year 1764.

Mr. Stirling's first work is entitled 'Lineæ Tertii Ordinis Newtonianæ, sive,' &c.: this work, which was published at Oxford, in 8vo., in 1717, contains a commentary on Newton's tract on the subject of lines of the third order. In this tract it is shown that all such lines may be expressed by four different equations, of the third degree, between two variable quantities x and y; and that of these equations one, which consists of terms involving the three first powers of x and the two first powers of y, comprehends sixty-five species of hyperbolic curves. Stirling discovered that the same equation contained two additional species, and the Abbé De Gua (*Usage de l'Analyse de Descartes*) subsequently detected in it four others which had been overlooked by Stirling, probably because he directed his researches almost entirely in the steps of his author. The English mathematician has the honour of being the first who observed, if the value of y in the given equation be found in an infinite series of terms containing descending powers of x, that on taking one term only of such series for the value of y, there is obtained an equation of the first degree, which determines the position of a rectilinear asymptote to the curve: that on taking two terms, there is obtained an equation of a curve, which may be considered as an asymptote to the original curve, and which approaches nearer to it than the rectilinear asymptote; and so on. It may be observed however that the division of curve lines into classes and species is arbitrary, Newton, Euler, and Cramer having made the number of curves of the same order very different: it is also now of small importance, since when the equation of any curve is given, the rules of analysis enable the mathematician to determine immediately its tangents, asymptotes, normals, and 'singular' points.

The work which contributed most to Stirling's reputation is his 'Methodus Differentialis, sive Tractatus de Summatione et Interpolatione Serierum Infinitarum:' this work was published in London, in 4to., in 1730; and in the first part of it there are investigated general formulæ, expressing the sums of given series by means of a factor, by which each term in a series being multiplied, the product is equal to the next following term: the factor itself is in the form of a series consisting of terms arranged according to the ascending or descending powers of a variable quantity; and for this variable are to be substituted different numbers increasing from unity. When the given series is not susceptible of having its sum expressed in finite terms, the factor is an infinite series, and then the formula expressing the sum is also an infinite series; but being highly convergent, the summation of a few of its terms gives a very near approximation to the value of the given series. The second part of the work relates to the interpolation of terms between those of any given series: the values of the interpolated terms are found agreeably to the method of Newton, and there are added several theorems for facilitating the processes by which they are obtained. There are also given various formulæ for approximating to the quadrature of curves by the method of equidistant ordinates.

In the 'Philosophical Transactions' for 1735 there is a paper by Stirling 'On the Figure of the Earth and on the Variations of the Force of Gravity at its Surface.' And a second edition of the 'Methodus Differentialis' was published in 1764.

STIRLING. [STIRLINGSHIRE.]

STIRLINGSHIRE, an inland county of Scotland. It is bounded on the north by Perthshire, from which it is in several parts separated by the river Forth; on the north-east by Clackmannanshire and a detached portion of Perthshire, from both which it is separated by the Forth, which here becomes a wide æstuary; on the east and south-east by Linlithgowshire, or West Lothian; on the south by Lanarkshire and a detached portion of Dumbartonshire; and on the south-west and west by the main portion of Dumbartonshire, from which it is separated by Loch Lomond. The form of the county is irregular; the greatest length is from north-west to south-east, from the neighbourhood of Glengyle at the head of Loch Katrine or Cateran, to the shore of the Forth near Grangemouth, 42 miles; the greatest breadth at right angles to the length is from Logie near Stirling, to the neighbourhood of Calder, not far from Glasgow, 25 miles. There are two insulated portions surrounded by Perth and Clackmannan shires, and including the parish of Alva and part of Logie parish. The area of the county is estimated at 502 square miles, or 321,280 acres, of which 13 square miles, or 8320 acres, are in lochs. (Mac Culloch's *Statistical Acct. of the British Empire*.) Dr. Playfair's estimate is 560 square miles. (*Description of Scotland*.) The population of the county at the different enumerations made during the present century was as follows: 1801, 50,825; 1811, 58,174; increase 14 per cent.; 1821, 65,376; increase 12 per cent.; 1831, 72,621; increase 11 per cent.; 1841, 82,179; increase 13 per cent. The number of inhabitants to a square mile, according to the census of 1831 (which we retain to facilitate comparison), and taking Mac Culloch's estimate of the area, was 145; it was at that time the thirteenth county of Scotland for amount of population, exceeding Orkneyshire, but falling short of Dumfriesshire; and the eighth in density of population, exceeding Ayrshire, but falling short of Forfarshire. In area it is the sixteenth county, being larger than Fifeshire but less than Banffshire. Stirling, the chief town is 31 miles from Edinburgh Castle in a direct line west-north-west, or 35 miles by the road through Linlithgow, Falkirk, and Bannockburn. The county is included between 55° 54′ and 56° 20′ N. lat., and 3° 40′ and 4° 40′ W. long.

Surface; Geology.—The north-western extremity of the county is included in the district of the Highlands, and is occupied by the mountain-range which forms the western extremity of the Grampians, and separates Loch Lomond from Lochs Chon and Ard, in which the Forth rises. Of this range the principal mountain is Ben Lomond; 'on the north it is precipitous; on the south, setting out from the inn of Rowardennan, on the bank of the lake (Loch Lomond) you ascend easily in three hours, walking over a space of three miles. When you reach its conical summit, overtopping every surrounding eminence, and elevated 3000 feet above the level of the sea, you have on the north an endless succession of mountains like the billows of the stormy ocean; and on the south you have presented before you, as on a map, the riches and beauty of the central district of Scotland from the Western Isles to the Frith of Forth.' (*New Statist. Account of Scotland.*) At the foot of this mountain range, in Loch Lomond, are several islands, part of which are included in Stirlingshire. This range consists of primary rocks, chiefly slates. Roofing-slates frequently occur, and there is some limestone; but neither are available to any extent for economic purposes; the slates because they are too heavy to pay for land carriage, and the limestone because it is too distant from coal.

East of this district the face of the country becomes more level, and is occupied by rocks of the old red-sandstone group; but in the central parts of the shire it again rises into hills, which form the group of the Lennox hills, extending from east-north-east to west-south-west from the Forth about Stirling to the Clyde near Dumbarton. They are estimated to attain in their highest part the height of 1500 feet, and present many indications of a volcanic origin. The Campsie Fells, which constitute part of the group, and skirt the valley of the Kelvin, consist chiefly of large tabular masses of trap, the geological position and character of which vary considerably. The other hills of the group, the Gargunnock, Fintry, and Kilsyth hills are chiefly trap or whinstone: the face of them is broken with crags and glens. These trap rocks appear to have penetrated through the old red-sandstone, and through the limestone and the coal formations, which toward the south-east cover the old red-sandstone. That part of the country which skirts the Lennox hills to the south and east, and is drained by the Kelvin, a feeder of the Clyde, and by the Carron and other tributaries of the Forth, belongs to the coal district of Central Scotland, and yields coal, ironstone, freestone, and limestone in considerable quantity. Silver and cobalt were formerly obtained in the detached part of the shire which constitutes the parish of Alva. The carses or dales are generally occupied by the later formations or by alluvium.

Hydrography and Communications.—The county belongs partly to the basin of the Forth and partly to that of the Clyde. The Duchray Water, one of the principal affluents of the Forth, and which some regard as the principal head of that river, takes its rise from several springs on the northern and eastern slopes of Ben Lomond, and forms for five or six miles the boundary of the county. It then enters Perthshire, but again touches the border of the county after its junction with the other principal head of the Forth; and except for a short distance in the parish of Kippen, where its course wholly belongs to Perthshire, and again near Stirling, where it wholly belongs to Stirlingshire, forms the northern boundary of the county till it receives the Avon, which forms the eastern boundary. Its course in the neighbourhood of Stirling is very winding. Its Stirlingshire tributaries are all small; the Bannockburn, the Carron, and the Avon are the principal. Some more important streams, the Teith, the Allan, and the Devon join it on the opposite bank. Up to Stirling bridge the Forth is navigable for small sailing-vessels and steam-boats. At the junction of the Carron with the Forth is the small port of Grangemouth. The Forth abounds in pike, perch, and eels; trout and salmon are not so plentiful as formerly; trout are however abundant in the streams that flow into it.

No part of the Clyde is in this county: but the Endrick and its feeder, the Blane Water, which drain the chief part of the district between the Highlands and the Lennox hills, and the Kelvin, which drains the southern part of the county, are both affluents of the Clyde. The Endrick does not indeed immediately join the Clyde, but falls into Loch Lomond, which communicates with the Clyde by means of the Leven Water. The Endrick abounds in trout. In the parish of Fintry it falls over a rock 90 feet high, presenting, when the waters are swollen by a flood, a magnificent cascade: there is a second smaller fall lower down.

The 'Great Canal,' which connects the Forth and the Clyde, has part of its course in this county. Commencing in the Forth, or rather in the Carron, at Grangemouth, it runs west-south-west into the detached portion of Dumbartonshire; its whole length is 35 miles, or with the branch to Port Dundas near Glasgow 37½: about ten miles of its course belong to Stirlingshire. The canal is on the average 57 feet wide at the top, 27 at the bottom, and nine feet deep; it has 39 locks, and admits vessels of 90 tons burden. The manufactures of Glasgow are conveyed by this canal to the eastern parts of the island; and goods of various kinds conveyed back. This canal was begun in 1768, opened to a certain extent in 1775, and completed in 1790. The Edinburgh and Glasgow Union Canal commences at Port Hopetoun basin, in the neighbourhood of Edinburgh, and joins the Forth and Clyde Canal at Port Downie, near Falkirk, about four miles from Grangemouth; its whole length is 31½ miles, partly in this county. It enters the county by a fine aqueduct bridge over the valley of the Avon, and passes near its junction with the Forth and Clyde Canal through a tunnel nearly 1000 yards long cut in the solid rock. It was begun in 1818 and finished in 1822, and is used for the conveyance of coal, manure, goods, and passengers.

The Edinburgh and Glasgow Railway passes through this county, having its course parallel to that of the Union Canal and of the Forth and Clyde Canal. The Act for this railway was obtained, and the railway itself begun, in 1838. It commences at the Hay-market of Edinburgh, and is carried across the valley of the Avon, where it enters this county by a viaduct of twenty arches, some of them 90 feet high, and terminates in George Square, Glasgow: it passes by a tunnel 845 yards long through a hill near Falkirk. There is to be a short branch to the town of Falkirk.

The Slamannan Railway, which runs from near the termination of the Ballochney Railway in Lanarkshire to the Forth and Clyde Union Canal at Linlithgow, has part of its course in this county: its whole length is about twelve miles and a half; the main line was opened in 1840.

The road from Edinburgh to Stirling, and from thence to Perth and the north of Scotland, enters this county on the east side at Linlithgow bridge, over the Avon, and runs by Falkirk, Bannockburn, and St. Ninian's, to Stirling. At Camelon, just beyond Falkirk, a road branching from this to the left runs by Kilsyth and Kirkintulloch to Glasgow, with a branch from Kirkintulloch to Dumbarton. The road from Stirling to Glasgow falls in with this road between Camelon and Kilsyth; and after coinciding with it for a short distance, turns off to the left, and runs by a more direct line to Glasgow.

Soil, Agriculture, &c.—The hilly district of the centre and the highland tract of the north-west, with the lower lands that lie between them, are in most places bleak and sterile; but the carse, or valley of the Forth, from the neighbourhood of Falkirk to Stirling, consists of low and fertile alluvial lands. The eastern side of the county presents a finely diversified appearance, and the view from Stirling Castle is of almost unequalled beauty.

In the parish of Buchanan, which comprehends nearly the whole of the highland district, with an area of above 76,000 acres, only about 1500 acres are of arable land: this consists of the alluvium on the banks of the Endrick, and on the shore of Loch Lomond. Good crops of oats and a little barley are raised here, and potatoes and turnips are grown. There are above 4000 acres of natural woods or plantations, the latter being chiefly of oak and larch. The woods, both natural and planted, are divided into twenty-four portions, and one is cut every year, so that the whole are cut every twenty-four years: they produce copse-wood, not timber, except that a few trees are left at every cutting for standards: the bark forms an important part of the produce, and a great quantity of small wood is annually consumed in a manufactory of pyroligneous acid and dye-stuffs established in the parish. The products of the manufactory are consumed in the print-works round Glasgow. The greater part of the parish is waste land, used as a sheep-walk or pasture: about 16,000 or 17,000 sheep, chiefly black-faced and of small size, are reared yearly; and about 1300 or 1400 cows or black cattle, and a very few horses.

In proceeding from the highland district towards the south-east the quantity of cultivable land increases. In Drymen, the adjacent parish to Buchanan, of 32,200 acres, about 7000 are cultivated, and are occasionally in tillage: this land is chiefly in the Strath, or valley of the Endrick or in the neighbourhood of the Forth. The soil in the Strath of Endrick is a rich brown loam: along the Forth are nearly 3000 acres of deep moss, called 'Flanders Moss,' under which there is a rich clayey soil, capable of producing good crops. The low flat moss-lands, of which this is the commencement, and which extend along the Forth all the way to Stirling, distant sixteen miles, are supposed to have originated from the destruction of the forests cut down by the troops of Severus in his war against the Caledonians. Trees of immense size are frequently dug out, lying in various directions, and having the marks of the axe upon them. Improvements in agriculture have been generally introduced into this part of the county: a five-shift rotation of crops is generally adopted in the best lands, and draining has been extensively practised. Two-thirds of the parish consist of moor-lands, partly between the Forth and the Endrick, partly to the south of the Endrick. The small black-faced sheep, improved by the occasional introduction of Linton and Lammermoor rams, are general; but a few Leicesters are kept on the better farms. The Ayrshire breed of cattle is prevalent, though some of the mongrel breed formerly in use are still retained.

In the lower ground which separates the highlands from the Lennox Hills, and in the straths or valleys of the Forth, north of those hills, and of the Kelvin, south of them, the quantity of arable land is greater in proportion. The lower grounds are commonly divided into the carse or valley, and the dryfield or upland slope between the valley and the moorland hills. Oats and hay form the principal crops: barley and potatoes are grown to a considerable extent; and turnips, cabbages, tares, beans, and wheat in a smaller proportion. A six-year shift is the common rotation. Draining and other improvements have greatly extended, and are still extending. Milch-cows are now numerous; the Ayrshire breed is preferred. The butter made and the buttermilk find a ready market in Glasgow. Scarcely any cheese is made except for home use. Many calves are reared, though none are fattened. The hills are occupied as sheep-walks, as in the highland district; and the black-faced sheep from Tweeddale are prevalent. There are some plantations upon and around the Campsie Hills of Scotch fir, larch, spruce, ash, elm, birch, oak, lime, and plane.

The eastern part of the county is the most fertile, and, in an agricultural point of view, the most important. It comprehends the carse or valley of the Forth below Stirling, the soil of which consists principally of a bluish clay mixed with sand. There is comparatively little waste land; the soil is almost wholly occupied in tillage or in plantations; and the greater facility for obtaining manure by means of the navigation of the Forth has tended to the improvement of agriculture. A six-year shift is common; and the produce in wheat, barley, and beans is larger in proportion to other produce than in the more western districts of the county. Gardens and orchards are numerous and productive: the soil is particularly adapted to pear-trees. The horses reared are of superior description.

Rents vary. Arable land in the highland district brings about 25*s*. per acre; but the rent of a farm is commonly calculated by the number of sheep which it will keep, and is about 3*l*. to 3*l*. 10*s*. per score. In Drymen, adjacent to the highland district, the inferior arable land lets at from 10*s*. to 15*s*. per acre; and that of better quality at 2*l*. 10*s*.: the rent of a cow's grazing in the best land is 3*l*. 10*s*.; and of a hill-fed sheep 5*s*. or 6*s*. From the various quality of arable land, great variety of rent is given; perhaps 2*l*. may be taken as the average rent of arable land in the whole shire: in a few instances it rises to 4*l*., and in some places falls as low as 7*s*. Leases are commonly for nineteen years. Grain rents are common in the lower part of the carse or valley of the Forth, below Stirling. The greatest fairs or markets for cattle in Scotland are held near Falkirk in this county: they are known as 'Falkirk Trysts.'

Wild animals abound in the wastes of the highlands. Ptarmigan and white hares are found on Ben Lomond, and the eagle is occasionally seen there. Grouse are common on the upland moors, and black game and roes are increasing. Pheasants, which were introduced by the late duke of Montrose, have spread through the whole extent of the strath of Endrick. Hares are numerous in the grounds of Buchanan House, where they are strictly preserved. Hares, rabbits, partridges, grouse (black and red), wild-ducks, woodcocks, and pheasants, are common in the Lennox Hills and their neighbourhood, and a few roes are seen: otters, weasels, stoats, polecats, foxes, and squirrels, are numerous; as are the smaller birds of prey. Pike and perch abound in the lochs in Strathblane parish, and in one of them char is found. The streams generally contain trout, and in the lower part of the Endrick the salmon is taken. Badgers and wild-cats, formerly abundant, are now extinct.

Divisions; Towns.—The shire contains twenty entire parishes, and part of five others, viz. Logie, part of which is in Perthshire, and another part in Clackmannanshire; Stirling, which is partly in Clackmannanshire; Lecropt and Kippen, which are partly in Perthshire; and East Kilpatrick, which is partly in Dumbartonshire. It contains the royal burgh of Stirling, the parliamentary burgh and town of Falkirk, the port of Grangemouth, and a number of thriving manufacturing and other villages. Falkirk is described elsewhere. [Falkirk.]

Stirling, which gives name to the shire, is near the south bank of the Forth. A castle or tower was early erected here, under the protection of which the town grew up; and from its commanding the passage of the Forth, rose early into importance. The name was at first Stryveline or Stryveling; and has been Latinized by Buchanan and others, Starlineum. It was made a royal burgh; its earliest known charter is dated A.D. 1119. In the twelfth and thirteenth centuries, Stirling Castle was considered to be one of the four principal fortresses of the kingdom; and is one of four which are still upheld by virtue of the articles of the Union. It appears conspicuously in the history of the English wars, and was frequently the residence of the Scottish kings.

The parliamentary burgh of Stirling comprehends the town of Stirling proper, the hamlet of Newhouse, and the village of St. Ninians, which are now united to Stirling by an almost continuous line of buildings. The royalty (or municipal jurisdiction) includes the town and immediate vicinity, but does not extend to Newhouse or St. Ninians, and indeed does not include the castle and government lands, and some lands held in trust for charitable institutions, though they are in the town. On the other hand, some portions of the municipal burgh are north of the Forth, and not within the parliamentary limits. The parish again is not exactly coincident with either the municipal or parliamentary borough. The census of 1831 gave to it 829 houses, inhabited by 1904 families; 3 houses building, and 14 uninhabited; with a population of 8556, of which but a small part was agricultural. The parish of St. Ninians had 1706 houses inhabited by 2055 families, 10 houses building, and 35 uninhabited, with a population of 9552: but from the great extent of this parish, a comparatively small part is comprehended in the parliamentary borough of Stirling. The population of this included part may be estimated at about 2000.

The town of Stirling is irregularly laid out; a winding street or road, not lined with houses throughout, leads to the bridge over the Forth, and by that towards Perth. The Castle-hill, a somewhat long and narrow ridge, is on the north-west side of the town, toward which it rises gently, but presents a steeper slope on the other sides, and is in some parts quite precipitous. The prospect which it commands is very fine. The castle presents a singular assemblage of buildings, some of them antient, but altered and adapted to the purposes of modern warfare. The palace, built by James V., is now converted into a barrack; and the adjacent hall, built by James III. for the meeting of the Scottish parliament, is now a riding-school. Adjacent to this is the chapel royal, built by James III., and rebuilt by James VI. (I. of England), now desecrated and employed as a store-room and armoury. South-west of the castle is the space formerly occupied by the king's park and garden: it is surrounded by an old wall, but is chiefly occupied as pasture or cultivated ground. A series of concentric polygonal mounds marks a spot in the garden, said to have been the scene of some forgotten diversions; a hollow, called 'the valley,' is said to have been appropriated to jousts and tournaments, which the ladies viewed from what is still a craggy pyramidal mound, called 'the ladies' hill.' To the north of the castle are a series of rocky eminences, called the Gowan or Gowlan hills, gradually descending towards the plain: the remotest of these eminences, near the bridge, was the antient 'heading-hill,' or place of execution for state criminals. The castle contains a depôt of arms, and is occupied by a regular garrison.

The more antient streets of the town are narrow, winding, and in many places ill-paved; with decayed houses: but several streets have been much improved in the present century, and are lined with good shops; and the different roads out of the town are lined with neat modern villas, Stirling being a favourite place of retirement for gentry and persons out of business. The town is lighted with gas. The old church, a fine Gothic building, stands near the castle: it has a massy tower of decorated English architecture at its west end. It was originally the conventual church of a Franciscan friary, founded by James IV. in 1494. The nave is low, with round piers and moulded arches pointed, and some good windows of decorated English character. The chancel was built by Cardinal Beaton at a later period than the rest of the building. It is lofty, with fine piers and arches: the east end is an octagon, with a curious stone ceiling. South of the church is Gowane's Hospital, built in 1639; and north of it are the ruins of a curious old house of the earls of Mar, called 'Mar's Work,' deserving of examination. There is another old house, Argyle's Lodgings, of the same period. The old bridge over the Forth is an inconvenient structure of stone, of uncertain date, but certainly as old as the middle of the sixteenth century: a new and more convenient bridge has been built just below it. The wooden bridge, which preceded the old stone bridge, was about half a mile higher up the river: there is a ford at the spot, and the remains of the bridge are still visible at low water. The town-house is an old building with a spire; behind it is the gaol. There are commodious corn and meat markets, and a handsome building, the Athenæum, devoted to literary purposes.

The chief manufactures are of tartan and tartan shawls, carpets, yarns, cotton goods, malt, leather, soap, and candles. There are dye-houses for yarns, home-made cloths, and silks, rope-yards, and breweries. Considerable trade is carried on in corn, wood, coals, bricks, tiles, lime, and wool. About a hundred vessels are said to be engaged in the trade up the Forth to Stirling; and there is constant communication by steam with Newhaven, near Edinburgh, and the intermediate places on the Forth. The market is on Friday, and there is a weekly cattle and horse market between Candlemas and Whitsuntide. There are five banking establishments. The circuit court for Stirling, Clackmannan, and Kinross shires, the sheriff's court, and the burgh court are held here.

The burgh council, under the act 3 & 4 William IV., cap. 76, consists of a provost, four bailies, a treasurer, and fifteen other councillors. The corporations are the guildry or merchants, seven incorporated trades, and four other bodies, called 'tolerated communities.' The burgh revenue is above 2000*l.* per annum: the debts amount to about 11,000*l.* Stirling unites with Inverkeithing, Dunfermline, Queensferry, and Culross in returning a member to parliament.

There are two churches of the establishment, formed by dividing the old church, already noticed; each is capable of accommodating nearly 1200 persons; and it has been proposed to erect a third. There are three parish ministers. They hold an evening service in an ex-Cameronian meeting-house. There are two United Secession congregations, one Reformed Presbyterian, one Independent, one Baptist, one Scotch Baptist, one Original Burgher congregation, one Scotch and English Episcopalian, and one Roman Catholic. The Secession kirk had its origin in Stirling, through the deposition, A.D. 1738, of the Rev. Ebenezer Erskine, one of the three ministers of the parish.

There are some important charitable institutions. Gowane's Hospital, for poor members of the guildry and their families, has a clear yearly revenue of 2000*l.*; Spittal's Hospital, for the benefit of the seven incorporated trades or crafts, has a clear yearly revenue of 400*l.*; Allan's Charity, for maintaining, educating, and apprenticing poor boys belonging to the seven trades, of about 300*l.*; and Cunningham's Charity, for similar purposes, for boys belonging to the guildry, has a capital stock of nearly 6000*l.*

There were in 1834 three parochial schools (a grammar-school, an English school, and a writing-school), with five teachers, and from 106 to 109 scholars, chiefly boys; and eighteen other schools (some private; others, partly at least, supported by patronage), with twenty-eight teachers, attended by about 455 boys and 376 girls.

St. Ninians consists principally of one long street of old-fashioned houses; some of these are very curious, and have not only the date of erection, but the utensils or other emblems of the trade of the original occupier carved on stones on the front. Several of the houses are whitewashed. There are a parish church and a meeting-house for Dissenters of the Relief kirk. The steeple of the former parish church yet remains; the church itself was occupied by the Highlanders in the rebellion of 1745, as a powder-magazine, and was destroyed by an explosion, while the steeple remained uninjured. The inhabitants are engaged in the manufacture of nails and leather; and in the tartan and tartan shawl manufacture, of which Stirling is the centre. The parish of St. Ninians is large, and comprehends, besides the village of St. Ninians, the flourishing village of Bannockburn, comprising, with its colliery, a population of 2400; and several other villages and hamlets. Bannockburn has a considerable share in the tartan and carpet manufactures; and a good deal of business is done in tanning leather.

Grangemouth is in the parish of Falkirk, three miles north-east of the town of Falkirk. It is at the junction of the Forth and Clyde canal with the Carron, near the outfal of the Carron in the Forth. It takes its name from the Grange burn which formerly joined the Carron at this spot, but has lately been made to join the Forth, a mile eastward from the town, in order to convert its former channel into wet docks. The town of Grangemouth was commenced in 1777 by Sir Lawrence Dundas, in the well-founded hope that its connection with the canal would give it some consequence as a port. Having been built on a regular plan, the streets are well laid out, and there are some neat good houses; from the flatness of the surrounding country and the adjacent sea-dykes and canal, the place has the appearance of a Dutch village. The town and neighbourhood have been constituted a parish *quoad sacra;* and a new church of Norman architecture has been built by the Earl of Zetland, the proprietor of the town. The Forth and Clyde canal terminates here in a basin and harbour, and two extensive wood-ponds. The basin and harbour afford facilities for large vessels to unload, and for the smaller ones to unload or to wait till they can proceed by the canal, the traffic on which is very great. Since April, 1838, great efforts have been made to improve the port; a wet-dock in the former channel of the Grange burn is in course of construction, with an immense sea-lock, second in size to that of Bristol alone; the river Carron has been or is to be deepened; and one of the wood-ponds enlarged and made to communicate with the wet-dock by means of a canal. The improvements are expected to be so forward by 1843, as to admit vessels into the wet-dock. There are private wharfs on the Carron.

Grangemouth has a custom-house; Alloa, Stirling, and Kincardine are included in the port. The imports are, grain, both coastwise and from the Baltic; timber from the Baltic, Norway, Canada, and New Brunswick; flax, hemp, tallow, pitch, tar, and manganese-ore from the Baltic; cheese, bark, madder, and geneva from Holland and Belgium; and goods of all descriptions from London, Hull, Newcastle, Arbroath, Montrose, Dundee, and Aberdeen. The exports are, coals, pig and wrought iron, glass, bricks, cordage, linen yarn, and cotton and woollen goods. Steam and other vessels are built, and sail-cloth and rope manufactured.

The parochial schools are taught in a neat building in the cottage style, containing two good school-rooms, a library, and dwellings for the teachers, with a large playground. There are a female missonary society, an auxiliary Bible society, and a temperance society.

Kerse House, the seat of the Earl of Zetland, near Grangemouth, is in the Elizabethan style, and is in the midst of a finely wooded park.

Lauriestown is a mile and a half from Falkirk, on the Edinburgh road; the inhabitants are chiefly employed in nail-making, weaving, and agriculture. The village is regularly laid out, with a square in the centre. There are three schools and a Reformed Presbyterian meeting-house. Camelon is about a mile west of Falkirk, on the Glasgow turnpike road. It has a handsome new church and two schools, one built by subscription. The inhabitants are chiefly employed in nail-making. Both Lauriestown and Camelon are in Falkirk parish.

Campsie is a large parish in the southern part of the shire. The population in 1831 was 5109, and is now probably 6000; it has increased nearly fourfold since 1783, owing to the introduction of manufactures. The principal village is Lennoxtown, which contains nearly half of the population. Torrance has a population of about 800, and there are some other villages of tolerable size. There are three places of worship in the parish, namely, a large and handsome new parish church of Gothic architecture, a Relief meeting-house, and a Catholic chapel, all in Lennoxtown, where is also a handsome new school-house. The Catholic congregation consists of Irish, engaged in the cotton printing, the staple branch of industry in the parish. The most extensive print-work is the Lennox mill-field, which lately gave employment to nearly 700 persons of both sexes and of all ages. Kincaid field employed above 370; and Lillyburn field 150, and sometimes more, making a total of at least 1220. The are two bleach-fields which employed about 130 persons; and a work for manufacturing alum, prussiate of potash, prussian blue, &c., which employed 180 persons. There are several coal, ironstone, and lime works.

The state of education in the parish has been very low, but is improving. There are three parochial schools; a large school, not parochial, and an infant-school held in the new schoolhouse at Lennoxtown, built by subscription; and five or six small private schools. The number of children under instruction in day-schools is about 520, besides those in evening-schools and Sunday-schools, and those taught during work-hours in Lennox mill. There are two subscription libraries.

Kilsyth parish adjoins Campsie on the east. The population in 1831 was 4297, and has been nearly stationary since, except that it received a temporary augmentation from the persons employed in the construction of the Edinburgh and Glasgow railway. The village of Kilsyth is at the junction of the roads from Falkirk and Stirling to Glasgow. It is irregularly laid out, and the houses are small and mean-looking; the streets are lighted with gas. The parish church is a modern building of considerable elegance, but far too small for the population; a new church has been built in the village of Banton. There is a meeting-house for the Dissenters of the Relief kirk, and there is a small Methodist chapel, and a Mason lodge occupied as a place of worship by Independents. The inhabitants are chiefly hand-loom weavers employed by the manufacturers of Glasgow; two factories have been commenced lately. There are in the parish a small sickle manufactory, a paper-mill, and a brick and tile work. The Forth and Clyde Canal and the Edinburgh and Glasgow Railway pass near the village. Freestone, limestone, ironstone, and coal are dug in the parish. There is no weekly market, and the two yearly fairs are of no account. Kilsyth has a post office.

Kilsyth was erected, A.D. 1826, into a burgh of barony; it has a baillie and four councillors elected annually, who hold monthly courts for small debts and petty offences; all tenants and proprietors of houses of 5*l.* yearly rental are entitled to vote at the election.

There are three parochial schools, one in the immediate vicinity of the town; and there are two other schools; about 500 children are under daily instruction. There are a savings' bank, three benefit societies, several small libraries, and a temperance society.

Larbert is a parish adjacent to Falkirk parish, on the north-west. It contains the village of Carron, where is the most extensive iron-foundry in Europe, about two miles north of Falkirk. There are five blast or smelting furnaces, four cupola furnaces, and twenty air furnaces; besides mills for grinding fire-clay, boring cylinders, grinding and polishing the metal, &c. Water and steam are the moving powers employed. The goods manufactured are machinery, agricultural instruments, and warlike implements, as cannon, carronades (which take their name from this place), mortars, shot, and shells. These works are carried on by a chartered company, the shareholders of which hold and work extensive coal, ironstone, and lime pits; and have about twenty vessels to export their goods to London and elsewhere, and bring back coal and lime. The Carron works employ about 2000 persons.

Denny parish is adjacent to Falkirk parish, on the west. The population in 1831 was 3843, and has since increased to about 4300. It contains four villages, Denny, Hags, Fankerton, and Loanhead, or Lonehead. The village of Denny has the parish church with a turreted steeple at the west end 75 feet high, and a United Secession meeting-house. The houses are generally of modern erection, of two stories, with garrets, slated roofs, and sash windows. A neat school-house has been lately built. There is a church belonging to the establishment at Hags (to which a district has been attached as a *quoad sacra* parish), and a United Secession meeting-house at Loanhead. There are in the parish two mills for grinding charcoal for the moulders at the iron-works; two mills for paper and millboards; three mills for the manufacture of tartans, shawls, and linsey-woolsey; a dye-stuff-mill, a saw-mill, and three corn or oatmeal and pot-barley mills; also two distilleries, a brick-work, two calico-print works, a pyroligneous acid manufactory, and a spade manufactory. Most of the mills are on the Carron. Ironstone, freestone, and whinstone are dug, and there is one coal-pit at work. About 1100 persons in the parish and about 200 in adjacent parishes are (or were lately) employed directly or indirectly by the manufactories and mills; 1000 of these are connected with the calico print-works; besides the manufacturing population, about 90 persons are employed in the coal-pit. There are ten schools, one of them parochial, another a dame's school; a parochial library, a religious library, a congregational library at Loanhead, and several benefit, Bible, mutual instruction, and other societies. Denny has a post-office and two yearly fairs. The Forth and Clyde canal, and the Edinburgh and Glasgow railway, pass not far from Denny.

Balfron parish is in the western part of the county; the population in 1831 was 2057, of whom about 1700 were in the village of Balfron, which is in the western part of the parish, 19 miles from Glasgow, and as many from Stirling. The census of 1841 makes the population of the parish 1968. The village is neatly built and clean, and the shops are lighted with gas from the adjacent cotton-works of Ballindalloch, which lately employed about 260 persons, chiefly women and girls. There are many hand-loom weavers: from 300 to 400 looms were lately at work, making light jaconots and lawns. The parish church is a plain building rebuilt in 1832-3; and there are three dissenting places of worship in the parish. There are four schools, one of them parochial, another partly supported by subscription, and having a school-house and master's residence built by subscription, a third in connexion with the cotton-works, by the owners of which it is mainly supported, and the fourth a private school. There is a subscription library.

Kilpatrick parish, sometimes distinguished as East or New Kilpatrick, is at the southern extremity of the county, and is partly in Dumbartonshire: the population in 1831 was 3090; of whom about 1250 were in the manufacturing village of Milngavie. In the parish, and most of them in the village, are a cotton-mill, two bleachfields, three printfields, a distillery, a paper-mill, a snuff-mill, and several corn-mills, giving employment altogether to 900 persons. There is a meeting-house for dissenters of the Relief kirk in the village; the parish-church is two miles distant, in Dumbartonshire. There are a parish-school and five private schools, with about 300 scholars; five Sunday-schools, with about 190 scholars; and a respectable subscription library.

The parish of Alva forms a detached part of the county; the village of Alva is on the river Devon, between Stirling and Kinross. The woollen manufacture has long been established in the parish; the earliest article made appears to have been serge; this was succeeded by plaidings and blankets; at present tartan shawls, blankets, and plaidings, and chequered kerseymeres are the chief articles: about 500 or 600 men, women, and children are employed in this manufacture. The parish school-house, a good building, is in the village; the parish church, on an eminence a little to the east of the village. Besides the parish school, there are a subscription school; and an infant-school and a girls' school, supported by the principal family in the parish.

Fintry is the most central parish in the shire; its population in 1831 was 1051; above 600 of whom are in the village of Fintry, which has arisen from the establishment of a cotton-mill, which contains 20,000 spindles, and employs about 260 persons. There are also a distillery and a small wool-factory. The village consists of a row of houses regularly built, with two stories and a garret, ranged on one side of the road, with their gardens on the other side. There are a parish school and an endowed school, the latter chiefly for the children of those who work in the mill, with a good school-room and house for the teacher: this school has 100 day scholars, and 50 to 60 evening scholars. There are also a Sunday-school and a subscription library. The parish church is a plain neat building, nearly a mile from the village.

In Strathblane parish, on the south-west side of the county are a calico print-work and two bleachfields, which ive employment to above 200 persons. There are one parochial and two private schools; a young men's society, combining the double object of a religious meeting and a mechanics' institute; a parish library; a savings'-bank; and Bible, missionary, and temperance societies.

Menstrie, with a population of 500, has a woollen-manufactory and a distillery; and the pretty village of Bridge of Allan, with a population of 200, is resorted to for the sake of the adjacent mineral springs of Airthrey. Both are in Logie parish, which is on the north side of the Forth near Stirling.

Divisions for Ecclesiastical and Legal Purposes.—The twenty-six parishes wholly or partly in the shire are arranged as follows:—

Parish.	Presbytery.	Synod.
Baldernock	Dumbarton	Glasgow and Ayr
Balfron	"	"
Buchanan	"	"
Drymen	"	"
Fintry	"	"
Killearn	"	"
Kilpatrick, E. or New	"	"
Strathblane	"	"
Campsie	Glasgow	"
Kilsyth	"	"
Kippen	Dunblane	Perth and Stirling
Lecropt	"	"
Logie	"	"
Airth	Stirling	"
Alva	"	"
Bothkennar	"	"
Denny	"	"
Gargunnock	"	"
Larbert, with Dunipace	"	"
Ninians, St.	"	"
Stirling	"	"
Falkirk	Linlithgow	Lothian and Tweeddale
Muiravonside	"	"
Polmont	"	"
Slamannan	"	"

Larbert and Dunipace are for ecclesiastical purposes united: there are several *quoad sacra* parishes which have been formed by the subdivision of the above. The Seceding churches of the associate synod are chiefly in the presbyteries of Glasgow, and of Stirling and Falkirk; those of the Relief kirk in the presbyteries of Glasgow and St. Ninians; and those of the Reformed Presbyterians in the presbyteries of Edinburgh and Glasgow.

While the Scottish church was episcopal, the parishes in the eastern part of the county were in the diocese of St. Andrews; and those in the western and southern parts in that of Glasgow; Kippen was in the diocese of Dunkeld, and Alva in that of Dunblane. On the erection of the diocese of Edinburgh by Charles I., A.D. 1633, all the parishes in the diocese of St. Andrews, except Logie and Lecropt, were subtracted, and placed under the jurisdiction of the newly created bishop. The Rev. Ebenezer Erskine, one of the leaders of the great secession, and founders of dissent in Scotland, was minister of Stirling, and was deposed from his charge by the General Assembly in 1738. His influence led to the secession of a great number of persons in this shire.

The circuit court of justiciary, and the general quarter-sessions for the county, are held at Stirling. Ordinary and small debt sheriff-courts are held weekly at Stirling and at Falkirk: there is a sheriff-substitute at each place. Sheriffs' small-debt circuit-courts are held quarterly at Drymen, at Lennoxtown of Campsie, and at Balfron. There is a county and burgh prison at Stirling for debtors and criminals, but in the Inspectors of Prisons' Fourth Report (*Parl. Papers* for 1839, vol. xxii.) it is described as being one of the worst in Scotland: the discipline and general management were altogether very bad, and the keeper quite unfit for his place. The average number of criminal prisoners in the year ending 1st October, 1838, was about 26 males and 7 females: of debtors about 3, almost entirely males: the average number for the year ending Michaelmas, 1839, was from 42 to 43 criminals (27 males, and 15 to 16 females), and from 3 to 4 debtors, all males. There is a small burgh gaol at Falkirk, in which there were, on an average of the year 1838-9, 4 criminals, chiefly men. There are small lock-up houses at Alva and Kilsyth. Those at Falkirk and Kilsyth are altogether unfit. The police of the county is altogether insufficient.

The county returns one member to parliament: the number of electors registered in 1835-6 was 2092; viz. 863 sole or joint proprietors, 22 life renters, 1025 leaseholders, or tenants paying a gross sum of 300*l*., 36 husbands voting on their wives' qualification, 35 voters by virtue of office, 7 with joint qualification, and 104 transferred from the old roll of freeholders: in 1839-40 the total number of voters was 2323, viz. 993 proprietors, 127 life renters, 1032 leaseholders, &c., 40 husbands, 38 officers, 5 with joint qualification, and 88 freeholders from the old roll; showing an increase in four years of 231 voters. The detached parish of Alva is, for parliamentary purposes, attached to the county of Clackmannan, but for judicial purposes remains attached to Stirlingshire.

Stirling returns a member in conjunction with Culross, Dunfermline, Inverkeithing, and Queensferry. The number of voters at Stirling was, in 1835-6, 497; in 1839-40, 471; showing a decrease of 26. For the whole district the number was, in 1835-6, 1220; in 1839-40, 1141; showing a decrease of 79. Falkirk returns a member in conjunction with Airdrie, Hamilton, Lanark, and Linlithgow. The number of voters at Falkirk was, in 1835-6, 313; in 1839-40, 387; showing an increase of 69. For the whole district of burghs, the number was, in 1835-6, 1083; in 1839-40, 1369; showing an increase of 286. The writs for the two districts are proclaimed at Stirling and Falkirk respectively.

Education and Crime.—By the Returns made in 1834, and presented to Parliament in 1837 (*Parl. Papers* for that year, vol. xlvii.), the number of parochial schools was thirty-three, with 39 teachers, and a number of scholars varying from 1331 to 1857, nearly two-thirds of whom were boys: the number of other schools was one hundred and twenty-one, with 138 teachers, and a number of scholars varying from 3552 to 5211, about three-fifths of whom were boys; making a total of one hundred and fifty-four schools, with 177 teachers, and from 4883 to 6969 scholars. By making an allowance for defective returns, the estimated number of scholars is supposed to be from 6670 to 8825. The number of children between the ages of five and fifteen who have learned or are now learning to write, as specified in the returns, is 2467, but the estimated number, making due allowance for defective returns, is supposed to be 4959: the number who have learned or are learning to read is by the returns 4223; but after allowing for defective returns, is supposed to be 8489, which is probably not half the whole number of children in the shire. The above returns relate to day-schools alone, not to Sunday-schools.

The state of education in the manufacturing parish of Kilsyth is declared by the inspector of prisons to be unsatisfactory. (*Second Report, Parl. Pap. for* 1837, vol. xxxii.) 'Many parents altogether neglect the instruction of their children. . . . . It is estimated that about two-thirds of the adult population are able to read easily. The people are not however much given to reading.' There is a great deal of drunkenness, and many offences are committed, chiefly assaults and petty thefts, which escape detection and punishment, the police being inefficient. Crime had indeed increased, but not in a greater proportion than population, and the offences were of a less heinous character. (*Report*, as above.)

There appear to be many offences of rather a petty kind in this county, though not many that are very serious. The most common are assaults and thefts. Falkirk, Alva, and Lennoxtown of Campsie, with their respective neighbourhoods, are the places in which offences are most frequent. The offences at Falkirk are chiefly assaults and petty thefts; but the assaults appear to be decreasing: they occur chiefly at Carron (the most notorious place for offences in the east side of the shire), and are usually occasioned by drunkenness. Grangemouth, on the other hand, is one of the most quiet and orderly places in the district. The highland parish of Buchanan, the parishes of Drymen and Killearn in the western part of the shire, Baldernoch in the south, and Bothkennar and Slamannan in the east, are stated to be particularly free from crime and disorder.

There is a good deal of crime at Stirling, where there is, for the size of the place, a considerable disorderly population, consisting of prostitutes, thieves, and other loose characters; and there are always a number of vagrants in the town, by whom half the crimes and disturbances are com mitted. (*Inspectors of Prisons' Second, Third, and Fourth Reports.*)

History, Antiquities, &c.—Stirlingshire was, at the most antient historical period, included in the territory of the Δαμνόνιοι (Damnonii), a nation mentioned by Ptolemy and by Richard of Cirencester, who calls them Damnii. They were subdued by Agricola, A.D. 80, who formed a line of forts through their territory, reaching across the island from the Boderia Æstuarium, or Frith of Forth, to the Glotta or Clyde: this line of forts, the Roman general Lollius Urbicus, in the reign of Antoninus Pius, about A.D. 140, connected by a continuous rampart of earth or turf. Whether all the forts which may be traced, or which with good reason are supposed to have existed along the line of the rampart, were built by Agricola, or whether the number was increased by Urbicus and his successors, cannot now be determined. The forts, like the connecting rampart, were originally of earth, but appear to have been, at a subsequent period, faced with stone.

The rampart of Urbicus, or, as it is sometimes called from the emperor in whose reign it was constructed, 'the rampart of Antoninus' (Antonini Vallum), commenced on the shore of the Frith of Forth, a little to the east of Borrowstowness in Linlithgowshire, and ran westward through Linlithgow, Stirling, Lanark, and Dumbarton shires, to the Clyde at West or Old Kilpatrick. It consisted of a comparatively slight rampart, with a deep ditch on the north side, and a military road accompanying it on the south side: the remains of it are popularly known as Graham's, Græme's, or Grime's Dyke, a name the origin of which is not ascertained. It entered Stirlingshire in the parish of Polmont, about three miles east of Falkirk, and ran west-south-west through Polmont and Falkirk parishes, into a detached part of Dumbartonshire. In the parish of Polmont all traces of the work have disappeared, but in Falkirk there are some traces of the ditch, which are particularly observable in Callendar park and Lauriestown, just to the east of Falkirk town. The remains of one of the forts may be seen at Castle-Cary, six miles west of Falkirk, just where the rampart leaves the shire. It is a square fort, with an area of six acres, the rampart of Urbicus forming its northern side; the military way passed through it from east to west, and another military road entered it from the south. Several antiquities have been dug up in the ruins of a house in the south-east angle of this fort; and from the number of human bones found in the building, and from a great quantity of burnt wheat, it is supposed that the garrison must have been slaughtered, and the place burnt by the natives. It is supposed to have been the Κόρια (Coria) of Ptolemy. Another fort, about three miles and a half to the east of Castle-Cary, is described by Roy (*Military Antiquities of the Romans in Britain*), and Nimmo (*Hist. of Stirlingshire*); but all traces of it have now disappeared, except a slight elevation of the ground marking its site: it was called Rough Castle.

At Camelon near Falkirk, about three-quarters of a mile to the northward of the rampart of Urbicus, were to be seen, some years since, the remains of a Roman station. They were on a Roman road, which led from the rampart to the Forth, which it crossed above Stirling, and thence to the Roman posts in Perthshire. Roy describes the station at Camelon as being, from its extent, and the many vestiges of buildings remaining in it, one of the most considerable which the Romans had in North Britain. It consisted of two parts, the southern part appearing to have been the original station, and the northern part a subsequent addition. All traces of it have now disappeared. The Alauna of Richard of Cirencester is supposed to have been at Kier, in Lecropt parish, between the rivers Teith and Allan, north of the Forth, not far from Stirling; but there do not appear to have been any traces of works observed. The names Alauna and Allan probably embody the same element. The Roman road just mentioned probably ran from Camelon by Alauna or Kier to Lindum (Ardoch), Victoria, and other posts in Perthshire. Some parts of this road may yet be observed near Camelon. It was formerly, and perhaps is still, called Camelon causeway. It is a very carefully-made road, consisting of several layers of stones and earth, filling a trench made for it, and rising above the level of the ground, so as to form a raised causeway, with a small ditch or drain on each side.

A singular building on the banks of the Carron, near where the iron-works are now, supposed to have been a sacellum or chapel, was demolished about a century since. It was a circular stone building, of nearly 20 feet diameter inside, with the walls rising perpendicularly at first, and gradually closing inward so as to form a dome, with a large circular opening at the top 11 feet 8 inches in diameter.

There are some other antiquities referrible perhaps to the Roman period, or to the periods immediately before or after it. There are a few of the stone monuments commonly regarded as Druidical, earthen forts, cairns, and mounds or barrows, in Baldernock, Muiravonside, Gargunnock, Dunipace, Logie, and other parishes. Of the condition of the shire in the ages succeeding the Roman dominion we have no account. It was probably debateable ground, lying near the frontier of four kingdoms, having the Anglo-Saxon kingdom of Northumbria on the south-east, the British kingdom of Strath-Clyde on the south-west and west, the Scottish on the north-west, and the Pictish kingdom on the north and north-east. It is stated by Nimmo, but we believe on very questionable authority, that a severe battle was fought near Stirling, between the Scots, under their king Kenneth II. (Mac Alpin), and the Picts, in the course of that revolution which united the Scottish and Pictish kingdoms under one sceptre. Nimmo (*Hist. of Stirlingshire*) is disposed to trace the name Cambuskenneth, near Stirling, to this battle, and to regard some large stones (supposed by others to be Druidical) near the church of Logie, two miles north of Stirling, as memorials of it.

As the united kingdom of the Scots and Picts was extended by the addition of the territories of the Strath-Clyde and Cumbrian Britons, and of the northern part of the Anglo-Saxon kingdom of Northumberland, Stirling became an important town, from its central situation, its strong fortress, and its commanding the passage over the Forth. It early become a royal burgh, sharing the honour with Edinburgh, Berwick, and Roxburgh. Its earliest known charter is of Alexander I., A.D. 1119, but this is simply confirmatory of one conferred previously.

Cambuskenneth abbey, one of the most eminent in Scotland, was founded, A.D. 1147, by David I., king of Scotland, for regular canons of St. Augustin, on a small peninsula on the north side of the Forth, a little below Stirling. Of this edifice some ruined walls and the belfry tower still exist. It was not unfrequently called Striveling or Stirling Abbey, from its neighbourhood to that town.

Other religious houses in the shire were founded by succeeding monarchs.

In the invasion of Edward I. Stirling was abandoned by the Scots and occupied by the English (A.D. 1296). In the rising under Wallace, that chieftain, having made considerable progress in Forfarshire, advanced to Cambuskenneth on the Forth with about 40,000 men, to oppose the English army, which was advancing to Stirling, under the orders of the earl of Warenne and Surrey, guardian of Scotland, and of Hugh Cressingham, an ecclesiastic, whom Edward had made treasurer of Scotland. At the bridge of Stirling, at that time a wooden structure, half a mile above the present 'old' bridge, the English, who numbered above 50,000, were, through the weakness of Surrey and the presumption of Cressingham, utterly routed (11th September, A.D. 1297), and the whole of Scotland was recovered by the blow. Next year (A.D. 1298) Edward in person entered Scotland with an immense army of 80,000 infantry and 7000 cavalry, besides a body of Gascons, and at Falkirk routed Wallace, who could muster only a third part of the enemy's numbers, and whose inferior force was further weakened by the disunion or treachery of its chiefs. The Scots lost 15,000 men; the remains of their army retreated to Stirling, but unable to hold the town, they reduced it to ashes: Wallace resigned his office as guardian of the realm; but Scotland was not immediately subdued. Stirling castle, which was garrisoned by the English, was besieged by the Scots, under the regents, Comyn of Badenoch and John de Soulis, and forced by famine to surrender (A.D. 1299). When in A.D. 1303 Edward overran Scotland, Stirling castle held out against him, and Comyn broke down the bridge, and with all the force he could muster encamped on the ground which Wallace had occupied before his great victory. Edward however passed the river by a ford, and dispersing Comyn's force, quashed for the time all resistance, except in Stirling castle, in which a handful of brave men held out for three months against all the efforts of the king in person, and which was the last fortress that surrendered in Scotland.

In the reign of Robert Bruce, who had recovered Scotland from the English, the great battle of Bannockburn was fought in this shire (A.D. 1314). Bannock-burn is a small rivulet flowing eastward, south of Stirling, and falling into the Forth below that town, and has given name to a flourishing manufacturing village on or near it. Stirling castle, which appears to have been held by the English ever since its last capture by Edward I. (A.D. 1303), had been besieged by Bruce, and was to surrender if not relieved by midsummer. It was to the relief of this fortress that the English host of 100,000 men were advancing. Bruce, with 40,000 men, encamped between Stirling and Bannockburn, and here awaited the attack, which ended in the utter defeat of the English. Stirling castle surrendered, and Scotland was delivered from impending ruin. This was the third time, in seventeen years, that the fate of that country had depended on a battle fought in this shire; twice, at Stirling and at Bannockburn, it had been delivered by the conflict, and once, at Falkirk, had fallen under the power of its enemies.

In A.D. 1333 Stirling castle, with the rest of Scotland, came into the hands of Edward Baliol and his English allies. It was retaken (A.D. 1341) by the Scots after a long and gallant defence. The garrison were compelled to surrender by famine.

In the reign of James II. Stirling castle was the scene of the assassination of the earl of Douglas (A.D. 1451). The troubles of the reign of James III. were brought to a close in this shire by the battle of Sauchie-burn, a small rivulet midway between Falkirk and Stirling. (A.D. 1488.) The insurgent lords, with the king's son (afterwards James IV.) at their head, gained the victory over the royal army, and James, thrown from his horse in the flight, was murdered in a cottage to which he had been carried.

Stirling castle was the frequent residence of James V., and from it he frequently issued on those excursions in which he mingled in disguise among his subjects. Sir W. Scott's 'Lady of the Lake' details a supposed adventure of the king in one of these excursions.

James VI. was crowned at Stirling (A.D. 1567) at thirteen months old; and during his childhood, usually resided here with his preceptor Buchanan, who wrote here his 'History of Scotland.' In the troubled period of his minority, while the Scottish parliament were assembled at Stirling (A.D. 1571), the leaders of it were surprised and captured by a party of 400 men, sent from Edinburgh castle by Kirkaldy of Grange, who held out in that fortress for Queen Mary. The surprising party were however defeated, and the prisoners rescued by the earl of Mar, who sallied from the castle. The earl of Lennox, the regent for the king, was mortally wounded in the fray.

The earls of Angus and Mar, with others of those concerned in 'the raid of Ruthven,' took possession of Stirling town and castle (A.D. 1584), but were soon obliged to quit the place and flee into England. Returning next year with a considerable force, they occupied the town, and prepared to invest the castle, where the king (James VI.) was with a very inadequate force. An accommodation took place, and the judicial sentence which had been passed against the fugitive lords was reversed. This transaction is commonly called 'the raid of Stirling.'

Prince Henry, eldest son of James VI., was born at Stirling (A.D. 1594), and his baptism was performed in the castle with great state.

On occasion of the disturbances which arose at Edinburgh on the introduction of the New Liturgy in the reign of Charles I., A.D. 1637, the privy council and the court of session removed to Stirling, to which town none were allowed to repair without a warrant from the privy council; but on the very evening on which proclamation to this effect was made, and another proclamation read appointing the use of the Liturgy, a body of 2000 armed men entered the town, from whence they marched next day to Edinburgh to consult about further proceedings.

The last victory gained by Montrose in his brilliant campaign of 1644-5 was in this county. General Baillie, an officer of experience, who nominally commanded the Covenanters, was compelled by 'the Committee' which had been appointed to direct and control him, to attack Montrose, who, with the Royalist army, was at Kilsyth. Baillie had 6000 infantry and 1000 cavalry, while the Royalists had only 4400 foot and 500 horse; but notwithstanding his superior numbers, he was utterly routed, and nearly all his infantry killed or taken. He fled with such of his cavalry as he could collect to Stirling.

After the failure of the Scots' expedition into England in favour of Charles I., under the duke of Hamilton (A.D. 1648), those who had opposed that expedition rose in arms, and a body of Highlanders of the insurgent party, under the marquis of Argyle, was surprised at Stirling and cut to pieces or captured; the rest of the party, under the earls of Eglintoun and Loudon, were posted at Falkirk, and with them an accommodation was entered into, which brought the affair to an amicable issue. The Scotch army retired to Stirling after their defeat by Cromwell at Dunbar, A.D. 1650; and again occupied the town and encamped at Torwood, about six miles south of it, previous to their ill-fated march to Worcester (A.D. 1651). Cromwell was encamped at Linlithgow, and vainly attempted to draw the Royalists, who were commanded by Charles II. in person, to a battle. He stormed Callender House, close to Falkirk, in their sight; and having obliged them to retreat from Torwood to Stirling, captured many of their sick and a considerable quantity of military stores. Charles having marched into England and been followed by Cromwell, Monk, whom the latter had left behind him, occupied the town of Stirling, and in a few days forced the castle to surrender. The castle, and the steeple of the church, near which the besiegers had planted their batteries, bear still the marks of the damage sustained during this siege.

In the rebellion of 1715 the Royalists, under the duke of Argyle, marched from Stirling to encounter the rebels under the earl of Mar, at Sheriff Muir near Dunblane. [PERTHSHIRE.] The highland district of Stirlingshire was about this period the resort of the celebrated Rob Roy. In the rebellion of 1745-6 General Cope took post at Stirling previous to his march into the north of Scotland; but the Young Pretender eluded him, crossed the Forth below Stirling, and marched to Edinburgh. On the retreat of the rebels from England they besieged Stirling castle (12th of January, 1746), and General Hawley, at the head of a considerable force, having advanced to relieve it, was defeated by them (17th of January) at Falkirk. The Royalists numbered about 6000 men, the insurgents rather more. The loss of men was not great, but some pieces of cannon were taken, and the whole affair was discreditable both to Hawley and his troops. The siege of Stirling castle was resumed after the engagement, but finally abandoned on the approach of the royal army under the duke of Cumberland; the rebels in their retreat blew up their powder magazine and abandoned their cannon and a number of their sick and wounded.

During the political excitement of the year 1820 some skirmishing took place at Bonny Muir, near Falkirk, between the Radicals and the military, who were sent to repress the disturbances. The Radicals, who were armed, were chiefly from Glasgow.

The principal antiquities, besides Stirling Castle and Cambuskenneth Abbey, are the remains of some old castles and towers. There is the keep of an old castle near the Roman fort of Castle Cary, on the line of Urbicus' rampart. Duntreath Castle, in Strathblane parish, is a tolerable extensive ruin. The remains of Colzium Castle crown an eminence near Kilsyth; and the castle of Almond is a massive ruin between Falkirk and Linlithgow. The ruins of Manuel Priory are near the castle of Almond.

(*New Statistical Account of Scotland;* Nimmo's *History of Stirlingshire;* Tytler's *History of Scotland; Parliamentary Papers, &c.*)

STIVER. [MONEY.]

STIZOLO'BIUM, a genus of plants which was so named by Persoon, from *stizo*, 'to prick,' and *lobos*, 'a pod,' from the pods of the several species being covered with hispid hairs. The species have now been removed chiefly to Pachyrhizus [DOLICHOS] and to Mucuna; of the latter of these Stizolobium now forms a subgenus. The principle species of Mucuna have already been mentioned under the article COWITCH, or COWAGE, which is no doubt a corruption of the Hindostanee name *kiwach*, which is the *Mucuna prurita* of Hooker, indigenous in various parts of India, but usually confounded with *Mucuna pruriens*, a native of the West India Islands. The Indian M. prurita is distinguished by its smaller leaves, its more obtuse leaflets, the middle one being more truly rhomboidal, its flowers more constantly in threes, and by its legumes being much broader, compressed, and free from any raised line on the back of the valve, whilst in the American M. pruriens the pods are narrower, terete, and keeled on the valves. Another valuable but little known species is *Mucuna utilis*, the *pois noire* of the islands of Mauritius and Bourbon, and thought to be a native of Arabia. It is universally employed in the above islands for enriching the soil for the cultivation of sugar. The thick covering of herbage with which the soil becomes covered, must be useful in preventing the soil from becoming parched, while the whole crop, being afterwards ploughed in, is found to be eminently useful in enriching the soil. The seed has been introduced into India and is spreading over the country.

STJERNSTOLPE, JONAS MAGNUS, was born December 8, 1777, in the parish of Stenquist, in the province of Södermanland, in Sweden, of respectable parents, but who were so poor that they could afford to give him only the most ordinary education. In all probability therefore his talents would have remained in obscurity, had not his unusual abilities attracted the notice of Baron Fletwood and some of his friends, who put him to school at Strengnäs, where he soon distinguished himself, and whence he was afterwards sent to finish his studies at Upsala. He seems however to have been very scantily provided for, since in order to eke out his means of support he was obliged to give lessons and employ himself in translating novels for booksellers. At length an event occurred in 1802 which he himself has described as a most propitious revolution of fortune, namely, his being taken into the family of M. Beskow, a merchant, as tutor to his two sons, one of whom (Bernhard) has since distinguished himself as a poet, and has edited some of Stjernstolpe's posthumous pieces, with an interesting biography of their author. From this event however no permanent advantage to his circumstances seems to have resulted, for notwithstanding his attachment to his studies, he determined to renounce his prospects in any of the learned professions, and to accept a small appointment in a public office (the Krigs-Expedition), devoting only his leisure time to literary occupations. These consisted at first merely of translations of Müller's 'Siegfried' and other German romances, to the extent of about 30 volumes. It was then that Beskow, wishing to assist him, offered him a situation in his own counting-house, with a salary more than double of what he then had; but he rejected the well-meant proposal, saying, that he preferred drinking water and writing verses to drinking wine and casting up accounts. Though he himself might not consider the labour of translating drudgery, that kind of it in which he first engaged was certainly unworthy of his talents. Therefore although it is to be regretted that he did not undertake some original work of similar extent, it was not without advantage to the literature of his own country that he afterwards transplanted into it some of the productions of such writers as Cervantes, Wieland, and Voltaire. Besides 'Don Quixote,' 'Oberon,' and some of the tales of Voltaire, his translations of this class include those of Pope's 'Rape of the Lock,' and Blumauer's 'Æneis' (which latter poem he completed by adding the three last books, and which is considered to be in many respects even superior to the original); not to mention a number of minor pieces, both from antient and modern poets. Among his original productions, which are comparatively few, the principal are, 'Lunkentus,' a dramatic popular tradition; the 'Argonauts;' and his comic tales in verse.

Notwithstanding his decided taste for works of fancy and humour, satire and wit, his reading extended to others of a very different class, to mathematics and the physical sciences, geology and astronomy, to which last study he was greatly attached. According to his biographer Beskow, the same remarkable sort of contrast displayed itself in his conversation, for he would pass alternately from the gayest and liveliest topics to the most serious, from the most playful to the most profound. His conversational powers were, in fact, of the highest order: it was there that the originality of his mind fully displayed itself, for he possessed such extraordinary *improvisatore* talents, that he would delight his auditors almost an entire evening by a continual flow of wit and eloquence, which carried away both himself and his hearers. These captivating qualities and the amiableness of his personal character, his frankness and his disinterestedness, caused his society to be greatly sought after by all who were distinguished in literature and art; whence it was said of him that he was not only known to all Sweden, but intimate with one half of it. He constantly refused however to become a member of any literary society for which institutions he entertained no great respect. His epistolary correspondence was very extensive, and was marked by the same qualities as his conversation, though hitherto but a few specimens of it have been published by his biographer. He had commenced a translation of Ariosto, but did not live to make any great progress with it, being carried off by a paralytic attack on the 17th of September, 1831. (Beskow, *Minnesteckning*.)

STOAT. [WEASELS.]

STOBAE'US, JOANNES, a native of Stobi in Macedonia, whence he derives his name Stobaeus, lived either at the end of the fifth or in the sixth century of our æra. Respecting his life no particulars are known. We possess through him a number of extracts from antient Greek writers. He collected them in the course of his extensive reading from more than five hundred authors, both in prose and in verse, and put them together, and arranged them according to subjects for the use and instruction of his son Septimius. We are thus indebted to Stobaeus not only for an immense number of fragments of well known antient writers, but some authors would be altogether unknown to us if Stobaeus had not preserved their names, together with some of their sentiments. The words of Greek poets are of course quoted verbatim, but in regard to prose writers he followed two different methods; sometimes he quotes the author's own words, and gives us real extracts, and sometimes he gives a mere summary or epitome of what his author contained. He himself called this anthology from Greek literature, *'Ανϑολόγιον ἐκλογῶν, ἀποφϑεγμάτων, ὑποϑηκῶν*, and divided it into four books. But the work has come down to us in a somewhat different form. In our MSS. it is divided into three books, which form two separate works. The first and second books are usually called *'Εκλογαὶ φυσικαί, διαλεκτικαί, καὶ ἠϑικαί*, and the third *'Ανϑολόγιον*, or Sermones. It has therefore been supposed that one book of Stobaeus is lost, but it is more probable that the 'Sermones' contain the third and fourth books in one, according to the original division. It is true that the third book at present consists of 127 or 128 chapters, while in the time of Photius the two last books together only contained 100 chapters. This difference in number however may be accounted for by supposing that some of the larger chapters were divided by copyists into two or more smaller ones.

The editio princeps of the 'Eclogae' is that by W. Canter, Antwerp, 1575, fol., with a Latin translation. It was reprinted, together with the 'Sermones' (the first edition of which was edited by Trincavelli, at Venice, 1536, in 4to.), at Geneva, 1609, in fol. C. Gesner published three editions of the 'Sermones.' under the title 'J. Stobaei Sententiæ,' Tigur., 1543; Basil., 1549, and Tigur., 1559, with many arbitrary alterations. The best modern edition of the 'Eclogæ' is that by A. H. L. Heeren, with notes and a Latin translation, Göttingen, 1792-1801, 2 vols. 8vo.; and the best edition of the 'Sermones' is that by T. Gaisford, Oxford, 1822, 4 vols. 8vo., reprinted at Leipzig, 1823 and 1824, in 4 vols. 8vo. A complete edition of both works of Stobaeus has been published by Tauchnitz, at Leipzig, 1838, in 3 vols. 16mo. (Schöll, *Geschichte der Griech. Lit.*, iii., p. 395-414.)

STOCK, the English name for the genus of plants named by Brown *Matthiola*. [MATHIOLA.] Many of the species of this genus are great favourites in gardens, on account of their handsome flowers and fragrant smell. In order to raise the more valued kinds, as the double-stock gilliflower, the Brompton and queen's stocks, the seed should be saved from plants growing among double flowers, as it has been proved that such seed produce more plants with double flowers than the seed obtained from plants bearing double flowers. The seed should be sown in May, and when the young plants have attained a height of two or three inches, they should be thinned out till they are about nine inches asunder. The plants that are taken out may be planted in the flower-border, at about six inches distance from each other. If the following winter should be severe, they should be covered over with mats. In the following spring they will produce their flowers. The annual or ten-week stock (*Matthiola annua*) may be sown three or four times in the season: in February, March, April, and May; those that are sown in the last month will blossom till Christmas. All the annual sorts may be treated in this way. The double varieties of the shrubby kind may be propagated by cuttings, under a hand-glass, and placed in a shady place. A soil that is light and mixed with sand is the best adapted for them. The stock will not bear transplanting at a late period of its growth, as its fusiform root is not supplied with lateral radicles, and the spongioles at the end of the root are almost sure to be destroyed when this operation is deferred beyond a few weeks.

STOCKBRIDGE. [Hampshire.]

STO'CKHOLM, the capital of Sweden, is situated in 59° 20′ N. lat. and 18° E. long., on the channel by which the lake Mälarn discharges its waters into the Baltic. Following the numerous windings of this channel, the open sea is reached at a distance of 36 miles from the town, but in a straight line the distance does not exceed 24 miles. The channel varies in width between less than a mile and five miles, and is interspersed with numerous rocky islands.

The city of Stockholm is built partly on the continent and partly on nine islands formed by the above-mentioned channel: the islands are called *holmen*. In the middle of the channel are the islands of Stockholmen, also called Staden, because the town was originally first built on it, and Riddar Holmen (the island of the knights). South of them is the large island of Söder Malm, at the western extremity of which are Lang Holmen and Räkning Holmen. North of the channel a large portion of the town is built on the continent, and called North Malm. With this part is united the island of Kongs Holmen (King's Island), which lies west of it, and those of Blasii Holm, Skepps Holmen (Island of Vessels), and Kastell Holmen, which are east of North Malm.

The Staden, or Stockholm, occupies the centre of the town, and contains several fine public and private buildings. The royal palace, an edifice of great architectural merit, stands on an eminence, and is surrounded by a large garden. Besides the apartments in which the royal family reside, it contains a library, collections of paintings, coins, and antiquities. Before the extensive court-yard of the palace, and near the banks of the channel, is the colossal statue of Gustavus III., of bronze: and in its vicinity, along the eastern shore of the island, is the proper harbour of the town, in which the largest vessels find excellent anchorage. Along it there are large storehouses for foreign goods. Farther to the west is the cathedral, or St. Nicolai Church, also called 'storkyrka,' or head church, in which the kings of Sweden are now crowned: and at some distance from it, on the Riddarhustorg (or Square of the Hall of the Knights), is the statue of Gustavus Vasa, of bronze. From the square a stone bridge leads to the Riddarholmen, which is much smaller than Stockholmen, but which contains several large public buildings, among which are the old palace and the old church of Riddarholmen, in which the kings and distinguished persons born in Sweden are buried, and about five thousand flags are hung up, the trophies of the Swedes in their numerous wars. The legislative body also holds its meetings here.

Söder Malm, or the southern division of Stockholm, is built on the island of the same name, which is about three miles long and nearly two miles across in the widest part: it is joined to Stockholmen by a long bridge of boats, and provided with a large lock on account of the great rapidity with which Lake Mälarn sometimes discharges its waters. The surface of the island is rocky and very broken; and though there are also many fine buildings near the channel, the interior of this section of the town is mostly composed of small wooden houses situated between rocks and swamps, and of gardens and corn-fields. In the Söder Malm is the great depôt of iron, whence it is shipped to all quarters of the globe. The most remarkable of the buildings are the town-hall, the Danviken or Great Hospital, and the Maria Magdalene and the St. Catharine Church. The island of Lang Holmen, which is farther west, and is united to the Söder Malm by a bridge, contains the houses of correction; and on Räkning Holmen, which likewise is joined to Söder Malm by a bridge, there is a park.

The Norr Malm, or northern division of the town, is on a gentle slope, which gradually rises about 200 feet above the sea-level. It is much better built than the Söder Malm, and has several fine squares and streets, among which King's Street is distinguished by many good buildings. A well-built bridge connects it with Stockholmen. On the finest of the squares, called that of Gustavus Adolphus, is the bronze equestrian statue of that great king. One of the sides of the square is occupied by the opera-house, a fine large edifice. Not far from the square is the king's garden (Kungs Tregorden), a fine piece of ground, planted with trees and used as a public promenade, in which a statue of Charles XIII. has been erected; and near it is the play-house. Among the churches of this part of Stockholm, that of Adolphus Frederick is distinguished by its beauty. At the northern extremity of Norr Malm is the observatory which is well provided with astronomical instruments and a library; and somewhat farther is the botanical garden. The island of Kungsholmen, which lies west of Norr Malm, is joined to it by two bridges. It is not much built on, but contains the great iron-foundry established by an Englishman, Mr. Owen; a large hospital, the Bible printing-office, and the royal cannon-foundry of Marieberg. Contiguous to the Norr Malm on the east is Ladugords Gärdet, on which formerly were some royal farms, a part of which however has been built upon; whilst another part has been converted into a royal park, called Humblegord (hop-garden), to which the public has access. The island of Blasii Holmen, which has been converted into a peninsula by filling up the narrow channel which divided it from the continent, is north-east of Stockholmen and south-east of Norr Malm, of which it now constitutes a portion. It contains some fine buildings. Contiguous to it, and only separated by a narrow channel, over which there is a bridge, is the small island of Kyrkholmen, from which a long wooden bridge leads to Skeppsholmen, where the flotilla of the skära is stationed. Another wooden bridge leads to Kastellholmen, a very elevated island, planted with fine trees: a castle is built here for the defence of the entrance of the harbour.

There is probably no capital in Europe, except perhaps Constantinople, which can be compared with Stockholm as to the beauty of its environs. The numerous channels between the islands—in some places contracted to the narrowness of a river, and at a short distance expanding to the dimensions of a lake, enclosed by a rocky bank, changing continually in elevation and form, and overgrown with beech, birch, and pines, and at several places cut by narrow valleys, partly cultivated and partly covered with meadows—present an infinite variety. Country-houses are dispersed over the hills surrounding the town; but the place which is most resorted to for pleasure is the zoological garden, which lies eastward of the town, and is separated from the Skeppsholmen and Kastellholmen by a narrow arm of the sea. It is a peninsula two miles long and about one mile wide, and its surface is diversified by groves of birch, beech, and pines, by steep rocks and numerous depressions, frequently covered with a fine turf. Within the zoological garden is the royal country-seat of Johansdal, formerly called Rosendal, which is surrounded by a large park. Other royal country-houses are north of Norr Malm, as Ulriksdal, Haga, and Carlsberg: the last is now a military academy. But the most distinguished of the royal country-houses lie to the west of the town, on islands in the lake of Mälern; they are Gripsholm, Drottningholm, and Swartsjö. Drottningholm is an edifice distinguished by great beauty, and contains a fine collection of pictures and coins. Swartsjö is surrounded by an extensive park.

Stockholm is the seat of the government, and generally also the place where the legislative bodies meet. It contains consequently the offices of all the branches of administration and the superior courts of justice. There are several scientific and literary societies, among which the Royal Society of Sciences has greatly contributed to the advancement of natural philosophy, chemistry, and natural history. There is also a Royal Academy of literature, history, and antiquities; the Swedish Academy, whose object is to promote the cultivation of the native language; an academy of military sciences, an academy of liberal arts, a musical academy, and an academy of agriculture. The charitable institutions are very numerous, and in this respect Stockholm is superior to any other city in Europe of equal size. The institutions for education are also numerous. Besides a well-conducted grammar-school, there are some schools for the middling classes, and 14 elementary schools, mostly conducted on the plan of Bell and Lancaster. There is also a school for grown-up persons whose education has been neglected, and who wish to improve their knowledge.

The population of Stockholm consisted, according to the census of 1825, of 79,473 individuals; in 1833, according to Forsell's account, of 81,000; and in 1839, of 83,885 persons, according to the same authority. The number of families in 1825 was 14,436, of which 1314 were rather wealthy, 8777 in comfortable circumstances, and 4345 poor. The number of persons employed by government and their families, the military included, did not exceed 8453; and the remainder consisted of merchants, tradesmen, mechanics, and seamen, with their families, and the persons attached to their business.

Stockholm is the most industrious and commercial town of Sweden. There are manufactures of cloth, cotton, calico, silk, ribands, sugar, tobacco, leather, cast-iron, and soap. But no branch of manufacturing industry is carried to such an extent, either in Stockholm or in any other place in Sweden, as to supply the demand, and large quantities of foreign manufactures, and especially English, are annually imported.

The commerce of Stockholm is more important. Nearly the whole of the superfluous produce of the countries north and west of Stockholm is brought here, to be exported to foreign countries. It is mostly shipped in Swedish vessels, of which in 1827 Stockholm possessed 146, with nearly 27,900 tons burden, and crews amounting to 1507 persons. The most important article of export is iron: according to an average of ten years (1821-1830), it amounted annually to 31,993 tons. The second article is timber, boards, &c.; and the third is tar and pitch. Minor articles are copper, cobalt, ready-built vessels, linseed-oil and oil-cakes, tobacco, steel, bricks, and a few manufactured articles. The most active commerce is carried on with England, the United States of North America, Denmark, France, Prussia, Portugal, the Netherlands, and Italy. The most important articles of import are sugar, coffee, wine and brandy, rum, woollen manufactured goods, cotton, silk, linens, china and crockery, hemp, cotton, cheese, potash, hides and skins, tallow and candles, train-oil, dyeing-woods, raisins, almonds, pepper, cinnamon and cassia, tea, butter, and wool.

(Forsell's *Statistik von Schweden*; Forsell's *Anteckningar öfver Sverige*, Stockh., 1839; and Schubert's *Reise durch Schweden, Norwegen, Lapland*, &c.)

STOCKING WEAVING. [WEAVING.]

STOCKPORT, an important manufacturing town and parliamentary and municipal borough, on the river Mersey, partly in the parish of Manchester, in the hundred of Salford, in the county of Lancaster, but chiefly in the hundred of Macclesfield, in the county of Chester, 180 miles northwest from the General Post-office, London, by the coach (formerly mail) road, through Barnet, St. Albans, Northampton, Leicester, Derby, Ashbourn, Leek, and Macclesfield, and about seven miles south-east from Manchester.

Stockport, antiently called Stokeporte and Stocport, was made a free borough by Robert de Stokeporte, with the permission of Edward I. as earl of Chester: the same Robert had the grant of a market and an annual fair. There was an antient castle at Stokeport, of which not a vestige now remains. The town was garrisoned by the Parliamentarians in the great civil war, and was taken, A.D. 1644, by the Royalists, under Prince Rupert, who had previously repulsed the garrison, 3000 in number, when they marched out to attack him: the Parliamentarians subsequently recovered the place. Stockport-bridge was blown up in 1745, to prevent the retreat of the rebels after their advance to Derby; and they were in consequence obliged to wade through the river.

The parish of Stockport, which is wholly in Cheshire, comprehends an area of 24,810 acres, with a population of 66,610: it is divided into fourteen chapelries or townships, of which the township of Stockport (which coincided with the antient borough) had an area of 1740 acres, with a population of 25,469; but the town having extended beyond the township, and across the Mersey, into Lancashire, the parliamentary boundaries were, by the Boundary Act, made to comprehend, in addition, the most populous parts of the township of Heaton Norris (in Manchester parish), part of the township of Brinnington, in Stockport parish, and the hamlets of Brinksway and Edgeley, in the townships of Cheadle Bulkeley and Cheadle Moseley, in Cheadle parish; the whole having a population of about 43,000. The town stands at the junction of the rivers Tame and Mersey, and consists of a number of streets irregularly laid out, with a large open market-place in the centre. It is well paved under the provisions of the general Highway Act, and is lighted with gas under a local act. The principal part of the town is built on a steep and irregular hill of soft red sandstone, rising in some parts precipitously from the south bank of the Mersey. The market-place and the parish church are on a tolerably extensive level on the summit of the hill; the streets leading to them are steep and narrow. There are four bridges in or near the town, over the Mersey, and one over the Tame. The 'old bridge' over the Mersey, near the market-place, is of one arch, built high above the river to avoid the inconvenience caused by the sudden and violent swelling of the stream, and having its abutments built on the solid rock, which here lines the banks of the river. Below the 'old bridge' is another bridge, of eleven arches, crossing not only the river, but its valley, at an elevation of 40 feet above the water. The arch over the river is of 90 feet span; most of the dry arches are on the Cheshire side. This bridge was built that the Manchester and Buxton turnpike-road might avoid the ascent and descent caused by the uneven site of the town.

The parish church is, for the most part, modern, having been rebuilt early in the present century, in the perpendicular style of architecture. It has a tower with pinnacles and pierced battlements, a nave with side aisles, and a chancel. The chancel is the sole remaining part of the former building, but it has been much altered. It had a fine east window of decorated English character, but much decayed, the old church having been built of soft red-sandstone: there were also some fine stone stalls in the south wall of the chancel. There are three other places of worship of the establishment in the borough, viz. St. Thomas's church, built A.D. 1825, a handsome building of Grecian architecture, with a tower surmounted by a cupola; St. Peter's chapel, a neat brick building, erected about the middle of the last century; and a district chapel of modern erection in Heaton Norris. Besides these, there are a number of dissenting meeting-houses of different persuasions. There were, in 1834, three for Independents, three for Methodists, and one each for Baptists, Unitarians, Roman Catholics, and Quakers. There are some very large Sunday school-rooms, built by subscription at a cost of above 6500*l.*; a grammar-school, lately rebuilt by the Goldsmiths' Company of London; a very large national school, an infirmary, which is a very ornamental building, and a small theatre.

Stockport is one of the principal seats of the cotton manufacture. Pigott's 'Directory' for 1834 enumerates nearly one hundred and twenty firms in Stockport and Heaton Norris engaged in different branches of this manufacture; there are also three cotton-printing establishments, two bleaching establishments, and several dye-houses. To the cotton manufacture, which is the staple of the town, may be added the manufacture of silk goods, thread, hats, brushes, spindles, and shuttles. About 4500 men were, in 1831, engaged in manufactures in and round the town. There are several breweries, a distillery, several iron and brass foundries in the town, and a great number of bricks are made in the neighbourhood. There are three banking establishments. A branch canal communicates with the Manchester and Ashton canal, and the town is on the line of the Manchester and Birmingham Railway, which has been opened between Manchester and Stockport. The market is on Friday, and is the most important in Cheshire for corn, oatmeal, and cheese. There are four yearly fairs, chiefly for cattle.

Stockport was formerly incorporated, but the corporation, previously to the late Municipal Reform Act, had gone to decay; a mayor was chosen at the court leet and baron of the manor; but his office was merely nominal, the jurisdiction of the town being in the hands of the county magistrates. By the Reform Act Stockport was made a parliamentary borough to return two members; the boundaries of the borough have been already described. The number of voters, in 1835-6, was 1137; in 1839-40, 1279. By the Municipal Reform Act the parliamentary boundaries were adopted for municipal purposes, the borough was divided into seven wards, a number which the revising barristers reduced to six; the town council consists of fourteen aldermen and forty-two councillors, and the town has a commission of the peace.

Stockport has an auxiliary Bible society, a news-room, and a subscription library. Two newspapers, 'The Stockport Advertiser' and 'The Stockport Chronicle,' are published in the town.

The living of Stockport is a rectory, in the rural deanery of Macclesfield, and in the archdeaconry and diocese of Chester, of the clear yearly value of 1882*l.*, with a glebe-house. The chapelries of St. Thomas and St. Peter are curacies, of the clear yearly value of 110*l.* and 220*l.* respectively; Heaton Norris is a chapelry, in the parish and rural deanery of Manchester and in the same archdeaconry and diocese as

Stockport; its clear yearly value is 116*l.* The townships of Stockport, Brinnington, Heaton Norris, Cheadle Bulkeley, and Cheadle Moseley, which are wholly or partly in the borough, had the following number of schools in 1833:—

	Day Schools.	Scholars.	Sunday Schools.	Scholars.
Stockport	50	1962	8	7259
Brinnington	2	114	..	..
Heaton Norris	9	481	4	1141
Cheadle Bulkeley	9	336	3	653
Cheadle Moseley	4	163	1	345
	74	3056	16	9398

One of the day-schools at Stockport is an endowned grammar-school, under the patronage of the Goldsmiths' Company of London. It had, in 1833, 150 boys; another was a national school, with 235 boys and 170 girls. One of the Sunday-schools, 'the Stockport Sunday-school,' was not exclusively connected with any denomination. The Bible was used as the school-book, and the children were taken alternately to church and to dissenting places of worship. This school, with four branches, had, in 1833, 5244 scholars, about half of each sex. It was supported by subscription, and was under the management of a committee elected from among the subscribers of a guinea and upwards, and of visitors chosen from among the persons actively engaged in the school. There were two libraries, a teachers' library of 850 volumes, and a scholars' library of 1700. There were connected with the school a religious tract society which circulated yearly 30,000 tracts, and a Bible association which distributed yearly about 400 copies of the Scriptures. There were no paid officers connected with the institution.

STOCKS, in Horticulture, are young trees which are designed for the reception of the grafts or buds from other trees. The process by which a part of one tree is transferred to another is called grafting or budding [GRAFTING], and the object attained by it in gardening is the securing the continuance and multiplication of an individual plant that may possess peculiarities deemed worthy of preservation. It is by this process that the great number of varieties of cultivated fruits are preserved with remarkable integrity, and by which a constant improvement may be ensured.

In the process of grafting much depends on the stocks which are employed, and it is by ascertaining the best modes of growing stocks, and the relation that exists between the various kinds of stocks and the grafts and buds that are placed upon them, that we are to look for the improvement of the various kinds of garden fruit.

Stocks are for practical purposes divided into three kinds. Crab stocks, free stocks, and dwarf stocks. Crab stocks are those which are grown from the seeds of wild and ungrafted trees, as the cherry, plum, apple, &c. These stocks are commonly used where a large and hardy growth is desirable. In the selection of wild stocks, those which grow cleanest, and are freest from irregularities of the stem and defects in the bark, should be chosen. Free stocks are those which are raised from the seeds or layers of fruit and orchard trees which have been grafted. These stocks are found desirable when the object of grafting is to obtain choice varieties of apples, peaches, nectarines, apricots, or plums. Dwarf stocks are those which are raised from low-growing shrubby trees. They are used in the grafting of low-standards for small gardens, also for wall-trees, and espaliers.

Stocks are raised in nurseries from seeds, suckers, layers, and cuttings. When raised from seeds, they should be sown in the autumn, in beds of common light earth: all lateral branches should be cut off as they grow up; and, according to circumstances, they will be fit for grafting in one, two, or three years. Stocks may be used when they have attained the size of a goose-quill, up to that of a man's finger. When stocks are wanted expeditiously, they may be produced from suckers taken up and planted in the autumn, when they will be ready for use the following July or August. They are not often raised from layers and cuttings.

In the selection of stocks, not only is care required that they be of the same kind as the graft or scion, but that there is a proper relation between the rapidity of their growth according to the objects wished to be attained. When the growth of the scion is more rapid than that of the stock, it will sometimes die. This is the case with peach-trees budded on plum-stocks and pears on the hawthorn. At the same time, when trees are naturally too luxuriant in leaves and branches, they may be dwarfed their growth and made fruitful by placing a scion from them on a stock that grows slower than themselves. In this way apples may be dwarfed by being grown on paradise, pear, or quince stocks. Of this fact Knight gives the following explanation:—'The disposition in young trees to produce and nourish blossoms, buds, and fruits, is increased by this apparent obstruction of the descending sap; and the fruit of such young trees ripens, I think, somewhat earlier than upon other young trees of the same age which grow upon stocks of their own species; but the growth and vigour of the tree, and its power to nourish a succession of heavy crops, are diminished, apparently by the stagnation, in the branches and stock, of a portion of that sap which, in a tree growing upon its own stem or a stock of its own species, would descend to nourish and promote the extension of the roots. The practice therefore of grafting the pear-tree on the quince-stock, and the peach and apricot on the plum, where extensive growth and durability are required, is wrong; but it is eligible wherever it is wished to diminish the vigour and growth of the tree, and where its durability is not thought important.' (*Hort. Trans.*, ii.)

It is frequently desirable to select those stocks which are hardier than the scion, for the purpose of ensuring the growth of the latter. Not that the stock has any power of communicating hardiness to the scion; but those stocks that are accustomed to colder latitudes will supply a sufficient quantity of sap, and be able to resist the influence of a decrease of bottom heat.

M. Dubreuille of Rouen has lately pointed out the fact that the kind of soil in which a stock grows has something to do with its being adapted for the growth of certain scions Thus he found that in the chalky gardens about that city, neither the plum nor the wild cherry would do as stocks for stone-fruit, nor the doucin or quince stock for pears and apples. The crab was found best for the apple, the wild pear for the cultivated pear, the almond for the plum, and the mahaleb for the cherry.

The following table, from Dr. Lindley's 'Theory of Horticulture,' p. 24, gives a comparative view of the stocks that were found best suited for the scions of the apple, pear, plum, and cherry, in three different soils:—

Scions.	*Stocks.* Loamy soil.	Chalk soil.	Light soil.
Apple	Doucin.	Crab.	Doucin.
Pear	Quince.	Wild pear.	Quince.
Plum	Plum.	Almond.	Almond.
Cherry	Wild cherry.	Mahaleb.	Wild cherry.

It has long been known that many scions did better on another species of stock than on their own, but it was not known that soil could have any influence on this; and hence is opened a field of interesting inquiry for the vegetable physiologist and horticulturist.

STOCKS, a term applied to the various 'Funds' which constitute the national debt. The number of distinct accounts of stock on which dividends were paid in 1839 was as follows:—

Dividends not exceeding		Dividends not exceeding	
£ 5	85,069	£ 500	2827
10	45,147	1000	1367
50	98,946	2000	266
100	26,205		
200	14,816	Exceeding	
300	4,495	2000	192

Each proprietor of stock may transfer his interest to others by sale. When the transfer is effected by a broker, he must be authorised by a power of attorney from his principal, the stamp-duty on which is 21*s.* 6*d.*; and the document may be so drawn as to empower him both to buy and sell stock and to receive the dividends for the person by whom he is commissioned. Few persons buy or sell stock except through the medium of a broker, but the general practice is to receive their dividends themselves. The purchaser acquires the dividend due upon the stock for the current half-year, and thus at one point there will be a sum of 29*s.* 4*d.* due on three-per-cent. stock, and a fortnight afterwards only 1*s.* 8*d.* On the bargain being completed, the parties repair to the Bank or South Sea House (according to the stock), where the actual transfer is effected. 'For this purpose the seller makes out a note in writing, which contains the name and designation of the seller and purchaser, and the sum and description of the stock to be transferred. He delivers this to the proper clerk, and then fills up a receipt, a printed form of which, with blanks, is obtained at the office. The clerk, in the mean time, examines the seller's accounts; and if he find him possessed of the stock proposed to be sold, he makes out the tranfer. This is signed in the books by the seller, who delivers the receipt to the clerk; and upon the purchaser's signing his acceptance in the book, the clerk signs the receipt as witness. It is then delivered to the purchaser upon payment of the money, and thus the business is completed.' (Dr. Hamilton, *History of the National Debt.*)

Bargains in stock are transacted in the Stock Exchange, in Capel-court, Bartholomew-lane. Brokers and jobbers who are not members assemble in the open court in front of the building. All the more respectable brokers are members of the Stock Exchange, into which association they are elected annually by ballot; but many of the jobbers are said to be persons of wealth. The governing body consists of a committee of twenty-four, also elected by ballot. The established rate of brokerage is one-eighth per cent. (or 2*s.* 6*d.* in the 100*l.*) upon the amount of stock transferred. There is no stamp-duty or tax of any kind upon transfers of Government Stock; but the transfer of Bank Stock under 25*l.* costs 9*s.*, above that amount, 12*s.*; of South Sea Stock under 100*l.*, 10*s.*, above it, 12*s.*; and of India Stock, of any amount, 1*l.* 12*s.*

The dividends on all descriptions of stock are due half-yearly, either on the 5th of January and 5th of July, or on the 5th of April and 10th of October, and are paid about a week afterwards; and for about six weeks previously, the books at the Transfer Office being closed, transfers cannot be regularly made. The transfers on each stock are effected at other times only on certain days in the week, which may be ascertained by a reference to any Almanac.

The bargains for *time* form a very important portion of the business of the Stock Exchange. They are bargains to deliver stock on a certain day at a certain price, the seller of course believing that the price will fall, and the buyer that it will rise. When the period for completing the bargain has arrived, a settlement is usually effected without any payment of stock, the losing party simply paying the difference. 'These bargains are usually made for certain days fixed by a committee of the Stock Exchange, called *settling days*, of which there are about eight in the year, viz. one in each of the months of January, February, April, May, July, August, October, and November; and they are always on Tuesday, Wednesday, Thursday, or Friday, being the days on which the commissioners for the reduction of the national debt make purchases. The settling days in January and July are always the first days of the opening of the Bank books for public transfer; and these days are notified at the Bank, when the books are shut to prepare for the dividend. The price at which stock is sold to be transferred on the next settling day is called the price *on account.* Sometimes, instead of closing the account on the settling day, the stock is carried on to a future day on such terms as the parties agree on. This is called a *continuation.*' (Dr. Hamilton.) Time bargains cannot be enforced in a court of law, and the parties are held to them only by a sense of honour and self-interest, and the fear of exclusion from the Stock Exchange, which ruins their credit. A defaulter, in the language of the Stock Exchange, is termed a 'lame duck,' and his name is posted for a certain time in the great room. The sellers of time bargains are also technically called 'bears,' and the buyers 'bulls;' the interest of the former being to beat down prices, and of the latter to raise them.

Stock of a high denomination may usually be bought cheaper than that of which the nominal interest is lower; and it is therefore the most advantageous for temporary investment. There is always a probability that the stock bearing the highest rate of interest will be reduced by the government when a favourable occasion presents itself; but the price of any one stock may be taken pretty nearly as an indication of the prices of the rest. For example, when 100*l.* in three per cent. stock costs 90*l.*, the par would be 105*l.* in a three and a half per cent. stock. When the Government reduces the interest on a particular stock, it is guaranteed against further reduction for a specified period; and this period having expired in regard to the New Three and a half per Cent. Stock, its relative value, compared with the Three per Cent. Stock, is as 90 to 99, there being always a probability that the interest on the former may be reduced. The fluctuation in the price of stocks generally may be traced to an almost infinite variety of causes—to the abundance or scarcity of money, and the opportunities of employing it to advantage in mercantile speculations; to the rumours of a new loan, or of the imposition of a fresh tax, or even the repeal of a tax; to rumours of war; and to innumerable other circumstances relating to the trade, finance, and other domestic affairs of the country. In 1797 the Three per Cents. were reduced to the lowest point which they have ever reached (47¼) by the success of the French armies, combined with adverse circumstances at home.

The following is a brief notice of each description of stock at present existing, which are bought and sold on the Stock Exchange, with the amount of each on the 5th of January, 1841:—

1. South Sea Stock, divided into the Company's Stock, or trading capital, amounting to 3,662,784*l.*; Old South Sea Annuities, 3,497,870*l.*; New South Sea Annuities, 2,460,830*l.*; and South Sea Annuities of 1751, 523,100*l.*, all of which have been created out of the capital of the famous South Sea Company by successive Parliamentary arrangements. The interest paid by the State upon the whole amount of this stock is now 3 per cent., although the dividend received by the proprietors of the 3,662,784*l.* of Company's trading stock is 3½ per cent. The additional half per cent. is obtained from certain fines and from the allowances made by Government for the management of this portion of the public debt.

2. Debts due to the Bank of England, amounting to 14,686,800*l.*, advanced at different times by the Bank to the public; the Bank receives interest on the amount at the rate of 3 per cent.

3. Bank Annuities, created in 1726, amounting to 825,251*l.* This stock was originally 1,000,000*l.*, which was raised in 1726, by lottery, to pay off arrears that had accumulated on the Civil List, and for which Exchequer bills had been previously issued: it bears interest at 3 per cent.

4. Consolidated Annuities, commonly called Three per cent. Consols. The amount of this stock, in January, 1841, was 362,542,977*l.* It was originally formed by the union of several funds which had before been kept separate, in the year 1751, at which period it was little more than 9,000,000*l.*

5. Three per Cent. Reduced Annuities, amounting to 125,861,030*l.* This stock consists of various sums originally borrowed at a higher rate of interest, but on which the interest has been afterwards reduced at different times.

6. Annuities at 3½ per Cent., 1818, amounting to 10,159,721*l.* Formed in 1818, partly by the funding of Exchequer bills, and partly by the conversion of certain 3 per cent. consolidated and 3 per cent. reduced annuities.

7. Reduced 3½ per Cent. Annuities, amounting to 66,259,849*l.* Formed in 1824, by the conversion of a former stock called the Old Four per Cents.

8. New 3½ per Cent. Annuities, amounting to 145,225,865*l.* Formed in 1830 out of the former stock called the New Four per Cents.

9. New 5 per Cent. Annuities, amounting to 428,076*l.* Formed in 1830, by the same arrangement out of which the New 3½ per Cent. Annuities then arose.

The total amount of the Irish Stocks, on the 5th of January, 1841, was 33,909,266*l.*

Besides these several stocks, there are—

1. The Long Annuities, occasioning an annual charge of 1,294,140*l.* These have been granted at different times, chiefly as premiums or douceurs to the subscribers to loans, and all expire on the 5th of January, 1860.

2. The Annuities per 4 Geo. IV., ch. 22, commonly called The Dead Weight Annuity. This is an annuity of 585,740*l.* paid every year by the public to the Bank of England, and to be so paid till the year 1867, in consideration of advances to the amount of 13,089,419*l.* made by that establishment. [NATIONAL DEBT.]

3. Life Annuities per 48 Geo. III., ch. 142, 10 Geo. IV., ch. 24, and 3 Will. IV., ch. 14, occasioning a charge of 857,856*l.* These are annuities upon the lives of individuals, which the Commissioners for the redemption of the National Debt were originally empowered to grant by an Act passed in 1808, in exchange for so much stock in interminable annuities as was calculated to be of equivalent value, according to a scale varying with the fluctuations in the prices of stocks. In 1829, however, Mr. Finlaison, the Government actuary, discovered that the tables which had been all along used in these calculations were erroneous,

when the Act upon which the annuities are now granted was passed.

4. Annuities for terms of years, under the above Acts, of which the present charge is 1,314,927*l*. These annuities are granted for various terms of ten years and upwards.

5. There are certain Tontines, and other Life Annuities granted by various Acts, of which those forming part of the English debt occasioned, in January, 1841, a charge of 9,969*l*., and those forming part of the Irish debt, a charge of 34,230*l*.

The two following descriptions of stock, in addition to the above, are constantly operated upon by the sale and purchase of shares at the Stock Exchange.

1. Bank Stock, being the trading capital of the Bank of England, or that upon which interest is paid to the proprietors, amounting formerly to 14,553,000*l*., but since the last renewal of the charter, in 1833, to only 10,914,250*l*. The interest is 8 per cent.

2. East India Stock, or the capital belonging to the East India Company, amounting to 6,000,000*l*. Ever since 1793 the interest upon this stock has been 10½ per cent.

Besides these English funds, shares in many descriptions of foreign stocks, which have been created by loans raised in this country, are constantly for sale in the money-market, as are also shares in railway, canal, mining, and numerous other similar speculations.

STOCKS, a wooden machine formerly much used for the punishment of disorderly persons by securing their legs. The time when they were first used in England does not appear; but in the second Statute of Labourers, 25 Edw. III., A.D. 1350, in the octave of the Purification, it is enacted that refractory artificers shall be put in the stocks by the lords, stewards, bailiffs, or constables of the towns where their offence has been committed, by three days; or sent to the next gaol, there to justify themselves; and that stocks be made in every town for such occasion between that time and the feast of Pentecost. (*Rot. Parl.*, ii., 234.) In 1376 the commons prayed the king for their establishment in every village. (*Ibid.*, 341.)

In 'King Lear,' act ii., sc. 2, Shakspere has introduced the stocks upon the stage. Farmer, commenting upon the passage (see Malone's *Shaksp.*, edit. 1821, vol. x., p. 99), says, 'It should be remembered that formerly in great houses, as still in some colleges, there were moveable stocks for the correction of the servants.' The last pair of stocks seen in London remained till within these very few years in Portugal-street, Lincoln's-Inn-Fields. A whipping-post usually adjoined the stocks.

STOCKTON, distinguished as **STOCKTON-UPON-TEES**, a town in the south-west division of Stockton ward, in the county of Durham, 340¼ miles from the General Post-office, London, by railway through Birmingham, Warrington, Manchester, Normanton, York, and Darlington; or 242½ miles by the coach (formerly mail) road through Barnet, Biggleswade, Norman Cross, Stamford, Grantham, Newark, East Retford, Doncaster, Abberford, Boroughbridge, Thirsk, and Yarm.

Stockton was at an early period the residence of the bishops of Durham, who had a hall here, which afterwards was called the castle, though in fact only a strong moated manor-house, where Bishop Morton took refuge (A.D. 1640) when the army of Charles I. was defeated by the Scots in the skirmish at Newburn. In 1645 the town was occupied by the Scotch army; and in 1647 the castle was ordered by parliament to be dismantled, and was entirely demolished in 1652. It commanded the passage of the river. The traces of the moat and embankment still mark the site.

The town is situated on the left bank of the Tees, which approaches the town in a northward direction, and then makes a sudden bend toward the east. The town is laid out with considerable regularity; the principal street is broad, and extends nearly a mile in a straight line from south to north: other streets either branch from this at right angles or run parallel to it. The wharf is on the bank of the river, just above the bend, and runs parallel to the High Street. Near the south end of the High Street the London and Darlington roads, united, enter it from the west; and quite at its southern extremity a road from it bends first to the south-east, then to the east, and crosses the Tees into Yorkshire by a stone bridge of five arches, erected (A.D. 1764-1771) in the place of the previously existing ferry. The streets are well paved, and lighted with gas, under a local act. The houses are for the most part of brick; the few that are built of stone are from the materials of the castle. The church is on the east side of the High Street, and at the eastern end of the church is a green, now inclosed and formed into a square. Altogether Stockton is one of the handsomest and cleanest towns in the north of England. The church is a spacious and convenient brick building, erected early in the last century, with a tower at the west end 80 feet high. There are places of worship for Independents, Baptists, Unitarians, Quakers, Wesleyan and Primitive Methodists, and Roman Catholics. The town-hall, in the middle of the High Street, is a respectable quadrangular building, surmounted by a clock-tower and spire. There are a custom-house, a news-room, assembly-rooms, billiard-rooms, and a small theatre. There is a race-course on the opposite side of the Tees.

The parish of Stockton comprehends an area of 4190 acres: the population, in 1831, was 7991: it is divided into the three townships of Stockton, Hartburn, and Preston: the township of Stockton, which contains the town, has an area of 2610 acres, with a population, in 1831, of 7763. The principal manufacture is that of linen and sail-cloth, which latter employs 400 hands: some ship-building, rope and sail making, and yarn and worsted spinning are carried on: there are also iron and brass foundries, breweries, and several corn-mills. Stockton is a port: the harbour is formed by the river Tees, the navigation of which has been improved by a cut just below the town, whereby a considerable bend is avoided. The chief imports are timber, deals, masts, spars, staves, iron, hemp, flax, tallow, oak-bark, linseed, clover-seed, hides, &c., chiefly from the Baltic, Holland, Hamburg, and British America; and groceries, wine, spirits, and colonial produce, brought coastwise. The exports to foreign parts are chiefly lead, and that in small quantities: the exports coastwise to London, Leith, Hull, Sunderland, &c., are chiefly of flour, butter, cheese, bacon, oak timber, linen, linen and worsted yarn, lead, and especially coal, the export of which has much increased. Communication is maintained with London and with Newcastle-upon-Tyne by steam-packets; and with Darlington, York, Manchester, Birmingham, and London by railway. The Stockton and Darlington Railway, which forms the first part of this line of communication, has one terminus on the quay, in the very heart of the town, and extends by Yarm and Darlington to Witton Colliery, near Bishop Auckland. A branch to Middlesbrough, a rising port in Yorkshire, lower down on the Tees, parts from the main line just to the south of the town of Stockton, and is carried over the Tees by a suspension-bridge (just above the stone bridge at Stockton), 240 feet long within the piers, and 30 feet above low-water mark. This railway was commenced under an act obtained in 1821, and was opened in 1825. Its whole length with the branches is 54 miles: it is the first railway on which locomotive engines were employed. A branch of the Clarence Railway (which extends from the Stockton and Darlington Railway, between Darlington and Bishop Auckland, to the mouth of the Tees, on the Durham side), has its terminus on the east side of the town. There are two weekly markets (Wednesday and Saturday) and two yearly fairs, besides a cattle-fair or great market on the last Wednesday of every month. There are four banking establishments at Stockton. There are extensive coal-works and some brick-yards near the town, and a salmon and other fishery in the Tees.

Stockton has a savings'-bank, a mechanics' institution, a dispensary, and almshouses.

Stockton is a borough by prescription; it has no charter, nor had the corporate officers any jurisdiction. Petty-sessions were held weekly by the county magistrates for Stockton ward. The borough comprehended only a small portion of the town; but a considerable extension of its limits has been recommended. By the Municipal Corporations' Reform Act the borough was divided into two wards, and has six aldermen and eighteen councillors. The borough has now a commission of the peace. Stockton is a polling-station for the southern division of the county of Durham.

The living of Stockton is a vicarage, in the archdeaconry and diocese of Durham, of the clear yearly value of 247*l*., with a glebe-house.

The township had, in 1833, twenty-one day-schools, with 902 children of both sexes; and five Sunday-schools, with 611 children. Of the day-schools, one, with 208 boys and 70 girls, was supported by endowment; and another, with

40 girls, partly by endowment and partly by annual subscription. The other townships of the parish have no school. A later account enumerates a grammar-school, a national school, a blue-coat charity-school, and seventeen private schools.

STOFFLER, JOHN, a celebrated German astronomer, who was born December 10, 1452, at Justingen in Swabia. He was appointed professor of mathematics in the University of Tübingen (in Wirtemberg), where, besides pure mathematics, he taught astronomy and geography, and he appears to have been successful in gaining the esteem of his numerous pupils, among whom are said to have been Melanchthon and Sebastian Münster. In the year 1530 he made a journey to Vienna, in order to be present at the installation of a professor of mathematics in the University of that city; and, according to Melchior Adam, he died of a contagious malady at Blaubeuren, February 16, in the following year, being 79 years of age. His funeral was celebrated with great magnificence, and his tomb was adorned with his effigy.

According to the practice of astronomers in that age, Stoffler spent much of his time in the computation of ephemerides, and he appears to have been first brought into notice by continuing the series which Müller (Regiomontanus) had commenced. He constructed an astrolabe, which was intended to be used as an instrument for making celestial observations, and on the plane of which were projected the circles of the sphere: an account of the astrolabe was given by him in a tract which was published at Tübingen in 1513; and in the same tract there is given an account of an instrument for determining the hour of the day by an observed altitude of the sun. Stoffler was addicted to the study of astrology; and in the ephemeris for the year 1524 he announced that, in consequence of a conjunction of the superior planets in the month of February, there would happen a deluge which would be fatal to the human race. Many persons had faith in the prediction, and took measures to save themselves: and it is remarkable that the fact of the prediction being found to be erroneous, neither disposed the author to renounce the study of astrology nor diminished the sale of his ephemerides. He published these works in a regular series from the year 1500 to about 1531.

Stoffler employed himself on the subject of reforming the Julian Calendar, and it is stated that he was the first who proposed to rectify the error of that calendar by the omission of ten days in one year, in order to make the succeeding days of the year correspond, as at first, to the place of the sun in the ecliptic. It is said also that Stoffler offered his project to the Lateran council, and that it was not accepted.

Besides the ephemerides, and the above-mentioned tract on the use of the astrolabe, Stoffler published astronomical tables (Tübingen, 1500); a tract on the calendar (Oppenheim, 1518); and a commentary on the Sphere of Proclus (Tübingen, 1531).

STOICS. [ZENO.]

STOKE, distinguished as **STOKE-UPON-TRENT**, one of the new parliamentary boroughs created by the Reform Act, in the northern division of Pyrehill hundred, in the county of Stafford. Stoke, which gives name to the borough, and Burslem, one of the principal towns in it, are each 152 miles north-west from the General Post-office, London, by Barnet, St. Albans, Daventry, Coventry, Coleshill, Lichfield, Stone, and Newcastle-under-Lyne; or 162 miles by the Birmingham and Grand Junction railways to Stafford, and from thence by Sandon and Newcastle. Hanley, the largest town in the district, is about a mile farther.

This borough has this peculiarity, that instead of comprehending one principal town and its suburbs, it consists of a considerable district, extending 7½ miles in length from north-north-west to south-south-east, and above 3 miles in breadth at the widest part. It includes the township or liberty of Tunstall Court in Wolstanton parish; the township of Burslem with the vill of Rushton Grange and the hamlet of Sneyd, in Burslem parish; and the chapelries of Hanley and Lane-End, and the townships of Shelton, Penkhull, Boothen, Fenton-Vivian, Fenton-Culvert, and Longton, in Stoke parish. In this district, the chief seat of the earthenware manufacture of England, familiarly designated 'the Potteries,' are the market-towns of Burslem, Hanley, Lane-End, Stoke, and Tunstall Court. The district is of no historical interest; its importance has arisen from the manufacture of which it is the seat. [EARTHENWARE.] Burslem is described elsewhere. [BURSLEM.]

Hanley is near the centre of the district, about a mile from Stoke. It is united with Shelton into one market-town, the largest in the district. It stands on the south-western slope of a gently rising eminence. Most of the streets have been laid out within the present century; they are wide and have a brick pavement for foot passengers on each side, and are lighted with gas. There are some spacious and elegant houses, but the generality are smaller and of tolerably uniform height, viz. of two stories. The market-place is large and surrounded by spacious shops; in it is a pump or fountain, in the form of a Doric pillar of cast-iron, surmounted by a lamp. The market-hall is convenient; in one corner is the watch-house, in another corner is a two-celled prison or lock-up-house. The church, or rather chapel, at Hanley is a commodious brick building with a tower 100 feet high. A new church has been built in Shelton. There is a neat building for the national school, and a handsome one for a British school. There are several places of worship for different classes of Dissenters; that for the Methodist New Connection has a large Sunday-school room attached to it, capable of containing 1000 children.

The population of Hanley chapelry and Shelton township, in 1831, was 16,388: 1444 men were returned as engaged in manufactures; they were nearly all engaged in the earthenware manufacture, in which they were assisted by their families. There is one banking establishment, and there is a large paper-mill of modern erection. Etruria, a long street of about one hundred and twenty houses, with a Wesleyan Methodist chapel and a large British school, an extensive earthenware manufactory (Wedgwood's) and a mansion (Etruria Hall), erected by Josiah Wedgwood, the great improver of the earthenware manufacture of the district [EARTHENWARE, vol. ix., p. 243] is in Shelton township, and its population is included above. These are well-supplied markets on Wednesday and Saturday, the latter being the principal; the tolls, which a few years since produced 700*l.* per annum, are appropriated to the improvement of the town.

Lane-End is at the south-south-east extremity of the district, about three miles from Stoke. It was formerly remarkable for the irregularity with which it was laid out, but the more modern parts are regularly laid out, and built with tolerable uniformity. There are two places of worship of the establishment; one built, or rather rebuilt, in 1795, the other in 1834; several Dissenting or Methodist meeting-houses, and a Catholic chapel; an English free-school, and a large national school. Lane-End has two market-places: one, with regular shambles and stalls, is used for the weekly market; the other, with a spacious market-hall, commonly used for public meetings, is appropriated for the yearly fairs. The market tolls are devoted to the improvement of the town. The population of the chapelry of Lane-End, and of the township of Longton, into which the town extends, was, in 1831, 9608; of whom 981 men (besides their families or assistants) were employed in manufactures, almost entirely of earthenware. There is an iron-work for smelting the ironstone found in the neighbourhood. There are two banking establishments. The market is on Saturday. There are several yearly fairs.

Stoke has a number of modern houses, regularly laid out. The streets have their footpaths paved with brick, and are lighted with gas. In the centre of the town is the extensive earthenware manufactory of Messrs. Spode and Co., covering an area of several acres. The town-hall is a neat building, well adapted to its purposes, with an engine and lock-up-house beneath. The church is a modern structure, of Gothic architecture, erected in place of an older one now pulled down: it has a tower 112 feet high. There is a handsome and commodious national school adjoining the churchyard. The population of the township of Penkhull, in which the town stands, was, in 1831, 5876, of whom 609 men were employed almost entirely in the manufacture of earthenware. The earthenware manufactories of Stoke are not numerous, but are among the most important in the district. The market is on Saturday, and is well supplied.

Tunstall-court has risen during the present century from a mere hamlet of sixty houses. It is on the declivity of a considerable eminence, about four miles north from Newcastle-under-Lyne. It has a new church, built about ten years since, and three Methodist meeting-houses. The spacious market-place was formed in 1815. There are a market and court house, with lock-up cells for offenders. The population of Tunstall-court township in 1831 was 3673, of whom only 19 men were returned as employed in manufacture, but there was obviously some mistake in the return here. Earthenware and blue tiles are manufactured; and there are corn-mills and chemical-works. The market is on Saturday.

These are the principal places in the borough, the total population of which, in 1831, was as follows:—

	Houses.			Families.	Population.
	Inhab.	Uninh.	Build.		
Burslem, township .	2731	94	11	3042	12,250
Rushton Grange, vill*	..	..	..	..	..
Sneyd, hamlet .	170	4	..	186	963
Hanley, chapelry .	1321	76	18	1402	7,121
Lane-End, do. .	278	18	..	299	1,488
Shelton, township .	1840	61	26	1971	9,267
Penkhull, do. .	1071	38	12	1215	5,876
Boothen, do. .	21	..	..	22	121
Fenton Vivian, do. .	189	18	..	222	1,002
Fenton Culvert, do. .	535	54	21	629	2,708
Longton, do. .	1593	201	7	1815	8,120
	9749	564	95	10,803	47,916

In the borough, or in its immediate neighbourhood, about 4400 men, with their families, were, in 1831, engaged in the manufacture of earthenware. A number of men are employed in the adjacent coal-works. Coals, marl, and potters' clay are dug in the neighbourhood. The potters are generally steady men, as attested by the fact that a greater number reside in houses belonging to themselves, purchased by their savings, than in any other place of equal population in England. Many of them rent small plots of ground, on which they raise in rotation crops of potatoes, wheat, and oats; the straw is used in packing the earthenware. The hazel-rods and coppice-wood of the surrounding district are used in considerable quantity in making crates to pack the earthenware. The Trent and Mersey Canal and the Caldon Canal run through the heart of the Potteries. The Manchester and Birmingham Railway was designed to run through them, but the line has been altered.

The living of Burslem is a rectory, of the clear yearly value of 455*l.*, with a glebe-house; the benefice of the new church at Burslem is a perpetual curacy, of the clear yearly value of 109*l.* The benefice of the new church at Tunstall is a perpetual curacy. The living of Stoke-upon-Trent is a rectory, of the clear yearly value of 2717*l.*, with a glebe-house. The benefices of Hanley, Shelton, Lane-End, and Longton are perpetual curacies. The clear yearly value of Hanley is 220*l.*, and of Lane-End, 154*l.*, each with a glebe-house. All these places are in the rural deanery of Newcastle and Stone, in the archdeaconry of Stafford and diocese of Lichfield. There were in the borough, in 1833, besides private day-schools, two infant-schools, with 164 children; one at Hanley and one at Lane-End; three national schools, namely, the Hanley and Shelton school, with 215 boys and 156 girls; the Stoke-upon-Trent school, with 120 boys and 187 girls; and the Lane-End school, with 103 boys and 64 girls; a Lancasterian or British school at Shelton, with 150 boys and 100 girls, and a Roman Catholic school in Lane-End, with 90 girls. The national schools are attended by many hundred children in addition on Sundays, and there are many Sunday-schools, some of them very large. There are a literary society at Tunstall, and a mechanics' institution called the Pottery Mechanics' Institution. The North Staffordshire Infirmary is in the township of Shelton; it is a spacious and commodious brick building.

The number of voters on the register for 1835-6 was 1445; for 1839-40, 1623, showing an increase in four years of 178. The number of qualifying houses (*i.e.* houses worth 10*l.* a year) in proportion to the population is unusually small, rents being very low, owing to the abundance of building ground and the cheapness of building materials. The borough returns two members to parliament.

(Shaw's *History of the Staffordshire Potteries; Parliamentary Papers.*)

STOLE, originally a long vestment, a matron's robe, from the Latin *stola*, and that from the Greek στολή. Pitiscus, in his 'Lexicon Antiquitat. Roman.,' has a long article upon the *stola* as worn by the antients.

In later times stola was the term more particularly applied to a broad strip of cloth or stuff, with three crosses upon it, worn by priests of the Romish church as a sacerdotal vestment, with whom it was also called *Orarium*. 'Orarium est stola,' says Lyndwood, in his 'Provinciale,' 'qua sacerdos in omni obsequio divino uti debet, et suo collo imponitur ut significet se jugum Domini suscepisse.'

The stole or orarium, according to Palmer (*Origines Liturgicæ*, vol. ii., pp. 316, 317), has been used from the most primitive ages by the Christian clergy. It is spoken of by the first council of Braga, A.D. 563; by Isidore Hispalensis, A.D. 600: the Council of Laodicea, in Phrygia, A.D. 360; Severianus Gabalitanus, in the time of Chrysostom; and many others (see Bingham's *Antiq.*, b. xiii., c. 8, § 2; and Gerberti, *Liturg. Aleman.*, tom. i., p. 240); and it has been continually used by all the churches of the west and east, and by the Monophysites of Antioch and Alexandria. 'The stole,' says Palmer, 'always called Ὡράριον by the Greeks, was fastened on one shoulder of the deacon's albe, and hung down before and behind. The priest had it over both shoulders, and the two ends of it hung down in front. The Eastern churches call the stole of the priests ἐπιτραχήλιον. Thus simply were the dresses of deacons and priests distinguished from each other in primitive times.'

The pall of the metropolitans was originally only a stole wound round the neck, with the ends hanging down behind and before.

That the word stole, in the sense of a sacerdotal vestment, was of early adoption into the English language, appears from the 'Saxon Chronicle' under the year 963, when Archbishop Dunstan, at the time of personally confirming King Edgar's grant of lands to the monastery of Peterborough, added that he himself gave, among other vestments, his *stol* to St. Peter. (Ingram's *Sax. Chron.*, p. 156.)

STOLE. [STEM.]

STOMACH. One of the most constant characters by which animals are distinguished is the possession of an internal digestive cavity, in which their food is received and subjected to a peculiar chemical change before it is appropriated to the nutrition of the different parts of the body. In some animals the chemical change is effected in every part of the cavity; in others it goes on in one portion of it exclusively, and this portion is named the stomach. Its forms in each of the chief divisions of the animal kingdom are considered in their appropriate articles: in the present therefore, the anatomy and a part of the physiology of the human stomach alone will be described. Most of the important facts concerning its office are detailed in the article DIGESTION; but since that was published, the knowledge of the process has been greatly increased by some researches into the minute structure of the stomach, the nature of the digestive substance, and the results of artificial digestion.

The human stomach is a membranous sac of an irregularly conical form, which lies almost transversely across the upper and left portion of the abdominal cavity. [ABDOMEN.] Its larger extremity is directed to the left, its smaller to the right. To the left it is in contact with the spleen; to the right, with the liver: above it is covered by the diaphragm, and, at about one-third of the distance from its left to its right extremity, it communicates, by an orifice called the cardia, with the œsophagus: at its right end it opens by another orifice, named pylorus, into the intestinal canal. Of these orifices the pyloric lies rather lower than the cardiac: they are separated from each other by the upper and shorter border, or small arch, of the stomach, the greater part of the cavity being formed as if by the dilatation of the left side of the œsophagus into a great cul-de-sac and great arch, which form the left and inferior boundary of the stomach.

The coats or walls of the stomach are composed of three distinct membranes, connected by a firm but very extensible cellular tissue. The external or peritoneal coat is a layer of fine compact cellular tissue, woven into a thin membrane, and covered by a fine cuticle or epithelium, from which, like all the other organs within the abdominal cavity, it obtains a perfectly smooth and polished surface. The peritoneum invests every part of the stomach except the upper and lower borders, where there are spaces in which the trunks of the blood-vessels run, and from each of which the peritoneum is continued in a double layer to form the greater and less omenta. [OMENTUM.] Its only purpose seems to be to permit the stomach to move easily upon the adjacent organs.

Between the peritoneal and the internal or mucous membrane, there is a stratum of loose cellular tissue, in which are inlaid the fibres of the middle or muscular coat. This is composed of three different sets of fibres, resembling in their structure those of most involuntary muscles. [Muscles.] The fibres in the first and most superficial layer run longitudinally: they are continued from those of the outer coat of the œsophagus, which, at the cardia, expand or radiate, and pass in fasciculi at some distance apart, from left to right, along both the anterior and posterior surfaces of the stomach. The second layer is composed of circular fibres which form numerous fasciculi, each of which encompasses a considerable portion of the circumference of the stomach. The third and internal layer consists of two principal fasciculi of muscular fibres, which proceed from the cardia and expand over the great cul-de-sac and middle portion of the organ. By the differently combined contractions of these fibres, all the motions of the stomach, described under Digestion, are performed.

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* Included, we believe, in Burslem township.

The interior or mucous coat of the stomach is that in which the essential apparatus for the production of the digestive material is placed. To the naked eye it appears a soft spongy membrane, about one-tenth of an inch thick, with a polished slippery surface. After death it varies considerably in its colour, but during life has a light pinkish tinge, and, accordingly as the stomach is distended or contracted, is either perfectly smooth or is thrown into various deep and irregular but chiefly longitudinal wrinkles. At the pylorus it forms a deep fold, between the two layers of which are strong fasciculi of circular muscular fibres: these constitute the pyloric valve, by which the aperture between the stomach and intestines is guarded. At the cardiac orifice the boundary between the mucous membrane of the stomach and that of the œsophagus is marked by a jagged line, at which the thick and opaque epithelium of the latter terminates, and the much finer epithelium lining the stomach commences.

The more intimate structure of the mucous membrane can be seen only with the aid of the microscope. If its surface be examined with a lens whose magnifying power multiplies diameters about forty times, it appears to be covered by minute polygonal fossæ, from $\frac{1}{100}$ to $\frac{1}{350}$ of an inch in width, surrounded by narrow sharp-edged borders, to which little leaf-like processes are sometimes attached. At the bases of each of these fossæ there are, at least during digestion, from six to ten minute apertures leading into tubes which pass vertically into the substance of the mucous membrane. A thin section of the membrane, made perpendicularly to its surface, shows that nearly its whole substance is composed of these tubes, which are minute cylindrical glands, opening on the surface in the fossæ just described, but closed below, and set compactly side by side in groups. They vary in length from one-fourth of a line to nearly a line, the longest being situated near the pylorus. Near their bases they measure about $\frac{1}{300}$ of an inch in diameter, and near their orifices about $\frac{1}{150}$. Their lower closed extremities sometimes seem (but only seem) a little convoluted or baccated. They lie in every part of the mucous membrane, but are largest and most densely set, so that they are actually in contact, near the pylorus; a few of them are branched, two or more tubules opening by a single orifice. The small blood-vessels pass vertically in the cellular tissue between the groups of tubules from the submucous tissue to the surface of the stomach, on which they form an angular network, marking out the borders of the shallow fossæ.

The walls of these little tubular glands are composed, near the surface of the stomach, of a fine structureless membrane, and, at the deeper part, of minute nucleated cells adhering by their edges. Their office seems to be the production of cells containing the fluid for digestion. In different parts of the stomach, and at different times, they vary in the nature of the substance which they contain; and it seems probable that these variations depend on whether the tubes are, or are not, engaged in producing digestive fluid. Those which are so occupied are completely filled with cells in different stages of development; those which are inactive are empty, and have their walls lined internally by epithelium, similar to that which invests the interior of the stomach. In the production of the cells containing the digestive fluid, small granules are first generated in the deeper part of each tubular gland: these, coalescing by twos or threes, form nuclei, on which the cells are developed according to the ordinary mode of formation of primary cells. [Nutrition.] The cells are of an oval form, about $\frac{1}{2000}$ of an inch in length; and, as fast as they are produced, they are pushed towards the orifices of the tubes, from which, while digestion is going on, they are discharged in such numbers as to form, with a small quantity of fluid separated at the same time, the thick layer of mucus by which the whole interior of the stomach is lined, and by which the portions of food are invested. In the intervals between successive acts of digestion, it seems probable that the orifices of the tubules are closed by small portions of epithelium similar to that by which they are lined, and which are elevated and broken through for the discharge of the cells as soon as the active process commences.

During digestion there are also often found, just beneath the surface of the mucous membrane, around either the cardiac or pyloric orifice, and along the lesser arch of the stomach, a number of small closed sacculi, filled with an opaque white fluid containing cells, which, when their contents are matured, burst and discharge them into the interior of the stomach. But the exact office of these bodies (which have been generally described as the gastric follicles, or lenticular glands of the stomach) is not known; they are certainly not always present, but, probably, are produced rapidly while digestion is going on, and, having discharged their contents, are again rapidly absorbed.

The distinctive character of the fluid contained in the cells formed by the tubular gastric glands is, that it holds in solution a peculiar chemical principle, to which the name of Pepsin has been given, and which in conjunction with a small quantity of acetic or muriatic acid constitutes the true gastric juice or digestive fluid. It may be extracted from the mucous membrane of the stomach after death, and if a slightly acidulated solution of it be mixed with food, the latter will pass through the same changes as are produced by digestion in the living stomach or in the gastric fluid obtained during life, and will be at last converted into chyme. [Digestion.]

The simplest proceeding for observing this process of artificial digestion, is to macerate a stomach (if taken from a ruminant animal, it must be the fourth stomach) in about twice its weight of lukewarm water, to which about $\frac{1}{10}$th part or any sufficient quantity of muriatic or acetic acid has been added, to make it taste pretty strongly sour. The maceration having been continued for eight or ten hours at a temperature between 80° and 100° Fahrenheit, the liquor may be poured off, and will serve for all ordinary experiments. A purer digestive fluid is obtained by removing the mucous membrane from the middle portion of a pig's stomach (which contains the greatest number of active glands), washing it carefully, digesting it for a few hours in about six ounces of distilled water at a temperature of 90° Fahrenheit, and then again repeatedly washing it in cold water till it begins to be a little putrid. The liquor in which it has been macerated and washed must be filtered, and acetate of lead being added to it will be precipitated in combination with the pepsin. The precipitate should then be repeatedly washed, and a stream of sulphuretted hydrogen gas passed through the water in which it is kept suspended by constant stirring. By this means the lead is removed; and the fluid, being again filtered and evaporated to the thickness of syrup, must be mixed with absolute alcohol, which will precipitate the pepsin combined with a small quantity of acetic acid in white flocculi. These may be collected on a filter and dried in the air.

Slightly acidulated water, in which $\frac{1}{60000}$ part of its weight of pepsin thus prepared is dissolved, forms an active digestive fluid, and portions of meat, albumen, &c. are converted into chyme after a few hours immersion in it, at a temperature between 70° and 100° Fahr. This peculiar property, its power of coagulating milk, and its not being precipitated from its acid solutions by ferro-cyanide of potassium, are the chief qualities which distinguish pepsin from albumen; in all other chemical characters they closely agree.

The best method of exhibiting the action of an artificial digestive fluid is, to put small pieces of boiled white of egg, bread, meat, &c. into several chemical test-tubes; and to add to those in the first tube some solution of pepsin with acid, to those in the second some of the same solution without acid, to those in the third some water with the same proportion of acid, and to those in the fourth some water alone. After remaining for a few hours at the temperature already mentioned, the substances in the first tube alone will have undergone any material alteration. In about twenty-four hours, they will be nearly or completely dissolved, and will have lost many of their chemical properties; the albumen, for instance, being no longer coagulable, but resolved into osmazome, salivary matter, and some new substance, while the same materials in the other tubes will be still unchanged. In short, the changes that may be effected by this artificial fluid are exact repetitions of those described under DIGESTION as resulting from the gastric juice. To this article therefore we may again refer, only observing that all the facts of artificial digestion render it nearly certain that the similar process which takes place in the living body is not due to any vital property of the gastric fluid, but to its peculiar chemical condition; though in what this peculiarity consists, and whether the acid or the pepsin be the actual solvent principle, are questions at present altogether undecided.

The best works in which the subjects here considered may be further studied, are Sprott Boyd, *On the Structure of the Mucous Membrane of the Stomach*, in *Edinburgh Med. and Surg. Journal*, 1836; Purkinje, *Isis*, 1838, and Müller's *Archiv.*, 1838; Bischoff, *Ueber den Bau der Magenschleimhaut*, Müller's *Archiv.*, 1838; Krause, *ibid.*, 1839, cxx.; Eberle, *Physiologie der Verdauung*; Schwann, Müller's *Archiv.*, 1836; Wasmann, *De Digestione*, and the *Physiological Systems of Müller and Wagner*.

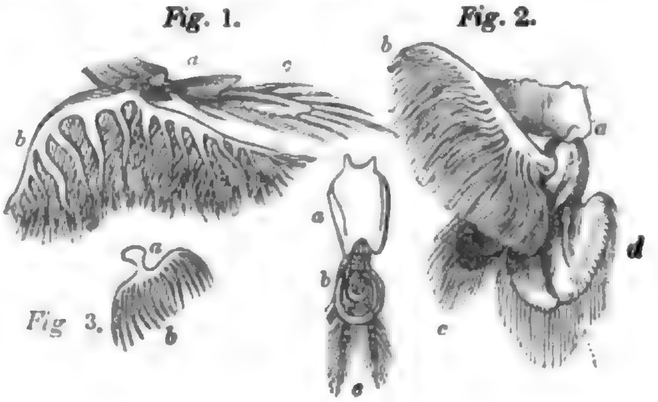
STOMAPODS. M. Milne Edwards comprises in the order *Stomapodes* all the podophthalmous crustaceans which are deprived of thoracic branchiæ lodged in internal cavities.

ORGANIZATION.

This division is entirely composed of swimming crustaceans, whose body is elongated, and whose general form often approaches closely to that of the macrourous decapods; but in those animals the concentration of the rings of the head and thorax is carried less far. In the greater part of the Stomapods the ophthalmic and antennular rings are not confounded with the rest of the head, and they even sometimes acquire a remarkable development. As in the other *Podophthalma*, there always exists a *carapace*, which is formed by the enlargement of the dorsal arch of the antennary or mandibular rings; but the dimensions of this buckler vary greatly. Sometimes it covers nearly the whole of the thorax, and only leaves exposed a portion of the last ring of that part of the body; sometimes, whilst it prolongs itself above the thoracic rings, it only adheres to those which are near the mouth, and leaves the others free and complete under its lower surface. In other cases it does not reach the four or five last rings of the thorax, which then resemble those of the abdomen. In form it varies too much for general description. The *thorax* is generally elongated, and entirely composed of segments moveable upon each other. Sometimes all the rings of this part of the body are united into a single piece. The conformation of the *abdomen* varies still more; this portion of the body presents in general nearly the same disposition as in the macrourous decapods, and terminates by a great caudal fin composed of appendages of the sixth ring and the following segment; but in some stomapods the abdomen is rudimentary. The disposition of the limbs is equally variable. The *eyes* are always carried on a first pair of moveable appendages, the length of which is often very considerable, and whose disposition is essentially the same as in the macrourous decapods. The first pair of *antennæ* are rather long, and terminate in two or three multiarticulate filaments; their peduncle is always cylindrical, and they can never be bent back under the front as in the brachyurous decapods. They are inserted below the eyes, near the median line, or externally to the base of those organs. The second pair of antennæ vary still more; their conformation however generally approaches that in the SHRIMPS. The basilary joint of their peduncle nearly always carries above a great ciliated blade, and they terminate by a long multiarticulate filament. In the greater part of the Stomapods they are inserted outside the first pair, nearly on the same transversal line. The distance which separates the mouth from these appendages is generally very considerable; and the carapace never recurves below, so as to form round that aperture a well determined frame serving to lodge the jaw-feet, as in the greater part of the decapods. In the majority the buccal apparatus is more simple than in the preceding order, and is only composed of an upper lip, a pair of mandibles, a lower lip, two pairs of jaws, and a single pair of jaw-feet; these last organs are either altogether wanting, or are transformed into natatory feet, and nearly always the seven following pairs of limbs are all so formed as to constitute natatory or prehensile feet. It is also worthy of note, that in the stomapods the second pair of jaws never carry at their base a lamellar appendage analogous to the valvule, which, in the decapods, fulfils functions so important in the mechanism of respiration; and this modification of structure is a natural consequence of the absence of a respiratory cavity which includes the thoracic branchiæ, as in the preceding order.

There are generally seven or eight pairs of feet, often presenting the same mode of conformation. They are nearly always provided with an appendage, which may be considered as the analogue of a palp. There is often found also at the base of many of the anterior feet another soft and vesicular appendage, which has sometimes the form of a *galette*, and which represents the flagrum, an organ which, in the greater portion of the decapods, is lamellar and of a horny consistence; but which, in certain shrimps, presents a structure similar to that in the stomapods. Three of the last pairs, or a greater number, are always natatory; the first pair, or even the four first, are often prehensile; but they never terminate in a didactylous pincer, as in the decapods: they are subcheliform, that is to say, nothing more than a moveable claw which falls on the preceding joint. The greater part of these organs are approximated to the mouth, or even applied against it; a disposition which has been the cause of the appellation *Stomapods*. The abdominal members present nothing peculiar; their number is nearly always six pairs.

The *branchiæ* of the stomapods are always external, and present in general a more complicated structure than those of the decapods. Instead of being composed of lamellæ or simple filaments, they are framed of cylinders ranged in parallel order, giving origin to other smaller cylinders, which, in their turn, are equally fringed. Sometimes these ramose branchiæ are fixed at the base of the thoracic feet, and suspended under the thorax; but in general they spring from the basilary joint of the abdominal false feet: in some of the order they are reduced to a rudimentary state; in others nothing is to be seen which can be considered as a special organ of respiration; and, in such cases, there is every reason to believe that this function is exercised by the general surface of the teguments.



Branchiæ of Stomapods.

1, one of the branchiæ of *Thysanopoda*. *a*, base of the posterior foot; *c*, palp: *b*, branchiæ. 2, a branchia of *Squilla*. *a*, base of the false foot; *b*, branchia; *c*, *d*, the two terminal branches of the false foot. 3, *a*, one of the branches of this ramose branchia: *b*, the branchlets (ramuscules). 4, one of the abdominal false feet of *Cynthia*. *a*, basilary joint; *b*, branchia; *c*, lamellar appendages.

The apparatus of *circulation* differs much from that of the decapods. In the *Squillæ*, the only stomapods which have been anatomically examined, the heart, instead of being nearly quadrilateral, and situated towards the middle of the thorax, has the form of a long cylindrical vessel, which extends throughout the length of the abdomen: the arteries which spring from this tubular heart are distributed in a peculiar manner; and the principal venous sinuses, instead of being situated on the thorax, occupy the abdomen.

The *stomach* of some stomapods presents vestiges of the solid framework, which, in the decapods, is armed with teeth serving to bruise the aliments in the interior of the digestive cavity; but in general nothing similar is to be found. The structure of the *liver* also varies; and in those species in which the organs of *generation* have been examined, remarkable peculiarities have been observed in their disposition. The *nervous system* in this order presents also modifications which have not been found in the decapods; but its disposition varies too much to enable M. Milne Edwards to say anything general of it.

Such is the organization of the stomapods, as stated by M. Milne Edwards, an order less numerous indeed than the decapods, but comprising crustaceans which differ much from each other, both in general form and in the particular structure of their principal organs.

Systematic Arrangement and Natural History.

The same excellent author, and we can follow none more deeply versed in the subject, divides the stomapods, after the example of Latreille, into three families:—the *Caridoides*, the *Bicuirassés*, and the *Unicuirassés*.

1. *Caridoïd Stomapods.*

The crustaceans arranged by M. Milne Edwards under this family bear a close resemblance in their general form, he observes, to the family of *Salicoques* or SHRIMPS; and indeed till lately their position had been in the order *Decapoda*, where they constituted a small and peculiar family under the name of SCHIZOPODA; but the anatomical investigations made by M. Milne Edwards with respect to the organs of respiration in these animals, and the discovery of new species which establish a passage between the former and PHYLLOSOMA, led him to propose new limits between the decapods and stomapods, and to place the schizopods in the second of those groups. This innovation, he remarks, had been adopted by Latreille in his last work (*Cours d'Entomologie*); and that scientific naturalist gave to the new division of the order *Stomapods*, established for the reception of those *Podophthalmous Crustaceans* which are deprived of internal thoracic branchiæ, but are similar to certain *Salicoques* in their external form, the name of *Caridoïds* from that resemblance.

Family Character.—Body thick, and slightly compressed laterally; head confounded with the thorax, and all the rings of the last-named part (with the exception, sometimes, of the last, or of the two last) completely united together and soldered above with the carapace. *Abdomen* considerably developed, and terminating by a great fin composed of five laminæ or blades, disposed in a fan-shape, as in the *Macrourous Decapods*. The *carapace* descends on each side against the base of the feet; covers the whole, or nearly the whole, of the thorax, as well as the head; and presents only a rudimentary rostrum in front: there is no moveable plate in place of this frontal prolongation, as in *Squilla*, and the ophthalmic ring is in general very short and naked. The disposition of the eyes, of the antennæ, and of the pieces of the mouth, varies. The thoracic plates are all slender, natatory, and resemble each other; but their number varies much. The *abdomen* is composed, as ordinarily, of seven rings, the five first of which carry natatory false feet; whilst the seventh forms, with the appendages of the sixth segment, the caudal fin: these last appendages consist each of a small very short basilary joint, and of two great terminal plates disposed as in the macrourous decapods. Finally, the conformation of the respiratory apparatus varies: sometimes the branchiæ do not exist; sometimes vestiges of them are found at the abdominal false feet; and sometimes they are, on the contrary, very much developed, and suspended under the thorax. (M. E.)

M. Milne Edwards divides the *Caridoïds* into two small tribes, the *Mysians* and the *Luciferians*.

1st tribe. Mysians.

This tribe resembles the *Salicoques* so closely, that till lately the species forming it had been arranged under the *Macrourous Decapods*, where they constituted the family designated *Schizopods*.

Character of the Tribe.—*Carapace* extending to the base of the ocular peduncles, and presenting in general in the middle of the front a rudimentary rostrum. *Antennæ* inserted on two lines and formed as in the shrimps, excepting only that the lamellar appendage of the second pair is less. *Mouth* situated very near the base of these last, and composed essentially of a *labrum*, a pair of mandibles furnished with a palpiform stem, a lower lip, and two pairs of lamellar jaws; sometimes the whole suite of limbs, which succeed to these appendages, belong to the apparatus of locomotion; but, in other cases, one or even two pairs of these organs constitute jaw-feet, without their form always differing much from that of the thoracic feet. These feet each present two branches which are well developed and carried on a very short basilary joint, so that they seem to be bifid from their base. *Abdomen* of moderate length; *false feet* fixed to its first rings, sometimes rudimentary. (M. E.)

Under this family M. Milne Edwards arranges the genera *Mysis*, *Cynthia*, and *Thysanopoda*.

Mysis.

Generic Character.—*Body* narrow, elongated. *Carapace* covering the anterior extremity of the trunk as well as the greater part of the thorax, and bent down on each side so as to apply itself against the base of the feet. It is free laterally, and does not adhere to the last rings of the thorax; anteriorly it is narrowed considerably, and terminates by a small flattened and very short rostrum; its posterior border is deeply notched. *Eyes* large, short, and with their base hidden under the anterior part of the carapace. *Internal Antennæ* inserted below the eyes, near the median line; peduncle of the same form as in the shrimps, and carrying at its extremity two multiarticulate and rather long filaments. The *second pair of antennæ* inserted below the preceding, and, equally, directed forwards: the first joint of their peduncle gives origin to a very elongated lamellar appendage, which is ciliated on the internal border that covers the base of those organs, as in the shrimps. The two succeeding joints of the peduncle are slender and cylindrical, and the terminal filament is filiform, multiarticulate, and longer than the upper antennæ. *Mouth* very much approximated to the base of the antennæ, and presenting, as ordinarily, an upper transversal lip succeeded by a pair of mandibles, a lower lip, two pairs of jaws, and a certain number of jaw-feet. *Mandibles* toothed on their internal edge and carrying a highly developed palpiform stem extending forward to a considerable length. The first pair of *jaws* each composed of two small flattened blades or flattened lobes ciliated on the internal border. Second pair of jaws larger and much resembling those of *Squilla*, without being however so narrow. They are lamellar and divided on the external side into four lobes, by more or less deep incisions; the last of these lobes is formed by the terminal joint, and the first belongs also to a distinct basilary joint; but the two median lobes are confounded together to their base, and would seem to belong to a single joint, the external border of which is dilated, rounded, and ciliated; the internal border of these organs is equally furnished with hairs. The *jaw-feet* are two in number; but differ very little from the true feet. The first pair are short, rather long at their base, and composed of three branches; the internal is pediform, divided into five joints, furnished with hairs, and bent back internally before the mouth; the median branch or palp is more elongated, and presents a very large basilary joint succeeded by a kind of ciliated strap (lanière) on each side, and composed of a very great number of small joints. Finally, the external branch or flabelliform appendage is represented by a semimembranous blade which is directed upwards and lodged between the carapace and the sides. The second pair of jaw-feet have the same form, but their internal branch is more elongated and they want the flabelliform appendage; as in the preceding, the last joint of their internal branch is lamellar, wide, short, and rounded at the end. The six pairs of thoracic feet, which succeed the buccal apparatus, and which are composed of members corresponding to external jaw-feet and to the five pairs of ambulatory feet in the decapods, are all slender and divided into two branches; their length increases progressively from before backwards, and they are all formed for swimming only. The internal branch presents nearly the ordinary form, but terminates in an unguiform tarsus, which is hardly visible, and precedes a styliform joint, which seems multiarticulate, and is ciliated in its two borders. The external branch or palp is nearly as long as the internal branch, and has the same form as that of the jaw-feet. The four first pairs of feet carry no external branch or flabelliform appendage, whilst those of the two last are provided with it. In the males, those appendages are rudimentary, but in the females they acquire an extreme development and constitute great semicorneous blades bent in under the sternum, so as to form a species of pouch destined for the lodgment of the eggs, and of the young during the early part of their life; a disposition very analogous to that observable in the ISOPODA. The two last rings of the thorax are entire, more or less completely exposed, and resembling those of the *abdomen*, which is elongated, nearly cylindrical, and gradually narrowed from before backwards: the dorsal portion of these last rings is not prolonged laterally so as to encase the base of the false feet, as in the majority of the shrimps; it terminates by a great caudal fin, composed of five blades disposed in a fan-shape, exactly as in the macrourous decapods. Finally, the five first pairs of feet are rudimentary, and are only composed each of a small ciliated blade in the female; but in the male may be distinguished a peduncle and a terminal blade; the first and last pairs acquire sometimes a considerable development.

There is no vestige of branchiæ, either at the vault of the sides or at the base of the feet, or at the lower surface of the abdomen, and the only appendage which would seem to be modified in its structure so as to become more proper than the rest of the body to fulfil the functions of an organ of respiration, is the flagrum of the first pair of jaw-feet, whose disposition, for the rest, is nearly the same as that which may be remarked in a great number of crustaceans provided with branchiæ. Some authors give the name of branchiæ to the basilary joint of the external branch or palp of the thoracic feet, but without supporting this determination by any argument which might lead one to adopt it.

Such is M. Milne Edwards's luminous description of this most interesting genus of crustaceans; but we must not overlook the distinguished labours of Mr. John V. Thompson, so well known for his accurate and original observations relating to the *crustacea* and other marine animals of the Irish seas. To the last-named zoologist, more than perhaps to any other, we owe our knowledge of the organization and habits of these *opossum shrimps*, as they have been named from the pouch or personal nest, above described, provided for the reception of their eggs and young. He closely examined the circulation of these animals, and has shown that their heart is elongated and occupies the posterior part of the thorax. Anteriorly it gives origin to a slender vessel which has its course above the stomach, and is continued backwards with a large abdominal artery; on each side, it receives a vessel which appears to be a branchio-cardiac trunk. The pulsations of the heart are so rapid that they resemble vibrations, and the blood is so transparent and so little coloured, that its movement is only to be distinguished by means of the globules floating therein. Mr. Thompson states that on observing with attention the termination of the posterior aorta at the end of the tail, a periodical action may be noticed, as of the opening and closing of a valvular opening on each side, accompanied each time by the filling of the corresponding end of a vessel of considerable size, lying on each side of the intestinal canal; and that these vessels or veins propel the blood towards the heart by successive contractions of their muscular fibres, and seem to be lost at length in a great sinus or auricle, lying beneath the heart. But Mr. Thompson adds that it remains to be ascertained by dissection, whether this is the case or not; he thinks however that there can scarcely be a doubt that the two large veins constitute the *venæ portæ*, and ultimately send their blood to the branchia.

The same diligent observer thus describes the *valvular pouch*:—'Attached to the base of each of the inner divisions of the two posterior pairs of feet in the *female*, is a large concave scale, strongly pectinate in front, of which the posterior is the outermost, largest, and most concave, lapping considerably over the anterior scale, so as to admit of a considerable extension of the size of the pouch which they form by meeting each other in front, in order to accommodate its capacity to the growth of the ova and young brood. In the *male*, in place of the valvular pouch of the female, we perceive attached to the inner part of the last pair of feet only, a single small hollow scale on each side, ciliate in front, and provided with a marginal row of slender hooks at the apex: these are probably an appendage of the male organs, which have a similar situation in the shrimps.'

Within this pouch in the female, the eggs, or rather embryos, Mr. Thompson informs us, are received when excluded from the ovarium, and enveloped in a mucous or subgelatinous secretion, and gradually developed without any visible attachment to the parent. 'The ova when first received into the pouch are considerably more advanced than those of the shrimps, crabs, &c. on their first expulsion, and by no means so numerous, a circumstance more than compensated by the rapidity with which one brood succeeds another during the whole of the spring and summer months. The number of broods produced by one individual, as well as the time occupied in their evolution, have not been determined; but the changes which the embryo undergoes in configuration are sufficiently obvious; in the present instance, these cannot be considered as metamorphoses, but simply a gradual development of parts; hence the *Schizopoda* may be regarded as one exception to the crustaceans undergoing transformations, another character by which they are separable from the true shrimps, &c. The first change which is perceptible in the ova after their reception into the maternal pouch, is a slight elongation at one end, and the appearance of two short members on each side: this elongation, which proves to be the tail, increasing in length, shortly after becomes forked at the end, accompanied by a proportional growth in the four lateral members, and which are the rudiments of two pair of antennæ in the perfect animal; the embryo going on thus with a progressional development from day to day, begins to assume a more complete form, and an approximation to that of the parent, in which stages the divisions of the abdomen, the tail, the pedunculate eyes, and the various members are sufficiently distinct; a still more close resemblance to the perfect animal is attained before the young are finally excluded, which is effected by the parent spreading open the valves of its pouch, when the whole brood emerge at once into the ambient element, and, in most of the species, continue associated with the community from which they sprang: the slight differences which they now present (and which are necessary to be known in order to preclude the possibility of their being mistaken for individuals of a different species) affect only the inner rows of feet, the subabdominal fins, the outer antennæ, and the tail; the first of these, in place of the multiarticulate termination, have but one or two short joints and a curved claw superadded to the end of the tibiæ, and hence this division of the limb is shorter in proportion; the subabdominal fins consist only of a linear joint surmounted by a few bristly hairs; the outer antennæ differ in no other respect than in the ciliated scale which is attached to their base being shorter and less developed, as is also the brush of hair in the males; the three intermediate scales of the tail are proportionally shorter, but yet present the character peculiar to the species in their form, indentations, and appendages, so as to testify the acuteness of Dr. Leach in having fixed upon this part to distinguish the species from each other. What is further remarkable in the embryos is the way in which they are arranged within the pouch from the moment they assume an elongated form; their heads being towards the breast of the mother, with the curvature of the tail part suited to that of the outline of the pouch, and the large size and blackness of their eyes.'

The different stages of development, &c. are illustrated by Mr. Thompson, in his 'Zoological Researches,' the work in which he gives the above description, and which is most valuable for the insight afforded to the naturalist into some of the most curious and hitherto obscure phenomena manifested by the crustaceans generally. The student will, no doubt, be led to compare the development of the young opossum shrimps with that of the quadrupedal **MARSUPIALIA**.

Geographical Distribution of the Genus.—The species swim freely in the sea in numerous troops, and are particularly abundant in the north, where, according to Otho Fabricius, they constitute a principal portion of the food of the whale-bone whales (*Balænæ*). Captain James Ross, R.N., states that *Mysis flexuosus* (*Cancer flexuosus*, Müll.), though but sparingly found in the seas of Europe, inhabits some parts of the Arctic ocean in amazing numbers, and constitutes the principal food of the prodigious shoals of salmon that resort thither in the months of July and August, and upon which the inhabitants of **BOOTHIA** depend, in great measure, for their winter store of provisions. He further observes that it is also the chief food of the whale, by which such a prodigious quantity of fat is produced in the body of that immense animal. Captain Ross adds that during the summer these crustaceans assemble in vast myriads at the mouths of rivers, but in the winter are more generally distributed along the whole line of coast, and, together with the *Argonauta Arctica* (*Clio helicina* of Phipps and Gmelin—**HYALÆIDÆ**, vol. xii., p. 372), are to be seen in every crack that opens with the tide, even at the coldest period of the year. The natives call this crustacean *Il-le-ak-kuk*. (*Appendix to the Second Voyage of Captain Sir John Ross.*)

M. Milne Edwards divides the genus *Mysis* into the following sections:—

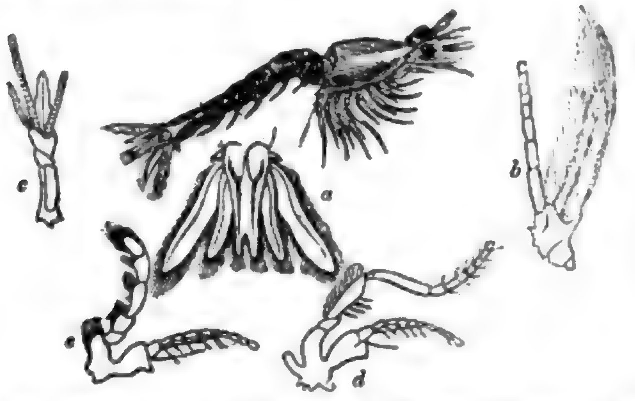
1. *Species which have the middle blade of the caudal fin bifurcated.*

Example, *Mysis spinulosus*, Leach.

Description.—Rostrum depressed and triangular, and not more than the third of the length of the ocular peduncles. Carapace extending nearly on the penultimate thoracic ring. Peduncle of the internal antennæ stout and very short. Lamellar appendage of the external antennæ narrow, of the same length (width?) to the end, and ciliated within and at the end. Median blade of the caudal fin furnished with spines on its lateral borders, and deeply notched at the end; internal blades of the lateral appendages narrowing gradually towards the end, and the external blades very obtuse. Length about 10 lines; colour brownish, with a small star in the middle of each of the rings of the abdomen.

Locality.—The British Channel and the coasts of La Vendée. (M. E.)

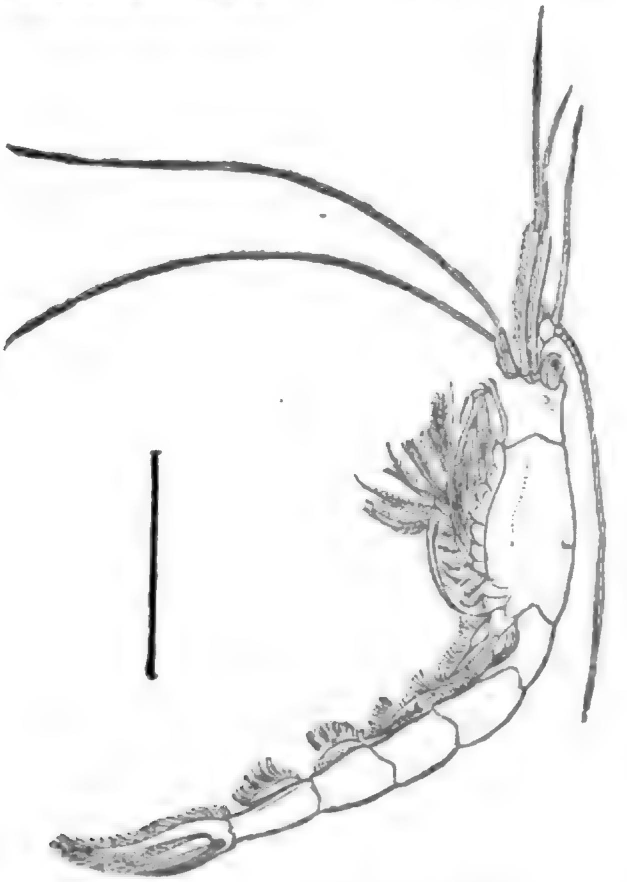
M. Milne Edwards gives the following as synonyms of this species:—*Praunus flexuosus*, Leach; *Mysis Leachii*, Thompson (*Zool. Res.*). Leach's *Mysis Fabricii* does not appear to M. Milne Edwards to differ notably from *M. spinulosus*, especially if one may judge of it from the figure given of it by Desmarest; but at the same time, he observes, one ought not to forget that Latreille has represented, in the atlas of the 'Encyclopédie,' the lamellar appendage of the external antennæ as being ciliated externally as well as internally; a disposition which, if it really exist, would be characteristic.



Mysis Fabricii magnified. *a*, The last ring of its body, or its terminal fin; *b*, base of a lateral antenna; *c*, base of an intermediate antenna; *d*, one of the second pair of jaw-feet; *e*, one of the first pair. These parts highly magnified. (Desm.)

2. *Species which have the median blade of the caudal fin entire at the end.*

Example, *Mysis vulgaris*.



Mysis vulgaris, magnified. (Thompson.)

Description.—Rostrum moderate; internal antennæ short, having their peduncle formed as in *M. spinulosus;* lamellar appendage of the external antennæ as in *Mysis longicornis;* lateral and middle fins of the caudal fin diminishing gradually in width from their base to their extremity; length about an inch; colour greyish.

Locality, Habits, &c.—Common on the Irish coast. Abounding in the Lee, even up to Cork, from the early part of spring to the approach of winter, according to Mr. Thompson, who states that during the still period of the tide at low-water, they repose upon the mud and stones at the bottom of the river, and, as the tide rises, may be observed forming a wide belt within its margin, the youngest swimming nearest to the shore, the oldest farther out and in deeper water. They appear, he adds, to be mostly females, the males being few in proportion, and they swim in a horizontal position, contributing towards the food of various young fish, from which they frequently escape by springing up out of the water.

Cynthia. (Thompson.)*

Generic Character.—Body slender and of the same form as in *Mysis;* but the carapace of *Cynthia* is smaller and terminates anteriorly by a small rostral prolongation; behind it a certain number of thoracic rings are exposed. *Eyes* stout and short, of moderate length. First pair of *antennæ* excavated at their base to make room for the eyes; their peduncle is stout, and they have two terminal filaments. The second pair of antennæ are inserted below the preceding, as in *Mysis*, but they are much smaller; the lamellar appendage which covers their base is shorter than the peduncle of the upper antennæ. Conformation of the buccal apparatus nearly the same as in *Mysis;* palpiform stem of the mandibles very large; second pair of jaws lamellar and divided on the internal side into many lobes. The eight pairs of limbs which succeed the jaws, ought, according to Mr. Thompson, to be considered as natatory feet; but M. Milne Edwards does not agree in that opinion, and the latter believes that the first pair of these organs also belong to the buccal apparatus, and constitute jaw-feet. In fact, observes M. Milne Edwards, those appendages, although more elongated than in *Mysis*, are bent back just in the same way as in that genus below the jaws, and their internal branch terminates by an enlarged joint, which is proper for retaining the aliments during mastication, whilst the feet terminate in a small hooked nail. The middle branch or palp of these jaw-feet is formed as in *Mysis*, but the flagrum or external branch, which, in the last-named genus constitutes a great membranous blade, appears to be completely wanting. The first pair of thoracic limbs differ also a little from the six last pairs of feet; they are more enlarged, and terminate by a lamellar joint, whose borders are ciliated; but nevertheless, by reason of their length and their position, they ought, remarks M. Milne Edwards, to be considered as assisting in locomotion, and they furnish us with a new example of the gradual manner in which the passage is effected between animals in which the same organs are modified in their structure to serve different purposes. In *Cynthia* the number of thoracic feet amounts to seven pairs, and in their structure and functions they do not differ remarkably from the same organs in *Mysis;* their two branches are equally well developed, only the penultimate joint of the internal stem is stouter, does not narrow towards its end, is not ringed so as to appear multiarticulate, and the terminal nail is larger. M. Milne Edwards observes that the conformation of the appendages which probably exist on the posterior feet of the females, and which to all appearance ought to fulfil the same functions as in *Mysis*, is not known; in the males may be remarked, at the base of the posterior feet, a small blade which represents the flabelliform appendage. *Abdomen* formed as in *Mysis*, excepting that the false feet fixed to the five first rings are very well developed, and of the same form as in the shrimps; each of these limbs is composed of a very stout peduncular joint and of two long blades, which are multiarticulate and ciliated on their edges. *Branchial appendages* of a particular form are attached to the extremity of the peduncles of the false feet behind the terminal blades; these appendages consist of a membranous cylinder bifurcated near its base, each of whose branches is rolled upon itself.

Example, *Cynthia Thompsonii*.

Description.—Rostrum very short; carapace extending to the last ring of the thorax, and but little narrowed forwards; peduncle of the internal antennæ of the length of the lamellar appendage of the external antennæ, and having the last joint furnished within with a small piliferous scale; median blade of the caudal fin long, truncated at the end, and furnished laterally with spines; external blades shorter than the middle ones, and only having hairs or spines on their internal border and at their extremity; middle blades furnished with spines on their internal border; length about four lines.

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* Appropriated by Savigny to certain *Ascidians*. [CYNTHIA.]

Localities.—The Atlantic Ocean, between Madeira and the Antilles. (M. E.)

N.B. M. Milne Edwards observes that the *Cynthiæ* are of small dimensions, and seem to have the same habits as the species of *Mysis*, with which last they are frequently found. He further remarks that the males only have been as yet observed, and that possibly, when both sexes are known, it may be necessary to modify the characters assigned to this genus.

Thysanopoda. (M. Edwards.)

M. Milne Edwards states that these crustaceans resemble the shrimps greatly in the general form of their body, but are distinguished from the Decapods, as well as the other Stomapods, by the disposition of their respiratory apparatus. The branchiæ, he tells us, are each composed of a kind of stem, whence spring, at a right angle, a certain number of lateral branchiæ, whose inferior border is in its turn furnished with a series of long cylindrical filaments. This mode of organization is, he observes, very analogous to what may be seen in the *Squillæ*, but the branchiæ (see the cut, p. 77), instead of being inserted in the abdomen, as in the last-named crustaceans, occupy the thoracic part of the body, as in the Decapods. Nevertheless they are not enclosed in particular cavities, as in that order; they are situated on the exterior of the body, and float freely in the water with which the animal is bathed. They are fixed at the base of the eight pairs of thoracic feet, and their length increases from before backwards.

Generic Character.—External form resembling that of *Mysis*. *Body* presenting the same divisions as in the macrourous decapods. *Carapace*, which covers the head, hiding also the whole of the thorax. *Abdomen*, whose length much exceeds that of the cephalo-thorax, extended backwards, and composed of seven segments, the three median of which present on their posterior and superior borders a small spine, directed backwards. Carapace terminated anteriorly by a small pointed *rostrum*, which does not reach to the extremity of the eyes, whose peduncles are stout and short. *Antennæ* four in number, inserted on two lines, and nearly equal in length: the upper with a peduncle recurved at its base, to receive the eyes, and composed of three cylindroid joints: they are terminated by two rather long filiform stems. Base of the lower antennæ covered by a long lamellar scale, the extremity and internal border of which are ciliated, the terminal stem presenting nothing remarkable. *Mouth* situated at a small distance from the point of the insertion of the lower antennæ, and surrounded, as ordinarily, with a rather stout labrum, a bifid tonguelet, and a pair of *mandibles*, which are armed on their internal border with some pointed teeth, and carry a short and flattened palp, divided into three joints. Two pairs of *jaws* are applied on the mandibles and tonguelet. The first pair offer nothing remarkable. The second are composed of three lamellar joints, the two first of which are bilobated on the internal side: no trace is here to be seen of the great foliaceous appendage which always exists on the external side of these organs in the decapods, and which assists in the mechanism of respiration: their form and structure are absolutely the same as in *Squilla*, *Alima*, &c. The eight pairs of limbs which succeed the jaws, and which correspond both with the jaw-feet and ambulatory feet of the decapod crustaceans, have here all the same form and the same uses: not one of them enters into the composition of the buccal apparatus; but all serve for locomotion. These *feet*, with the exception of the last pair, are long, slender, and bifid, as in *Mysis*. Their basilary joint, stout and short, carries within a long stem, furnished with numerous hairs, and externally a palp or middle branch, composed of two pieces, the last of which is delicate, lamellar, and ciliated on the borders. The length of these natatory feet increases a little from the first to the fifth pair, and then diminishes; those of the eighth and last want an internal stem, and consist only of the external branch or palp. The five first segments of the abdomen support also small natatory feet, formed of a cylindrical peduncle, carrying two elongated and ciliated blades on the borders the internal of which, shorter than the external, carries in its turn a small cylindrical appendage. The limbs of the sixth and seventh rings of the abdomen become lamellar, constituting a fan-shaped fin, the median narrow and pointed piece of which terminates in three sharp spines; and the lateral ones, equally narrow, are furnished on the borders with long hairs. (M. E.)

Example, *Thysanopoda tricuspida*, the only species known. Length about 15 lines. *Locality.*—Found far at sea, in the Atlantic Ocean, by M. Reynaud.

M. Milne Edwards thinks that the genus *Podopsis*[*], or *Hammer-headed Shrimp* of Thompson, may belong to this family; but he observes, that it is too imperfectly known to warrant the assignment of precise characters to it. This crustacean, which was found in the Atlantic Ocean, and is phosphorescent, is figured and described in the interesting *Zoological Researches* above quoted.

2nd Tribe. Luciferians.

M. Milne Edwards observes that the genus *Lucifer*, established by Mr. Thompson, is one of the most singular known; and as it does not, without difficulty, admit of arrangement in any of the tribes already established, M. Milne Edwards, though he remarks that its history is still very incomplete, is of opinion that it should be taken as the type of a particular tribe, to which he thinks certain magnified figures of crustaceans in the atlas of Krusenstern's 'Voyage' ought to be referred.

Mr. Thompson states that this singular and extraordinary type, like *Noctiluca*, also described and figured by him in his *Zoological Researches*, conduces to the sparkling appearance of the sea in the tropical regions, and the individual figured by him (see cut) was taken in the Atlantic, in 11° 56′ N. lat. and 32° 55′ W. long.

M. Milne Edwards observes, that one of the most remarkable traits of this crustacean is the excessive length of the anterior portion of the head; the extreme brevity of the part of the body occupied by the mouth, and constituting the thorax; and the great development of the abdomen.

Generic Character.—M. Milne Edwards, whose description is more full than that of Mr. Thompson, and who records two species, *Lucifer Reynaudii*, and *L. Typus*, states that the general form of the body is nearly linear. *Eyes* and *Antennæ* carried at the extremity of a long, slender, and cylindrical prolongation, which is much longer than all the rest of the cephalo-thoracic portion of the body, and seems to be formed principally by the antennary ring. A small *carapace* covers the whole of the posterior portion of the cephalo-thorax, and presents nearly the same form as in *Mysis*. The *Eyes* are large, and carried at the extremity of very long peduncles. The first pair of *antennæ* are slender, short, and terminated by a multiarticulate, rudimentary stemlet; the second pair are inserted below close to the preceding, and are equally slender: near their base is seen a small lamellar appendage, but their mode of termination is unknown. *Mouth* projecting and situated behind the base of the prolongation, which carries the eyes, &c. Here are found *mandibles*, which are strong and toothed, but deprived of a palpiform stem; two pairs of *jaws*, each bearing two blades; two pairs of short and lamellar *jaw-feet*, and one pair of external *jaw-feet*, which are long, pediform, and bent back against the mouth. In succession to these organs may be seen four pairs of long and slender natatory feet, which gradually lessen towards the end, and are furnished with scattered hairs. M. Milne Edwards could find no vestige of a palp or a flagrum at the base of these feet, nor could he perceive any trace of the existence of the last pair of feet, which are here wanting to complete the normal number of the thoracic feet; but he observes that in the figure given by Mr. Thompson, there is at the posterior part of the thorax a tubercle, which is, perhaps, a vestige of those appendages. The *abdomen* is very narrow, and is composed, as ordinarily, of seven rings, but acquires a development entirely abnormal; for each of these segments is at least as long as the whole cephalo-thoracic portion of the body, where the mouth and feet are situated. The five first rings are nearly equal, and each carry a pair of very long false feet, composed of a basilary, cylindrical joint, and of one or two natatory, elongated, multiarticulate, and ciliated blades; in individuals which

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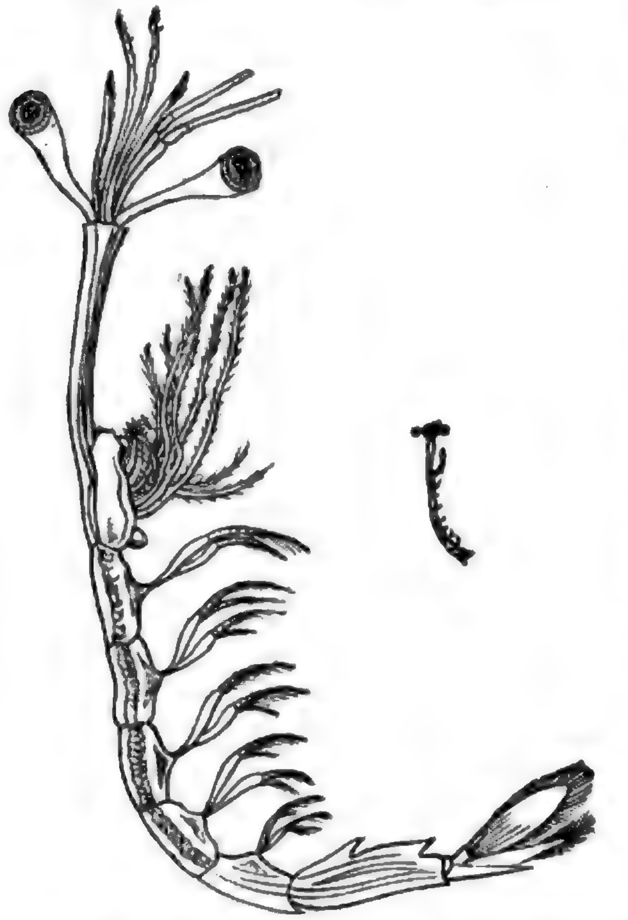
[*] Previously used for a supposed genus of *Conchifera*. [SPONDYLIDÆ, vol. xxii., p. 371.]

M. Milne Edwards presumes to be males, the first pair of false feet present towards the middle of their basilary joint a fleshy appendage of odd shape (forme bizarre). The sixth ring is compressed, very long, and toothed below. The abdomen is terminated by a caudal fin, composed, as ordinarily, of five blades disposed in a fan-shape. M. Milne Edwards did not find any vestige of thoracic branchiæ.

Example, *Lucifer Typus*. The same author states that this species differs from *Lucifer Reynaudii* (which was found in the Indian Ocean by M. Reynaud) in the form of the median piece of the caudal fin, which is lamellar, and without any notch below, in the more considerable length of the middle blades, and in the apparent absence of a separation between the carapace and oculiferous prolongation.



Lucifer Typus, or Long-headed Shrimp, magnified, and of its natural size. (Thompson.)

The crustaceans numbered 9 and 10 in the atlas of Krusenstern's 'Voyage' are those which, according to M. Milne Edwards, belong to this genus.

II. *Bicuirassed Stomapods.* [PHYLLOSOMA.]

III. *Unicuirassed Stomapods.*

M. Milne Edwards remarks, that the crustaceans of this family are provided with a sufficiently large carapace, but that they nevertheless approach the EDRIOPHTHALMA in the conformation of the thorax, for the greater number of the rings of this middle portion of the body are complete, moveable, and naked, or simply covered by the dorsal buckler without any adhesion to it. The independence of the first segments of the body is carried even farther, he observes, in these crustaceans than in any other, for in the greater part of them, not only the ophthalmic ring, but also the antennular ring remains free, and in some there is a transversal piece at the base of the second pair of antennæ, which seems to be the representative of the lower arch of the third cephalic ring, and not soldered, as ordinarily, with the succeeding ring, of which the carapace is an appendix. Frequently all the thoracic and cephalic rings situated behind this last are equally distinct from each other and more or less moveable, but, with the exception of the four last, they are incomplete above, and represented only by their sternal arch. The abdomen is always very well developed, and is composed of seven moveable segments, the last of which constitutes a very large caudal blade. The *eyes* are stout and convex (renflés) towards the end; the first pair of antennæ are inserted below and behind their peduncle, and are composed of a cylindrical peduncle formed of three joints and terminated by three filaments, which are ordinarily multiarticulate. The second pair of antennæ are inserted behind and outside the preceding, and are provided with a great lamellar appendage fixed on a stout and cylindrical joint, at the extremity of the first joint of their peduncle, which also carries in front a filament which is, ordinarily, multiarticulate. The *mouth* is rather distant from the antennæ, and carried on a nearly triangular eminence, the base of which corresponds with the insertion of the prehensile feet The upper lip is large, projecting, and semicircular. The *mandibles* are directed downwards and terminate by two toothed branches, one of which ascends in the back part of the mouth, towards the stomach; the palpiform stem which carries these organs is small and sometimes null. The lower lip is large and partially covers the extremity of the mandibles. The jaws are very small and applied exactly against the mouth; the first pair terminate by a kind of hook directed inwards, and armed with spines along the internal border of their second joint; there is also a small rudimentary palpiform appendage. The second pair of jaws are lamellar, nearly triangular, and composed of four or five joints placed end to end; nothing resembling a flabelliform appendage is to be seen. The members which belong to the seventh cephalic ring, and which, ordinarily, constitute the anterior *jaw-feet*, do not seem to belong to the buccal apparatus; they are very much elongated and form a pair of slender feet, generally enlarged towards the end, the uses of which are not known. The thoracic limbs of the first pair, which are the analogues of the second jaw-feet of the Decapods and of the anterior feet of the Edriophthalms, are largely developed and constitute great raptorial feet (*ravisseuses*), the last joint of which bends back as a long claw along the internal border of the preceding joint, and forms, after a fashion, a kind of pincer which the animal uses either for defence or the seizure of its prey. The three succeeding pairs of feet are much smaller, and in some sort brought forwards so as, ordinarily, to occupy a curved transversal line, and place themselves between the base of the raptorial feet: they are, in general, applied upon the mouth, and appear to serve only for the prehension of the aliments; they all terminate in a kind of oval hand, armed with a moveable claw, disposed so as to bend itself back against its internal border. These five pairs of limbs carry at their base, on the external side, a membranous vesicular appendage, flattened into the form of a disk and pediculated, which is the analogue of the flagrum, and which, according to some authors, may be a respiratory organ. The three last pairs of thoracic feet are rather distant from each other and directed downwards; they are slender, cylindrical, and nearly always furnished with a styliform appendage which springs at the extremity of their second joint. There are six pairs of abdominal limbs; the five first pairs are formed nearly as in the macrourous decapods, except that their peduncle is much wider, and that, in general, they give insertion to the branchiæ. The appendages of the sixth abdominal ring concur to form the caudal fin; they are directed outwards and terminated by two ciliated blades, between which is a great lamellar prolongation of the basilary joint; the external branch of these false feet is, ordinarily, composed of two joints. There is sometimes on the posterior border of the last segment of the abdomen a pair of moveable spines which may be considered as vestiges of a seventh pair of abdominal limbs. *Branchiæ* ramose, and composed of a great number of small cylinders, carried on stemlets, which, in their turn, spring from a stouter stem (see cut, p. 77); sometimes these organs are completely wanting or do not exist except in the state of vestiges, but, in general, they are highly developed. They are suspended under the abdomen, at the base of the external blade of the five first pairs of false feet, and float freely in the water.

M. Milne Edwards divides this family into two small tribes, *Ericthians* and *Squillians.*

1st Tribe. Ericthians. [ERICHTHUS.]

2nd Tribe. Squillians.

Corresponding with the genus *Squilla* of Fabricius, and the majority of authors, this tribe comprehends, according to M. Milne Edwards, the genera *Squilla* (containing the *Squillæ*, properly so called), *Gonodactylus*, and *Coronis* of Latreille. All these crustaceans have, observes M. Edwards, the greatest resemblance to each other, and the differences upon which these genera are established have not perhaps as much importance as was once thought.

The *Squillians*, says the author last quoted, are, of all the podophthalmous crustaceans, those in which the various constituent rings of the body are the most equally developed and the most independent of each other. With the exception of those which immediately surround the mouth, all these rings are more or less moveable on each other, and the greater part are complete. The *carapace* neither covers the two first rings of the head nor the four last rings of the thorax, and constitutes a horizontal buckler nearly quadrilateral, which is divided longitudinally into three lobes, more or less distinct, by two longitudinal furrows. In front of this buckler is a small triangular and moveable plate, which seems to be a dependence of it, and which covers the antennular ring; its form varies, and as it may be an element in specific differences, M. Milne Edwards terms it the *frontal plate*. The ring which carries the eyes is small, nearly quadrilateral, and moveable on the succeeding segment; the *eyes* are large, short, and convex. The antennular ring is also nearly quadrilateral and moveable, but larger, and gives insertion to the *internal antennæ* by its anterior border on each side of the ophthalmic ring. These appendages are directed forwards; their peduncle is long, slender, and composed of three cylindrical joints, and they terminate in three multiarticulate filaments of moderate length. The *second pair of antennæ* are inserted under the anterior border of the carapace, on each side of the antennular ring, and are formed nearly the same as in the *Ericthians*; the first joint of their peduncle is large and short, and continues itself with an articulation equally stout, which carries at its extremity a great oval blade, analogous to the palp or middle branch of the thoracic limbs, and the basilary scale of the external antenna of the shrimps; the internal branch, which, ordinarily, is greatly developed, remains here slender and so small, that it only seems to be an appendage of the middle branch; it springs from the anterior angle of the common basilary joint, and presents a peduncular portion, composed of two cylindrical joints and of a terminal multiarticulate filament. The *epistome* is very much elongated and constitutes a great projecting mass nearly triangular, the base of which directed backwards forms the upper lip. The *mouth* is situated towards the posterior third of the carapace, and presents on each side a mandible furnished with a small palpiform stem, which is directed forwards on the sides of the epistome; these mandibles are vaulted, and terminate in two diverging branches with dentilated borders, one of which ascends vertically in the interior of the œsophagus. A lower lip, deeply bilobated, closes the mouth behind, and is applied against the mandibles. The *first pair of jaws* are small, and furnished within with a denticulated lamina on the border, and with a conical lobe bent back upon itself, and terminated by spines; externally these organs carry also a small rudimentary appendage. The *second pair of jaws* are more developed, and cover the whole of the rest of the buccal apparatus; they are lamellar, nearly triangular, and composed of many joints placed end to end. The members, which ordinarily constitute the second pair of jaws, form, as in the preceding tribe, two long, slender, and cylindrical feet, which advance on each side of the head, and bear considerable resemblance to the external jaw-feet of certain macrourous decapods; the vesicular blade fixed to the base of these organs is rather large. The succeeding pair of limbs, which in the decapods constitute the anterior jaw-feet, acquire here a great development, and take the form of raptorial or captatory feet; they are in general bent back thrice upon themselves, and their form calls to mind the anterior feet of the insects of the genus *Mantis* [MANTIDÆ]; the conformation of their claw varies a little, and thus furnishes characters for distinguishing the true *Squillæ* from the *Gonodactyli*. The three succeeding pairs of thoracic limbs, instead of being directed outwards like the raptorial feet, are directed forwards, and applied against the buccal apparatus; they are inserted upon a semicircular line, and the last touch at their base and are brought between the preceding, so that the thoracic ring to which they belong seems at first sight to be apod; their confirmation is essentially the same as in the preceding tribe. The same is the case with the three last pairs of thoracic feet; only they are more developed than in the Ericthians; their appendage is sometimes styliform, sometimes enlarged, and the joint which terminates them is in general lamellar, oval, and ciliated on the border. The rings which carry these three last pairs of feet, and even that which precedes them, resemble almost entirely those of the abdomen, only they descend but little or not at all laterally on the outside of the insertion of the limbs. The *abdomen* is very large, and constitutes a powerful natatory organ; the caudal fin which terminates it is of great size; the basilary joint of the limbs of the penultimate segment is very long, very large, and is prolonged posteriorly into a great pointed blade, which advances between the two terminal branches of those organs; the internal branch consists, as ordinarily, of an oval blade, with ciliated borders; but, as in the preceding tribes, the external branch is composed of two joints placed end to end, of which the first is of some size, and the second lamellar. The false feet of the five first abdominal rings are very large; the basilary joint is quadrilateral, and carries two lamellar branches, the external of which gives attachment by its posterior surface, close to its peduncle, to a great ramose branchia disposed in the form of a plume.

The same author observes that the internal structure of the *Squillians* differs considerably from that of the decapods. The *heart*, instead of being quadrilateral, and enclosed in the middle part of the thorax, has the form of a long vessel, rather enlarged anteriorly, which extends nearly throughout the length of the abdomen as well as of the thorax, and which furnishes laterally in each of the rings which it traverses a pair of arterial branches; by its anterior extremity, this dorsal vessel gives origin to three branches, which seem to be the analogues of the ophthalmic and antennary arteries of the decapods; and, posteriorly it terminates by a small artery which penetrates into the last abdominal segment. The venous sinuses, in which the blood collects before it goes to the branchiæ, are extremely large; the principal cavity belonging to this system occupies the median line of the body, and goes below the intestine and between the lateral muscular masses of the abdomen; its lower wall is formed by a blade of cellular tissue, which encloses in its thickness the ganglionary nervous cord, and which is joined (accolée) to the teguments of the lower surface of the abdomen; on each side it communicates with the intermuscular lacunæ which surround the base of the false feet, and lead to the branchiæ. The peduncle of each of these last organs encloses two longitudinal vessels, the external of which seems to be the afferent canal, and the internal the efferent canal: this last conduit is continued superiorly with an irregular canal, with walls formed only of very fine cellular tissue, and which ascends on the lateral parts of the abdomen, and plunges between the upper longitudinal muscles and the viscera, to reach the upper surface of the heart, where may be seen a double series of branchio-cardiac apertures.

The *stomach* is very large, and advances into the head very far before the œsophagus, which is vertical and extremely short. The solid work (charpente solide) of this organ is much less complicated than in the decapods, and is reduced nearly exclusively to the subpyloric portion, which forms a species of valvule in front of the entrance of the intestine. This last tube is straight, and is surrounded with a cellular and granular mass which appears to be the liver, and which gives origin laterally to small prolongations which insinuate themselves between the muscles of the base of the feet.

This organ, according to M. Duvernoy, is a nervous sinus; but M. Milne Edwards thinks that the appearance which gave rise to this opinion depends on alterations which take place in the *Squillæ* after death, for the results of the dissection of several fresh individuals appeared to the latter incompatible with this new determination proposed by the scientific professor of Strassburg. (See *Compte Rendu*, 8th May, 1837.)

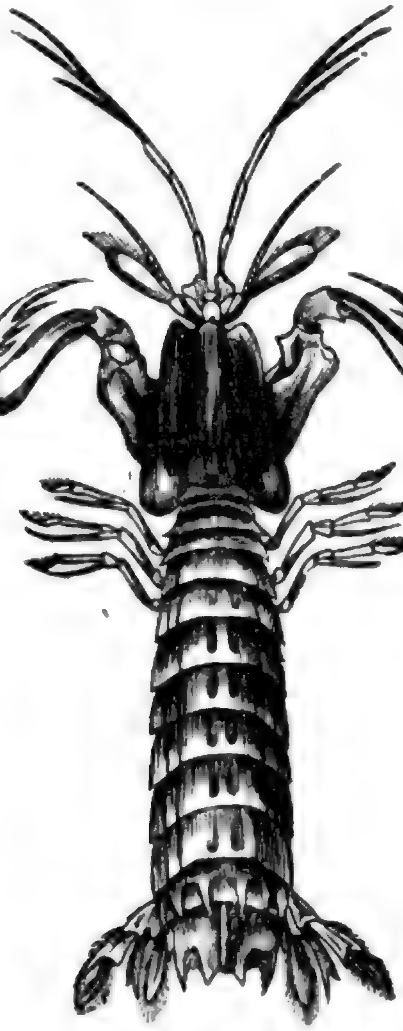
The organs of generation are situated above the digestive apparatus. In the male there issues from the base of each of the posterior feet a long slender cylindrical and white tube, which, in making a great number of circumvolutions, is directed backwards on the sides of the intestine, and terminates towards the anterior third of the abdomen in a whitish and lobulated mass, which is the analogue of the testicle, and which extends to the anus. The penes have the form of two horny tubes, the length of which is often very considerable. The ovary occupies the same place as the testicle, but is larger.

The nervous system presents nearly the same disposition as in the greater portion of the macrourous decapods; in the abdomen the ganglions are well developed, and the cords double; it is the same with the thoracic ganglions of the three last pairs, but all those of the anterior portion of the thorax are united in a single oval mass.

Genera.—*Squilla; Gonodactylus; Coronis.*

Squilla. (Rodeletius.)

M. Milne Edwards points out that the true *Squilliæ* are probably more carnivorous than the other crustaceans of this tribe, for they are furnished with much more powerful offensive arms. The claw which terminates their raptorial feet has a falcular form, the sharp edge of which is provided with long pointed teeth, and can be received into a groove of the corresponding border of the hand, which is equally compressed, and in general armed with spines on its prehensile border. The three last pairs of thoracic feet carry a slender, cylindrical, and elongated appendage, which represents the palp. The body is in general more slender and narrowed behind the carapace than in the other *Squillians.*



Squilla, seen from above.

Locality, Habits, &c.—*Squillæ* show themselves in the British Channel; but the species which are numerous are abundant only in the seas of warm regions; they keep in general at a distance from the coast, and at considerable depths. Their abdominal false feet are continually in motion, and they swim with great swiftness, striking the water with their powerful tail.

M. Milne Edwards divides the true *Squillæ* into two subgenera:—1 *Squilles Fines-tailles;* and, 2, *Squilles Trapues.*

1. Slender Squillæ.

The species arranged by M. Milne Edwards under this subgenus are remarkable for the narrowing of the posterior portion of their thorax and the gradual enlargement of the abdomen. The carapace, enlarged backwards, hardly reaches the anterior edge of the thoracic ring which precedes the three last segments provided with feet. The rostral plate hardly ever covers the ophthalmic ring. The last segment of the abdomen is never furnished with moveable marginal spines. The subgenus is divided by M. Milne Edwards into the following sections:—

a. Species whose abdomen presents above neither crests nor large tubercles, and has its last segment twice and a half as wide as it is long; rounded and hardly dentilated.

Example, *Squilla maculata.* Length from ten to twelve inches, and rather more. Colour yellowish; with three bluish bands on the carapace and a similar transverse band on the articulation of the rings of the abdomen.

Locality.—The Asiatic Seas.

β. Species whose abdomen presents above many longitudinal crests, or large elongated tubercles, and has its last segment in general nearly as long as it is wide.

* *Rostral plate not covering the ophthalmic ring.*

Example, *Squilla Mantis.* Length six or seven inches and upwards. Colour very pale yellowish grey.

Locality.—The Mediterranean.

* * *Rostral plate entirely hiding the ophthalmic ring.*

Example, *Squilla Ferussaci.* Length about four inches. Moveable claw armed with three teeth only. Colour purplish washed with greenish.

Locality.—The coasts of Sicily.

2. *Stout Squillæ*

This subgenus has the body very convex, all of a size, without any notable narrowing at the back part of the carapace. The posterior portion of the thorax is as wide as the abdomen, and the carapace reaches ordinarily to the antepenultimate thoracic ring. The rostral plate covers the ophthalmic ring entirely. The two posterior teeth of the last ring of the abdomen carry each at their extremity a moveable spine.

Example, *Squilla stilifera.* Last segment of the abdomen furnished above with seven delicate crests; two moveable spines inserted near the median line. Length about three inches.

Locality.—The Isle of France.

Gonodactylus. (Latreille.)

This genus bears a strong resemblance to the *Stout Squillæ* (Squilles Trapues). The principal distinction lies in the mode of conformation of the raptorial feet. The last joint of these organs, in lieu of having the form of the claw lamellar and strongly dentated, is straight, styliform, more or less convex at its base, and presents at most only vestiges of teeth on its prehensile border, which is enlarged. In general the convexity of the basilary portion is very considerable, and suffices to distinguish these crustaceans at the first glance.

* *Rostral plate armed on the median line with a long spiniform tooth.*

Example, *Gonodactylus Chiragra.* Length about three inches and a half.

Localities.—Probably all the seas of warm climates; Mediterranean, American coasts, Seychelles Islands, Trincomalee, and Tongataboo.

* * *Rostral plate rounded and nearly pointed in front.*

Example, *Gonodactylus Scyllarus.* Length about four inches and a half.

Localities.—Indian Seas and the coasts of the Isle of France.

Coronis. (Latreille.)

This form does not appear to M. Milne Edwards to differ sufficiently from the *Squillæ*, properly so called, to authorise its generic separation; but as he had not observed it himself, he continues to retain it as a genus. The following is Latreille's character:—

Lateral and posterior appendage of the third joint of the six last feet (the adactylous and thoracic) in form of a membranous blade or battledore (palette), which is nearly orbicular and a little bordered (rebordée).

Example, *Coronis Scolopendra.* (See Guerin, *Iconographie*, pl. 24, fig. 2.)

STOMATE'LLA. [HALIOTIDÆ, vol. xii., p. 16.]

STOMATES (from the Greek *στόμα*, an 'opening,' or 'mouth'), in Botany, are small longitudinal openings occurring in the epidermis of plants, and usually bounded by two or more lunate or kidney-shaped vesicles. The epidermis of plants has been described by Brongniart and others as consisting of three parts, which may be easily demonstrated by a lengthened maceration. The outermost of these consists of an 'extremely delicate homogeneous pellicle,' which does not present any decided marks of organization, and is perforated in places where the stomates exist. The second part consists of a single layer, sometimes of more than one, of flattened vesicles of cellular tissue. These vesicles are very small, and of various figures, but the most frequent form is the hexagonal. The third part of the epidermis is the stomates, which are placed under the above-mentioned pellicle and on the same plane with the layer of flattened vesicles.

The first botanist who observed the existence of stomates was Grew, who, in his 'Anatomy of Plants,' published in London, in 1682, gave an imperfect representation of these organs, and stated that they existed on several parts of plants, but he gave them no especial name. Malpighi afterwards described their existence in the epidermis of Marchantiaceæ, where they are very large, but entirely overlooked them in the higher plants. Guettard was the next writer who noticed them, and, believing them to perform the office of glands, called them *glandes miliaires* (glandulæ miliares). Saussure also thought them glandular bodies, and called them cortical glands. Hedwig and Gleichen were the first to give accurate drawings of them; and from that time their existence excited general attention, but they received a variety of designations. Hedwig called them *spiracula* and *pori exhalantes*; De Candolle, *pores corticaux*; Krocker, *rimæ annulatæ*; Mirbel, *pores elongées*. Sprengel and other German writers designate them as Spaltöffnungen; Rudolphi called them pores of the epidermis; Link proposed the name stomata, which has since been adopted by De Candolle, Brongniart, and Mirbel in France, and Lindley and Henslow in England. Link has however since proposed the name of Hautdrüsen (skin-glands), and this term is adopted by Meyen and later German botanists.

The structure of the stomates is best seen in the monocotyledonous plants, in which they generally occur of a larger size. They are quite imperceptible to the naked eye, but may be discovered by a lens of low power. In general they will be found to consist of two kidney-shaped bodies, which are merely cells of cellular tissue filled with a green matter, and from this circumstance contrast with the transparent cuticle in which they are placed. The kidney-shaped bodies lie with their incurved edges presented to each other, and their extremities unite with each other so that they leave between them a little oval chink or opening. This opening communicates with the parenchyma of the leaf or other organ underneath the cuticle, and at this point the cellular tissue is loose, and frequently a large cavity is observed, into which the stomate opens. Nees von Esenbeck, Brown, and others denied at first that the space between the lunate bodies was an opening, but the observation of later writers seems to have proved this point. (Lindley, *Introd. Bot.*, p. 52.) This difference among observers may perhaps be explained by the fact that the kidney-shaped bodies have a power of contracting and dilating, and thus closing or opening the space between them. This was first observed by Comparetti, and has since been confirmed by other writers.

The stomates are not all composed of two cells; those of Marchantia, according to Mirbel, are composed of four or five cells, which are arranged circularly, forming an upper outer rim of the stomate. Sometimes additional cells are found above these, but they differ little, except in their arrangement, from the cells of the tissue by which they are surrounded. This is one of the simplest forms of stomate. In *Nerium oleander* the stomates consist of cavities in the cuticle, which are filled up with little hairs. Dr. Lindley has described in Nepenthes two sorts of stomates, 'the one oblong, semitransparent, and almost colourless, with numerous pellucid globules in the cavity of the cells; the other roundish, much more opaque, and coloured red.' Although the form of the stomates is most frequently elliptical, they are sometimes quite spherical, as in *Oncidium altissimum*, and Link has noticed them of a quadrangular form in *Yucca gloriosa*.

The stomates are mostly arranged irregularly upon the surface of the epidermis, occupying generally about equal distances from each other. There are however some remarkable exceptions. In the grasses, for instance, and some other monocotyledonous plants, the stomates are arranged in regular rows, which run parallel with the bundles of woody tissue which enter into the composition of the leaf. In *Phormium tenax* and in Pinus the stomates are also arranged in a longitudinal series. In *Begonia spathulata* the stomates on the under surface of the leaves are collected together in the form of little rosettes. The same is seen in *Crassula cordata* and *arborescens*.

Stomates are found on plants whenever there is a distinct epidermis, and they exist on nearly all the parts of a plant exposed to the light. In the lower cryptogamic plants, as mosses, fungi, lichens, and algæ, they have never been found. Plants growing in the dark do not possess them, nor are they present on roots or the ribs of leaves. They are found on the bark of herbs and trees, but in the latter only whilst the bark is herbaceous. In those plants which live under water, as the Zostera, Ceratophyllum, and Potamogeton, they are not found. Those parts of the leaves of some plants which are concealed under the ground, as in the onion, &c., have no stomates. All the parasitical plants which have not a green colour, as the Orobanchaceæ, Lathrea, and Monotropa, are destitute of stomates, whilst those which are green, as the Loranthus, have abundance. They are only rarely found upon the filaments of the stamens, the anthers, or the styles. With the exception of Canna, they have not been found on the seeds of plants, nor are they present on fruits, except such as are membranous.

Stomates are not always present on both surfaces of the leaves. They are however much more frequently absent on the upper than on the under surface of the leaf.

The number of stomates contained in a given surface varies very much in different species and families of plants. Many observers have occupied themselves in counting them, and the following table gives the result of some of the observations of Sprengel, Krocker, Thomson, and Lindley on this point:—

Names of Plants.	Observer.	Number of Stomates in a square inch.	
		Under side.	Upper side.
Lilium album . .	Sprengel	17,280	3,556
——— bulbiferum .	Hedwig	83,000	not counted
Tradescantia discolor .	Sprengel	9,000	
Alisma Plantago .	Thomson	16,000	12,000
Andromeda speciosa .	..	32,000	none
Hydrangea quercifolia	..	160,000	none
Sempervivum tectorum	..	6,000	10,710
Rumex acetosa .	..	20,000	11,088
Viscum album . .	..	200	200
Prunus Laurocerasus	Lindley	90,000	none
Crinum amabile .	..	20,000	20,000
Stapelia (stem) . .	..	..	15,000
Cactus (stem) . .	..	..	15,000
Aloe (leaf) . .	..	20,000	25,000
Yucca . . .	..	40,000	40,000
Pinus halepensis .	Krocker	2,700	
—— Abies . .	..	3,600	
Aloe nigricans . .	..	7,200	
Citrus aurantium .	..	409,824	
Solanum sanctum .	..	448,704	

Meyen, who records Krocker's calculations, does not state on which side of the leaf he observed the stomates.

Brown is of opinion that the figure, number, and size of stomates might often be made use of to indicate the affinities of genera and natural families of plants, and has proved that this is the case in Proteaceæ. Schleiden also, in a recent paper, has pointed out the relations and differences of these organs in Cactaceæ, Coniferæ, Piperaceæ, and other orders.

The different names that have been given to the stomates by various writers will at once indicate the differences of opinion that have existed with regard to their functions. It was an early opinion that they were excretory glands, and that through their agency the bloom that exists on the leaves, &c. of many plants was formed. But this exists, as on the surface of plums, where there are no stomates. Link and Meyen still maintain that they are glands. The latter observes that the structure of the cells of the stomates is precisely similar to that of many of the glands of plants, and that supposing the stomates were only looked upon as organs by which exhalation is effected, yet that process is one of excretion rather than of simple evaporation. It is for this reason he still calls them Hautdrüsen (skin-glands), and looks upon them as excretory organs.

Bonnet found that leaves when flagging were restored by placing one of their surfaces in water, and hence he concluded that one of the functions of the stomates was to absorb moisture from the atmosphere, but the hygroscopicity of vegetable tissue would account for this absorption, and would effect it when necessary without having recourse to the supposition that a special organ was provided for it.

That they are organs by which the process of exhalation is carried on as a vital process, there is much reason to suppose. They exist in the greatest abundance in those parts of plants in which this operation is going on, they are also most abundant in membranous leaves, which are known to exhale most, and are deficient in succulent leaves, in which there is little exhalation. It was long ago observed by Comparetti, that the mouths of the stomates were open by day and closed at night, and this is quite in accordance with what we know of the action of light on the function of exhalation. It is more active in the day, and the mouths of the stomates are opened to allow of the exit of the vapour. Another argument in favour of this view is derived from the non-existence of stomates in those families of plants in which no proper transpiration takes place.

For further information consult Meyen, *Pflanzen Physiologie;* Lindley, *Int. Bot.;* De Candolle, *Organographie Végétale;* Brongniart, *Ann. des Sc. Nat.*, 1834.

STOMA'TIA. [HALIOTIDÆ, vol. xii., p. 17.]

STO'MIAS, a genus of fishes of the Pike tribe (family *Esocidæ*), distinguished by the muzzle being very short, the mouth very deeply cleft, the opercula reduced to small membranous laminæ; the maxillaries fixed to the cheek: the intermaxillary, palatine, and maxillary bones are rather sparingly furnished with teeth, and these are long and hooked, and similar teeth are observable on the tongue. The body is elongated, the ventral fins are placed very far back, and the dorsal fin is placed opposite the anal fin, on the hinder extremity of the body.

Only two species of this genus are known, both of which are inhabitants of the Mediterranean. One, the *Stomias barbutus*, has been so called on account of its having a long barbule on the chin. Both species are of a black colour, but have numerous rows of small silver spots on the abdomen.

The genus *Chauliodus*, Schn., appears to be closely allied to the present fishes, presenting much resemblance in the structure of the head and jaws, which are furnished, in front, each with two teeth which cross when the jaws are closed. The dorsal fin is placed opposite the interval of the pectoral and ventral fins, which are not placed so far back as in *Stomias*. The first ray of the dorsal is produced into a filament. One species only is known, the *Esox stomias* of Schneider, a fish found at Gibraltar (and apparently nowhere else), and which attains the length of about fifteen or eighteen inches, and is of a deep green colour.

STONE, METEORIC. [AEROLITES.]

STONE. [CALCULUS.]

STONE. [STAFFORDSHIRE.]

STONE, EDMUND, a mathematician of North Britain. He was of humble origin, having been the son of a gardener in the service of the duke of Argyle, and he was born near the end of the seventeenth century, probably on one of the duke's estates. A servant of the family taught him, when a boy, to read: and with no other guide than his own genius, he at length became learned in the higher branches of mathematical science.

The duke, happening accidentally to become acquainted with the extent of his scientific acquisitions, took an opportunity of drawing from him an account of the steps by which he had attained them, and learned with surprise that, from a desire to understand the use of a rule and compasses, and how to make computations relative to the art of building, the youth from books only had taught himself arithmetic and geometry, together with as much of Latin and French as enabled him to read scientific works in those languages.

It will be readily imagined that the young man was not left in his then obscure situation: in fact the duke, his master, generously gave him an employment which allowed him to have sufficient leisure for his studies; and he continued to cultivate the mathematical sciences to the end of his life. He was elected a fellow of the Royal Society in 1725, and there is inserted in the 'Philosophical Transactions' (vol. 41) a paper by him in which is an account of two lines of the third order, which are not mentioned by Sir I. Newton or by Mr. Stirling.

It is not known from what circumstance Mr. Stone lost the support of the noble family which had patronised him, but it appears that in the latter part of his life he subsisted by giving lessons in mathematics, and that he died in poverty in 1768.

Mr. Stone published, in 1723, a translation of Bion's 'Treatise on Mathematical Instruments;' in 1726, a 'Mathematical Dictionary,' in 1 vol. 8vo.; and in 1730 a translation of the Marquis de l'Hôpital's 'Analyse des Infiniment Petits,' together with a treatise by himself on the 'Method of Fluents, or the Inverse Method of Fluxions.' This work has been criticised by John Bernoulli; but the mistakes which occur in it are candidly ascribed to the circumstances under which it was written. In the following year Stone published 'The Elements of Euclid,' in 2 vols. 8vo., and in 1735 a translation, from the Latin, of Dr. Barrow's 'Geometrical Lectures.'

STONECHATS. [WARBLERS.]

STONEHENGE, an assemblage of upright, horizontal, and prostrate stones on Salisbury Plain, England; generally supposed to be the remains of an antient Druidical temple. The name is probably derived from the Saxon *stan*, stone, and *heng*, or *hang*, to hang or support. By the Welsh antiquaries it has been called *choir-gaur, chorea gigantum*, or, according to Stukeley, *chorus magnus*, the great choir or circle.

Stonehenge, with the far-famed pyramids of Egypt, and other works of the same class, may be considered as the oldest monuments of man's labour. Being anterior to all written evidence, their history is entirely unknown, and they have been the subjects of much unprofitable speculation, some of which however will require a short notice.

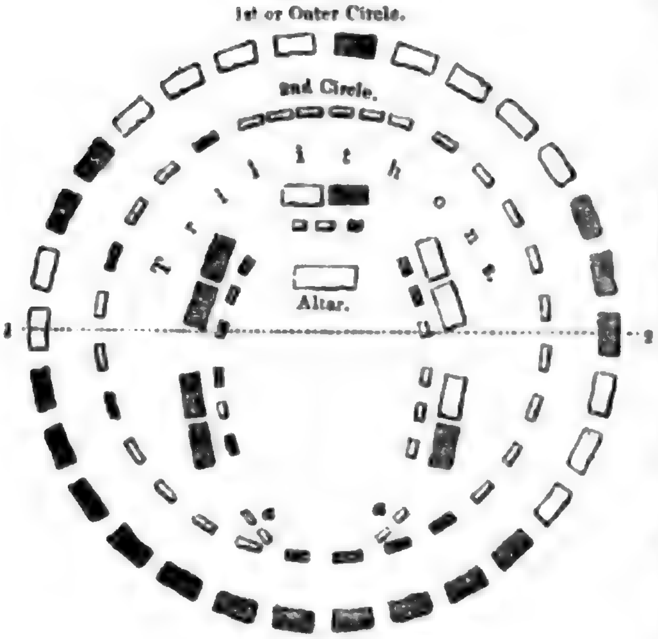
Stonehenge is situated about two miles due west of the town of Amesbury, and seven north of Salisbury, in Wiltshire. From its singular character and peculiar situation, which is easy of access, it has attracted more attention than any other relic of antiquity in Great Britain. Viewed at a distance it appears a trifling object; for its real magnitude appears diminished in the extensive plain or open country which surrounds it; and even on a near examination it often fails to satisfy expectation.

In various parts of the world there are circles of upright stones, some of which consist of a single circle, and others of many circles: but Stonehenge is of a peculiar character, and is, we believe, wholly unlike any other antient monument. Many of the stones have been squared, or hewn by art, and the horizontal stones of the outer circle are carefully attached by mortices to the uprights, which have tenons; whereas nearly all other examples of what are generally called Druidical circles are composed of rough unhewn upright stones, without imposts. The accompanying diagrams will give an exact notion of the form, arrangement, position, and general design of the whole structure, in its original as well as in its present state.

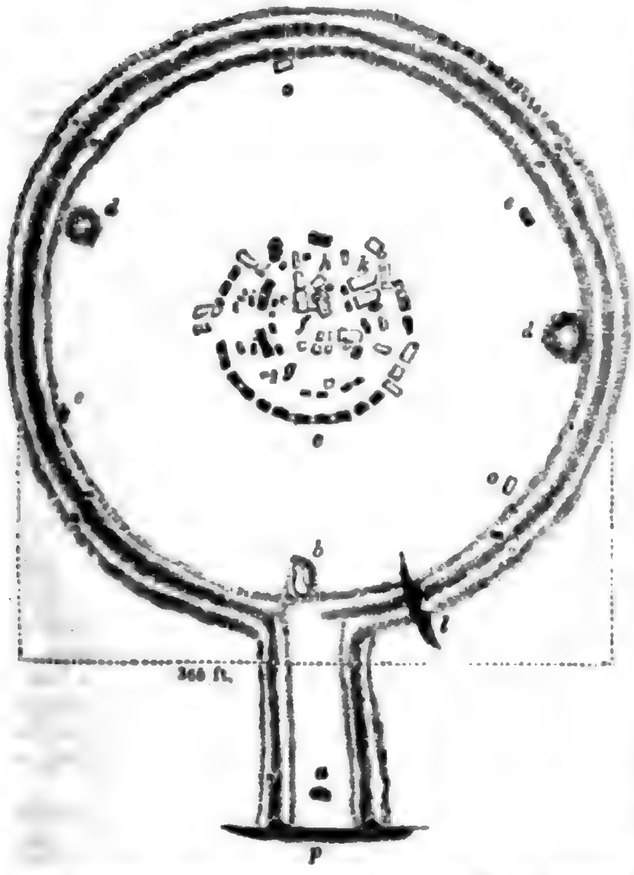
The stones are surrounded by a circular vallum, or bank of earth, within a ditch or foss. Withinside this bank are three stones, two of which are in an upright position, and the other is prostrate. It has been conjectured by Browne, with some probability, that these originally formed part of a circle. In the centre of the enclosed space is what is usually called the temple itself, which comprised originally an outer circle of thirty upright stones, at nearly equal distances apart, sustaining as many stones in a horizontal position, forming a continuous impost. Each of the upright stones had two tenons or projections on the top, which were adapted to fit into and fill up two mortices or hollows in each superincumbent slab. Within this was another, or second circle, consisting of about the same number of perpendicular stones, of much smaller size, and without imposts. This circle enclosed an elliptical arrangement of large and small stones: the former, which were divided into groups of three stones each, are called trilithons by Dr. Stukeley and subsequent writers. There were five trilithons, each of which consisted of two upright stones, and an impost, covering or extending to the extreme edges of the standing stones. Before each trilithon stood three small upright stones; and in the central space, or adytum, of the temple (in front of the principal trilithon) was a large flat stone, called the altar. This description will be readily understood by an examination of the accompanying cuts.

The plan No. 1 shows the original design of the main part of the temple: the stones which have fallen, or are entirely removed, are marked in outline, whilst the stones remaining in their original positions are shaded. The plan No. 2 shows, more minutely, the present dilapidated state of the edifice, together with the vallum and fosse, and other exterior works.

No. 1.



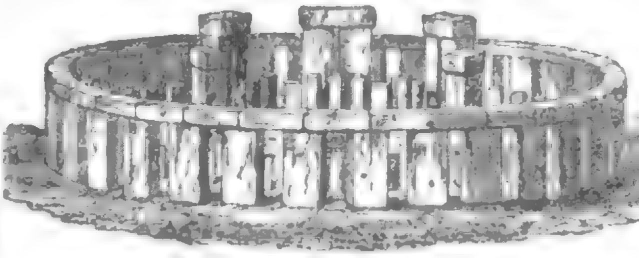
No. 2.



Ground-plan of the whole work in its present state, showing the approach or avenue from the north-east, with one stone still standing, *a*, at the distance of about one hundred feet from the ditch; *b*, fallen stone in the ditch; *c*, supposed entrance through the exterior circle, in a line with the avenue, and near the middle of the temple; *d*, *d*, two cavities or hollows in the ground; *e*, *e*, two stones, adjoining the surrounding bank; *f*, a flat stone, usually called the altar; *g*, a small impost stone with two mortices. The small size of this stone, as compared with the imposts of the outer circle and those of the trilithons, has caused much conjecture and speculation among the writers on this monument, as it could not have belonged to or formed any part of those portions of the structure. Some contend that it was part of a small trilithon in that situation, and that there was another of similar proportion on the opposite side, or on the right hand of the entrance (See Plan No 1, *a*, *a*): *h*, the tallest stone in the place, and forming part of the chief trilithon, or most prominent part of the structure; its corresponding stone, as well as the impost, have fallen: *i*, *i*, two standing and nearly perfect trilithons: *k*, a fallen trilithon, its three stones perfect, showing the full forms, proportions, and junction of the uprights and the impost; these fell in the year 1797: *l*, section through bank and ditch, marked *m*, *n*: *p*, section of banks on each side of the avenue: *o*, *o*, sites of two stones near the surrounding bank.

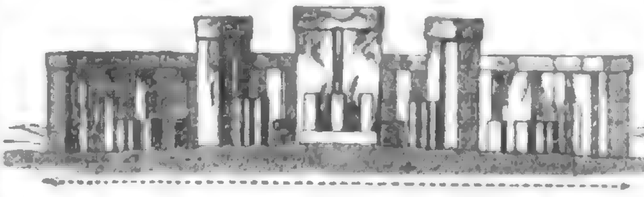
With respect to the two principal circles, the restorations given by Stukeley, Inigo Jones, Wood, and Smith, vary in no essential particulars; but as regards the number and arrangement of the trilithons, and the small upright stones before them, they differ materially from each other. Jones, for instance, made the number of trilithons *six*. The plan No. 1 (from Stukeley) seems fully justified by the existing remains, as shown in plan No. 2, whilst the discordant opinions on this point are easily accounted for by the fact that the central portion of the temple is comparatively in a much more ruinous condition than the two principal circles.

No. 3.



Stonehenge.—Perspective Elevation.

No. 4.



Stonehenge: section 1 to 2 (ground-plan, No. 1), 105 feet.

The plans (1 and 2), perspective view (3), and section (4), render it unnecessary to give a description of the present state of Stonehenge. The dimensions of the stones, and the space occupied by the structure, as nearly as they have been ascertained, are—

Diameter of the space enclosed within the vallum or bank . . .	300 feet.
Height of vallum . . .	15 feet.
Diameter of the outer circle	100 feet.
Do. of the second circle .	83 feet.
Height of the stones of outer circle	14 (*sides* 7 feet by 3).
Do. of trilithons .	16 ft. 3 in., 17 ft. 2 in., 21 ft. 6 in.
Do. of one of the small stones before the same . .	7 ft. 6 in.

The stones of the outer circle, the trilithons, the stones in the avenue, and adjoining the vallum, are, according to Dr. Townson, in 'Tracts and Observations on Natural History,' &c., 'a pure, fine-grained, compact sandstone, differing only a little in their colour, some being white, and others inclining to yellow.' They precisely resemble the grey-wethers and numerous other detached masses which lie on the surface of the downs in the vicinity of Avebury and Marlborough. The stones of the second circle, and the row within the trilithons, consist of 'a fine-grained grünstein,' interspersed with black hornblende, felspar, quartz, and chlorite, excepting four in the circle, one of which is a siliceous schist, another is an argillaceous schist, and the others are hornstone, with small specks of felspar and pyrites. The slab or altar-stone is different from all these, being a kind of 'grey cos, a very fine-grained calcareous sandstone,' which strikes fire with steel, and contains some minute spangles of silver mica.

The surrounding plain is covered with a profusion of barrows and earth-works, perhaps unparalleled in any spot of similar extent in England, and probably in the world. Many of the barrows were opened by Sir Richard Hoare and his indefatigable coadjutor Mr. Cunnington, and were found to contain, in some instances, cists or chests, filled with burnt bones, and in others entire skeletons, with various relics of British and Roman art. Some other objects besides the barrows demand our notice. The principal of these are the avenue and the cursus, the former of which has been previously noticed. It is a narrow strip of raised ground, bounded on each side by a slight bank of earth, and extending in a straight line from the entrance, through the vallum of the structure on the north-east, to the distance of 594 yards, at which spot it divides into two branches, one of which continues southward, and is seen between two rows of barrows; while the other proceeds northward, and approaches within a few yards of the cursus. The cursus is a very curious and interesting appendage to Stonehenge, if it can be properly so considered. It is a flat tract of land, bounded by two parallel banks and ditches, and is situated about half a mile north-east of Stonehenge: it measures one mile five furlongs and 176 yards in length, and 110 yards in breadth. Its direction is from east to west; and at the former extremity is a mound of earth resembling a long barrow, which stretches entirely across it. The western extremity is destitute of any mound like that at the eastern end, but there are two barrows irregularly placed near this end within the area of the cursus, a part of which appears also to be cut off by a slight bank. The original purpose of this bank is difficult to determine, for we can scarcely suppose that if the chariots started from the east end, they would be driven *over* this bank, to the termination of the course at this end. We should therefore be inclined to think that it had been raised at a later period, for some object distinct from racing, if there were not another similar bank thrown across a second and smaller cursus, which is situated at the distance of nearly a mile from the larger one. From the near resemblance of the above work to the genuine circus of the Romans, it is reasonable to suppose that, if not formed by the Romans, it was made in imitation of their chariot-course, and by a people familiar with their manners and customs. Hoare's 'Antient Wiltshire' contains a very interesting map, showing the surface of the plain around Stonehenge to the extent of about five miles from east to west by three miles from north to south. Within that area are two large encampments, two cursuses, other embankments supposed to mark British villages, and at least three hundred barrows or tumuli of various sizes and shapes. Hence it may be reasonably inferred that Stonehenge was a place of great importance in former ages.

The earliest published notice of Stonehenge occurs in the writings of Nennius, who lived in the ninth century. He narrates the particulars of the murder of four hundred and sixty British nobles at a conference between King Vortigern and Hengist, in the latter part of the fifth century, at or near the spot on which Stonehenge is situated; and attributes the erection of the monument to the surviving Britons, who thus endeavoured to perpetuate the memory of that tragical event.

The historical 'Triads of the Welsh Bards' refer its origin to the same cause, and relate that it was constructed by Merlin, after the death of King Vortigern. This likewise is the account of Walter Mapes [GEOFFREY OF MONMOUTH], who is very circumstantial in his narrative.

Geoffroy of Monmouth, who wrote in the 12th century, gives a similar account of its origin, with the addition of a legend, which is repeated by most subsequent writers. He states that Merlin employed supernatural agency to remove the stones from Kildare in Ireland and place them upright on Salisbury Plain; and he adds that they had been in the first instance conveyed to Ireland from Africa. The same story appears in Giraldus Cambrensis (1187), who mentions a similar monument which he had seen on the plains of Kildare.

Henry of Huntingdon, who also wrote in the twelfth century, discredits the story of Merlin; and says that no one can devise by what means or for what purpose such a work could have been raised. Neither Gildas, Bede, William of Malmsbury, Hovedon, Ingulphus, Matthew Paris, nor Florence of Worcester, have any notice of this remarkable monument; a circumstance which Henry of Huntingdon attributes to their inability to give any account of its origin or use.

Polydore Virgil (1534) says that it was raised by the Britons to the memory of Aurelius Ambrosius. Camden, who wrote in 1586, gives no opinion on its origin or purpose. His description and representation are so very erroneous, that it is doubtful if he ever visited the place. John Aubrey, in a manuscript referred to by Bishop Gibson, and Sir Richard Hoare, attribute its origin to the Britons prior to the Roman invasion.

Such is the scanty information which our old writers contain about this curious monument of antient times. Modern writers on Stonehenge, rejecting all historical evidence, have raised their theories on purely speculative foundations. Inigo Jones, in his essay on Stonehenge, undertaken at the desire of King James I., and which was published in one small folio volume, by his son-in-law John Webb, A.D. 1655, endeavours to show that Stonehenge was a temple of the Romans, of the Tuscan order, dedicated to Cœlus; but he has committed palpable errors in his restorations, to say nothing of the absurdity of his general assertion. The next essay was written about 1660, and published anonymously, in Langtoft's 'Chronicle,' called 'A Fool's Bolt soon shot at Stonage.' The writer considers it to have been a British temple, commemorative of a victory gained by the Cangi of Somersetshire, over King Divitiacus and his Belgæ. In 1663 Dr. Charleton published his 'Reflections on Stonehenge,' in which he contends that it was erected by the Danes, in the time of King Alfred, as a place for the crowning of their kings. Charleton's 'Reflections' called forth an essay of 228 folio pages, in support of Inigo Jones, by his editor John Webb, published in 1664: this essay is of no value. In 1676 appeared a volume by Aylett Sammes, who remarks, 'Why may not these giants (alluding to the title of *Chorea Gigantum* given to this monument) be the Phœnicians; and the art of erecting these stones, instead of the stones themselves, brought from the furthermost parts of Africa, the known habitations of the Phœnicians?' To this sage question one may answer, why may not the stones have come from the moon, and dropped down in their present position?

Bishop Gibson, in his edition of Camden's 'Britannia,' 1694, after opposing the theories of Jones and Charleton, concludes, 'One need make no scruple to affirm that Stonehenge is a British monument; since it does not appear that any other nation had so much footing in this kingdom as to be authors of such a rude and yet magnificent pile.' The bishop thinks that some part of this temple may have been erected subsequently to the Roman invasion; a conclusion which seems to be very probable. With reference to its modern name, Gibson refers to a Saxon manuscript of good authority, printed by Dugdale in the 'Monasticon,' in which it is called *Stanhengist*, proving its traditional connection, at an early period, with Hengist. In 1720 J. G. Keysler, a learned German antiquary, published, at Hanover, 'An Explication of the *Anglo-Saxon* Monument of Antiquity on Salisbury Plain, called Stonehenge.'

In 1740 Dr. Stukeley published a folio volume, entitled 'Stonehenge, a Temple restored to the British Druids;' he attributes the work to the British Druids. The plates which accompany his volume are good; and Stukeley's restorations are valuable; but a large portion of his essay is occupied with fanciful and irrelevant speculation.

J. Wood, an architect of Bath, published a series of elaborate plans of this structure, in 8vo., 1747. It is his opinion that it was a temple erected by the British Druids, about 100 years before the Christian æra.

The Rev. W. Cooke, in a treatise entitled 'An Enquiry into the Patriarchal and Druidical Religion, Temples, &c.,' 1755, supposes Stonehenge to have been held sacred by the Druids, and appropriated to the meetings of great assemblies, on civil as well as religious occasions; for which, he adds, 'the world does not afford a nobler spot.'

Dr. Smith's work on Stonehenge, called 'Choir Gaur,' 1771, gives a minute description of the structure, with a notice of most of the theories to which we have referred. He considers it to have been of Druidical origin, and that it was a 'great orrery,' erected as well for the purposes of astronomical observation as for religious ceremonials.

Edward King, in his 'Munimenta Antiqua,' devotes much space and applies great learning to the consideration of antient stone monuments. He conjectures that Stonehenge was constructed in the latest ages of Druidism, when that religion was struggling against Christianity.

Mr. Davies, the learned author of 'Celtic Researches,' 1804, and the 'Mythology of the Druids,' 1809, has discussed the question respecting the origin and use of Stonehenge perhaps with more research than any previous writer. He supposes that this structure and Silbury Hill are two of the three works alluded to in a Welsh Triad as constituting the greatest labours of the island of Britain; *i.e.*, 'lifting the stone of Ketti,' 'building the work of Emrys,' and 'piling the Mount of the Assemblies.' That Stonehenge is really a Druidical structure, the same learned writer remarks, 'is evident, from the language in which it was described, and the great veneration in which it was held, by the primitive bards, those immediate descendants and avowed disciples of the British Druids.' 'It was not exclusively dedicated to the Sun, the Moon, Saturn, or any other individual object of superstition; but it was a kind of Pantheon, in which all the Arkite and Sabian divinities of British theology were supposed to have been present.' As to its date, he remarks that 'it was a monument of venerable antiquity in the days of Hengist, and that its peculiar sanctity influenced the selection of the spot for the place of conference between the British and Saxon princes. Mr. Davies further cites a passage in Diodorus Siculus, who quotes Hecatæus, describing a round temple in Britain, dedicated to Apollo, which he concludes to have been most likely Stonehenge. (Diod., ii., 47.) Sir R. Hoare has entered more fully into this passage (*Antient Wiltshire*, i. 155).

The Rev. Jas. Ingram, in his 'Inaugural Lecture on the Utility of the Saxon Literature' (1808), considers Stonehenge to have been intended for a heathen burial-place, and the cursus adjoining as the hippodrome on which the goods of the deceased were run for at the time of the burial. This opinion is entitled to some consideration, from the vast number of barrows and other earth-works which abound in this part of the plain.

The late Mr. Cunnington, in Sir R. C. Hoare's 'History of Antient Wiltshire,' folio, 1812, observing the difference in quality and size between the stones of the exterior and interior circles, supposes that Stonehenge was erected at different times. He imagines that the larger stones, with their imposts, constituted the old or original work; and that the small stones of the second circle, and those of the inner range, were raised at a later time, as 'they add nothing to the grandeur of the temple.' But this opinion is not warranted by any example among the numerous Druidical circles of Great Britain; on the contrary, it seems more consistent to conclude that the second circle, of small, rough, unhewn stones, with another circle immediately within the ditch, and some other members now destroyed, formed the original or pristine temple, and that the larger hewn stones with imposts were afterwards added. Many arguments might be alleged in support of this opinion, and also to prove that the great circle of upright chiselled stones, with their imposts, and the third row of trilithons, were posterior to the former, raised by another class of people, and executed at a time when their principles and arts had been considerably changed. At the same time it is conjectured that an avenue of stones was raised, extending from the temple towards the cursus to the north-east, and also that those places for races and other sports were formed at a time when the inhabitants of Britain had intercourse with the Romans.

The 'Topographical Account, &c. of Wiltshire,' by J. Britton, forming the fifteenth volume of the 'Beauties of England and Wales,' 1814, contains an accurate description of Stonehenge and of other antiquities in its immediate neighbourhood.

In 1823 H. Browne published 'An Illustration of Stonehenge and Abury,' in which he endeavoured to show that both of those monuments were antediluvian, and even that the latter was formed under the direction of Adam. He ascribes the present dilapidated condition of Stonehenge to the operation of the general Deluge; 'for,' he adds, 'to suppose it to be the work of any people since the Flood, is actually monstrous.'

Godfrey Higgins, in a large 4to. volume, 1829, entitled 'The Celtic Druids; or an attempt to show that the Druids were the Priests of Oriental Colonies, who emigrated from India,' has given an elaborate account, with plates, of Stonehenge, but both the plates and the description are from the works of Stukeley, Sir R. C. Hoare, and others. His opinion is that Stonehenge 'was raised by the Druids, the priests of the nation, who were its sacred architects.'

About fifty years back Mr. Waltire gave lectures on Stonehenge, illustrated by models and drawings, and fancifully represented the temple as a place devoted to sacred and mysterious rites, and as forming a planisphere, in connection with the surrounding barrows and other works. Taking up a part of this theory, but allowing a wider latitude to conjecture, the Rev. E. Duke has lately published, in the 'Salisbury Journal,' a long series of essays, in which he endeavours to show that Stonehenge was one of the members, or planets, of a vast planetarium, representing the solar system, and extending over a wide extent of country, 'on a meridian thirty-two miles in length.'

The late John Rickman, in the 'Archæologia,' vol. xxviii., p. 399, supposes that 'Silbury hill, the Abury circus, and the avenues of approach to it, were not constructed earlier than the third century of the Christian æra, and that the more difficult operations requisite for the formation of Stonehenge may be assigned to the next century, or (to speak with due caution) that this temple was completed before the final departure of the Romans from Britain.'

The Rev. Thomas Maurice, in 'Indian Antiquities,' vol. vi., has a dissertation on Stonehenge, and endeavours to show that the Druidical rites and ceremonies of the West were derived from antient India, and that this monument or temple must have been erected more than 500 years before the Christian æra.

In 'Palestine: the Bible History of the Holy Land,' 8vo., 1841, by John Kitto, there is a learned essay 'On Antient Monuments of Stone, Druidical Remains,' &c., with an elaborate review of this much controverted subject.

In conclusion it may be observed that there appears much less reason for ascribing the erection of Stonehenge to any of the successive conquerors or colonists of Britain, than to its original inhabitants the Celtic Britons; and if this be admitted, it is a probable conjecture that the structure was erected for religious purposes under the direction of the Druids. The practice of commemorating an important event by raising a number of stones, is of the greatest antiquity; and there is nothing in the history either of the Romans or the Saxons to lead us to suppose that those nations ever erected temples or monuments like the stone circles of Avebury and Stonehenge.

STONEHOUSE, a township and parish in the county of Devon, 217 miles west by south from London, and about midway between the large towns of Plymouth and Devonport.

Apart from local distinctions Stonehouse would be considered as a component part of the one great town which Plymouth, Devonport, and Stonehouse really constitute. In a narrower point of view, Stonehouse would be regarded as a suburb of Plymouth, being on the same level, and connected with it by uninterrupted lines of buildings; while it is separated from Devonport by a creek, and by a long and steep ascent beyond, which is unoccupied by buildings: a toll-bridge over the creek makes the separation still greater. But when the Reform Act was drawn up, it was deemed proper to associate Stonehouse with Devonport in the exercise of the elective franchise, which neither had previously enjoyed. Stonehouse was constituted a township by this act, and is divided into two wards. It is under the jurisdiction of a bench of county magistrates, who sit every Tuesday at the so called town-hall, which is only a part of the watchhouse, which is used for the confinement of offenders until they are removed by order of the magistrates.

Stonehouse was originally called Hippeston, the name of a mansion first inhabited by Joel de Stonehouse, in the reign of Edward III. The original, or *West* Stonehouse, was on the other side of the water, at Cremhill, under Mount Edgcumbe, to the noble proprietor of which *this*, usually distinguished as *East* Stonehouse, also belongs.

For several centuries Stonehouse was a fishing village, with a small chapel. During the civil wars its population was between 700 and 800. The establishment of the Royal Naval Hospital in 1762, and of an extensive depôt for the Royal Marines in 1784, gave a great impulse to the prosperity of the place, which has, within the present century, been greatly strengthened by the late earl of Mount Edgcumbe, who, by granting leases on liberal terms, has caused the town rapidly to increase. The recent removal of the Royal Victualling Establishment from Plymouth to the extremity (Cremhill Point) of the peninsula on which Stonehouse is situated, will increase its prosperity.

The streets of Stonehouse are wider and more regularly laid out than we usually see in a town of its class. The houses are very neat, but small, except in two or three streets, which the gentry inhabit. There is no public building of any note, except those pertaining to the port of Plymouth, which have been already named. The parochial chapel of St. George, which has 1000 sittings, was built in 1789, and is a perpetual curacy, in the gift of the vicar of St. Andrews, Plymouth. The new chapel of St. Paul's, which has 950 sittings, was opened in 1831, and its minister is appointed by the incumbent of the parish. There is another episcopal chapel in the Royal Hospital. The Methodists, Calvinists, Independents, Baptists, and Roman Catholics, have their several places of worship, with sittings altogether for 2033 persons. In Stonehouse there are six commercial and classical schools, with 378 pupils; a national school with 188 boys and girls, and an infant school with 113 boys and girls. The Sunday schools are five, one belonging to the church, and the rest to the several denominations, with 752 children. Stonehouse has the usual charitable societies for the benefit of the poor, and an almshouse for eight poor widows has been lately established by Mrs. Bint. The workhouse is a plain structure, erected in 1801. There is a small library and a reading-room, connected with the Naval Club, which is not confined to the naval service. The market-place is a neat and convenient building. There are two annual fairs, one held in May, the other in September. The population of Stonehouse was 3407 in 1801, 6043 in 1821, and 9712 in

1841; but the last number is a very slight increase (141) upon 1831.

(*Statistics of the Three Towns*, by H. Woollcombe, Esq.; the *Guides* of the Rev. S. Rowe, and of G. Wightwick, with local information.

STONESFIELD FOSSILS. The accumulation of organic remains in the thin slaty limestones of Stonesfield is one of the most remarkable phenomena known regarding the distribution of the fossils in the oolitic rocks. Coniferous, cycadeous, and filicoid plants; lamelliferous corals, conchifers, gasteropods, cephalopods, crustaceans, insects, ganoid fishes, terrestrial and aërial saurians, marsupial mammalia; all these occur together, and suggest to the naturalist a variety of inferences and speculations. Viewed in their most general relations, the slaty beds of Stonesfield appear to be deposits produced in the sea near the shore in shallow water, at points to which fresh-water currents might send, at intervals, some of the spoils of the land. The marine conchifers are often found with valves united, and otherwise in conditions which indicate residence on or near the spot where they are buried; but the broken state of the land plants, the scattered elytra of insects, the detached state of the teeth and bones of fishes, saurians, and mammalia, seem the effect of transport from some distance. A great distance cannot well be supposed, for in that case we must imagine the course of a great river, and look for its effects over much wider areas than that of the Stonesfield fossils. There are indeed several rather similar deposits, and perhaps of the same or nearly the same geological date, in the oolitic series of Northamptonshire and Yorkshire, but they seem to be due to separate areas of littoral agitation.

Admitting then the original *habitat* of the Stonesfield fossils to be nearly identical with their present locality, we may venture to ask, to what local fauna and flora in any of the natural regions of the existing land and sea does the Stonesfield series of life offer the greatest analogy? Professor Phillips (*Treatise on Geology*, 1837, vol. i., p. 105), in discussing generally the resemblance of fossil and recent local groups, observes that 'it is impossible to turn to Australia without a suspicion that the anomalous productions of that region have more than the average resemblance to the primeval fauna and flora. For here, and near it, tree-ferns, *cycadeæ*, araucariæ, casuarinæ, grow upon the land; corals and sponges abound on the coast even of Van Diemen's Land; while *trigoniæ*, cerithium, isocardia, a cardium like C. hillanum of the green-sand, and quadrupeds of the peculiar marsupial races to which the Stonesfield animal is referred by Cuvier, seem to invite attention to the yet unexplored sea and land of this prolific region, as likely to yield still further analogies to antient animals and plants, and by consequence to furnish new and important grounds for determining the antient physical conditions of the globe.' A similar view of the determinate analogy of the races of animals and plants now living in Australia, and long since buried in the oolitic strata, has presented itself to Professor Owen, whose decision of the marsupial and mammiferous character of the lower jaws of quadrupeds found at Stonesfield is a gratifying confirmation of the opinions of Cuvier and Buckland, and one of the most important data for the palæontologist. (*Report to the Brit. Assoc.*, 1841.)

There is yet no complete catalogue published of the very numerous species of fossils found at Stonesfield, and preserved in the collections of Buckland and other geologists. Many of the plants are noticed by Sternberg, Brongniart, and Hutton; Mr. Sowerby has figured many of the shells; the work of Agassiz may be consulted for the fishes; Dr. Buckland's *Bridgewater Treatise*, and Professor Owen's *Report*, already alluded to, and other works of the same author, for the reptiles and mammalian remains.

STONHOUSE, SIR JAMES, who was originally a physician, afterwards a clergyman, and who became a baronet late in life, on the death of a distant relation, was born July 20, 1716, at Tubney, near Abingdon. His father was a country gentleman, and died when his son was only ten years old. He was educated at Winchester School, and afterwards at St. John's College, Oxford, where he took his degree of M.A. in 1739, that of M.B. in 1742, and that of M.D. in 1745. He was indebted for much of his medical knowledge to Dr. Frank Nicholls, with whom he resided for two years in his house in Lincoln's Inn Fields. He attended St. Thomas's hospital for two years under Sir Edward Wilmot, Dr. Hall, and Dr. Letherland, and carried on his medical studies for two years more at Paris, Lyon, Montpellier, and Marseille. On his return he settled at Coventry, where he married the eldest daughter of John Neale, Esq., member of parliament for that city. This lady, who died in 1747, soon after their marriage, in the twenty-fifth year of her age, is introduced as one of the examples of frail mortality in Harvey's 'Meditations,' and is further commemorated there in a note. In 1743 Dr. Stonhouse removed to Northampton, where his practice became very extensive. He was in all respects a great benefactor to the poor, and, among other schemes for their relief, founded the County Infirmary. During his residence at Northampton the celebrated Dr. Akenside in vain attempted to get a footing, for he found that Dr. Stonhouse, as Johnson observes, in his Life of Akenside, 'practised with such reputation and success, that a stranger was not likely to gain ground upon him.' After twenty years' practice in Northampton, Dr. Stonhouse quitted his profession, assigning as his reason that his practice was too great for his time and health; but neither the natural activity of his mind nor his unceasing wish to do good would permit him to remain unemployed. As he was particularly fond of the study of divinity, he determined to take orders, and was ordained deacon by the special favour of the bishop of Hereford, in Hereford cathedral, and priest the week after, by letters dismissory to the bishop of Bristol, in Bristol cathedral. In May, 1764, he was presented to the living of Little Chevrel, and in December, 1779, to that of Great Chevrel, where he applied himself to the duties of his station with fervour and assiduity, and became very popular as a preacher. About ten years before this, he had married his second wife. Dr. Stonhouse's piety, for which he was most admired, had not always been uniform. He tells us that he imbibed erroneous notions from Dr. Nicholls, and that he was for seven years a confirmed infidel, and did all he could to subvert Christianity. He went so far as to write a keen pamphlet against it; the *third* edition of which he burnt. He adds, 'for writing and spreading of which, I humbly hope, as I have deeply repented of it, God has forgiven me, though I never can forgive myself.' His conversion to Christianity (which he attributes to some of Dr. Doddridge's writings), and the various circumstances attending it, were such, that he was persuaded to write the history of his life. This he intended for publication after his death, but, in consequence of the suggestion of a friend, and his own suspicions lest a bad use might be made of it, he was induced to destroy it. He died at Bristol-Wells, Dec. 8, 1795, in the eightieth year of his age. Among other ways of doing good, Sir James Stonhouse was convinced that the dispersion of plain and familiar tracts on important subjects was one of the most important; and he accordingly wrote several of these, some of which have been adopted by the Society for Promoting Christian Knowledge. Much of his general character and conduct, his sentiments, and the vicissitudes of his professional employment, may be learned from his correspondence, published in 1805, 2 vols. 12mo., with the title, 'Letters from the Rev. Job Orton and the Rev. Sir James Stonhouse,' &c. See also *Gent. Mag.*, lxv., lxvi., and lxxxi.; and Chalmers, *Biog. Dict.*

STONY STRATFORD. [BUCKINGHAMSHIRE.]

STOP, a set of pipes in an organ. [ORGAN.]

STOPPAGE IN TRA'NSITU is the seizure by the seller of the goods sold during the course of their passage to the buyer.

In explaining the nature of the right of stoppage in transitu, it will be necessary to show—

1. Under what circumstances it exists.
2. By whom and how it may be exercised.
3. How it may be lost.
4. What is the effect of it.

When goods are sold on credit without any agreement as to the time of delivery, the right to the possession of them, as well as the property in them, vests immediately in the buyer. Originally it would appear that the right to the possession and the ownership were considered absolute, the consequence of which, in case of the buyer's bankruptcy or insolvency immediately after the sale, was, that the goods, although unpaid for, and still in the possession of the seller, formed part of the insolvent buyer's estate, and were liable to distribution among his creditors. This was at variance with the merchant law of other nations, and was considered inequitable, and, accordingly, about the year 1690, the Court of Chancery first introduced the doctrine of stoppage in transitu. (Wiseman *v.* Vandeput, 2 Vern., 203; Snee *v.* Prescott, 1 Atk., 245.) It has been since universally recognised in the courts of common law. By virtue of this doctrine the seller was held entitled, in case of the insolvency or bankruptcy of the buyer, to stop the goods at any time before they came into the buyer's possession. During such time they are said to be in transitu, by which, as Lord Mansfield says, is meant every sort of passage to the hands of the buyer; that is, until they have reached the place agreed upon between the buyer and the seller as the place of their ultimate destination. This is not necessarily the actual premises of the buyer; it may be any place, as, for instance, a seaport, the warehouse of the carrier, or even of the seller himself, if such has been assigned as the place of destination. The transitus however continues not only while the goods are actually in motion, but also while they are in any place of deposit connected with their transmission. Goods in the custody of a warehouseman may thus be said still to be in transitu, and with respect to goods so circumstanced, questions very frequently arise as to whether the right of stoppage in transitu still exists or not. When these questions are not determinable by the express terms of the contract, it may become material to inquire whether any other act remains to be done on the part of the seller previous to the actual delivery. If not, it is to be presumed that the transitus is at an end. The buyer's right to possess may be rendered absolute by various acts, as by the seller giving up to the buyer the key of the warehouse where the goods lie, the delivery of part from the bulk of them, the exercise of acts of ownership upon them by the seller, with permission of the buyer. [Sale.] After the transitus of the goods has commenced, it was held by Lord Kenyon that the natural termination of it could not be anticipated by the act of the buyer in meeting the goods and taking possession of them while on their route. The law however now appears to be, that if an actual delivery has taken place, even though by means of such an anticipation of it, the right of stoppage is lost. The part delivery of goods does not destroy the right. In a case where part of a cargo was delivered on a wharf, and was afterwards reshipped, it was held that the seller still retained the right of stoppage in transitu as regarded the whole of the goods.

When the transitus has once been entirely accomplished, the right of stoppage in transitu is extinguished, and cannot again be revived.

The right of stoppage in transitu may be exercised, although a part of the price of the goods has been paid, but not if upon the general account between the buyer and the seller the balance is in favour of the buyer. A seller is justified in refusing to part with his goods under such circumstances as would entitle him to stop them in transitu after the transitus has commenced.

2. The seller, or some one acting on his behalf, is the only person who can exercise the right of stoppage in transitu. No other person, however much interested, possesses this right. Thus a surety to the seller for the payment of the price of the goods, or one who had a lien upon them before he parted with the possession of them, has no right to stop them in transitu. A party however who bought goods for a correspondent from third parties, who were unknown to his correspondent, and charged him a commission upon the price, was held to be, as regarded his correspondent, in the light of an actual seller, and therefore entitled to stop the goods in transitu.

The buyer of goods cannot act as the agent of the seller for the purpose of stopping goods in transitu. No act of his, such as placing the goods in the hands of third parties, &c., will operate as a stoppage in transitu.

In order to effect a stoppage in transitu, it is not necessary that corporal possession of the goods should be obtained. A notice to a wharfinger not to surrender them to the buyer, to a carrier not to deliver them, &c., is a valid exercise of the right.

3. The right of stoppage in transitu being a right of the seller against the buyer, no right, generally speaking, derived to third parties through the buyer only, can defeat it. Such parties stand in the same condition towards the seller as the buyer stands, through whom their rights are derived. Thus a carrier cannot, as against the seller, claiming a right of stoppage in transitu, detain the goods on the ground of a lien upon them for the carriage of other goods for the buyer. If the buyer resell the goods and become insolvent before they have come into his possession, the right of stoppage in transitu still remains.

But in the case of goods which are subject-matter of a bill of lading, a dock-warrant, &c., the rule of law is otherwise. A party to whom a bill of lading is consigned, or a dock-warrant indorsed, has a property which may be the subject of an assignment; and a *bonâ fide* assignee, upon performance of the conditions, if any, of the bill of lading, becomes entitled, upon the assignment, to the possession of the goods absolutely as against the consignor, even in case of the insolvency of the consignee. This was decided as to bills of lading, after great consideration, in the case of Lickbarrow v. Mason (5 East, 21). But if the assignment of the bill of lading is fraudulently accepted by the assignee for the purpose of defeating the consignor's right of stoppage in transitu, it will be inoperative for that purpose, and will give the assignee, as against the consignor, no right beyond that possessed by the consignee himself at the time of the assignment.

By the 4 Geo. IV., c. 83, and 6 Geo. IV., c. 94, a factor is invested with a power of pledging, even for debts of his own, bills of lading, the property of his principal, which have been consigned to him [Factor]; but if he pledge also bills belonging to himself, the principal has a right to compel the pledgee to apply in the first instance the whole proceeds of the latter towards discharging the debt due from the factor to the pledgee. And if the consignor of a bill of lading assigned away in pledge, has taken the proper steps for exercising his right of stoppage in transitu against the consignee, he will be entitled to recover from the assignee the overplus of the proceeds that remains after satisfying the debt for which it has been pledged.

4. It would appear, although the point has never yet been expressly decided, that the exercise of the right of stoppage in transitu does not immediately rescind the sale and revest the property of the goods in the seller. Buller observes that it gives him a right to 'retain them till the original price be paid.' By 'original' he means the price bargained for at the time of the purchase, as distinguished from the value in the market at a subsequent period. The position also that the seller still retains the right to stop in transitu, although part of the purchase-money is paid, seems inconsistent with the supposition that the exercise of the right amounts to a rescission of the contract and sale. If this be correct, when the seller stops the goods in transitu, they still remain the property of the buyer, subject to being redeemed by him from the possession of the seller on payment of the price agreed on. They probably continue subject to this condition until the time allowed for credit has expired, where a time has been fixed on, and where it has not, until a reasonable time has elapsed. Probably also, in the case of goods of a perishable nature, the seller might be held to be authorized to sell the goods for the benefit of both parties. (Abbot *on Shipping*, tit. 'Stoppage in Transitu;' Cross *on Lien and Stoppage in Transitu;* Smith's *Leading Cases*, note to 'Lickbarrow *v.* Mason.)

STORACE, STEPHEN, a composer whose auspicious and brilliant career was arrested by the hand of death just as he had attained the age when most of those who are destined to distinguish themselves are but beginning to be generally known, was born in London, in 1763. His father, a Neapolitan (who added a *t* to his name on his coming to England), played the double-base at Drury Lane theatre, and married a sister of the well-known Dr. Trusler (who was famous by her manufacture of plum-cakes at Marylebone Gardens), the fruits of which union were, the subject of the present sketch, and *Anna*, the justly celebrated singer.

When about twelve years old, Stephen was placed by his father in the Conservatorio St. Onofrio, at Naples, where his progress fully justified the sanguine expectations excited in London by the budding of his genius. After completing his studies, he visited the different cities of Italy, giving various proofs of his talents, accompanied by his sister, a pupil of Sacchini, who at once was recognised as a first-rate vocalist. They then proceeded to Vienna, and reached the imperial city at the time that the Duke of York (then Bishop of Osnaburg) arrived there, who immediately honoured them by his notice, and never after withdrew his patronage. Signora Storace was speedily engaged at the emperor's Italian theatre, at a salary then thought prodigious—500*l.*; and her brother composed for the same an opera, *Gl' Equivoci*, the substance borrowed from Shakspere's *Comedy of Errors*. Portions of the music he afterwards used in his *Pirates*, and in *No Song, no Supper*.

In March, 1787, Storace and his sister returned to England, and were immediately engaged at the King's Theatre, the lady as first comic singer, and her brother as director of the music. Her success was most decided, but the intrigues of the Italian performers were too harassing for his sensitive nature, and he withdrew in disgust to Bath, devoting his time to drawing, an art for which he had much talent. In 1789 he produced his first opera at Drury Lane, *The Haunted Tower*, his sister appearing in the principal character, and this was performed no less than fifty times during the season. In 1790 he brought out *No Song, no Supper*, written by Prince Hoare. In 1791 appeared the *Siege of Belgrade*, altered by Cobb from *La Cosa Rara*, in which much of Martini's music is mixed up with Storace's. *The Pirates* was given, for the first time, in November, 1792; the performers were Kelly, Dignum, Sedgwick, Suett, John Bannister, Parsons, Mrs. Crouch, Miss De Camp (afterwards Mrs. C. Kemble), Mrs. Bland, and Signora Storace. The picturesque scenery was from designs made at Naples, by the composer himself. *The Prize* was brought out in 1793; *Lodoiska*, translated from the French by John Kemble, the music selected from the rival operas of the same name by Kreutzer and Cherubini, with additions by Storace, in 1794; and the same year also produced *The Iron Chest*, by George Colman, the younger, the incidental music by Storace. The composer's attendance on the first rehearsal of this, while under the influence of a severe attack of gout and fever, cost him his life. He returned from the theatre to his bed, whence he never rose again, dying on the 19th of March, in the thirty-third year of his age. Mr. Colman, in his preface to this play, describing the difficulties it had to encounter, thus eloquently mentions 'an event which deprived the world of a genius, and himself of a most intimate and valued friend;' and adds, 'nay, even the composer of the music—and here let me breathe a sigh to the memory of departed worth and genius, as I write the name of Storace—even he could not preside in his department. He was preparing an early flight to that abode of harmony where choirs of angels swell the note of welcome to an honest and congenial spirit.'

'At the time of his death he had a new opera, *Mahmoud*, in preparation. He had been to Bath to hear Braham, who then had not made his appearance on the London stage, and engaged him for Drury Lane. This however, by the assistance of Signora Storace and friends, was completed, and performed for the benefit of the widow and child of the composer, on the 30th of the month in which he breathed his last, and, supported by John Kemble's admirable acting, and Braham's not less admirable singing, was most successful.'

Our space will not allow us to particularise the other works of this highly-gifted amiable man; but it is only just to say of those here enumerated, that they 'abound in spirit, taste, science effectively but not pedantically displayed, strong feeling, and good sense;' and to add, that their author, in these as in other matters, evinced a vigorous and cultivated mind. 'His opinion on literary subjects was much respected by the best critics, and he was often consulted on points unconnected with his professional pursuits.' (*Harmonicon*, vol. vi.)

STORAX. [STYRAX.]

STORK, ABRAHAM. Notwithstanding the great merits of this eminent marine painter, and the high estimation in which his works have always been held, we cannot find that any author has been able to ascertain the year of his birth, or the master under whom he studied, or indeed whether he had any instructor. It is certain however that he was a most assiduous student of nature. He made accurate sketches of such objects, suited to his department of the art, as he thought might be introduced into his compositions, and hence every object in his pictures has the impress of truth.

He was equally successful in representing ships, either at sea or at anchor in port, either in calms or in storms. In his views of seaports, there is an extraordinary variety of ships, boats, and barges, with a great number of figures. This extraordinary number of figures engaged in every kind of employment incidental to a seaman's life, is in fact one of his chief characteristics. His most celebrated picture is that representing the reception of the Duke of Marlborough in the river Amstel, in which he has introduced an inconceivable number of vessels, barges, yachts, &c., superbly decorated, and crowded with figures, in a variety of costume, according to their rank and condition. Notwithstanding the extent of this composition, there is no confusion. It is painted with great spirit and highly finished. The colouring of this artist is very agreeable; his touch light, firm, and spirited; and his figures, though small, are designed with the utmost correctness. He died at Amsterdam, the place of his nativity, in 1708. (Pilkington; Fuseli; Bryan.)

STORK. [HERONS, vol. xii., p. 168.]

STORM, EDWARD, a Danish poet of some note, was the son of a clergyman at Guldbrandsdalen in Norway, where he was born, August 21, 1749, on the very same day with his literary contemporary Thomas Thaarup, whose mother is said to have dreamt that a rival to her own child would be born about the same time at Guldbrandsdalen. Storm began his literary career at the age of twenty-five, with a short heroic-comic poem in six cantos, entitled 'Brøger.' Being written in hexameters, it recommended itself at the time as a novelty, nor is it without merit in regard to that minute descriptive painting of familiar objects and circumstances which stamps the Idyls of Voss; but it will bear no comparison with Holberg's 'Peder Paars,' with which it inevitably forces a comparison. He was far more successful in his 'Fables and Tales,' which are some of the best in the language, and acquired considerable popularity. They first appeared in 1783, and in the following year a second edition of them was published. His 'Infödretten,' a poem in four cantos, of the didactic class, and one or two other productions of a similar kind, have many fine passages and poetical beauties; his reputation however now rests chiefly on his lyrical productions, which have obtained for him a place in Danish literature by the side of Thaarup. Storm was for some time manager of the theatre at Copenhagen, which post he held at the time of his death in 1794. (*Skilderie af Kiöbenhavn.*)

STORNAWAY. [ROSS AND CROMARTY.]

STOTHARD, THOMAS, an eminent painter, the son of a publican who kept the 'Black Horse' in Long-acre, was born there on the 17th of August, 1755. At a very early age he evinced a taste for drawing in copying Houbracken's heads and other engravings. At eight years old he was placed at school at Stretton, near Tadcaster, the birth-place of his father. There he remained till he was of age to be apprenticed, when he was removed to London, and bound to a pattern-drawer for brocaded silks. The last year of his apprenticeship was given up to him in consequence of the decline of the trade. During the period of his service, Mr. Stothard exercised himself diligently in the study of nature from flowers and other subjects of still-life. His first efforts in a higher branch of art were designs for the 'Town and Country Magazine,' published by Harrison, in Paternoster-row; and soon after he gained high repute by his admirable compositions for Bell's 'British Poets,' and the 'Novelist's Magazine,' works which caused him to be employed in the illustration of almost every publication which for many years issued from the press in England requiring pictorial ornament. During this period he diligently studied at the Royal Academy. The first picture that he exhibited at that institution was the subject of Ajax defending the body of Patroclus. In the year 1785 he was elected an associate of the Royal Academy, and advanced to the rank of Royal Academician in 1794. In 1810 he was appointed deputy librarian to Mr. Birch, and on the death of that gentleman, in 1812, succeeded as librarian. Among the more important of his works may be enumerated his designs for Boydell's Shakspere, his Canterbury Pilgrims, the Flitch of Bacon, and the Wellington Shield, of the last of which he made an etching. His largest performance is the fresco painting of the staircase at Burleigh, the seat of the marquis of Exeter. He also designed the ceiling of the Advocates' Library at Edinburgh. The first style of painting adopted by Mr. Stothard was that of Mortimer, whose chief characteristics he closely imitated, indeed so exactly that many of his early works are mistaken for those of that vigorous painter. In his later productions however he followed the bent of his own genius, which was essentially gentle. He is supposed to have made upwards of five thousand designs, three thousand of which have been engraved, and although, as might be expected in so large a number, there is a sameness and mannerism of style, yet truth, nature, simplicity, and grace are always apparent. In his comic subjects he was very happy, without in any one instance descending to vulgarity, whilst in his representations of female beauty his drawing is replete with purity of design and delicacy of execution. For several months before his decease, though Mr. Stothard's bodily infirmities prevented his attending to his labours as an artist, he would not relinquish his attendance at the meetings and lectures at the Royal Academy and in the library, notwithstanding extreme deafness prevented his hearing what was passing. He died on the 27th April, 1834, at his house in Newman Street, where he had resided more than forty years, and was buried in Bunhill-Fields burial-ground. He had a numerous family, the most eminent of whom was Charles Alfred, the author of 'Monumental Effigies of Great Britain.' A great number of his works have been engraved by Collins, Heath, Parker, Cromek, and Medland, and there are several engraved portraits of him, the principal of which are by Worthington, after Harlowe, and by Bond, after Jackson.

(*Annual Biography and Obituary; Gentleman's Magazine.*)

STOTHARD, CHARLES ALFRED, an antiquarian draughtsman, a son of Thomas Stothard, Royal Academician, was born in London, on the 5th of July, 1786. In 1807 he was admitted as a student of the Royal Academy, where he was soon distinguished for the chasteness and elegance of his copies from antique sculpture. In the following year he became a student in the Life Academy of the same institution, and attended at the British Institution, Pall Mall, to study from the pictures by the old masters. In 1810 he executed his first historical picture, 'The Death of Richard II. in Pomfret Castle,' in which the costume of the period was strictly adhered to, and the portrait of the king taken from his effigy in Westminster Abbey. As early as the year 1802, Mr. Stothard had been accustomed to make drawings from the monuments in the churches at Stamford and other places near Burleigh, the seat of the Marquis of Exeter. This occupation he undertook at the recommendation of his father by way of improving his knowledge of costume, as being valuable to a painter of historical subjects. This practice, together with a sight of some unpublished etchings by the Rev. P. Kerrich, of Cambridge, from monuments in the Dominican and other churches in Paris, suggested to him the idea of a work on the monumental effigies of Great Britain, of which the first number appeared in June, 1811. The work was accompanied by an advertisement, stating that the objects of the undertaking were, to give the historical painter a complete knowledge of the costume adopted in England from an early period of history to the reign of Henry VIII., to illustrate history and biography, and to assist the stage in selecting with propriety the costume for the plays of Shakspere. The success of the work was complete, and at once established the reputation of the author both as an antiquarian and an artist. In successive years he occupied himself in making excursions in search of monumental antiquities; and during the summer of 1815 he proceeded so far northward as the Picts' Wall to make drawings for Lysons' 'Magna Britannia.' In the same year he was appointed historical draughtsman to the Society of Antiquaries, and in 1816 was deputed by that body to make drawings from the tapestry at Bayeux. He left England for that purpose in September, and after having visited Paris, proceeded to Chinon, and discovered in the adjacent abbey of Fontevraud those interesting works the existence of which since the first French revolution had been matter of doubt, namely, the monuments of Henry II., his queen Eleanor of Guienne, Richard I., and Isabella of Angoulême, wife of King John. The abbey had been converted into a prison, and these effigies were placed in a cellar, where they were subject to injury from the prisoners. He made accurate drawings from these figures, and succeeded not without difficulty in discovering the painting on their surface. When visiting the abbey of L'Espan, near Mons, which he found converted into a barn, he discovered, under a quantity of wheat, the effigy of Berengaria, queen of Richard I. At Mons he also discovered the beautiful enamelled tablet of Geoffrey Plantagenet, which he considered the earliest specimen of a sepulchral brass, and of armorial bearings depicted decidedly as such. On his return to England, he suggested to government the removal of the Fontevraud effigies to Westminster Abbey, a suggestion which, though not acceded to, had the effect of causing them to be removed to a place of security.

In 1817 he made a second, and, in 1818, a third journey to Bayeux, in company with his wife, whom he had recently married. After completing his drawings of the tapestry, he made a tour in Normandy and Brittany, when he discovered at Ploermel the effigies of the dukes of Brittany, at Josselin those of Sir Oliver de Clisson and his lady, and at Vannes several others in a mutilated state. In 1819 he laid before the Society of Antiquaries the complete series of drawings from the Bayeux Tapestry, together with a paper, in which he proved that the tapestry was really a work coeval with the Norman invasion, a period assigned to it by tradition, and not, as attempted to be shown by the Abbé de la Rue, a work of the time of Henry I. The paper was printed in the nineteenth volume of the 'Archæologia;' and on the 2nd of July Mr. Stothard was elected a Fellow of the Society of Antiquaries. He soon after visited various places in Norfolk and Suffolk, for the purpose of making drawings for his monumental subjects, and whilst so engaged, he accidentally saw in a newspaper of the day an account of the discoveries then recently made on the walls of the painted chamber in the House of Lords. He immediately proceeded to London, and made a series of drawings from the paintings, of which, not long before his death, he prepared a paper, in which he investigated their age. In 1820 he travelled in the Netherlands, and, on his return, published the ninth number of his 'Monumental Effigies.' Early in 1821 he prepared a tenth number for publication, and also finished a large plate of the Royal Effigies at Fontevraud. He also began a work on seals, and left behind him about thirty unpublished drawings of the scarcest of our regal and baronial ones. Another of his undertakings was a work illustrative of the age of Queen Elizabeth. In May in the same year he left London for Devonshire, for the purpose of making drawings for the Rev. D. Lysons's account of that county. He arrived at Beer-Ferrers on Sunday the 27th, and after attending church, commenced a tracing of the portrait of Sir William Ferrers in the east window. For this purpose he stood on a ladder about ten feet from the ground, but one of the steps having broken, he was thrown with such violence against a monument, that he was killed on the spot. The most important work of Mr. Stothard is that before mentioned—the monumental effigies. The writings of Mr. Gough on the same subject are extremely valuable, but the delineating part contains so many errors, and bears so little resemblance to the style of the originals, that the labours of Mr. Stothard were appropriately devoted to the preservation of accurate as well as tasteful representations of those relics of antiquity.

(*Memoirs of the Life of C. A. Stothard*, by his widow; *Annual Biography and Obituary; Gentleman's Magazine.*)

STOUR. [Essex; Kent.]

STOURBRIDGE. [Worcestershire.]

STOURPORT. [Worcestershire.]

STOVE. [Warming and Ventilation.]

STOVE-PLANTS. [Hothouse.]

STOW, JOHN, was born in London, about the year 1525. His father Thomas Stow belonged to the company of Merchant Tailors, and both his father and his grandfather appear to have been tradesmen of credit and substance. Both had monuments in the church of St. Michael's, Cornhill, in which parish they dwelt, and which has probably also the honour of having given birth to the subject of the present article.

It is certain that Stow, in the earlier part of his life, followed some trade, and he is expressly called a tailor in at least one document of the time. It appears that in his own day he was regarded as secretly attached to the old religion, and he was more than once exposed to some danger on that account: he was certainly however no bigoted Romanist; his inclination in that direction was an antiquarian rather than a theological feeling; but he did not sympathise much with the destructive work of the Reformation; but he does not deny that both doctrine and practice were purer under the new than under the antient system; and his chief patrons and friends were some of the heads of the Established Church, to which also there can be no doubt that he always professed to belong.

He had probably been given from early life to the investigation of the national antiquities; but about his fortieth year, as we learn from himself, he left his business and applied himself altogether to this his favourite study. The different accounts he gives however vary somewhat as to the time at which he took or acted upon this resolution. Thus, in the edition of his 'Summary,' published in 1567, he describes the compilation of the work some years before as having resulted from his thinking it good at vacant times to take him to his 'old delectable studies;' in the edition of 1573, he speaks of its being then eight years, since, leaving his own peculiar gains, he had consecrated himself to the search of our famous antiquities; in the edition of 1598, his expression is, that it was 'full thirty-six years' since he had done so; and in the dedication of his 'Annals' to Archbishop Whitgift, dated 24th November, 1600, he says, 'It is now nigh forty years . . . . . since I first addressed all my cares and cogitations to the study of histories and search of antiquities.'

The accounts that have been given of Stow's publications are for the most part very defective, confused, and contradictory. Passing over for the present his 'Survey of London,' about which there is no difficulty, we will first exhibit the statements we have met with as to his other works, that have the air of having been drawn up with the greatest care:—

I. Strype, in an elaborate 'Life of Stow,' extending to 27 double-columned folio pages, prefixed to his edition of the 'Survey of London,' tells us that the first book Stow put forth of the history of England was his 'Summary of the Chronicles of England,' from the coming in of Brute unto his own time; that he set about this in 1562, on the suggestion of Lord Robert Dudley (afterwards the famous earl of Leicester); that when the work was published (it is not said in what year), it was dedicated, 'with the continuation and increase thereof from time to time,' to that nobleman; that not long after, namely, in 1573, it was enlarged and reprinted, and again dedicated to Leicester, in an address in which Stow speaks of his lordship's 'generous acceptation of many works presented unto him by others as well as himself,' and states that 'he fell upon the study and pains of examining and collecting of this English history five years before he set forth this Summary;' that before this larger Summary came forth, he had published several lesser Summaries; that 'after twenty-five years,' (it is not said from what time,) his fortune growing low, he addressed a petition to the lord mayor and aldermen, in which, as Strype quotes the words from the original, though without giving us the date of the paper, he represented that for the space of twenty-five years past (besides his 'Chronicle,' dedicated to the earl of Leicester), he had set forth various Summaries dedicated to the lord mayor, aldermen, and commoners of the city, and that he minded shortly, if God so permitted, to set forth a far larger Summary or Chronicle of the city and citizens thereof than had yet been published; that some years after he addressed another petition to the mayor and aldermen, in which, after telling them that he was of the age of threescore years and four, he goes on, as before, to speak of the Chronicles (not Chronicle) and divers Summaries he had set forth, 'for the space of almost thirty years last past;' that after his Summary, he published, in the year 1600 (now after near forty years study of history) his 'Flores Historiarum,' that is, his 'Annals of this land,' from the time of the antient Britons to his own, 'which,' however, 'were nothing else but his Summary greatly enlarged;' that 'this book was set forth again in the year 1605, by Stow himself, with enlargements, in the black letter, in a thick quarto;' that he intended to publish, or leave to posterity, a far larger volume, but died before he could accomplish that design; 'and where that laborious work of his is,' adds Strype, 'I know not; only we are told that he left the same in his study, orderly written, ready for the press; but that it came to nothing. We all know that another edition of the Annals was set forth in folio by Edmond Howes, some years after the author's death. Perhaps those historical collections are preserved in the curious repository of Sir Simonds Dewes, as some say the rest of Stow's books and papers are, many of which are now reposited in the incomparable library of manuscripts erected by the earl of Oxford and Mortimer.' Such is the substance of between four and five long wordy columns which Strype devotes to the matter. 'So that,' he concludes, 'Stow's histories, which he collected and wrote, were three, viz. his Chronicle, his Summary of Chronicles, and his Annals. The two latter he printed; but that Chronicle which he called his largest work was never printed.'

II. The account given by the writer of the article on Stow in the 'Biographia Britannica' is, that his 'Summary of the Chronicles of England' first appeared in 1565; that it was reprinted with additions and improvements in 1570, 1575, and 1590, and, with a continuation by Edmond Howes, in 1607, 1610, 1611, and 1618; that an abridgement of this 'Summary' appeared in 1566, and was reprinted with continuations in 1567, 1573, 1579, 1584, 1587, 1598, and 1604; that there was an edition of the 'Summary,' under the title of 'Annales,' published in 4to. in 1592; but that his 'Annals,' properly so called, first appeared in 1600, under the title of 'Flores Historiarum, or Annals of England;' and finally, that 'from his papers Edmond Howes published afterwards that folio volume which goes under the name of Stow's Chronicle,' first in 1615, and again in 1631, but that 'even this doth not contain all that "far longer work" which Mr. Stow mentions, and intended to have published, leaving it in his study orderly written, ready for the press.' The manuscript, it is added, 'is not in the British Museum, with others of our author's manuscripts,' which, as already stated, were among those of the earl of Oxford, now forming what is called the Harleian Collection.

III. Watt, in his 'Bibliotheca Britannica,' makes Stow to be the author of no fewer than four different printed works on English history, namely—1, his 'Summary of English Chronicles,' of which there were editions, in 8vo., in 1565, 1570, 1575, 1579, 1590, and, with continuations by Howes, in 1607, 1610, 1611, and 1618; 2, his 'Summary of Chronicles abridged,' printed in 8vo., in 1566, 1567, and 1579; 3, his 'Chronicles of England,' published, in 4to., in 1580, 1584, 1587, 1592, and, under the title of 'Flores Historiarum, or Annals of this Kingdom,' in 1600 and 1604, each time with a continuation; 4, his 'Annals, or a General Chronicle of England,' 12mo., 1573; 4to., 1592; 16mo., 1598; 4to., 1602, 1605, and, continued by Howes, folio, 1614-15, and again 1631. This account appears to be a mere jumble of blunders, made up from the 'Biographia Britannica' and probably the entries in some booksellers' catalogues.

It does not appear that there are really more than two historical works of Stow's which can properly be called different, namely, his 'Summary' and his 'Annals.'

1. The earliest edition of the 'Summary' that we have seen is a very small 18mo. volume, in black letter, entitled 'The Summarie of Englishe Chronicles (lately collected and published), abridged and continued till this present moneth of November, in the yeare of our Lord God 1567, by J. S.; imprinted at London, in Flete Street, nere to S. Dunstone's church, by Thomas Marshe.' But this is not the first edition of the book, for in a dedication to the Rt. Hon. Roger Martin, lord-mayor, the aldermen, and commoners of London, the author states that in first publishing this his small travail of English Chronicles, he thought good to dedicate it to the earl of Leicester; 'but now,' he adds, 'at the request of the printer and other of my loving friends, having brought the same into a new form, such as may both ease the purse and the carriage, and yet nothing omitted convenient to be known; and, besides all this, having example before my face to change my patron (reserving still my printer, as careful of his advantage rather than mine own), I am bold to submit it unto your honour and worship's protection,' &c. Another edition of the same size, but a greater number of pages, is entitled 'The Summarye of the Chronicles of Englande, lately collected, newly corrected, abridged, and continued unto this present year of Christ, 1573, by J. S.' It is dedicated to the Rt. Hon. Lionel Ducket, lord-mayor of London, the aldermen, and commoners; and in a curious address 'To the reader,' Stow says, 'Calling to memory, gentle reader, with what diligence, to my great cost and charges, I have travailed in my late Summary of the Chronicles, as also the dishonest dealings of somebody towards me (whereof I have long since sufficiently written and exhibited to the learned and honourable),* I persuaded with myself to have surceased from this kind of travail, wherein another hath used to reap the fruits of my labours. But now, for divers causes thereto moving me, I have once again briefly run over this small abridgment,' &c. There were probably many editions of the 'Summary' after this; but the only other published in Stow's lifetime which we have seen is one, also in 18mo., and in black letter, printed in 1598, which has his name at

* The person alluded to is his brother chronicler Richard Grafton, as appears from various indications.

full length on the title-page, and is dedicated to the Right Honourable Sir Richard Saltinstow, Knt., lord-mayor of London, the aldermen, the master, wardens, and assistants of the Merchant Tailors, and all the commons of the same city. In the dedication he speaks of the former editions of his 'Summary,' and also his 'late published Chronicle and Annals;' and again, of this his 'abridged Summary,' and other his 'larger Chronicles;' but we believe these various expressions refer only to one other work besides the 'Summary.' The next edition of the 'Summary' that we have met with is entitled 'The Abridgment of the English Chronicle, first collected by M. John Stow, and after him augmented with very memorable antiquities, and continued with matters forreine and domesticall, unto the end of the yeare 1610, by E. H., gentleman; imprinted at London for the Company of Stationers, 1611.' This volume is a 12mo., in black letter, like its predecessors; but the type is larger, and it does not seem to contain, with the exception of the Continuation, much more than what Stow had already printed, although Howes, the editor, tells us that, besides the time the present edition had cost him, he had laboured five years on a preceding edition of the work, which appears to have been published in 1607. The present volume has two dedications, one to Sir Henry Rowe, who was lord mayor in 1607, the other to Sir William Craven, who was elected to that office in 1610. Stow's 'Summary' seems to have been in constant demand for half a century after its first publication; it was the popular manual of our national history; hence the book was laid hold of by the Stationers' Company, who probably brought out new impressions of it every three or four years, continued to the date of publication like their almanacs and other similar handbooks.

2. Of the 'Annals,' a copy now before us in 4to. and black letter wants the title-page, but appears to have been printed in 1592, to which year the history is brought down. At the end, on p. 1295, the author, addressing the 'good reader,' says, 'I desire thee to take these my labours in good part, like as I have painfully to my great cost and charges, and not for hire, out of many old hidden histories, and true records of antiquity, brought the same to light, and freely, for thy great commodity, bestowed them upon thee: so shalt thou encourage me to publish a larger volume and history of this island, princes of the same, and accidents of their times, which I have gathered, and is ready to the press, when God shall permit me.' Stow's 'Annals,' although of course mentioning the same facts, with many others, as his 'Summary,' is altogether a different work from that: even this edition of 1592 must contain at least ten times as much matter as the most extended edition of the 'Summary.' Another edition, also in 4to. and black letter, a copy of which is in the British Museum, is entitled 'The Annales of England; faithfully collected out of the most authenticall authors, records, and other monuments of antiquity; lately collected, since encreased, and continued from the first habitation untill this present year 1605; by John Stow, Citizen of London. Imprinted at London for George Bishop and Thomas Adams. Cum privilegio regiæ majestatis.' This edition has the dedication to Whitgift, dated 1600, already mentioned, and also a 'Preface or Address to the Reader,' which contains the greater part of the Dedication prefixed to the various editions of the 'Summary,' and inscribed to the lord mayor for the time being. In his Dedication to Whitgift the author states that his laborious collections have now at length grown into a large volume, 'which,' he says, 'I was willing to have committed to the press, had not the printer, for some private respects, been more desirous to publish Annals at this present;' and he afterwards expresses his hope of the archbishop's favourable acceptance of the present work, as but part of that which he 'intended in a more large volume.' In his Preface also he describes this edition of his 'Annals' as an abstract of a far larger work which he has gathered, and meant to have published; and at the end of the 'Chronicle,' on p. 1438, after soliciting as usual the reader's favourable acceptance of his labours, he adds, 'So shalt thou encourage me, if God permit me life, to publish or to leave to posterity a far larger volume, long since by me laboured, at the request and commandment of the Rev. Father Matthew Parker, Archbishop of Canterbury; but, he then deceasing, my book was prevented by printing and reprinting (without warrant or well-liking) of Rayner Wolfe's Collection, and other late comers, by the name of Raphael Holingshead his Chronicles.' We doubt if, with the exception of the continuation, there be almost anything in this edition of the 'Annals' which is not in the preceding edition of 1592. Nor does there appear to be much added to the portion of which Stow is the author in either of the editions published after his death by Howes, in folio, the first in 1615, the second in 1631. Of the latter, still in black letter, the full title is 'Annales, or a General Chronicle of England; begun by John Stow, and augmented with matters forraigne and domestique, antient and moderne, unto the end of this present year 1631, by Edmund Howes.' In his dedication to the king however Howes intimates that he had been no less than thirty years employed upon the work, and that he had undertaken and performed the task in consequence of his 'oath and promise made to the late most reverend prelate Doctor Whitgift, Lord Archbishop of Canterbury.' We do not find that he professes to have made use of any manuscript materials left by Stow.

Stow's other work, his 'Survey of London,' was first published, in a quarto volume, in 1598; and again, in the same form, with considerable additions, in 1603. After the author's death, a third edition, also in 4to., was published in 1618, by A. M. (Anthony Monday), who, according to Strype, 'made several additions (as he pretended) which, or much of which (as he hinted in his Epistle), he had formerly from Stow himself, who, while he was alive, delivered him some of his best collections, and used importunate persuasions with him to correct what he found amiss, and to proceed in perfecting a work so worthy.' A fourth edition, in folio, came out in 1633, professing on the title-page to be 'now completely finished by the study and labour of A. M., H. D. (Humphry Dyson), and others.' Strype gives C. J. as one of the contributors, meaning probably the C. I. whose signature is appended to the prefatory address to the reader. The next edition was that published by Strype, in 1720, in two folio volumes, each twice the size of the folio of 1633. Strype's additions indeed made the 'Survey,' for the greater part, a new work. The writer of the article on Stow in the 'Biographia Britannica' is, as far as we know, mistaken in his assertion (Note L.), that this edition was reprinted in 1756.

Stow, in various passages of his 'Annals,' claims the continuation of Holinshed's 'Chronicle' from 1576 to 1586, as his own handiwork. He appears to have at least supplied a great part of the materials for that portion of the work; but he is merely mentioned as one of several contributors in the Epistle to the Reader prefixed to the edition of 1587 by A. F. (Abraham Fleming), who besides takes to himself the credit of having digested the whole. In his 'Annals,' under the year 1400, Stow states that the edition of Chaucer published (by Speght) in 1560, was founded upon divers written copies corrected by him. Dr. David Powel, in his 'History of Cambria,' published in 1584, acknowledges that he derived important assistance from Stow, who supplied him with a considerable number of manuscript historians, of which he had made use. Stow had possessed himself of a large collection of curious and valuable manuscripts, some originals, some transcribed by his own hand; among the latter, the six volumes of Leland's 'Collectanea' (since printed by Hearne), which he sold to Camden for a life annuity of eight pounds a year.

The hard fate of Stow in his old age is well known. The laborious and acute investigator of antiquity, and faithful and graphic depictor of the manners and customs of his own time, was left by his countrymen, when he had reached his eightieth year, literally to beg his bread. Strype has given a letter from James I., referring to letters patent under the great seal, granted 8th May, 1603, authorising Stow to collect the voluntary contributions of the people throughout the greater part of the kingdom,[*] and also the actual brief or licence by which the same privilege was renewed to him the following year. The latter paper, in consideration of Stow having, 'for the good of the common wealth, and posterity to come, employed all his industry and labour to commit to the history of chronicle all such things worthy of remembrance, as from time to time happened within this whole realm, for the space of five and forty years, until Christmas last passed (as by divers large and brief chronicles of his writing may appear), besides his great pains and charge in making his book called his "Survey of London," wherein he spent eight years in searching out of antient records concerning antiquities both for London and Southwark,' and in consequence of his having solicited the favour, and 'having left his former means, whereby he lived, only employing himself for the service and good of his country,' grants to him and his deputy, the bearer of the paper, licence for one year, to ask, gather, and receive the alms and charitable benevolence of all people in the counties and cities enumerated, and commands the authorities, at such times as Stow or his deputy shall come to any of their churches, or other places, to ask and receive the said gratuities, 'quietly to permit and suffer them so to do, without any manner let or contradiction.'

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[*] This paper has been lately more correctly given from the printed copy preserved in the Harleian Collection, by Mr. Bolton Corney, in his 'Curiosities of Literature Illustrated,' Greenwich, 1839, p. 40. The date of the letters patent referred to in the letter is there given the 8th of March (not May), 1603, which according to the modern reckoning, would be March, 1604.

Stow died of the stone colic, on the 5th of April, 1605, and was buried in his parish church of St. Andrew Undershaft, where his monument, exhibiting his effigy, erected by his widow, is still to be seen. Strype says that he left four daughters, but whether any sons he could not learn.

It is stated by Mr. Corney, in his 'Curiosities of Literature Illustrated' (p. 41, note), that a memoir of Stow was then contemplated by John Gough Nichols, Esq., F.S.A.; but, as far as we are aware, it has not yet appeared.

STOW-ON-THE-WOLD. [GLOUCESTERSHIRE.]

STOWE. [BUCKINGHAMSHIRE.]

STRABISMUS. [SQUINTING.]

STRABO (Στράβων) was born at Amasia, in Cappadocia, before the Christian æra, but the time of his birth is unknown. His mother was the granddaughter of Lagetas, who was one of the two sons of Dorylaus, a skilful commander who had been employed by Mithridates Euergetes. (Strab., p. 477, 478, ed. *Casaub.*) Moaphernes, who had been employed by Mithridates Eupator, was an uncle of Strabo's father (p. 499), or (according to the true reading of Strabo's text) the uncle of his mother by the father's side. We are not informed who his father was. It has been observed that his name, Strabo, is the cognomen of Pompeius Strabo, the father of Pompey the Great, whence it has been conjectured that on his father's side there was some connection with the family of Pompey; but what this connection may have been, is purely a matter of conjecture. Strabo, the son, received a good education. He studied at Nysa, under Aristodemus; at Amisus, in Pontus, under Tyrannio; and at Seleuceia of Cilicia, under Xenarchus, who was a Peripatetic. He also visited Alexandria in Egypt, where he had the instruction of Boethus of Sidon, also a Peripatetic; and Tarsus, then a great school of learning, where he studied under Athenodorus, who was a Stoic. It thus appears that even during the course of his education Strabo must have been a considerable traveller, and his own work shows that he must subsequently have visited many places. Syria, Palestine, and Egypt, as far as the cataracts of Syene, were within the range of his travels. In Egypt he became acquainted with Aelius Gallus, who commanded a Roman expedition into Arabia, in the time of Augustus, and he visited in his company the vocal statue of Memnon at Thebes (p. 816). He also travelled in Crete, Northern Greece, and probably some parts of the Peloponnesus: he tells us that he saw Cleonæ from the Acrocorinthus; but his remarks about Mycenae seem to show that he did not visit that part of the Peloponnesus at least (p. 377). He was personally acquainted with Italy, and he tells us that Elba, Corsica, and Sardinia are visible from the heights of Populonium (p. 223), from which it is a probable conclusion that he had seen those places from the Italian coast. It is also probable that he spent some time at Rome, where he would find materials for his geographical work.

There are various passages in his 'Geography' which indicate about what time they were written. In his sixth book (p. 288) he speaks of Germanicus and Drusus as still living; and in the thirteenth (p. 627) he speaks of Tiberius as the reigning emperor, and as having repaired the mischief done to Sardis by the great earthquake, A.D. 17. (Tacit., *Ann.*, ii., 47.) There are numerous other passages in this work in which he speaks of contemporary historical events, but perhaps none which can with certainty be referred to a later date than the great earthquake. In a passage of the fourth book (p. 206) he says that it was then the thirty-third year since the Norici had been reduced to obedience by Tiberius and Drusus, which took place about B.C. 15; according to which Strabo was writing his fourth book in the year A.D. 18.

Strabo's 'Geography' is mentioned by few antient writers: he is cited by Marcianus of Heraclea, Athenaeus, and Harpocration (Λευκάς, Αἴχαιον); but Pliny, who might frequently have cited him in the geographical part of his work, never mentions his name; nor does it occur in Pausanias. He is mentioned by Josephus and by Plutarch, not as a geographer, but as an historical writer.

Very different opinions have been given of Strabo's geographical work. That he was deficient in mathematical knowledge is evident, and his accuracy in many cases is at least doubtful. To form a proper judgment of him, we must ascertain what he proposed his work to be, which may be collected from various passages. His work was to be practical, that is, adapted to the use of persons of a certain amount of education, and particularly personages engaged in administration. He says that a 'man who reads his work ought not to be so ignorant as never to have seen a sphere or the circles marked on it;' and he goes on to say, that a man who is ignorant of these and other like matters, which he has enumerated, and which belong to the elementary parts of knowledge, cannot understand his work. 'His work,' he says, 'is, in a word, for universal use, political and profitable to all, just as history is' (p. 12, 13); and 'as he had written an historical work (ὑπομνήματα ἱστορικά), useful, as he supposed, both for ethical and political philosophy, he determined to add to it a geographical work, which was of a like kind, and addressed to the same class of men, and chiefly to those in power; and, as in the former work, only what related to distinguished men and to distinguished lives was recorded, and things trivial and mean were omitted; so in his geographical work he should dwell only on things which were of note and of importance, and things in which there was something useful for example, and worth recording, and agreeable.' From this it appears that Strabo neither designed a mathematical treatise, nor an enumeration of astronomical positions, nor a treatise on the physical character of countries. His design was to write something which should give an educated man a general notion of the earth's surface, its political divisions, the chief peculiarities of each, and so much of its history as would enliven and explain his geographical description.

Accordingly Strabo produced a work which contains a great mass of useful information, but is not strictly a geographical work, and though systematic according to his notion of system, it does not deserve the name of a system of geography. Though he resided a long time at Alexandria, he derived little advantage from the labours of the geographers and astronomers of that school for the correction of positions and fixing the bearings of places with respect to one another, or for determining the general form of the regions which he describes. His taste indeed was for other studies than those which belong to the geographer.

The first two books of Strabo contain his general geography. In the first book he treats of the advantages of the study of geography, and discusses the geographical knowledge of Homer, which he rates highly. He then mentions the old geographers, as Hecataeus, Democritus, Eudoxus of Cnidos, and Ephorus of Cumae; and the more recent geographers, Eratosthenes, Hipparchus, Polybius, and Posidonius. He passes a critical judgment on the first two books of Eratosthenes, which leads him to various discussions, and to observations on the changes which the earth's surface has undergone. In the second book he extends his criticism to the third book of Eratosthenes, and to the three books of Hipparchus. He also discusses the merits of Posidonius and Polybius. Strabo has thus preserved many passages of the Greek geographical writers; but the author's judgment is often prejudiced and inaccurate. He severely criticises Hipparchus, and points out many of his errors, particularly as to the latitude of places. The latter part of the second book treats of the preliminary knowledge which the geographer requires. Strabo was acquainted with the fact of the spherical figure of the earth; and he determines the boundaries of the habitable part of it. The world is divided by the equinoctial circle into the northern and the southern hemispheres. The habitable portion is bounded on the north by a parallel of latitude which passes through Ierne (Ireland), and on the south by the parallel which passes through the Cinnamon country. The parts to the north of the first parallel are not habitable on account of cold, and those to the south of the second parallel are uninhabited owing to excessive heat. He follows Eratosthenes in his measurements, and compares them with those of Hipparchus and Polybius. The habitable world (οἰκουμένη) is surrounded by water, and the Caspian Sea is a gulf of the Northern Ocean, a mistake which he might have corrected by the aid of Herodotus. The length of the habitable world is about double its breadth.

The third book contains the description of the Spanish Peninsula and the Balearic Islands; his principal authorities are Artemidorus, Posidonius, and Polybius. The fourth treats of Gallia, Britain, the Alps, and the tribes which inhabited the Alps, and the valleys belonging to that mountain-system: in general he follows the description of Cæsar, and he also used Artemidorus and Polybius, and probably the work of Aristotle on Political Constitutions, for his account of Massilia (Marseille): his description of Britain is exceedingly meagre; in treating of Thule he gives some account of Pytheas, but rejects his authority. The fifth and sixth books contain the description of Italy, Sicily, and the adjoining islands: he had probably seen a large part of these countries himself; yet he makes great use of Polybius, Posidonius, Ephorus, Eratosthenes, and many other writers: in treating of Corsica and Sardinia, he quotes the 'Chorographus,' without saying who is intended by the term: it has been suggested that the word has reference not to any particular individual, but to the results of the commission under the direction of Agrippa which made a survey of the empire: it has also been conjectured that Agrippa himself is meant by the Chorographus. In the seventh book Strabo treats of the countries on the Danube, and the parts included between the Danube, the Adriatic, and the Black Sea: the parts which treat of Macedonia and Thrace are lost, and in their place we have a scanty epitome. Strabo's authorities for this part of his work seem to have been very defective. The eighth, ninth, and tenth books contain his description of Greece and the Islands, in which he makes great use of Homer: Ephorus, Polybius, Posidonius, Hipparchus, Artemidorus, and Timosthenes, are also his authorities, in addition to many other writers. With the eleventh book Strabo begins his description of Asia, as to the extent and dimensions of which his notions are very inaccurate. He divides it into two main portions, determined by the range of Taurus. The western portion comprises the countries between the Tanais, Palus Maeotis, the Black and the Caspian Seas; the countries east of the Caspian, bordering on India; and Media, Armenia, and Cappadocia, to the Halys: these are described in the eleventh book. In the twelfth and following books he treats of Asia west of the Halys and the adjoining islands. His authorities for the eleventh book are, among others, Artemidorus, the historians of the Mithridatic wars; Metrodorus of Scepsis; and Patrocles, the admiral of Seleucus and Antiochus, for the account of the Oxus and Jaxartes. The twelfth book contains the description of Cappadocia, Pontus, Paphlagonia, Bithynia, Galatia, Lycaonia, Isauria, Pisidia, Mysia, and Phrygia, a great part of which is founded on his own personal knowledge. The thirteenth and fourteenth books conclude the description of Asia west of the Halys; and comprehend also the islands of Lesbos, Samos, Chios, Rhodes, and Cyprus. His description of the Troad, in the thirteenth book, is mainly founded on Homer; but he also uses Eudoxus, Charon, Scylax, and Ephorus. A great number of other writers were also used for the description of the several countries and places included in these two books. In the fifteenth book he passes to the description of the other portion of Asia, which is determined by the Taurus; and he first treats of the southern parts of the continent. In his description of India he chiefly follows Eratosthenes and the historians of Alexander, particularly Patrocles and Aristobulus. His notion of the form of India was entirely false, and he knew nothing of the great southern peninsula; but he speaks at some length of the customs and institutions of the people. After India he describes the Persian empire, comprehending under the general name of Ariana (Iran) the country bounded on the east by the Indus, and on the west by a line drawn from the Caspian Gates to the mouth of the Persian Gulf. Nearchus and Onesicritus are his authorities for the description of the coast: for other parts he uses Aristobulus, Eratosthenes, and Polyclitus. The sixteenth book contains the remainder of Asia: his authorities are generally the same as for the southern and eastern parts of Asia, with the addition of his own observations in Syria. The seventeenth book contains the description of Libya (Africa), and concludes with a brief sketch of the division of the Roman empire into provinces: Eratosthenes is his principal authority, but he also uses Agatharchides and Herodotus.

The text of Strabo is often corrupt, and there are many defective passages. There is extant an epitome, or Chrestomathia, of the whole work, which is referred to the tenth century A.D., which is sometimes useful in correcting the text. There are also extant various other extracts from the geography of Strabo. The historical work (ὑπομνήματα ἱστορικά) of Strabo, which he mentions in a passage already quoted, is lost: it was a continuation of Polybius, and extended at least to the death of Julius Cæsar.

Strabo first appeared in a Latin version in 1472. The first edition of the Greek text was printed by Aldus, at Venice, in 1516, fol. The edition of Isaac Casaubon, Geneva, 1587, folio, contains the translation of Xylander: this edition was reprinted after Casaubon's death, at Paris, 1620, folio, with his last corrections. Siebenkees undertook a new critical edition, for which purpose he collated several MSS.; he only lived to complete the first volume, which contains the first six books: this edition was finished by Tzschucke, and was published at Leipzig, 1796-1811, 6 vols. 8vo. Probably the best text of Strabo is by Coray, Paris, 1815-1819, 4 vols. 8vo., which has an index, but no translation. The 'Chrestomathia' is printed in Hudson's Minor Geographers, and in the editions of Almeloveen, and of Falconer. There is a French translation of Strabo in 5 vols. 8vo. (1805-1819), by La Porte du Theil, Coray, and Gossellin; the sixteenth and seventeenth books are by Letronne. Strabo was translated into Italian by Ambrosoli, Milan, 1828, 4 vols. 8vo. and 4to. The valuable German translation of Groskurd, in 3 vols. 8vo. (1831-1834), is founded on a corrected text, and is accompanied with critical notes and explanations.

A full account of the editions, translations, and various works in illustration of Strabo is contained in Hoffmann's 'Lexicon Bibliographicum.'

STRADA, or STRADA'NUS, JOHN, was born in the year 1536, of an illustrious family, at Bruges, where he studied the art of painting. He went while very young to Italy, and soon acquired so much proficiency and reputation, as to obtain employment at Florence in the palace of the duke, Cosmo I., and in those of several of the nobility. From Florence he went to Rome, where he devoted himself with the greatest ardour to the study of the antique and the works of Raphael and Michael Angelo. By this means he so much improved his taste, knowledge of composition, and correctness of design, that he was ranked among the most eminent artists of his time; and before he left Rome he was employed in the pope's palace, in conjunction with Daniel da Volterra and Francesco Salviati.

At Naples and other cities of Italy to which he was invited, he executed many considerable works in fresco and in oil; but he fixed his residence in Florence, in which city there are still some fine performances of his; the most celebrated is the Crucifixion, which is a grand composition, with numerous figures larger than life, and near the cross are the Virgin, St. John, and Mary Magdalen.

Though he chiefly painted subjects from sacred history, he was fond of painting animals, hunting parties, and sometimes battles, all of which he executed in a noble style, and with great spirit. It is not possible to reconcile the statements of authors respecting the birth and death of Strada: Sandrart and others say he was born in 1536, and died in 1604, aged 68. This is probably correct. De Piles and Resta say he was born in 1527, and died in 1604, aged 77. The authors of the 'Abrégé de la Vie des Peintres' say that he died at the age of 82; yet they fix his birth in 1536, and his death in 1605, which would make him only 69 years of age.

(Pilkington; Fuseli; Bryan.)

STRADA, FAMIA'NO, born at Rome in 1572, entered the order of the Jesuits, and became professor of rhetoric in the Gregorian college at Rome, where he spent the greater part of his life, and where he died in 1649. He wrote 'Prolusiones,' or Latin essays, upon rhetoric and literature, which were admired at the time. In these essays the author comments upon several of the Roman classical writers, and he introduces his own imitations of their style. He speaks very unfavourably of Tacitus, whom he accuses of malignity, impiety, and want of veracity, though he praises his style. But the work for which Strada is remembered, is entitled 'De Bello Belgico ab Excessu Caroli V. ad Annum 1590, being a history of the revolt and war of the Netherlands against Spain, which he wrote in Latin, about the same time as his contemporary Bentivoglio wrote the history of the same war in Italian. Strada brought his narrative down to the year 1590, and the work was continued by two other Jesuits, fathers Dondini and Galluzzi, who wrote the sequel as far as the year 1609: their compositions however are very inferior to Strada's in style. It appears that Strada undertook his work at the desire of the Farnese family, one of whose members, Alessandro Farnese, duke of Parma, became illustrious in the wars of Flanders, as commander of the Spanish armies. The history of Strada is not without merit, though it can hardly be expected to be quite impartial. His rival historian Cardinal Bentivoglio was also biased in favour of Catholic Spain against the Protestant Netherlanders, yet he wrote with considerable freedom, and the work of the Cardinal is generally preferred to that of the Jesuit, but this preference may be partly attributed to the circumstance that Strada's work is written in a dead language.

STRADELLA, ALESSANDRO, a composer much celebrated in musical history, was born at Naples, about the middle of the seventeenth century. His works, most of which are to be found in the British Museum and in the library of Christchurch, Oxford, are chiefly of a miscellaneous kind, consisting of airs, duets, cantatas, madrigals, &c. One oratorio and one opera comprise the whole of his dramatic compositions that Dr. Burney's diligent search enabled him to discover. The former—*San Giovanni Battista*—is highly extolled by the musical historian, who has, in his fourth volume, given a duet from it, as a specimen of the whole; but in the *Fitzwilliam Music* is a quintet from the same of a far superior order. It seems to be agreed that the study of his works contributed largely in forming the taste of many great composers,—of our own Purcell, of Clari, Steffani, A. Scarlatti, and Pergolesi, and this alone is sufficient to bestow on him a lasting reputation.

The personal history of Stradella is so interesting, so romantic when fully narrated, that a brief sketch of it will, we trust, not be thought obtrusive here. It has recently been represented in a dramatic form on the French stage.

He was not handsome, but remarkable for the symmetry of his form, for his wit and polished manners, and these, added to his exquisite style of singing, made his company desirable in the highest circles. At Venice he was engaged by a nobleman to instruct a young lady of high birth, named Hortensia, who, notwithstanding her family rank, submitted to live with the noble Venetian in criminal intimacy. After a time the fascinating qualities and accomplishments of her teacher raised a new flame in her bosom. The passion was mutual, the lovers were married, and fled to Rome, whither they were pursued by two assassins, engaged by the Venetian to punish the inconstancy of his mistress and avenge the injury his pride had sustained. These found the happy couple in the church of San Giovanni Laterano, and they determined to carry their design into execution as the fugitives retired, in a dark evening, at the conclusion of the sacred service. But while waiting the favourable moment, they heard the musician sing, and were so overcome by the charms of his voice and strains, that, confessing to him what had been their object, they declared their determination to abandon it. The intended victims immediately retired to Turin. There they were pursued by two other hired murderers, and though taken under the protection of the Duchess of Savoy, and lodged in her palace, Stradella received three stabs in his breast, and the assassins found a sanctuary in the hotel of the French ambassador, who refused to surrender them. The wounds, though most dangerous, did not prove mortal, and as a year elapsed after the recovery of the sufferer, and no fresh attempt on his life was made, he considered himself secure for the future. But the resentful Venetian only awaited a more certain opportunity for gratifying his unquenchable revenge. Stradella accepted an engagement at Genoa, to compose an opera, whither he went with his wife. Their enemy, informed of this movement, followed them by the agents of his unrelenting revenge, who, rushing into their chamber, stabbed both of them to the heart. This event Walther, in his Lexicon, fixes in the year 1670: but Dr. Burney shows that it must have occurred some years later.

STRAFFORD, THOMAS WENTWORTH, afterwards **EARL OF**, was born in Chancery-lane, London, on the 13th of April, 1593. He was the eldest son of Sir William Wentworth, of Wentworth Woodhouse, in the county of York, where his family are said to have been settled since the time of the Conquest. His family was one of the most opulent as well as antient of the class known in England under the name of gentry, and had frequently intermarried with the higher aristocracy. The estate which Wentworth inherited from his father was worth 6000*l.* a year, a very large sum at that time, probably equal to more than three times the amount in the present day. (Strafford's *Letters and Dispatches*, vol. ii., pp. 105, 106, folio edition, London 1739, and Dr. Knowler's *Dedication* prefixed to them.) He received part of his education at St. John's College, Cambridge. In 1611 he married the Lady Margaret Clifford, the eldest daughter of Francis, earl of Cumberland. The accuracy of this date, as that of his first marriage, given by his friend Sir George Radcliffe, appears to be established by a letter dated 11th January, 1611, from Sir Peter Frechevile to his father Sir William Wentworth; although the compilers of his Life in the 'Biographia Britannica' have chosen, in direct opposition to the statement of Radcliffe, the old and intimate friend of Wentworth, to place his marriage after his return from the Continent, towards the end of 1612 (by the old mode of reckoning, according to which the legal year began on the 25th of March, but by the new about the beginning of 1613), instead of in 1611, before his going abroad.

The same letter also shows that he was from his early years of studious and regular habits. He appears to have taken almost as much pains as Cicero recommends for the education of an orator. Sir George Radcliffe informs us that the excellence possessed by him in speaking and writing he attained 'first by reading well-penned authors in French, English, and Latin, and observing their expressions; secondly, by hearing of eloquent men, which he did diligently in their sermons and public speeches; thirdly, by a very great care and industry which he used when he was young in penning his epistles and missives of what subject soever; but above all, he had a natural quickness of wit and fancy, with great clearness of judgment, and much practice, without which his other helps of reading and hearing would not have brought him to that great perfection to which he attained. I learned one rule of him,' adds Sir George, 'which I think worthy to be remembered; when he met with a well-penned oration or tract upon any subject or question, he framed a speech upon the same argument, inventing and disposing what seemed fit to be said upon that subject before he read the book; then reading the book, compare his own with the author, and note his own defects, and the author's art and fullness; whereby he observed all that was in the author more strictly, and might better judge of his own wants to supply them.' (Strafford's *Let. and Disp.* vol. ii., p. 435.)

In some of Strafford's earlier letters, particularly those to Sir George Calvert, principal secretary of state in the time of James I., there is, though no marks of profound scholarship, a somewhat pedantic display of trite Latin quotations. From these however, though we may judge so far of the extent of Strafford's scholarship, it would be incorrect to estimate his abilities, for they are mostly confined to his early letters, and, among them, to his letters to courtiers.

Upon his early habits still further light is thrown by some advice which he gives to his nephew Sir William Savile, in a letter dated 'Dublin Castle, 29th September, 1633.' Advising him to 'distrust himself and fortify his youth by the counsel of his more aged friends before he undertakes anything of consequence;' he adds, 'it was the course that I governed myself by after my father's death, with great advantage to myself and affairs, and yet my breeding abroad had shown me more of the world than yours hath done; and I had natural reason like other men, only I confess I did in all things distrust myself, wherein you shall do, as I said, extremely well if you do so too.' (*Let. and Disp.*, vol. i., p. 169.)

The letter from which the above quotation is made contains so much good advice, so well and so weightily expressed, that it may bear a comparison with Burleigh's celebrated 'Advice to his Son:' the resemblance in some passages is striking. With respect to the greater part of this advice, particularly what regards economy and regularity in the management of his private affairs, temperance in drinking, and abstinence from gaming, it was the rule by which Wentworth shaped his own conduct, and to which, according to Radcliffe, he strictly adhered. The part of the advice to which he himself least adhered was that recommending calmness and courtesy of demeanour; for even his most intimate friend Sir George Radcliffe admits that 'he was naturally exceeding cholerick,' and the actions of his life show that in that particular he was never able thoroughly to subdue nature.

In the same year in which he was married, Wentworth went into France, having previously been knighted. He was accompanied by the Rev. Charles Greenwood, fellow of University College, Oxford, as his 'governor,' or travelling tutor, for whom he entertained the greatest respect and regard to the end of his life. In February, 161$\frac{3}{4}$, he returned to England. He was returned and sat for the county of York in the parliament which began April 5th, 1614. Radcliffe's account as to this date, though rejected by the writers in the 'Biographia Britannica,' and Mr. MacDiarmid, is confirmed by Browne Willis's 'Notitia Parliamentaria,' vol. iii., p. 169: 'Co. Ebor. Jo. Saville, kt., Thomas Wentworth, kt. and bart., anno 12 Jac. I., began April 5, 1614, and continued till June 7, and was then dissolved.' During this short parliament, which continued only two months, Wentworth does not appear to have spoken. Mr. Forster, his latest biographer, says that he has examined the Journals, and finds no trace of Wentworth's speaking on either side in the great struggle that was then going on. (*Life of Strafford*, in the *Cabinet Cyclopædia; Lives of Eminent British Statesmen*, vol. ii., p. 197.)

In 1615 Wentworth was appointed to the office of custos rotulorum for the west riding of the county of York, in the room of Sir John Savile; an office of which Savile attempted to deprive him about two years after, through the influence of the favourite, the duke of Buckingham, but without success, though he succeeded afterwards. The result was a feud between Wentworth and the Saviles, the father and son, Sir John Savile the younger, afterwards Lord Savile.

In 1621 Wentworth was again returned to parliament for the county of York; and this time he brought in Sir George Calvert, one of the secretaries of state, along with him. In Michaelmas term, he removed his family from Wentworth Woodhouse to London. He took up his abode in Austin Friars, where in 1622 he had a 'great fever.' When he began to recover, he removed, about July, to Bow, where shortly after his wife the lady Margaret died. On the 24th of February, 162$\frac{4}{5}$, he married the lady Arabella Hollis, a younger daughter of the earl of Clare, a lady, observes Radcliffe, 'exceeding comely and beautiful, and yet much more lovely in the endowments of her mind.'

Hitherto though Wentworth had not taken a very prominent part in the proceedings of parliament, still he was considered to have acted with the party that opposed the court, as appears from the fact of his being, on the eve of the calling together of a new parliament, among the number of those whom Buckingham attempted to disable from serving, by having them pricked sheriffs of their respective counties. In November, 1625, Wentworth was made sheriff of Yorkshire. A passage from one of his letters at this time shows that he was never inclined to go the lengths that some others did in resistance to the royal prerogative. (Strafford's *Letters and Disp.*, vol. i., p. 33.)

In May, 1627, he was committed a prisoner to the Marshalsea by the lords of the council for refusing the royal loan; and about six weeks after, his imprisonment was exchanged for confinement at the town of Dartford in Kent, from which place he was not to go above two miles. About Christmas he was released; and shortly after the third parliament of Charles began, in which Wentworth served as knight for Yorkshire. Wentworth had now resolved to make the court party more aware of the extent of his talents than they yet appeared to be. On the discussion of the general question of grievances, he spoke with an ability and spirit which proved to them that he might turn out such an enemy, that he was worth having as a friend. It has been usual to speak of Wentworth as an apostate, but he never appears to have been at heart on the popular, or rather, the parliamentary side. His whole conduct both before and after he became the king's minister shows that he considered the general movement in modern Europe to be not towards democracy, but towards the establishment of absolute monarchy. The several springs of Wentworth's conduct are now fully laid bare in a manner that they could hardly be to his contemporaries, and in a manner that few men's have ever been to after-ages, by the publication of the two large folio volumes of his 'Letters and Dispatches,' one of the most valuable collections of papers, both in a political and historical point of view, ever made public. In that collection there are two letters (Strafford, *Let. and Disp.* vol. i., pp. 34, 35), to Sir Richard Weston, chancellor of the exchequer, containing very unequivocal overtures, the non-acceptance of which at the time would seem to have produced the indignant outbreak of patriotic eloquence above alluded to.

In June, 1628, the parliament ended. In July Sir Thomas Wentworth, having been reconciled to Buckingham, was created Baron Wentworth. The death of Buckingham soon after removed the only obstacle to higher honours. In Michaelmas term he was made Viscount Wentworth, Lord President of the North, and a privy counsellor.

The establishment of the Council of the North originated in the frequent northern rebellions which followed Henry VIII.'s suppression of the lesser monasteries, and extended over the counties of York, Northumberland, Cumberland, Westmoreland, and Durham. The commission, though apparently only one of oyer and terminer, contained a clause authorising the commissioners to hear all causes real and personal, when either of the parties was poor, and decide according to sound discretion. This clause was declared by all the judges to be illegal. James issued a new commission, by which the commissioners were not ordered to inquire 'per sacramentum bonorum et legalium hominum,' or to be controlled by forms of law, but were merely referred to certain secret instructions which were sent down to the council. Against this however the judges had the courage to protest, and to issue prohibitions on demand to the president and council; and the instructions were ordered to be enrolled, that the people might have some chance of knowing them.

Dr. Knowler, the editor of the 'Strafford Papers,' in the adulatory dedication of them to his patron, the grandson of the earl of Strafford, gravely observes that 'Sir Thomas Wentworth, who was a true friend to episcopal government in the church, and to a limited monarchy in the state, could have no reason, when the Petition of Right was granted, to refuse to bear his share of toil and pains in the service of the public, or to withstand the offer of those honours his majesty was graciously pleased to make him, especially when it gave him an opportunity of setting an example of a wise and just and steady administration.' Wentworth's acceptance of this office of president of this council was a flagrant violation of the fundamental principle of the Petition of Right. His career in the office too did not belie the promise of its acceptance. One of his first acts was to declare that he would lay any man by the heels who ventured to sue out a prohibition in the courts at Westminster. (Rushworth, vol. ii., p. 159.) And one of the judges (Vernon), who had the courage to resist these encroachments on the ancient laws of the land, Wentworth tried hard to have removed from his office. (Strafford, *Let. and Disp.*, vol. i., pp. 129, 130.) Indeed, like his friend and coadjutor Laud, Wentworth never let slip an opportunity of expressing his bitter dislike of the interference of the judges and common lawyers with his scheme of governing, not by the laws of England, but according to 'sound discretion.'

In January, 1631, Wentworth was made lord deputy of Ireland. The principle on which he set about governing there was in substance the same as that of his government in the presidency of York. 'These lawyers,' he writes to the lord marshal, 'would monopolise to themselves all judicature, as if no honour or justice could be rightly administered but under one of their bencher's gowns.' (Strafford, *Let. and Disp.*, vol. i., p. 223.) And he adds, a line or two after, 'Therefore if your lordship's judgment approve of my reasons, I beseech you assist me therein, or rather the king's service, and I shall be answerable with my head.'

It is remarkable how frequently he alludes to this last as the test of the soundness of the policy of his measures. They were in the end so tested, and being found wanting, he was taken at his word; he was called upon to pay, and paid the forfeit. One of the principal means by which Wentworth sought to squeeze money out of the people of Ireland was by holding a parliament.

Wentworth's political economy was not very sound, yet he saw far enough to discover that to enrich the king, the way was, to begin by enriching the people. 'For this is a ground,' he says, 'I take with me, that to serve your majesty completely well in Ireland we must not only endeavour to enrich *them*, but make sure still to hold them dependent upon the crown, and not able to subsist without us. (Strafford's *Let. and Disp.*, vol. i., p. 93.) But the plan he proposed does not seem certainly very well adapted for enriching the people. 'Which will be effected,' he proceeds, 'by wholly laying aside the manufacture of wools into cloth or stuff there, and by furnishing them from this kingdom; and then making your majesty sole merchant of all salts on that side; for thus shall they not only have their clothing, the improvement of all their native commodities (which are principally preserved by salt), and their victual itself from hence (strong ties and enforcements upon their allegiance and obedience to your majesty); but a means found, I trust, much to advance your majesty's revenue upon salt, and to improve your customs. The wools there grown, and the cloths there worn, thus paying double duties to your crown in both kingdoms; and the salt outward here, both inward and outward there.' He thus sums up the advantages of the measures proposed:—'Holding them from the manufacture of wool (which, unless otherwise directed, I shall by all means discourage), and then enforcing them to fetch their clothing from thence, and to take their salt from the king (being that which preserves and gives value to all their native staple commodities), how can they depart from us without nakedness and beggary? Which in itself is so weighty a consideration, as a small profit should not bear it down.' (*Let. and Disp.*, vol i., p. 193.)

In one particular he did benefit Ireland. At his own risk he imported and sowed a quantity of superior flax-seed. The first crop having succeeded, he next year laid out 1000*l.* on the undertaking, set up a number of looms, procuring workmen from France and Flanders, and sent a ship to Spain freighted with linen at his own risk. Thus began the linen manufacture of Ireland, which in some measure verified Wentworth's prediction that it would greatly benefit that country. (Strafford, *Let. and Disp.*, vol. i., p. 473.)

Wentworth appears to have been of very infirm health, which, taken with the general course of his education and his position in society, will in part account for the acerbity and irritability of temper, and the impatience of any opposition to his will, which throughout his career involved him in so many personal quarrels. The number of powerful personal enemies which Wentworth thus arrayed against himself appears to us to be a proof of the want of real political talent of a high order. A really wise politician, such as Oliver Cromwell for example, does not raise up such a host of powerful personal enemies. Laud gives a good hint about this in one of his letters. 'And yet, my lord,' he says, 'if you could find a way to do all these great services and decline these storms, I think it would be excellent well thought on.' (Strafford, *Let. and Disp.*, vol. i., p. 479.)

In 1639 Charles raised Wentworth to the dignity of an earl, which he had in vain solicited formerly. He was created earl of Strafford and baron of Raby, and invested with the title of lord-lieutenant, or lieutenant-general of Ireland—a title which had not been borne since the time of Essex.

In 1640 the earl of Northumberland being attacked by severe illness, the king appointed Strafford in his place, to the command of the army against the Scots. He does not appear to have performed anything here to make good either his own high pretensions or the character for valour given him by some writers. Of his impeachment at the opening of the Long Parliament, Clarendon gives the following account:—'It was about three of the clock in the afternoon, when the Earl of Strafford (being infirm and not well disposed in health, and so not having stirred out of his house that morning), hearing that both houses still sate, thought fit to go thither. It was believed by some (upon what ground was never clear enough) that he made that haste there to accuse the Lord Say, and some others, of having induced the Scots to invade the kingdom; but he was scarce entered into the house of peers, when the message from the House of Commons was called in, and when Mr. Pym at the bar, and in the name of all the Commons of England, impeached Thomas, earl of Strafford (with the addition of all his other titles), of high treason.'

In the article PYM we have shortly adverted to the trial of the Earl of Strafford for high treason. To the remarks made there we may add that, though it was not to be supposed or expected that the Statute of Treasons of Edward III. (25 Edward III., st. 5, c. 2), being made to protect the king, not the subject, would provide specially for the punishment of such attempts as those of Strafford; it does nevertheless appear that Strafford was punishable for having become the instrument for administering the government of the Council of the North, carried on in direct violation of the Petition of Right, which during the time of Strafford's being president of that council was the law of the land. However the Commons changed their course and introduced a bill of attainder, which was passed on the 21st of April, in the Commons, and soon after in the Lords. The king with tears in his eyes and other demonstrations of weakness characteristic of him signed a commission for giving the royal assent to the bill, and then made some feeble and unavailing efforts to save the life of his obnoxious minister. 'The resort to the bill of attainder,' observes Mr. Forster (*Life of Strafford*, p. 404), 'arose from no failure of the impeachment, as has been frequently alleged, but because in the course of that impeachment circumstances arose which suggested to the great leader of the popular cause the greater safety of fixing this case upon wider grounds. Without stretching to the slightest extent the boundaries of any statute, they thought it better at once to bring Strafford's treason to the condemnation of the sources of all law.'

Strafford was beheaded on Tower Hill on the 12th of May, 1641. In his walk from the Tower to the place of execution his step and manner are described by Rushworth as being those of 'a general marching at the head of an army, to breathe victory, rather than those of a condemned man, to undergo the sentence of death.' Within a few weeks after his death, the parliament mitigated the penalties of their sentence to his children. In the succeeding reign, the attainder was reversed, and his son was restored to the earldom.

STRAIGHT, STRAIGHT LINE, PLANE. There is no occasion to define a straight line as matter of information; so that we have here only to consider the definitions which have been given and their relative merits, taking them as attempts to produce a mathematical description of straightness.

There are three attempts at definition of a straight line; by Plato (or one of his immediate school), by Archimedes (as is said), and by Euclid. The moderns have repeated these various forms, but have not, to our knowledge, ever succeeded in producing a definition entirely new which did not contain the defects of one or other of the three just mentioned.

The Platonic definition, according to Proclus, is as follows:—'A straight line is that of which the middle parts hide (ἐπιπροσθεῖ) the extremities;' a physical definition, owing its truth to the circumstance of the rays of light proceeding in straight lines, and involving the notion of straightness as a part of its own explanation. This definition has been little if at all used by geometrical writers.

Archimedes defines a straight line as the shortest distance between two points, or at least this definition is often attributed to him, but not correctly. It is one of his postulates in the book on the Sphere and Cylinder, that of all lines drawn between two points the least is that which is straight: but he is too well judging a geometer to assign such a property as a definition. The Arabs substituted the shortest-distance description for the definition in Euclid, and accordingly our earlier editions of Euclid do the same; nor was this flaw removed until 1505, when Zamberti translated Euclid from the Greek. It has been often supposed that this shortest-distance definition is good as a definition, though not proper for a pupil in geometry, an opinion from which we must dissent: for how is it known to those who are yet to learn what a straight line is, whether there can be a shortest distance? That is, how is it known that there are not many distances between two points, on different lines, which are severally shorter than any other distance, and equal to one another? The answer is, no doubt, that the mind has a perfect conception of the impossibility of such a thing; and the rejoinder is—yes, because the mind has a perfect conception of a straight line: that is to say, the definition is only saved from causing confusion by its own uselessness. Again, the supposition that measurement of distances on all manner of curves is to be a preliminary to one of the definitions of a science which treats no curve but the circle, and does not succeed, by reasons of certain limitations of process, in measuring distance even on that one, is an incongruity.

Euclid defines a straight line to be that which lies evenly (ἐξ ἴσου κεῖται) between its extreme points. The words ἐξ ἴσου have been translated *ex æquo* by Barocius, *ex æquali* by Zamberti, *equally* by Billingsley (taking some of the oldest translations as specimens). The definition wants precision, but the meaning is obvious. Two points being given, the surrounding space may be viewed in all manner of relations to those two points, as above or below, right or left, &c. The straight line which joins the two points is that which is not more related to one of these notions than to any other; and throughout its whole length takes an even course, without a possibility of being claimed, so to speak, by any one of the surrounding parts of space rather than by any other.

In making such a definition Euclid is well aware that he cannot rest any conclusion upon it, and that in the postulate that two straight lines cannot inclose a space lies all his power of producing a theorem. Why then, it may be asked, does he introduce a definition at all? Why not give the reader to understand that a straight line is a notion universally understood and incapable of definition in simpler terms? To these questions the answer may be twofold. In the first place, he is not answerable for the genius of any language but his own, and it is very possible that to a Greek commencing geometry, εὐθεῖα might be a hard word, and ἐξ ἴσου κεῖται a real explanation; in which case his definition is defensible until it can be shown that he might have chosen a better one. We are not to judge of the force of the last-quoted words from the *ex æquo* of the middle Latin, or the *evenly* or *equally* of the English. Secondly, he is evidently, in his first definitions, recalling, and not instilling, notions: he is proceeding with his reader as by words to which both attach a conception, and he tries these words for use by ascertaining that both parties agree on such circumlocution as can be substituted for them.

The greatest defect of Euclid's definition, since it applies even to the view just taken of its intent, is the want of words signifying that ἐξ ἴσου refers equally to *all* adjoining parts of space: Euclid is thinking too much of a plane before he has defined a plane. Suppose, for instance, a sphere, and that lines on a sphere only are contemplated: the line which joins two points ἐξ ἴσου with reference to all adjacent parts of that sphere is not a straight line, but an arc of a great circle.

Is it possible, taking such allowances as Euclid sanctions in the use of figure, to give what shall be, whether difficult or not difficult, capable of use or not capable, a just definition of a straight line? We think it is, as follows:—The Greek geometer implicitly allows (i. 4) a TRANSLATION of figure without change of form or properties: from this, by first defining the plane, a definition of the straight line may be proposed, which we bring forward, not for any value which it has, but because the stipulations of geometry are better understood by consideration of cases proposed for acceptance or rejection, than by any other method.

1. Let two points (A and B) be said to be at the same *distance* from a third (C), when A and C being joined by *any* line, the line CA can be translated, C remaining fixed, so that A shall be brought to coincide with B.

2. A plane is a surface any point of which is equally distant from two given points.

3. A straight line is the intersection of two planes.

In the debates of the normal school, which were taken down in shorthand, and published in 1800, is a discussion on this subject. Lagrange presiding, Fourier, then one of the pupils, proposed the preceding second and third definitions, but without assigning a definition of equidistance independently of the straight line. He also proposed as the definition of a straight line the locus of a point which is equidistant from three given points; which is faulty, inasmuch as the three given points should not be in one straight line, which cannot be supposed until the straight line is defined. Lagrange admitted the rigor of the definition, but considered that it failed in presenting a sensible image of the thing defined. Another of the pupils however insisted that the idea of distance involved that of a straight line, which is true of distance as a quantity, though not necessarily so of equidistance as a relation.

Colonel Thompson proposes to define a straight line as one which being turned about its extreme points suffers no change of place. Lagrange, in the debate above alluded to, suggested the same notion. This definition, we think, offers the most tangible illustration of that of Euclid. Let the two extremities of the intended straight line be situated in a solid; and let them remain fixed in space while the solid takes such motion as, under that condition, it is capable of. The straight line, the line which lies ἐξ ἴσου with regard to the extreme points, then remains fixed. For if any part of it moved, there would be in every position a relation to adjoining parts of space, which would be in a state of continual change. The connexion between this definition by rotation and that of Euclid might require more development to render it as clear as possible: but we think the student's own reflection will lead him to make it satisfactorily. But whatever may be thought of the endeavour to exercise the discrimination of which geometry points out the possibility by framing or arguing on definitions, we do not remember to have seen one so well calculated for the mere beginner as the following:—'A straight line is a straight line.'

The postulates relative to a straight line demanded by Euclid (we do not speak of his translators) are: 1. That such a line can be drawn from any one point to any other. 2. That when terminated, it can be lengthened indefinitely. 3. That two such lines cannot inclose (μὴ περιέχειν) a space. It is also tacitly assumed that every part of a straight line is a straight line: that every straight line, infinitely produced, divides a plane in which it lies into two parts, and will be cut by any line drawn from a point on one side of it to a point on the other. It might also have been assumed that two straight lines which coincide in two points, coincide when produced beyond those points; but here Euclid has preferred to assume that all right angles are equal. [RIGHT ANGLE.]

The definition which Euclid gives of a plane, is that of a surface which lies evenly between its bounding straight lines. To this definition there is the serious objection that though a plane may be as easily conceived as a straight line, yet it is actually capable of definition by a straight line. For a plane is the surface any two points of which can be joined by a straight line which lies wholly on the surface. Neither this definition (nor Euclid's) precludes the necessity of a postulate demanding the possibility of drawing a plane through any straight line. Objections might be made to the first part of Euclid's eleventh book, which would require for their answer that another postulate should be granted, similar to that required for a straight line, namely, that if two planes coincide in any portion of surface, they coincide altogether. Euclid does in fact assume a postulate which is not expressly laid down, namely, that a finite straight line can be produced in every plane in which it lies, but we think it may be fairly doubted whether the first three propositions of the book in question are as perfect as they might be made.

STRAIN and STRESS. [MATERIALS, STRENGTH OF.]

STRAIN. [SPRAIN.]

STRALSUND, one of the three governments into which the Prussian province of Pomerania is divided, consists of what was formerly Swedish Pomerania, with the island of Rügen and some other islands: it is bounded on the north by the Baltic, on the east and south by the government of Stettin, and on the west by Mecklenburg-Schwerin. It is almost entirely surrounded by water, having the Baltic on the north, and being divided from Mecklenburg by the navigable rivers Trebel and Reckenitz, and by the Peene from the government of Stettin. This is the smallest of the three governments of Pomerania: the area is 1660 square miles, with a population of between 160,000 and 170,000 inhabitants; it is divided into four circles. The soil is a heavy loam and black mould, far superior in fertility to the light sandy soils of the governments of Stettin and Cöslin; the products are similar, consisting of wheat, barley, and peas; flax and tobacco are likewise cultivated. The breed of horned cattle is not numerous, for want of sufficient pasture; sheep and hogs however are in great numbers, and there are immense flocks of geese. There are no manufactures of any importance. Those of linens and woollens are insufficient, and produce only coarse articles. The manufactories of tobacco and the brandy distilleries are very considerable. The commerce of this government is very important and lucrative; the exports are chiefly flour, malt (5000 lasts annually), and, above all, corn, which constitutes a third, and sometimes the half of the exports, and for the most part goes to Sweden. The fisheries are likewise very profitable.

STRALSUND, the capital of the government, is situated in 54° 15′ N. lat. and 13° 8′ E. long., in an extensive low sandy plain, bounded on one side by the Strait of Gellen, which separates the island of Rügen from the continent;

and on the other sides by great lakes and marshes, so that it is connected with the continent only by bridges. The celebrated fortifications have been razed, and the ramparts converted into public walks. It is rather a gloomy place, the houses being built in the old style, the streets are irregular, and the squares and market-places inconsiderable: it is however clean and well paved. There are four Protestant churches and one Roman Catholic chapel. The three principal churches are built in the Gothic style, and contain many fine paintings. The prospect from the lofty steeple of St. Mary's is very extensive. Among the other public buildings worthy of notice are—the government-house, the town-house, with a noble hall, and a considerable public library, the gymnasium, with a large library and cabinet of medals, the mint, the arsenal, and the water-works by which the city is supplied with good water. The principal public institutions are—the gymnasium, the normal school for training schoolmasters, a school for soldiers' children, two schools of industry, besides many other schools; an orphan-house, a lunatic asylum, and various other charitable establishments. The manufactures are of various kinds, chiefly woollens, linen, sugar, starch, soap, candles, tobacco, leather, looking-glasses, household furniture, and playing-cards. There are likewise brandy distilleries and oil-mills. The trade of this city is very considerable, being at least one-third of the foreign commerce of the whole province. The harbour is spacious and safe, and deep enough for ships drawing 15 feet water The northern outlet by the Gellen Strait has become gradually narrower, and Hassel says it is with difficulty kept open, but that the eastern channel has become broader. Stralsund was built about the year 1209, and joined the Hanseatic League, during its union with which powerful confederacy it had a very extensive export trade in wool and herrings to remote countries. At present the chief exports are malt, corn, and wool. The town has sustained several sieges; the most remarkable of which was in 1628, when Wallenstein vowed that 'he would make himself master of it, even though it were fastened by chains to Heaven,' but he was obliged to raise the siege after suffering considerable loss. In 1678 it was taken after a destructive bombardment by the great elector Frederic William of Brandenburg; and in 1715 by Frederick William I., king of Prussia, in alliance with Russia, Denmark, and Saxony against Sweden. The heroic Schill fell here in 1809. By the treaty of Kiel in 1810, it was ceded with all Swedish Pomerania to Denmark, and again ceded by Denmark in 1815 to Prussia.

(Müller, *Handbuch;* Heidemann, *Wörterbuch;* Hassel; Stein; Cannabich; Hörschelmann, &c.)

STRAMO'NIUM. [DATURA.]

STRANGE, SIR ROBERT, a descendant of the family of Strange of Balcasky, in the county of Fife, was born at Pomona, one of the Orkney Isles, on the 14th of July, 1721. After successively adopting and abandoning the study of the law and the pursuit of a seafaring life, he was apprenticed to a drawing-master. He had studied for a considerable time, when he joined the forces of the Pretender, and was appointed a lieutenant in the Life-Guards, a step he is said to have taken with a view of obtaining the hand of Miss Isabella Lumisden, a lady whom he married in 1747. After the battle of Culloden he sought refuge in the Highlands, where he suffered the severest privations. Subsequently he ventured to Edinburgh, where he subsisted upon the produce of a sale of his drawings of the chiefs of the rebellion, which he privately disposed of at a guinea each. After his marriage he went abroad, and at Rouen obtained an honorary prize for design, when he proceeded to Paris, where he studied engraving under the celebrated Le Bas, from whom he learned the use of the dry point, of which he made such successful use in his own plates. In 1751 Strange settled in London, and soon established a high reputation as an historical engraver, of which class he is considered to be the first in the English school.

In 1760 he again went abroad, and executed plates after pictures by many of the greatest of the old masters, and was made a member of the academies of Rome, Florence, Bologna, Parma, and Paris. On his return to England, he was received with every mark of distinction, and in 1787 was knighted. He died on the 5th of July, 1792. He left a widow, three sons and one daughter, amply provided for by the fruits of his industry and ability. Strange is the only Englishman whose portrait is introduced in the painting in the Vatican of 'The Progress of Engraving.' Force, vigour, clearness, and precision are the prevailing characteristics of his style, nor is he less noted for the careful distinction which he makes in his plates between the texture of the various materials represented. He was the author of an unpublished treatise entitled 'The History of the Progress of Engraving,' to which he added impressions of his principal plates and a portrait of himself. The following is a list of his most important works:—St. Cecilia, after Raffaelle; the Virgin and Infant Christ, with Mary Magdalen, St. Jerome, and two Angels, after Correggio; Mary Magdalen, the Death of Cleopatra, Fortune flying over a Globe, Venus attended by the Graces, and Joseph and Potiphar's Wife, after Guido; Christ appearing to the Virgin after his Resurrection, Abraham expelling Hagar, Esther and Ahasuerus, and the Death of Dido, after Guercino; Venus and Adonis, Venus reclining, and Danäe, after Titian; Romulus and Remus, and Cæsar repudiating Pompeia, after Pietro da Cortona; Sappho consecrating her Lyre, after Carlo Dolci; the Martyrdom of St. Agnes, after Domenichino; Belisarius, after Salvator Rosa; the Virgin with St. Catherine and Angels contemplating the Infant Jesus, after Carlo Maratti; the Choice of Hercules, after Nicholas Poussin; and the Return from Market, after Philip Wouvermans. Amongst his portrait engravings may be particularly mentioned the Children of Charles I., and Queen Henrietta Maria, with the Prince of Wales, and Duke of York, after Vandyke. (*Memoir of Sir Robert Strange;* Aikin's *General Biography*.)

STRANRAER. [WIGTONSHIRE.]

STRASBOURG (in German, *Strassburg*), a town in France, capital of the department of Bas Rhin, 243 miles east of Paris in a direct line, or 294 miles by the road through Château-Thierry, Châlons-sur-Marne, St. Dizier, Bar-le-Duc, Toul, Nancy, Lunéville, and Saverne; in 48° 35′ N. lat. and 7° 47′ E. long.

Strasbourg was known to the Romans by the name of Argentoratum or Argentoratus. It is first mentioned by Ptolemy, who calls it a town of the Vangiones; but this is an error, as it really belonged to the Tribocci. It was in the Roman province of Germania Prima or Superior (the First or Upper Germany); and it was near this town that Julian, while he held the command in Gaul, as Caesar, defeated the Allemans under their king Chnodomar (A.D. 357). At a subsequent period it appears to have fallen into the hands of the Allemans, from whom it was taken by Clovis and the Franks. It was afterwards included in Lotharingia, or the kingdom of Lothaire; and in the tenth century was incorporated with the German empire. It was during these changes, perhaps in the sixth century, that it exchanged its antient name of Argentoratum for that of Stratae-burgus, modified into Stratsburg and Strassburg. It was in the landgraviate of Alsace; but having obtained the privileges of a free city, it increased in prosperity. In A.D. 1349 it suffered from a fearful mortality, which was attributed to the Jews, 200 of whom were in consequence burned. The principles of the Reformation were early introduced, and gained such ground, that, though checked by the emperor Charles V., the Protestants obtained possession of several of the churches. In 1681 Strasbourg surrendered to Louis XIV., who had previously gained possession of Alsace. Louis enlarged the circuit of the walls, and so improved the defences as to render it one of the strongest fortresses in Europe. It has remained ever since that period incorporated with France.

The town stands in a flat situation in the valley of the Rhine, which valley has here a considerable breadth, extending from the mountains of the Schwarzwald or Black Forest, to the Vosges. The form of the town is irregular. Its greatest length is from east to west, nearly two miles; its greatest breadth about one; and its circuit five or six. It is surrounded by a wall strengthened by bastions, ditches, and outworks, and has at its eastern extremity a citadel, with five bastions, constructed by Vauban, the outworks of which extend as far as the Rhine. This river flows a little to the east of Strasbourg, and is crossed here by the bridge of boats of Kehl, a fortress in Baden, on the right bank. The entrance into the city is by seven gates, two on the north side, one on the north-west, two on the west, and two on the south.

The river Ill flows through the town in a north-north east direction. After it enters the town it is divided into several branches, which reunite before it quits the place The principal arm, which bears the name of the Bruche, is

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navigable, and receives on its right bank the canal of the Rhine, by means of which there is ready communication with that river. Another arm, which has the name of Tanners' ditch (fossé des Tanneurs), is much used for supplying tan-yards and other manufacturing establishments. The river can be made to inundate the neighbourhood, by means of a sluice at the point where it enters the town. There are a great number of bridges, some of stone, others of wood. Some of the branches of the Ill, judging from their direction, have been the ditches dug to encircle and defend the town before it had attained its present extent.

Dr. Dibdin, who visited Strasbourg in July, 1818, thus describes its general appearance :—'The city of Strasbourg encloses within its walls a population of about fifty thousand. I suspect however that in former times its population was more numerous. At the present moment there are about two hundred and fifty streets, great and small, including squares and alleys. The main streets, upon the whole, are neither wide nor narrow; but to a stranger they have a very singular appearance, from the windows of almost every house being covered on the outside with iron bars arranged after divers fashions. This gives them a very prison-like effect, and is far from being ornamental, as it is sometimes intended to be. The glazing of the windows is also frequently very curious. In general the panes of glass are small and circular, being confined in leaden casements. The number of houses in Strasbourg is estimated at three thousand five hundred. There are not fewer than forty-seven bridges in the interior of the town. . . . . . . The houses are generally lofty, and the roofs contain two or three tiers of open windows, garret fashioned, which gives them a picturesque appearance; but which, I learn, were constructed as granaries, to hold flour for the support of the inhabitants when the city should sustain a long and rigorous siege.' (*A Bibliographical, &c. Tour in France and Germany*, by the Rev. T. F Dibdin, D.D.) From another authority we learn that the streets amount to more than two hundred and sixty, and are for the most part crooked and narrow; that there are several public squares, of which the principal is the parade, planted with trees, adjacent to the citadel; that the houses are for the most part built of stone, and that the antient houses in the German style are being gradually replaced by others of modern construction. (*Dictionnaire Geographique Universel*, Paris, 1832.)

The principal public building is the cathedral of Notre Dame, a Gothic edifice of singular beauty. The nave and choir have a total length of 355 English feet, of which 244 belong to the nave: the width of the nave, with its side aisles, is 132 feet, but the height of the nave is only 72 feet. Nine massive clustered columns, the larger of them having a circumference of 72 feet, the smaller of 30, support the roof on each side. The choir has no side aisles: it is 67 feet wide, and much lower than the nave. The sides have been covered most incongruously with a number of pillars and pilasters of Grecian architecture. There are two chapels, those of St. Laurent and St. Catherine, besides that of Le Saint Sepulchre, which is the crypt; and twelve altars, of which the two principal are in the chapels of St. Laurent and St. Catherine. The windows are adorned with abundance of stained glass; but generally of a sombre tint, and producing a gloomy effect, with the exception of the circular or marygold window of the west front, which is brighter. There are a stone pulpit, unequalled for the richness, variety, and elaborateness of its sculptured ornaments; an organ of admirable power and softness; and a remarkable astronomical clock, formerly accounted one of the wonders of the place for the variety and skilfulness of its mechanical contrivances, and the elaborateness of its ornaments, but now much out of order, and useless. The most striking part of the cathedral is its western front, a masterpiece of enriched architecture, decidedly superior, in the opinion of some critics, to our own cathedrals of York, Lincoln, or Peterborough. It is divided into three compartments by its ornamented buttresses (two of which are at the angles, and two in the centre); and each compartment again into three portions by horizontal bands. The lower portions are occupied by three porches, that in the centre being the most ornamented and the loftiest. In the second or middle portion the most striking feature is the enormous circular or marygold window; and three equestrian statues of the Frankish kings Clovis and Dagobert, and the German emperor Rudolph of Hapsburgh, in canopied openings in the buttresses. A fourth canopied opening is unoccupied. The third or upper portion has some beautiful windows; and the northernmost of the three compartments is surmounted by a tower and spire, having at each of the four corners of the tower spiral staircase enclosed in open work. The spire rises to the height of 500, or perhaps 530 English feet. The cathedral was commenced near the close of the thirteenth century; and the external structure, as it now appears, was completed about the beginning of the fifteenth. It was much injured during the Revolution: two hundred and thirty-five statues were taken down from different parts of the building to be demolished, and only sixty-five of them have been preserved.

This celebrated church was built at various periods: the choir is said to be of as early a date as the age of Pepin le Bref and Charlemagne; the nave was commenced in the early part of the eleventh century by the bishop, Werner of Hapsburg; and the west front and the tower were planned by Erwin or Ervin of Steinbach, an architect of the thirteenth and fourteenth centuries. He superintended the erection of these parts until his death, A.D. 1318. The tower was not finished till the middle of the fifteenth century. The architect who completed it was John Hültz, a native of Cologne.

Of the subordinate churches (Strasbourg possesses fifteen in all, seven Catholic, seven Lutheran, and one Calvinist, beside a Jews' synagogue), the most remarkable for size and antiquity is that of St. Thomas, belonging to the Lutherans. Some portions are perhaps more antient than the cathedral, but the outside is a tasteless jumble of various styles, and the inside has been trimmed up and smartened in the most tasteless and incongruous style. It has several antient monuments; a much vaunted but really tasteless and absurd mausoleum of Le Maréchal de Saxe; and modest unassuming monuments of Schoepflin, Oberlin the classical scholar, and Koch the historian. The churches of St. Etienne and St. Martin are antient: Le Temple Neuf has some lancet-shaped stained glass windows of exquisite beauty. The public library is attached to this church, and some of the books are kept in the church itself.

The other principal buildings are the antient castle, with a terrace-walk on the Bruche; the office of the prefect; the town-hall; the custom-house; the court of justice; the public granary; and the theatre, adorned with an Ionic colonnade, and having a spacious and elegant interior. There are several public walks; among which are the promenade of Le Broglie, which skirts the Tanners' ditch, the ramparts, which are planted with trees, the esplanade in front of the citadel, the suburb of Robertsau or Rupersau on the north side of the town, and the islands of the Rhine, on one of which a monument has been erected to the memory of Desaix.

The population of Strasbourg, in 1831, was 45,642 for the town, or 49,712 for the whole commune; in 1836 it was 57,885 for the commune. The trade of the town is very considerable: its manufactures include jewellery, metal buttons, starch, alum, oil of vitriol, white-lead, steel, cutlery, pins, combs, cast-iron goods, earthenware, porcelain, enamel, soap, oil from seeds, succory or chiccory, morocco and other leather, straw and other hats, woollen and cotton stuffs, cotton yarn, hosiery, printed flannels, sail-cloth, oilcloth, thread, carpeting, furs, paper-hangings, playing-cards, &c. There are bleach-grounds, dye-houses, rope-walks, tan-yards, breweries, printing-offices, plaster-kilns, tile-yards, an iron-forge, a type-foundry, a sugar refining-house, a royal snuff-manufactory, &c. The publication and sale of books is an important branch of industry at Strasbourg. There is a considerable trade carried on with other parts of France, and with Holland, Germany, Switzerland, and Italy, by means of the Rhine and the Ill and their connected navigation; and much business is done in the produce of the surrounding territory, which includes corn, wine, tobacco, madder, hemp, hops, saffron, &c. There are four important yearly fairs much frequented by the Germans.

Before the Revolution there was at Strasbourg a Protestant University, with four faculties. It was established by the town council or senate in 1538 as a gymnasium or public school: this was changed into an academy, with the power of granting degrees in arts, by the emperor Maximilian II., A.D. 1566; and was raised to the rank of a university by the emperor Ferdinand II., A.D. 1621. There are now two seminaries for the Roman Catholic priesthood; a Protestant seminary, and a gymnasium or college; a faculty of theology of the Lutheran body; and faculties of law, medicine, science, and literature; a normal class for training schoolmasters; a school of midwifery and a school of medicine; a drawing-school; a royal college, with a philosophical apparatus; a museum, a cabinet of natural history, a cabinet of anatomy, an observatory, a botanic garden, where lectures are delivered, and a public library of above 50,000 volumes; an academic society, which confers premiums; a society of agriculture, sciences, and arts; a Protestant Bible society; a society for the relief of young persons discharged from prison who have shown symptoms of penitence; public baths; a noble arsenal, including a school of artillery and a cannon-foundry; vast barracks for cavalry, infantry, and artillery; a mont de piété or loan society; three hospitals, including one for orphans and one for foundlings; two military hospitals; a military prison, a gaol, and a house of correction, to which is attached a lunatic asylum; a number of government offices for fiscal, judicial, and administrative purposes; a mint, and a government stud (*dépôt des étalons*). It is the capital of the department; the seat of a bishop, who is a suffragan of the archbishop of Besançon, and whose diocese comprehends the departments of Bas Rhin and Haut Rhin; the seat of a Lutheran consistory, and of an académie universitaire, and the head-quarters of the fifth military division, which comprehends the two departments of Bas Rhin and Haut Rhin.

Strasbourg was the birthplace of Mentel, one of the fathers of the art of printing; of General Kleber, who was left by Bonaparte in command of the French army in Egypt; of the classical scholars Brunck, Oberlin, and Schweighaeuser; and of the philanthropist Oberlin, pastor of the Ban de la Roche, and brother of the scholar. The population of the town is partly Protestant and partly Roman Catholic. German may be considered as the native tongue of the inhabitants; but among the educated classes both German and French are used.

The arrondissement of Strasbourg has an area of 546 square miles, and comprehends 162 communes, with a population, in 1831, of 205,029, and, in 1836, of 218,839. It is divided into twelve cantons or districts, each under a justice of the peace. The bishopric dates from the fourth century: the bishop had formerly the title of prince of the empire, and was a suffragan of the archbishop of Mainz or Mayence.

STRATE'GY (from the Greek *στρατηγία*, which may be translated 'generalship') is, properly, the science of combining and employing the means which the different branches of the art of war afford for the purpose of forming projects of operations and of directing great military movements: it was formerly distinguished from the art of making dispositions, and of manœuvring, when in the presence of the enemy; but military writers now, in general, comprehend all these subjects under the denominations of grand and elementary tactics. [TACTICS.]

Strategy consists chiefly in making choice of convenient bases (fortified places or strong positions) in order to place there in security the military establishments of an army; such as the barracks, hospitals, and magazines of ammunition and provisions, previously to commencing offensive operations, or in contemplation of the army being compelled to act on the defensive. In the former case, it may be necessary to decide on undertaking the siege of some fortress on a frontier, for the purpose of holding the neighbouring district in subjection, and commanding the roads by which it may be thought convenient to penetrate into the enemy's country, or by which the provisions and warlike stores may be brought up to the immediate seat of the war. In the latter case, choice is to be made of positions strong by nature, or which may be made so by art, in order that the army may be enabled to dispute the ground gradually, to harass the enemy by frequent skirmishes, or to prevent him from receiving supplies by intercepting his convoys on the roads.

Thus, after the battle of Vittoria (1813) the allied British and Spanish armies being at a great distance from the original base of operations in Portugal, and it being intended to carry the war into France, Lord Wellington undertook to besiege St. Sebastian and to blockade Pampeluna, in order, by the possession of those places, to have secure stations for his recruits and magazines while the army advanced into the mountainous districts between St. Jean Pied-de-Port and the sea. On the other hand, the conviction, in 1809, that the British army would be compelled to act entirely on the defensive, induced the English general to take measures for a retreat into Portugal, and to commence, many months before the retreat took place, two chains of strong redoubts on the north of Lisbon, in the expectation of being able there to resist effectually the very superior forces of the enemy.

The project formed by Marshal Soult, in 1813, in opposition to that of Lord Wellington, affords also a good illustration of the nature of strategical operations. The French general decided to advance towards Pampeluna in the hope of being able to succour that place, and afterwards to unite his army with that of Suchet in Aragon: he expected also to command the road along the Spanish frontier, by which he might have got to the rear of the allies in a fertile country, where his army could have found subsistence. (Napier, vol. vi.) This project failing, and the battles of the Pyrenees having forced the French army to act on the defensive, Marshal Soult took measures for protracting the war to the utmost.

In the defence of an extensive territory, since it is generally impossible to cover the whole, the principles of sound strategy indicate that the army should be kept in force on a few of the most important positions. By securing these, the designs of the enemy may be more effectually frustrated than if it were attempted to occupy every post in the country; for the different divisions of the army being in the latter case weak and ill supported, they are liable to be cut off in detail, whereas the difficulty of dislodging a large body of troops from one strongly intrenched position may deter the enemy from attempting it: at the same time the occupation of that position by the defending army may paralyze his movements by rendering it dangerous for him to leave in his rear a force which might prevent him from drawing supplies from his magazines. The evils attending the dissemination of troops over a great extent of country are strongly exemplified in the surprise of the Austrians by Marshal Turenne. The French general caused the several corps of his army to be drawn together towards Befort in such a manner as not to excite notice; and from thence suddenly penetrating into Alsace, in the midst of the enemy's quarters, he defeated the troops before they had time to unite.

STRATFORD-UPON-AVON, a municipal but not a parliamentary borough in the Stratford division of Barlichway hundred, in the county of Warwick, 96 miles northwest of the General Post-office, London, by Uxbridge, Beaconsfield, Wycombe, Oxford, Woodstock, and Shipston-on-Stour.

Stratford was a place of some consequence three centuries before the Conquest. The manor was included in the possessions of the bishopric of Worcester, the holders of which obtained charters from the earlier kings of the Plantagenet family for a market and five yearly fairs. In the reign of Edward VI. the manor came by exchange to Dudley, earl of Warwick and duke of Northumberland, and has since then passed through various hands. There was some skirmishing here in the great civil war (A.D. 1642-3). But the principal interest of the town is derived from its having been the birth-place of Shakspere (A.D. 1564), and the place to which he retired in his maturer years, and where he died (A.D. 1616). [SHAKSPERE, WILLIAM.] In A.D. 1769 a festival termed 'the Jubilee' was celebrated at Stratford, in honour of Shakspere, under the direction of Garrick. The festival was attended by a great concourse of persons of rank; but the incongruity of many of the arrangements provoked the satire of some of the wits of the day. A triennial festival in honour of Shakspere has been celebrated these last few years.

The town stands on the west or right bank of the Avon, and is approached from London by a long stone bridge of fourteen pointed arches, erected in the reign of Henry VII. at the sole charge of Sir Hugh Clopton, lord mayor of London, and widened of late years. There is another bridge just below, by which a railroad is carried across the river, and at the south end of the town is a wooden foot-bridge. The streets are irregularly laid out, but the principal ones are well-paved and remarkably clean. They are lighted in the winter with oil. The old houses are, many of them, commodious and well-built; some of the modern ones which are interspersed among them are capacious and handsome. The town has increased considerably during the last few years, and many houses have been built in the out skirts. The church is at the south-eastern corner of the town, near the bank of the river. It is 'a large and handsome cross-church, the nave only separated for service. The transept, tower, and some parts of the nave are early English. The tower appears to have been strengthened by underbuilding the antient arches by others of perpendicular character. The upper part of it is decorated, with curious circular windows, having varied tracery. The south aisle is decorated, with some good windows; the west end of the nave, with the piers, arches, and clerestory, are perpendicular, as is the north porch. The chancel is late perpendicular, and a fine specimen of its date. On the north wall is Shakespeare's (Shakspere's) monument; on the south side are some stone stalls, and there are many of the wood stalls remaining. In the south aisle of the nave are the remains of some stone stalls which have had rich canopies. In some of the windows are portions of good stained glass. The present font is modern; the antient one, after being long a receptacle for rain water, is now carefully preserved in a gentleman's garden. It appears to have been perpendicular, of elegant design and good execution. The same gentleman also preserves part of the antient cross.' (Rickman, *Essay on Gothic Architecture*, Appendix.) The remains of Shakspere are buried in the chancel, on the north side, and are covered with a stone bearing this inscription:—

Good frend, for Jesus' sake forbeare
To digg the dust encloased heare;
Blese be ye man yt spares thes stones,
And curst be he yt moves my bones.

The monument against the wall is surmounted by a half-length effigy of Shakspere, executed with some taste and skill. It was originally coloured to represent life. Beneath the effigy is a poetical inscription consisting of a Latin distich and six lines of English verse; below the inscription is the record, 'Obiit Ano. Doi. 1616, Aetatis 53, Die 23 Ap.' The church at Stratford was collegiate.

Besides the parish church there is a chapel-of-ease, antiently the chapel belonging to the brethren and sisters of the guild of the Holy Cross. At the dissolution of monastic institutions, the possessions of this fraternity passed to the crown, and were granted after some years to the corporation of Stratford for specific purposes. The chapel is of late perpendicular character, much like the chancel of the parish church. It was adorned within with fresco-paintings of singular character, which, after having been long covered with whitewash, were discovered during some repairs in 1804. They were too much injured however to allow of their being preserved. Adjoining the chapel is the hall of the guild, an antient building, which has undergone much alteration. The lower part is used for the business of the corporation, the upper part is occupied by the grammar-school. The residences of the schoolmaster and vicar, with the chapel and the hall of the guild, form three sides of a quadrangle. The town-hall, which is used for the larger meetings of the corporation and for other public purposes, is a modern building (A.D. 1768) of the Tuscan order. The principal room, 60 feet by 30, has some portraits; among them are one of Shakspere by Benjamin Wilson, and one of Garrick by Gainsborough. Outside of the building, on the west side, are the arms of the corporation; and on the north side, in a niche, is a statue of Shakspere. There are meeting-houses for Independents, Baptists, and Wesleyan Methodists. Part of the antient house, in which Shakspere is said to have been born, is standing in Henley Street on the north side of the town: a room is pointed out as the very chamber of his birth, and it may be really so: it is covered with the names of visitors. [Shakspere.] 'New Place,' the residence of Shakspere in his latter years, was pulled down (A.D. 1759) by the Rev. Francis Gastrell, the owner, who had previously (A.D. 1756) cut down the famous mulberry-tree planted by the poet's own hand. The present theatre, a neat brick building, is appropriately placed within the precincts of Shakspere's garden.

The parish of Old Stratford, in which the town stands, has an area of 6860 acres; the population in 1831 was as follows: the borough of Stratford, 3488; the hamlet of Luddington, 127; outskirts of the borough and other parts of the parish, 1556: together, 5171. There were in the town 673 houses, inhabited by 683 families; 21 houses uninhabited, and 2 building. The only manufacture is that of Florentine silk buttons; the trade of the place, though not great, appears to be increasing. The navigation of the Avon commences here. The Stratford-upon-Avon canal runs from the north side of the town to the Worcester and Birmingham canal in the parish of King's Norton near Birmingham. It was made under several acts passed from A.D. 1793 to A.D. 1821. The Stratford and Moreton railway (constructed under Acts passed from A.D. 1821 to A.D. 1833) extends from near the termination of the canal to the town of Moreton-in-Marsh, Gloucestershire, 16 miles, with a branch (2½ miles) to Shipston-on-Stour, in a detached portion of Worcestershire. The railroad consists of a single track, and horses are the moving-power: the railway crosses the Avon by a bridge. The coal brought by the canal from the South Staffordshire Coalfield [Staffordshire] is sent forward to Moreton and Shipston by the railway; and stone and agricultural produce are brought back. The market at Stratford is now held on Friday, and is a considerable corn and cattle market. There are two yearly fairs, beside a statute-fair and several great cattle-markets.

Stratford is a municipal borough, but the borough limits do not include the whole town. The corporation was formed by a charter of Edward VI., A.D. 1553; and by the late Municipal Reform Act has 4 aldermen and 12 councillors. An enlargement of the boundary has been recommended. The borough is not to have a commission of the peace except on petition and grant. The borough courts had fallen into disuse previous to the passing of the act. The income of the corporation is considerable, consisting of the produce of the estate of the guild of the Holy Cross, and of the tithes formerly possessed by the college of priests belonging to the parish church. The corporation maintain an almshouse and the free grammar-school, and pay stipends to the vicar of Stratford and to a chaplain or vicar's assistant.

The living is a vicarage, of the clear yearly value of 239*l.*, with a glebe-house: it is in the rural deanery of Kineton or Kington, in the archdeaconry and diocese of Worcester.

There were in the whole parish, in 1833, two infant-schools, with 240 children of both sexes; fourteen day-schools, with 664 children (viz. 432 boys and 204 girls, and 28 children of sex not stated); and three Sunday-schools, with 263 children; besides which, two of the day-schools, partly supported by voluntary contributions, with 130 boys and 60 girls, were also Sunday-schools. Two of the day-schools, with 130 boys and 70 girls, were national schools; another, with 12 boys, was the free grammar-school; and a fourth, with 28 children, was supported by voluntary contributions: the remainder, except the two which were also Sunday-schools, were private schools.

STRATFORD, FENNY. [Buckinghamshire.]

STRATFORD, STONY. [Buckinghamshire.]

STRATA. In Geology, both the separately deposited layers of rock, and the rocks formed of these similar layers, accumulated together, have received the name of strata. Dr. William Smith uses the term in the latter sense, and in general this is the meaning attached to it in those useful tabular expositions of the 'Series of Strata,' in various districts of the globe, which are now familiar to geologists. In special and local descriptions of rocks, the several beds are commonly enough called strata (*couches*, French). As a general scheme showing the rank frequently assigned to these and other terms, the following view may be useful, the most comprehensive term being to the left:—

Systems, Formations, Strata, Beds, Laminæ.

The terms series and group are very conveniently employed to collect under one head for purposes of reasoning, any of the laminæ, beds, strata, formations, or systems (or parts of one formation and parts of another), without any other limit than that imposed by the principle of grouping. For instance, the *Belemnitic Series* of strata includes the lias formation, lower, middle, and upper oolite formations, and the green-sand and chalk formations; it includes two systems of strata: by the *Trilobitic Series* of strata we may understand the whole of the Palaeozoic deposits, excepting perhaps the magnesian limestone and the oldest of the slaty rocks. [Stratification; Geology, &c.]

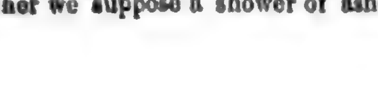
STRATICO, SIMONE, COUNT, born at Zara, in Dalmatia, in 1730, of a family originally from Candia, studied at Padua, where he took his doctor's degree, and was made professor of medicine in that University when only twenty-five years of age. In 1761 he accompanied to England the ambassador sent by the Venetian senate to congratulate George III. on his accession; and on his return to Padua he succeeded the Marquis Poleni in the chair of mathematics and navigation. He wrote several works on hydraulics and hydrostatics, and upon naval architecture and navigation. In 1801 he was appointed by the government of the Italian republic to the chair of navigation in the University of Pavia, and under Napoleon's kingdom of Italy he was made inspector-general of roads, rivers, and canals, and senator of the kingdom and knight of the iron crown. After the Restoration the emperor of Austria gave him the cross of the order of St. Leopold. Count Stratico died at Milan, in 1824, at the age of ninety-four. His principal works are—1, 'Raccolta di Proposizioni d' Idrostatica ed Idraulica,' Padova, 1773; 2, 'Vocabolario di Marina,' 3 vols. 4to., Milan, 1813-14, a work which was wanted in the Italian language. Stratico collected the nautical expressions used by the Venetians, Pisans, and Genoese, in the time of their maritime greatness, and added the modern expressions adopted from the French and English; 3, 'Bibliografia di Marina,' 1823; 4, 'M. Vitruvii Pollionis Architectura cum Exercitationibus J. Poleni et Commentariis Variorum,' Udine, 1825. This is an excellent edition of Vitruvius, with important illustrations and comments by Poleni and Stratico, and was published after the latter's death. Stratico was one of the most distinguished men of science in Italy. His cabinet of models for shipbuilding, and his collection of books relative to the art of navigation, were bequeathed by him to the Lombardo-Venetian kingdom, and they have been placed in the library of the Institute of Milan.

(Maffei, *Letteratura Italiana;* Biographical Notice of Stratico, in the 'Antologia' of Florence, vol. xvi.)

STRATIFICATION. Mineral masses, separately deposited, and arranged into parallel layers under the influence of gravitation, compose a large portion of the known rocky crust of the earth, and are called stratified rocks; other masses, in which no such successive deposition and tendency to be bounded by originally horizontal surfaces is traceable, are locally prevalent, and receive the name of unstratified rocks: they are generally supposed to be of igneous origin; the former are mostly known to be the fruit of sedimentary aggregation under water. To each class there are exceptions. Parts of certain limestone rocks, formed in water, as modern coral reefs, are really not at all or very slightly stratified; and certain melted rocks which have spread in successive sheets like lava over antient surfaces, or have been forced by great lateral pressure between really stratified rocks, often assume the stratiform aspect. Without now dwelling on these and several other exceptional cases, it is our purpose to present a general view of the present state of knowledge of the phenomena of stratification, as exhibited in rocks which show clearly the fact of their mineral particles having been separately subject, during the aggregation of the mass, to the influence of gravitation, while partially supported in media lighter than themselves, as water and air, and generally influenced by lateral movements, such as occur in a state of nature in those almost universal fluids.

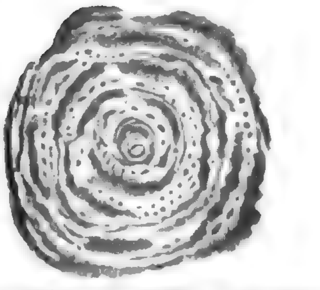
1. Let us suppose a case of a shower of comminuted mineral matter falling through a limited section of air on the ground. It will be collected in a conical form, the slopes of the cone having reference to the velocity of descent of the sandy particles, the mutual support they yield one to another, and the form of the surface on which they fall. Omitting these sources of variation, the slopes of the conical heap will be generally within moderate limits of uniformity, and the inclination of these slopes constitutes what is called the *angle of rest.* A second shower of such sandy matters falling uniformly, will cover the cone with a parallel sheath, and thus *conical strata* may result from such operations repeated. (See diagram No. 1.) The nearest analogy to this type of stratification occurs in a volcanic cone; where however the showers of ashes falling not uniformly, but in different quantities in different directions, the result is a *streamy* or imperfectly concentric stratification, characteristic of the cause, and presenting on a cross-section an appearance as in the diagram No. 2.

No. 1.



Vertical section of strata formed by conical superposition (theoretical).

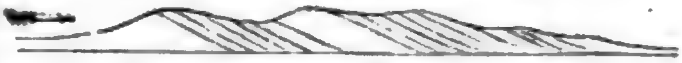
No. 2.



Horizontal section of strata formed by falling of ashes round a vertical axis irregularly.

2. If further we suppose a shower of ashes or sands to be much affected while falling by horizontal currents of air; in this case the supposed conical heaps No. 1 will be drifted, so as to show stratification inclined or dipping from the windy quarter. (See diagram No. 3.) Similar effects might follow the drifting of sand which had fallen into heaps.

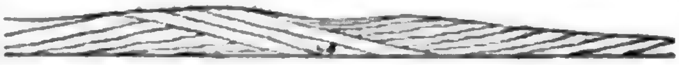
No. 3.



Laminated deposits of sand by the effect of wind.

If the currents of air changed their direction at intervals, there would arise complication of the strata, *oblique stratifications,* such as are often seen in sandy rocks and sandhills, and these would be more or less distinct as the interval between the winds had been marked by vegetation, sediment, or any other cause of consolidation of the surfaces. (See No. 4.)

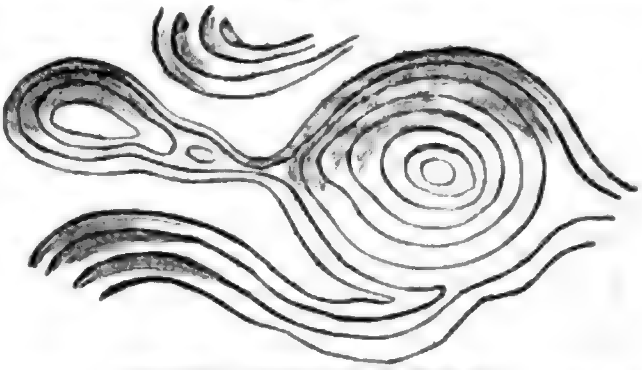
No. 4.



Oblique lamination in sand and gravel.

3. On surfaces of loose sand once deposited, under whatever of the influences stated, winds have the power of producing other effects; winds eddying among the inequalities of partially grass-grown sandhills, excavate in them circular, oval, or irregular pits, and make ridges and crests of fantastic forms. (Diag. No. 5.) Winds also wear away by horizontal action the edges of these basins and crests, and make appearances of level stratification, as water which changes level wears its banks in parallel lines. Winds also by their peculiar action on fluid or loose masses, which move with a different velocity from the current of air, produce undulations on the surface of the sand lying across the current, and much resembling the 'ripple or current mark' (which is a secondary phenomenon from the same cause) on the beds of sand below agitated water.

No. 5.



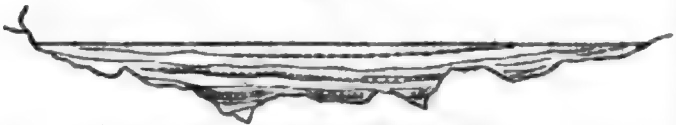
Excavation of cavities in sandhills by wind.

The falling velocity in air of the different sorts of mineral particles which enter into the composition of rocks is not materially different, even if the masses be considerably unequal in size; but both in regard to falling in water and drifting by wind or water, the specific gravity and the magnitude of the masses require to be taken into account.

For our present purpose it is sufficient to observe that in a mixture of pebbles and sand, subject to drifting, there is an angle of ascent which limits the movement of the pebbles, and yet allows the sands to pass on. Hence, on the sea-coast, the almost stationary pebbly beach is margined on the landward side by parallel ridges of moving sandhills, and thus a separation is effected of the bases of conglomerates and the bases of sandstones.

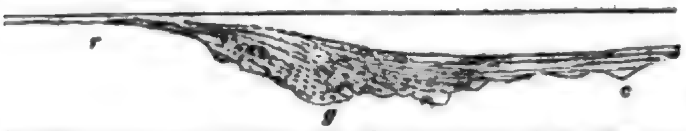
If now, instead of comminuted materials falling through air on the land or drifted by wind over its surface, we imagine such materials falling on and sinking in lakes perfectly calm, or the sea always in motion, other effects will follow, and other forms of stratification will result. In a calm lake the sediment may be supposed to fall vertically downwards, and, except the bed of the lake be very irregular, to settle in layers or strata of considerable uniformity. The least lateral moment, by mixing the suspended matter through the water, would tend to widen the deposit, and to fill up the inequalities of the lake-bed, so that by many repetitions a very irregular subaqueous surface would be equalized and levelled. This effect is perhaps actually witnessed in the sediment called trass which lies in the valley of Brohl, near Andernach; this is apparently derived from volcanic dust stratified in the water which received the shower of ashes. (No. 6.) Besides showers of ashes, lakes and the sea receive comminuted mineral substances from shores wasted by tides and storms, and from rivers which transport detritus from the interior of the country. In a very calm lake the sediment from the influx of rivers subsides under the influence of gravitation downwards and communicated motion forwards, so that a kind of conical stratification in a delta continually advancing with a level top into the lake is the result. In this delta the arrangement of the strata is probably such as to exhibit successive layers dipping forward into the lake, but there may also be some more horizontal lines depending on the separation of the coarser and finer sediment, owing to their unequal falling velocity in water. Moreover the coarser sediment will fall near the point where the stream enters, and the finer will be longer suspended in water, be transported farther, and rest on more horizontal surfaces, and thus a new complication of the strata will arise, as represented in No. 7.

No. 6.



Arrangement of ashes falling in a lake.

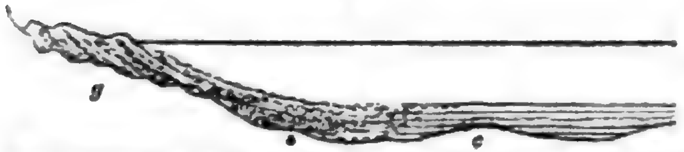
No. 7



Deposition of coarse gravel and sand (*g*) and fine clay (*c*) in a lake by a river (*r*)

The earthy materials poured into the sea by rivers follow the same general laws of distribution, but are subject to the additional effects of tides and storms. The effects of these agencies are exhibited in great distinctness on coasts which confront violent winds and the full oceanic flow, and which are margined by pebbles and sands. The sands with ripple-marked surfaces gently inclined extend to some distance below low-water, the pebbles spread upwards in more steeply inclined banks thrown up and left by the breakers in heaps, long parallel ridges, and terraces. A contemporaneous surface of deposition in such cases may be as represented in No. 8, where clay or sand below low-water, and pebbles between low and high water, appear in a continuous layer. Such a surface differs from that found under a calm lake by the concave slope of its pebbly laminæ toward the shore, while the lake deposit has convex slopes in the same part.

No. 8.



Gravel beaches (*g*), sand beds (*s*), and fine clay (*c*), in the sea, under the influence of the tides.

Such appearances, at least partially, may perhaps be recognised among the strata accompanying coal, and in other groups of rocks where the unequal size of the granular materials and antient exposure of these to littoral agitation supply the necessary conditions.

Near the shore various causes locally in operation are known to produce on the sea-bed that oblique and variously directed lamination which has been already noticed as an effect of wind (diagram No. 4), and may be seen as an ordinary occurrence in the sections of 'diluvium' and in the banks of rapid rivers which change irregularly their channel. (See the notice of this effect in the valley of the Arve, in Lyell's *Principles of Geology*.) Among the stratified rocks this appearance is common. It occurs in Sussex among wealden strata supposed to be of fluviatile origin; at Nottingham in new red-sandstone, which contains no internal evidence of the nature of the water in which it was arranged; in millstone grit of Yorkshire, and in the oolite of Weston near Malton, and Old Down near Bath, which are all deposits from the sea. It is perhaps impracticable to determine by mere inspection of the oblique lamination alluded to the exact order of phenomena which occasioned it. Tidal agitation, fluviatile violence, the force of temporary inundations, sea currents, each and all of these may have been concerned in the phenomena of this nature, which are so frequent in pebbly sandstones, and in general we may be justified in believing that such appearances may be safely ascribed in most cases to irregular violence of shallow water; while in regard to the more regular and extended parallel lamination of ordinary micaceous sandstones, and still more the fine uniform deposits of clay and argillaceous limestone, must be referred to the wider and gentler influence and longer suspension due to calmer, that is to say, generally deeper water, farther from shore.

The origin of the materials of stratified rocks is seldom obscure. Conglomerates full of pebbles rounded by attrition, sandstones with grains worn and rounded, shales and clays with broken and scattered mica, and disseminated fragments of other minerals, are so similar to ordinary accumulations by the diurnal agency of water, that no person can hesitate about the origin of such materials. Many of these are *recomposite rocks*; as the old red-sandstone conglomerates, which contain pieces of quartz from mineral veins, and masses of previously consolidated grauwacke. Others, as new red-sandstone, seem to be derived from wasting shores or the detritus of inundations; and certain schistose beds in the older strata of Devon, Cornwall, and Shropshire are positively aggregations of ashes, scattered by volcanic explosions on the antient ocean. It has been conjectured that the same explanation may apply to some other portions of the great series of Palæozoic slaty rocks, and in a few cases a direct reaggregration of the materials of trap rocks (Oban) or granite rocks (millstone grit of Derbyshire) appear. Well stratified limestones have probably been formed from precipitation of carbonate of lime, as now happens in lakes and in the sea; and the limited portions of the same rocks which show no such structure, are often certainly known to be, like modern reefs, the fruit of coralligenous polypiaria.

The changes to which the sedimentary deposits, which were the origin of stratified rocks, have been subject since their aggregation, are so considerable, as to gain for them, in extreme cases, the distinctive title of *Metamorphic Rocks*.

Consolidation of mass is the first of these changes to which we may here allude. It appears to be a phenomenon principally due to *pressure:* as in the buried peat of Dartmoor, and the buried clays of Holderness, the originally light and uncondensed matters have been compressed to some considerable firmness, solidity, and weight; so in respect of antient clays, mere pressure appears to be a sufficient cause for their condensed, often shaly consistence. But more than this must be appealed to for the *induration* of slate, coal, limestone, and sandstone. The *particles* of these rocks cohere with force, by a process of internal molecular arrangement; and it appears to be a fair inference from numerous facts, that among the most influential of the exciting causes of this molecular action is the internal heat of the globe—locally manifested in the induration of stratified masses in the vicinity of trap dykes and other igneous rock masses, and generally exhibited in the hardness, symmetrical structure, and crystalloid aspect of the lower and more antient strata, which may be supposed to have been more subject, and for a longer time than the others, to the influence of subterranean heat.

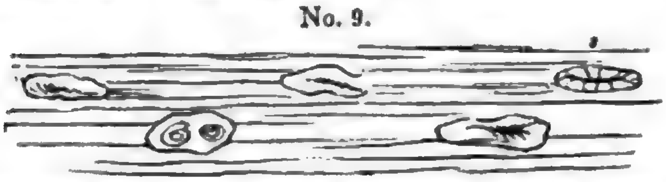
Very unequivocal signs of this action of heat appear in the vicinity of the granite rocks of Cumberland, Devon, Cornwall, Wicklow, &c., and perhaps they are seldom absent from such situations. One of the most ordinary of such effects is the development, in the mass of the stratified rocks, of peculiar crystals, as felspar near the granite of Wastdale Head, in virtue of which slates become porphyry; of hornblende and chiastolite in those of Skiddaw, just as garnets are developed in argillaceous beds near the trap rocks of Teesdale and Anglesey. [ROCKS.]

There is some danger of carrying too far the application of this doctrine. The metamorphism of rocks is a real and very extensive phenomenon, but we must have always a reason for referring to this class any peculiar appearances of stratified rocks which differ from the ordinary appearances of common aqueous sediments. We must not ascribe to re-arrangement of molecules what is not consistent with such an effect, nor without examination call textures of rocks imperfect crystallization and re-arrangement of molecules which perhaps may be only due to disintegration and re-aggregation of masses.

A case of this kind is very important; the primary strata of gneiss and mica-schist are often, without examination, but merely by applying as a universal consequence what really depends on very partial inquiry, declared to be crystallized, or crystalline, or crystalloid rocks; when, in fact, in many cases they are really, as MacCulloch knew, stratified aggregations of the disintegrated parts of crystallized rocks, and in others show evidence of the same origin, disguised by subsequently applied heat. [GEOLOGY—*Primary Periods.*]

Some cases of re-arrangement of particles depend on molecular action, not excited by heat, but determined to particular centres by the previous existence there of solidified bodies. Oolite is an example of common occurrence among limestones of the secondary class, and few things are more interesting to examine than a polished slab of the oolite of the mountain limestone of Bristol and Lancashire, or the pisolite of Wilts. In the centre of the spherical grains of the former, and in or near the axis of the less regular nodules of the latter, are grains of sand, bits of shells, or small foraminifera, and round these parallel coats of carbonate of lime are neatly and concentrically arranged. An extremely large and irregular pisolitic nodule gives us the link between these concretionary arrangements and the 'nodules' or 'balls' of limestone and ironstone which enclose pieces of plants, leafits of ferns, shells, bones, or fish-scales, and lie in parallel layers in the coal-shales, lias-clays, &c. These balls are evidently formed by accretion round the organic objects which they enclose, and the process is the more curious, because the matter of the ball is usually more calcareous or more ferruginous than the surrounding matrix, and seems to have been collected from out of it by some peculiar elective attraction depending on the nature of the organic body. (See Diagram No. 9.)

No. 9.



Re-arrangement of deposited matter in nodules, round organic or inorganic masses; *s*, one of these cracked as in Septaria.

In addition to this process it has frequently happened that the 'ball' has been cracked internally across by subsequent contraction during *consolidation*, and the cracks are filled by carbonate of lime, iron pyrites, silica, &c., introduced through the apparently solid texture of the external parts according to the peculiar circumstances of the operation. Thus by a peculiar species of electrical transfer, analogous to what is supposed in the case of mineral veins, the internal cavities become filled, and the result is the septarium, for whose formation internal heat was once deemed necessary by the advocates of the Huttonian hypothesis. (Playfair's *Illustrations*, p. 30.) Derived from sources so various, and aggregated under aqueous agencies so diversified in respect of power and direction, it is not surprising that the stratified rocks present themselves in a variety of appearances. It is clear that in the same bed of the antient sea, or on the same basin of the actual sea, contemporaneous surfaces of deposition might extend over calcareous, argillaceous, arenaceous, and pebbly deposits: that in different basins contemporaneous deposits might be extremely unlike; and that metamorphism, more or less important, must be allowed to have often further increased such original diversity. Yet, notwithstanding these limitations, it appears to be a fact sufficiently established that there are general characters of mineral composition and structural aggregation which are associated with the strata of each great period of the earth's history, so as more or less completely to distinguish one period from another. [GEOLOGY.]

STRATON, the son of Arcesilaus, and a native of Lampsacus, a Peripatetic, who about B.C. 286 undertook the charge of the Peripatetic school after Theophrastus. He was the master of Ptolemy Philadelphus, and was well paid for his services.

Respecting his doctrine only scattered hints can be gathered, as all his works have perished. He differed from his master Aristotle on certain points. He maintained that there was a principle of motion destitute of intelligence inherent in all matter; which principle causes all composition and decomposition of bodies; that the world, in consequence, was not formed by an extramundane deity, nor by any intramundane animating pervading intelligence; but it was formed by the innate force of matter, which momently creates and dissolves. He was called Physicus (φυσικός), from his making physical matters his chief study. A list of his works is given by Diogenes Laertius (*Straton*), and a copy of the philosopher's testament.

Eight persons of the name of Straton are enumerated by Diogenes.

(Diog. Laert., 'Straton;' Cicero, *De Natura Deorum*, i. 13; Brucker, *Instit. Hist. Phil.*)

STRATTON. [CORNWALL.]

STRAUBING is a considerable town in the province of Lower Bavaria (previously called the circle of the Lower Danube), in the kingdom of Bavaria, in 48° 53′ N. lat. and 11° 35′ E. long., in a pleasant country, on an eminence on the right bank of the Danube. The town is divided into the Upper and Lower town, and is surrounded with walls, in which there are four principal gates; but the walls are now for the most part broken, and the moat converted into gardens. It is tolerably well built. The population is about 7000. The Danube here divides into two arms, one of which flows close by the town, half a league below which they again unite. There is a stone bridge 325 feet in length over the Danube, from which the unfortunate Agnes Bernanernon, wife of duke Albert, was thrown on the 12th of October, 1435, by order of her father, a citizen of Augsburg, without whose knowledge the Duke had married her. She was celebrated for her extraordinary beauty. Her husband erected a handsome monument to her in St. Peter's church, which still remains. The principal public buildings are the seven churches, the palace, the government-house, the gymnasium, and the town-house. There are four hospitals, a seminary for schoolmasters, a convent of Ursuline nuns, in which there is an establishment for female education, and numerous charitable institutions. The handsomest part of the town is the great square, in which are the church of the Holy Trinity, the palace, the town-house, the government-house, and the church of St. James and St. Veit. This town has, properly speaking, no manufactures, but it has a good trade on the Danube, and great corn and cattle markets. The surrounding country is remarkably fertile. The town has frequently suffered by extensive fires.

(*Conversations Lexicon*; Stein; Cannabich; Hörschelmann; Von Schlieben, *Gemälde der Deutschen Bundesstaaten.*)

STRAW-PLAT MANUFACTURE AND TRADE. The domestic character of this branch of industry, which renders it peculiarly important as a means of affording employment to women and children, especially in agricultural districts, may probably account for the circumstance that very little is known of its history. An interesting account of this manufacture is given in M'Culloch's 'Dictionary of Commerce,' in the article 'Hats,' and some information on the subject may be gleaned from the published 'Transactions' of the Society for the Encouragement of Arts, Manufactures, and Commerce. From these and some minor sources of information, the following details are derived.

The article first alluded to (which is stated to be written by Mr. Robert Slater, of Fore Street, London) observes, that it is not known when the manufacture of hats or bonnets of platted straw first became important in Italy, where it has long formed one of the leading pursuits of the agricultural population, but that it appears from Coryat's 'Crudities,' published in 1611, that 'delicate strawen hats' were worn at that time by both men and women in many places in Piedmont. Coryat states that many of these hats had at least a hundred seams, from which it is evident that very fine plat was made at that time. The same article states that the straw-plat manufacture does not appear to have been followed in England for more than sixty or seventy years, 'as it is within the remembrance of some of the old inhabitants of the straw districts, now alive, that the wives and daughters of the farmers used to plait straw for making their own bonnets, before straw-plaiting became established as a manufacture.' This was published in 1834. Gipsy straw-hats were worn by ladies in this country about 1745-6, according to the 'Pictorial History of England' (vol. iv., p. 806). When Arthur Young visited Dunstable, in 1768, the straw-plat manufacture appears to have been established, though not very extensively. He says (*Six Months' Tour*, vol. i., p. 16), 'At that place is a manufacture of basket-work, which they have carried to a great perfection of neatness, and make of hats, boxes, baskets, &c. a large quantity annually; but not a great number of hands are employed by it.' In the 'Commercial Gazetteer' appended to Macpherson's 'Annals of Commerce,' published in 1805, Dunstable is described as 'a town in the neighbourhood of which the women and children are employed in making hats, baskets, and many fancy articles, of straw, which in their hands assumes a vast variety of figures and colours, and produces considerable emolument, especially since the straw hats have been in general request among the ladies.'

The large size of the wheat-straw used in this country for platting prevented the home manufacture from entering into competition with that of Italy in articles of fine quality; the straw grown for the purpose in Tuscany being much smaller, as well as superior in colour. This difficulty was in some degree overcome by the expedient adopted in England towards the end of the last century, of splitting the straw, and using the narrow *splints*, or slips of straw, in lieu of whole straws. The operation of splitting is performed by small cutting instruments called *machines*, which have a number of sharp edges so fixed as to divide the straw, by a motion in the direction of its length, into four, five, six, or more equal parts. Before machines were invented, straws were occasionally split with knives by hand; a process which was both tedious and unsatisfactory, since it gave no security for the uniform width of the splints, upon which the beauty of the plat greatly depends. It has been stated that the ingenuity of the person who contrived the machine used for this purpose was rewarded by realising a fortune of 30,000*l.*; but a communication from a correspondent at Watford gives a very different account of the matter. Our informant states that his father, Thomas Simmons (now deceased), was residing when a boy, about the year 1785, at Chalfont St. Peter's, Buckinghamshire, and that when amusing himself one evening by cutting pieces of wood, he made an article upon which he put a straw, and found that it divided it into several pieces. A female who was present asked him to give it to her, observing that if he could not make money of it, she could. She had the instrument, and gave the boy a shilling. He was subsequently apprenticed to a blacksmith; and, on visiting his friends, he found them engaged in splitting straws with a penknife. Perceiving that the operation might be much better performed by an apparatus similar to that which he had made some time before, he then made some machines of iron on the same principle. So far from realising a fortune by the invention, his son states that he only realised one shilling. The inconvenience of the process as performed by hand may possibly have led more than one individual to devise similar means for overcoming the difficulty. Be this as it may, the introduction of split straw gave a great impulse to the plat manufacture. Mr. Corston, in a letter addressed to the Society of Arts in 1810, observes that 'by the mere invention of the splitting of a straw a source of employment has been discovered, which has increased the returns in that branch not less than from 300,000*l.* to 400,000*l.* annually.'

Greatly as the British straw-plat manufacture had been encouraged by the use of split straw, by improvements in bleaching, and by increased care in the selection of straws of uniform size and colour, it was found, when the re-establishment of peace allowed the free importation of Italian straw hats, that the home manufacture was unable to compete with the foreign, notwithstanding the heavy protecting duty levied upon hats or bonnets of straw imported from other countries. The Society of Arts has therefore, for a long series of years, offered encouragement to attempts for the improvement of the British straw manufacture, which has called forth many interesting communications, and has led to great improvement. As early as 1805, the Society presented a gold medal to Mr. William Corston, of Ludgate-hill, for a substitute, of his invention, for Leghorn plat. His plat was formed of rye-straw, and was so good that some specimens had been examined by London tradesmen, who confessed their inability to discover the difference between them and the real Italian Leghorn. Mr. Corston states that 781,605 straw hats had been imported from 1794 to 1803; and that in the last four years of that period 5281 lbs. of straw-plat, which was equal to 26,405 hats, had also been brought to this country. By the introduction of his new plat, it was considered that much poor land might be brought into profitable cultivation, and that employment might be provided for many females and children. In a subsequent communication, dated May, 1810, Mr. Corston states that the country was beginning to reap the benefit of his proposals. (*Trans. of the Soc. of Arts*, vols. xxiii. and xxviii.) More recently rye-straw has been tried for the same purpose by Messrs. J. and A. Muir, of Greenock, who attempted to establish the straw-plat manufacture in the Orkneys. These gentlemen communicated the results of their experiments to the forty-fourth and forty-fifth volumes of the 'Transactions' of the Society of Arts. The manufacture is still followed in the Orkneys.

In the fortieth volume of the Society's 'Transactions,' which was published in 1823, the defects of British straw-plat were particularly noticed. In plat made of split straw, unless two splints are laid together, with their inside surfaces towards each other, as in the plat called 'patent Dunstable,' it necessarily happens that the face of the plat exhibits alternately the outer and inner surfaces of the straw, which differ from each other in colour and gloss. Articles made of split straw are also inferior to those of whole straw of equal fineness, in pliability and durability. Another circumstance which greatly increases the beauty of Leghorn plat is the mode of joining it, so as to form, by the combination of several narrow strips, an extended sheet of platted work. British plat is usually joined by making the several rows of plat overwrap each other a little, and then stitching through the two overwrapping pieces with a needle and thread. The surface of a hat or bonnet formed in this manner consists of a series of ridges; and part of each row of plat is concealed by that next above it, so that an unnecessarily large quantity of plat is required to form a given extent of surface. Thus to form a band one inch wide, with a plat a quarter of an inch wide, it will be necessary to use *five* pieces of plat; at least a fourth part of the width of each being absorbed by the overwrapping joint. Leghorn plat is formed in such a manner that it may be joined without this loss; the edge of one row of plat being, as it were, knitted into the edge of the other, in such a way that the pattern may appear uninterrupted, and the line of junction may be almost invisible. In addition to these differences of quality, it is stated that the cheapness of labour on the Continent gave a great advantage to foreign competitors; so much so, indeed, that the best Hertfordshire straw might be, and actually was, sent to Switzerland, platted there, and thence returned to England, paying the import duty of 17*s.* per lb., and yet sold 25 per cent. cheaper than that platted in this country. The Society were therefore very desirous of promoting such improvements in British straw-plat as might place the manufacture in a more favourable position. With this view they awarded, in 1822, a silver medal and twenty guineas to Miss Sophia Woodhouse (afterwards Mrs. Wells), of Connecticut, in the United States, for a new material for straw plat. This material is a kind of grass (poa pratensis) which grows spontaneously in that part of the United States, and is there called 'ticklemoth.' The plat she formed of it is stated to be superior to Leghorn in fineness and colour. Miss Woodhouse sent seeds to the Society, from which the grass was raised in this country; and she also communicated an account of the process of manufacture. (*Trans. of the Soc. of Arts*, vol. xl.) In the following year, Mr. Cobbett communicated to the Society his experiments on native British grasses, of which several appeared likely to answer for platting; and some rewards have been since bestowed for experiments of like character. Before noticing these, allusion must be made to another, and a very important paper, in the fortieth volume of their 'Transactions.'

The paper alluded to is a communication from Mr. John Parry, who received, in 1822, the large silver medal of the Society for the manufacture of Leghorn plat from straw imported from Italy. The import duty charged upon straw-plat was then, as it still is, considerably less than that upon straw hats or bonnets, and the duty on unmanufactured straw still less in proportion. The home manufacture of Italian straw had been tried, but without success, by Mr. Bigg; and it was afterwards attempted by Mr. Parry, who, at the date of his communication, had more than seventy women and children employed in it. The ears are, it is stated, cut off with a knife, and the straws are then carefully sorted to obtain uniformity in length, thickness, and colour. The plat of which the formation is described, and of which an engraving is given to illustrate the description, consists of thirteen straws. These are to be tied together at one end, and then divided into two portions; six straws being turned towards the left side, and seven to the right, so that the two portions of straw may form a right angle. The seventh or outermost straw on the right-hand side is then to be turned down by the finger and thumb of the right hand, and brought under two straws, over two, and under two. This being done, there will be seven straws on the left and six on the right side of the angle; and the next operation is to turn down the outermost of the seven with the left-hand finger and thumb, and to pass it under two straws, over two, and under two. The right side will again have seven, and the left side six straws; and the platting must be continued in the same manner, alternately doubling and platting the outermost seventh straw from side to side, until it becomes too short to cross over so as to double on the other side of the angle. The platter is then to take another straw, and to put it under the short end at the point of the angle (the middle of the plat), and, by another straw coming under and over the joined one from both sides of the angle in the operation of platting, it will become fastened; the short end being then left out underneath the plat, and the newly fastened straw taking its place on that side of the angle to which the short one was directed. The plat thus formed is represented in the cut *Fig.* 1, copied from the engraving which accompanies Mr. Parry's communication. It is about double the real size. The plat is formed in pieces of great length, which are adjusted in spiral coils, with their adjacent edges knitted together, so as to form the large circular pieces of plat which, under the name of hats, or *flats*, are so extensively exported from the north of Italy. The mode of effecting the junction is described in the same volume, and may be explained by the help of the annexed cuts. *Fig.* 2 represents, about four times the real size, the two adjacent edges when knitted together; the dotted lines indicating the edges of each piece of plat, and showing how far the angular folds, or *eyes*, of one piece are inserted into those of the adjoining piece. The thread by which the two rows of plat are held together is here straight, and is entirely concealed in the plat. The joint is, indeed, only to be detected on either side by the slightly increased thickness of the plat where the angles are inserted into each other, and the thickness of the thread itself. The mode of junction may perhaps be better understood from *Fig.* 3, which represents the pieces of plat drawn a little asunder, and shows the course of the thread, which is indicated by dotted lines where it is covered by the straw. The operation is performed by pushing a needle through the folds in the required order, and, after passing it through as many as can be conveniently done at once, drawing it through in the manner of a bodkin, leaving its place to be taken by the thread. It is observed that if the edges of the plat are not thrust sufficiently close, the needle will miss some of the folds, and the junction, though not visibly imperfect, is really so. It is further stated that sometimes, for the sake of expedition, only every other fold is threaded. This is a very injudicious practice, because it requires a coarser thread to make the junction secure, and therefore, by rendering the line of junction more prominent, impairs the beauty of the work. In arranging the plat in a spiral coil, as in making a hat, it is necessary, in a few places, to force two loops of the smaller circle into one of the larger circle adjoining it, to allow for their different diameters.

Fig. 1.

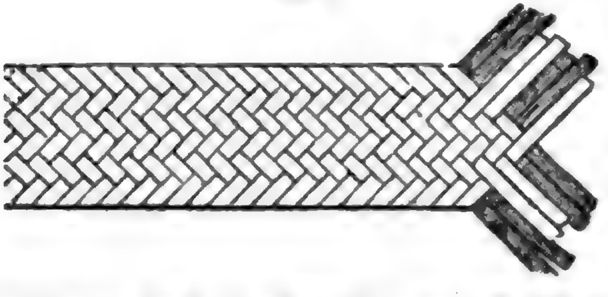


Fig. 2.

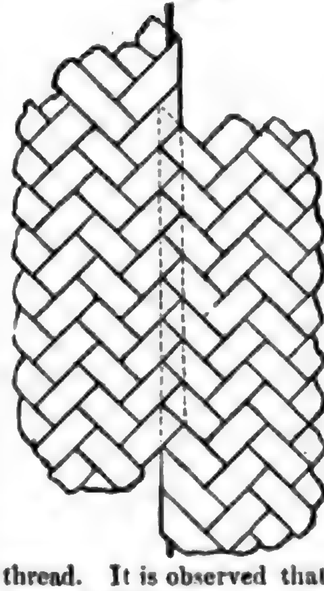
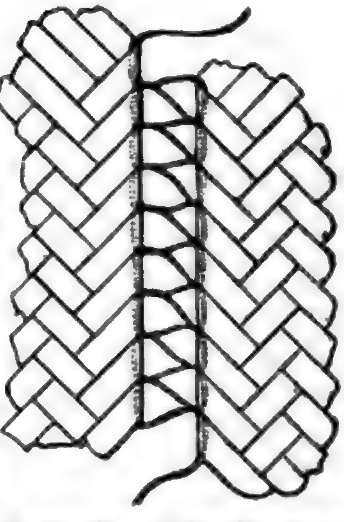


Fig. 3.



The information thus circulated respecting the mode of manufacturing Italian plat, has been of great importance to the British manufacture. In the year after it was published the Society of Arts rewarded sixteen individuals for the production of bonnets formed of grasses indigenous to Britain, platted and joined according to the Italian methods. Several of the specimens produced were even finer than real Leghorn; but it should be remembered that such extreme fineness can only be attained by a sacrifice of strength, and also that it increases the work. Most of them were imperfect in colour and regularity of size; but these defects are not incapable of remedy. The Society reported, that 'Upon the whole it appears to be satisfactorily proved that the stems of the crested dog's-tail grass are a material for plat finer than the average quality of Leghorn; and that the deficiencies in texture and colour of most of the bonnets produced before the Society are only such as practice and experience will shortly remove.' (*Transactions*, vol. xlii., p. 79.)

Various statements have been made respecting the material commonly used for plat in Tuscany. According to a communication made by Mr. W. Salisbury to the Society of Arts (*Transactions*, vol. xliii., p. 21), the straw used is that of *triticum turgidum*, a variety of bearded wheat, which seems to differ in no respect from the spring wheat grown in the vale of Evesham and in other parts of England. It is grown in Tuscany solely for the straw, and not for the grain; and the upper joint of the straw is that chiefly used for platting. Dr. Ure states (*Dict. of Arts, &c.*, p. 1190) that the straw is pulled while the ear is in a soft milky state; the corn having been sown very close, and consequently produced in a thin, short, and dwindled condition. It is then dried by spreading it thinly upon the ground in fine hot weather, and afterwards tied up in bundles and stacked, for the purpose of enabling the heat of the mow to drive off any remaining moisture. 'It is important,' he further says, 'to keep the ends of the straw air-tight, in order to retain the pith, and prevent the gummy particles from passing off by evaporation.' After remaining in the mow for about a month, it is spread out in a meadow, and exposed to the action of dew, sun, and air, in order to bleach it. The straw is frequently turned during this operation; and after it is completed, the lower joint of the straw is pulled off, leaving the upper joint, with the ear attached to it, for use. This part is then subjected to the action of steam, and to fumigation with sulphur, in order to complete the bleaching, after which it is ready for use. It is tied up in bundles, and imported to England in this state.

Bleaching with sulphur is commonly practised in this country, and Dr. Ure states that a solution of chloride of lime may be used for the purpose. The apparatus he describes for the former process consists of a cask open at both ends, with its seams papered. It is to be set upright on the ground, having a hoop nailed to it inside, about six inches beneath the top, to support another hoop with a net stretched across it, upon which the straw is to be laid loosely. The cask is then covered with a tight overlapping lid, stuffed with lists of cloth. A brazier of burning charcoal is inserted beneath the cask, and upon this is placed an iron dish containing pieces of brimstone. The brimstone soon takes fire, and the sulphurous acid gas evolved during its combustion fills the cask, and bleaches the straw in three or four hours. Care must be taken to prevent the too rapid combustion of the sulphur, which might cause black burned spots on the straw. After bleaching, the straw is to be aired and softened by spreading it upon grass for a night, and it is then ready for splitting.

Straw may be dyed, for ornamental purposes, of many different colours. Dr. Ure states that blue is given by a boiling-hot solution of indigo in sulphuric acid; yellow, by decoction of turmeric; red, by boiling hanks of coarse scarlet wool in a bath of weak alum-water containing the straw; or directly, by cochineal, salt of tin, and tartar. Brazil wood and orchil are also employed for dyeing straw.

The *splints*, or pieces of split straw, being curved in a way which would impede the operation of platting, require to be flattened between rollers. These, as well as the whole straws used in other kinds of plat, are moistened with water to render them easy to work. It need hardly be observed that cleanliness is indispensable to the beauty of the plat. Hence the Italian platters find the spring to be the most favourable season for the work, as the plat is not then exposed to the smoky atmosphere of the huts as in winter, nor to the dust and perspiration of summer. The Italian plat is dressed and polished by passing it forcibly between the hand and a sharp piece of wood. It is needless to enumerate the varieties of straw-plat, of which there are many, differing in the number and mode of platting the straws, in the circumstance of the straws being whole or split, &c.

In the kind of straw-platting above described, the plat is formed into a narrow strip or riband, which must be formed into a spiral coil, or united edge to edge, to form a hat or bonnet. In 1834, Mr. T. B. Smith, of St. Alban's, received a prize from the Society of Arts for applying Brazilian plat to the manufacture of hats and bonnets of split straw. This kind of plat is not formed in strips, but is at once platted or woven into the required form and size. The process is fully explained, and illustrated with cuts, in the fiftieth volume of the Society's 'Transactions.' One advantage claimed for the method is that either the glossy or the dull surface of the split straw may be placed entirely on one side of the plat.

The British straw-plat district comprises Bedfordshire, Hertfordshire, and Buckinghamshire; those counties being, according to M'Culloch's 'Dictionary,' the most favourable for the production of the wheat-straw commonly used for English plat. The manufacture is also followed, according to the same authority, in a few places in Essex and Suffolk; but very little in other counties. The principal markets are Luton, Dunstable, and St. Alban's. In Italy the manufacture is chiefly followed in the neighbourhood of Florence, Pisa, Siena, and the Val d'Arno, in the duchy of Tuscany; and it is also established in Venice and other places. There, as in England, the manufacture is purely domestic. The chief market is Florence; and the demand is principally from England, France, Germany, and America. Of late years the demand has fallen off so greatly, that many of the Italians have abandoned the manufacture.

The following tables, compiled from official returns, will show how greatly the imports of straw hats have diminished of late years, especially from Italy; and will also indicate, by the increased imports of straw-plat and straw for platting, the gratifying progress of that department of the British manufacture in which foreign materials are used with home labour.

I. Table showing the number of *straw hats* imported, exported, and entered for home consumption, and the net revenue derived therefrom, in each period of five years, from 1820 to 1839:—

Years.	Imported. Number.	Exported. Number.	Home Consumption. Number.	Net Revenue. £.
1820-4	676,479	42,905	626,236	180,501
1825-9	1,356,767	70,465	1,217,221	343,837
1830-4	458,437	174,432	356,258	101,036
1835-9	83,600	73,824	20,299	6,040
	2,575,283	361,616	2,220,014	£631,420

During the period embraced by this table the import duty was as follows:—8*l.* 8*s.* per dozen upon hats not exceeding twenty-two inches in diameter, down to August 16, 1837, and not exceeding twenty-four inches in diameter after that date; and 6*l.* 16*s.* per dozen for hats of larger dimensions. We are not acquainted with any published data for showing, for the whole of this period, the proportionate amount of imports from different countries; but from 1827 to 1829 about 83¼ per cent. of the total number of straw hats imported were from Italy, about 15¾ per cent. from France, and rather less than 1 per cent. from Holland and Belgium. In the five years from 1830 to 1834, the principal imports were—from Italy, 89¼ per cent. of the whole; from France, about 8½ per cent.; and from the United States, about 1¼ per cent. From 1835 to 1839 the proportions were about as follow:—Italy, 38½ per cent.; France, 26¾ per cent.; Philippine Islands, 14¾ per cent.; United States, 17¾ per cent.; East India Company's territories, 6¾ per cent.; British North America, 3 per cent.; and Russia, 1¾ per cent. The remaining fraction in each case consists of very small quantities imported from various places.

II. Table showing the quantities of *straw-platting* imported, exported, and entered for home consumption, and the net revenue derived therefrom, in each period of five years, from 1820 to 1839:—

Years.	Imported. lbs.	Exported. lbs.	Home Consumption. lbs.	Net Revenue £
1820-4	9,051	..	8,497	7,224
1825-9	38,585	2,629	31,153	26,476
1830-4	116,241	10,096	89,794	74,813
1835-9	185,789	52,685	141,956	119,085
	349,666	65,410	271,400	£227,598

The import duty on straw-platting, during the whole of the above period, was at the rate of 17*s.* per lb.

III. Table showing the quantities of *straw and grass for platting* imported, exported, and entered for home consumption, the rate of duty, and the net revenue derived therefrom, from 1820 to 1839:—

Years.	Imported. £	Exported. £	Home Consumption. £	Rate of Duty.	Net Revenue £
1820-4	..	..	..	20 per cent. ad valorem.	..
1825-9	12,100	..	12,100	10 per cent. ad valorem.	3,081
1830-2	41,359	22	41,344	Do.	4,092
	Cwts.	Cwts.	Cwts.		
1833-4	4,479	40	4,784	1*d.* per cwt.	9*
1835-9	17,172	282	16,928	Do.	72

STRAWBERRY, the English name of the fruit and plant of the *Fragaria*, a genus of plants belonging to the natural order Rosaceæ. The fruit of the Fragaria is one of the most delicious of our summer fruits. The name Fragaria is derived from the Latin *Fragum*: and the English name from the practice in this country of cultivating the plant with straw surrounding it.

The genus Fragaria is known in its family by possessing a calyx with a concave tube, the limb of which is 10-parted, and the outer 5 segments accessory; 5 petals; stamens and carpels indefinite, the latter placed upon a fleshy and succulent receptacle, forming the juicy and succulent part of the fruit.

The species are perennial plants, throwing out runners; the leaves are trifoliate, each leaflet being coarsely toothed; the receptacle on which is seated the carpels, and which is called the fruit, is round, and assumes a variety of colours from a scarcely perceptible pink to a dark red.

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* This is for 1834 only; the tables issued by the Board of Trade (part iii., 1820-33) state that in 1833 the repayments exceeded the gross receipts.

Several species of this genus have been described. Linnæus gave only two; but Wildenow admitted eight; and Geo. Don, in 'Miller's Dictionary,' enumerates fourteen. Duchesne, who is followed by many French botanists, makes only two species, and makes the species of other writers varieties of these. All of them are natives of temperate or cold climates; and are found in Europe, America, and the mountains of Asia.

As with regard to plants so extensively cultivated as the strawberry, it is frequently difficult to distinguish between the varieties and species, we shall follow Don, and enumerate those species which afford the varieties of cultivated strawberries.

Wood or alpine strawberry (*Fragaria vesca*) has plicate leaves, pilose beneath; the sepals reflexed, and the hairs on the peduncle pressed down. It is found wild in woods and on hill-sides throughout Europe, and is abundant in Great Britain. Duchesne describes eight varieties of this species, mostly characterised by the different form of the fruit or fleshy receptacle. Many of these produce the cultivated varieties which are known in gardens. The *F. v. semperflorens* produces the red, the white, the American, and Danish alpine strawberries, all of which are of a fine flavour, and greatly valued. *F. v. minor* produces the red wood-strawberry, or *frasier d'Angleterre*, and the white wood-strawberry, both very fine kinds. To the *F. v. eflagellis* belongs the red and white alpine bush-strawberry, but these do not produce so good fruit as the last.

Hill strawberry (*Fragaria collina*) has the sepals erect after flowering, and the hairs on the peduncles and calyx erect. This species is a native of Switzerland and Germany, and is characterised by its producing green fruit. The varieties of strawberries which are called green are the produce of this species. In flavour and size they are only a second-rate strawberry.

The Majaufe of the French (*Fragaria Majaufea*) has long stamens, with the calyx pressed down after flowering. This species is a native of France, and produces a fruit which is known in that country under the name of *Majaufe*.

Hautbois strawberry (*Fragaria elatior*) has the sepals reflexed on the peduncle, the hairs of the peduncles and petioles extending horizontally. It is a native of North America, and is occasionally found in groves in the south of England. The shape, size, and colour of the fruit of the hautbois are subject to great varieties, according to its mode of cultivation. It is the parent of a great number of sorts known in gardens, most of which, when properly managed, produce fruits of a first-rate kind. The most common of these are the black, brown, and common hautbois; the globe, the large flat hautbois, the long-fruited muscatella, and Sir Joseph Banks, belong to this species.

Virginian strawberry (*Fragaria virginiana*) has the calyx expanded after flowering; the hairs of the peduncle pressed down, and those of the petiole upright. It is a native of Virginia, and to this species belong the great list of sorts cultivated in gardens and known by the name of scarlet and black strawberries. The various kinds of scarlet, globe, cone, and some pine strawberries are produced from this species.

Large-flowered strawberry (*Fragaria grandiflora*) has leaflets glaucous, coriaceous, crenated, glabrous above, and pilose beneath; reflexed sepals, and hairs on the peduncles and petioles spreading. It is a native of Surinam, and has furnished our gardens with the sorts called pine strawberries. The various sorts named Bath, pine, Carolina, Dutch, and others, belong to this species.

Chili strawberry (*Fragaria Chilensis*) has leaves obovate obtuse, with silky villi beneath; calyx erect, hairs on peduncles and petioles spreading. It is a native of South America, both in Chili and Peru, and is the parent of a number of mostly inferior strawberries.

The other species of Fragaria do not bear strawberries that are worthy of cultivation.

Strawberries, when ripe, may be eaten in almost any quantity without injury. They are frequently eaten mixed with sugar and cream or wine. When ripe and well grown they hardly require such additions; but when their sugar is deficient, this ingredient may be safely added; and the addition of wine under these circumstances should be preferred to cream, as the latter is very liable to disagree with disordered stomachs.

Strawberries may be propagated either by means of their suckers or runners, or by sowing seed. The young plants will generally bear the year after they have been planted or sown. In order to obtain the fruit in perfection, they should be planted where they have access to abundance of light and air. Plants grown from runners are best for new beds, and should be planted out in March, in beds with three or four rows, leaving an alley between each bed. The alleys should be wide, the beds kept clear from weeds, and the runners cut at least three times in the season. In the autumn the rows should be dug between, and in the spring some straw or dung should be laid between the rows. If the latter produces too luxuriant a growth of the plants, it should not be employed. The *pine strawberries* require a light loam. The rows of the beds should be two feet apart, the plants eighteen inches asunder, and the alleys three feet wide between each bed. The *scarlet strawberries* may be treated in the same manner. The duration of these and the preceding strawberries is about three years. The *hautbois* require a light soil and the same general treatment; and as they are diœcious, care should be taken that there are male plants in the bed in the proportion of about one to ten. The *wood-strawberry* is best produced from seed, which should be sown as soon as it is obtained from the fruit, and should be planted in beds in March, in the same way as the others. The *alpine strawberry* is best grown from seeds, which should not be sown till the spring, and may be planted in July or August, in rows at the back of hedges or walls, in a rich or moist soil. The duration of these and the last seldom exceeds two years.

As a choice selection of sorts that can be procured for the garden, Mr. Lindley recommends the following:—Austrian Scarlet, Black Roseberry, Grove-end Scarlet, Old Scarlet, Roseberry, Downton, Sweet Cone—all varieties of *Fragaria virginiana;* Black Prince, Elton's Seedling, Keen's Seedling, Old Pine—varieties of *F. grandiflora;* Large Flat Hautbois, Prolific Hautbois—varieties of *F. elatior;* Red Alpine, White Alpine—varieties of *F. vesca;* Wilmot's Superb, Old Scarlet—varieties of *F. Chilensis*.

For further information see Lindley's *Guide to the Orchard and Kitchen-Garden;* Don's 'Miller,' vol. ii.; *Hort. Transactions*, vol. ii.

STREATHAM. [Surrey.]

STREETS, PAVEMENT OF. [Road.]

STRELITZ, the capital of the grand-duchy of Mecklenburg-Strelitz, is situated in 53° 25′ N. lat. and 13° E. long. It consists of two parts, Old Strelitz and New Strelitz, which are not quite contiguous, but about a mile distant from each other, and though considered as one town, each has its own magistrates. Old Strelitz, which was formerly the residence of the duke, has 3500 inhabitants, among whom there are 450 Jews, who have a synagogue, a rabbi, and their own judges. The inhabitants manufacture leather, tobacco and tobacco-pipes, and are partly employed in agriculture and gardening. They have four annual fairs, one of which is a much-frequented horse-fair. There are some public offices, an hospital, a workhouse and lunatic asylum, a church, and a free-school with five masters. The ducal palace, at Old Strelitz, having been destroyed by fire in 1713, the duke built a new one at a place called Glienke, a short distance from it, and in 1733 founded New Strelitz, a very neat town, built in the form of a star, with eight rays diverging from the market-place in the centre. This town, which is now the residence of the duke and the seat of the principal government offices, has a gymnasium and several schools. The most remarkable edifice is the ducal palace, in which there is a library of 50,000 volumes, a cabinet of medals, and a very curious collection of German antiquities. The palace has a fine garden and an extensive park. The inhabitants, now near 6000, have no manufactures of any importance, and derive their subsistence chiefly from the expenditure of the court and the public offices, from handicrafts and agriculture. The environs of the town, which is situated on the Zirker lake, are very pleasant.

(Hassel; Stein; Hörschelmann; Hempel, *Beschreibung von Mecklenburg*.)

STRELITZES. [Peter the Great: Russia.]

STRENGTH OF BEAMS AND OTHER MATERIALS. [Materials, Strength of; Roof.]

STREPSI′CERUS, Colonel Smith's name for the Koodoo. [Antelope, vol. ii., p. 78.]

STRE′PSILAS. [Scolopacidæ, vol. xxi., p. 86.]

STREPTAXIS, Mr. J. E. Gray's name for a genus of pulmoniferous mollusks, separated from *Helix* on account of the eccentricity of the penultimate whorl.

Generic Character.—Shell ovate or oblong; subhemispherical in the young state, deeply umbilicated, and with the whorls rapidly enlarging. As the shell becomes complete, the penultimate whorl is bent towards the right and dorsal side of the axis, where the umbilicus becomes compressed, and often nearly closed. Aperture lunulate, border of the outer lip thickened and reflected; a single tooth often present on the outer side of the inner lip.

Example, *Streptaxis contusa*. [HELICIDÆ, vol. xii., p. 110.]

STREPTOSPO'NDYLUS, H. von Meyer's name for an extinct genus of reptiles belonging to the *Cœlospondylian tribe* of the *Crocodilian order* in the arrangement of Professor Owen, who thus defines the vertebral characters of this highly interesting form, the *Steneosaurus rostro-major* of Geoffroy, and the *Crocodile d'Honfleur* of Cuvier:—

'The distinguishing vertebral characters are a ball-and-socket articulation of the bodies of the vertebræ; but the positions of the ball and cavity are the reverse of those in the existing crocodiles, the convexity being on the anterior part of the vertebræ, and the concavity directed backwards. In the anterior vertebræ, which have the ribs articulated with the body, there is a deep pit behind the costal articular surface; the transverse process rises by four salient ridges, one from each oblique process, and the two inferior and principal ones from the base of the neurapophysis; these ridges converge at an acute angle as they ascend, and meet at the under part of the transverse process, so as to include a triangular space, which is deeply concave. A third salient ridge ascends from the fore part of the base of the neurapophysis to the anterior oblique process, nearly parallel with the posterior of the two last-mentioned ridges, so that the side of each neurapophysis appears as if marked with the letter N in high relief. In the cervical and anterior dorsal vertebræ there are, instead of a single inferior spinous process, two ridges, which terminate each in front by a tubercle.'—(*Report on British Fossil Reptiles. British Association.*)

The Professor states that he is not aware that remains of this Crocodilian genus have hitherto been recognised in any of the British strata; and he proceeds to describe certain fossils found in the oolite in the vicinity of Chipping Norton, among which the anterior half of an anterior dorsal vertebra belonging to this animal, and in the collection of Mr. Kingdon of that town, is described as follows:—

'The articular surfaces for the ribs are, as usual, close to the anterior part of the body of the vertebra, and this terminates by a convex articular surface, instead of being, as in the Crocodiles, concave: the second character is the remarkably deep pit behind each of the costal articular surfaces. It is as if a man had pressed his two thumbs forwards and inwards up to the first joint, into the substance of the body of the vertebra, until their extremities had nearly met. The aperture of each pit measures one inch by ten lines. Sufficient of the neurapophysial arch is preserved to show the depression which has separated the two anterior ridges of its external surface; but these characteristic ridges, with the transverse spinous and oblique processes, are wanting. The medullary canal is compressed, and gives an oval vertical section one inch six lines high, and one inch two lines wide. Both upper and lower surfaces of the medullary canal are flat, and join the lateral surfaces at nearly a right angle. There is a slight ridge along each side of the medullary canal, indicating the neurapophysial suture, which extends here outwards and obliquely downwards to above the middle of the costal depression. This depression is vertically ovate, with a deeper oblique pit in the middle, two inches in the long diameter, by one inch six lines across the broadest part. The texture of this vertebra is coarsely cellular, except for about two lines at the margin, where it is in very compact laminæ. The anterior articular surface of the centrum is slightly and irregularly convex, being nearly flat at the upper part.

'There is a slight deviation from the symmetrical figure in the whole of this vertebral fragment. The body of the vertebra is much compressed in the middle, and suddenly expands to form the terminal articular surface. This character is likewise indicated by Cuvier in his *Crocodile d'Honfleur*;[*] thus the transverse diameters of the middle of the vertebral body, across which the present fossil has been fractured, measures two inches three lines, whilst the same diameter of the convex articular extremity is four inches.

'The corresponding diameters of one of the anterior dorsal vertebræ of the *Streptospondylus*, described by Cuvier, are respectively one inch seven lines, and two inches six lines; whence we may conjecture that the length of the entire vertebra here described would have been four inches and a half. The vertical diameter of the articular surface is three inches nine lines.

'The non-articular surface of the vertebral body is smooth, except near the articular extremity, where it is rather coarsely rugous. The inferior ridges and tubercles have disappeared at the part of the vertebral column to which the present vertebra has belonged.

'The osseous substance of the present fossil, like that of the bones of the *Streptospondylus* from Honfleur, present a deep chocolate-brown hue, and take a bright polish. It is not completely mineralized; the small cavities of a great part of the diploë are empty, and not filled with semitransparent calcareous spath, as in the Honfleur specimens.' (*Loc. cit.*)

We now proceed to the other fossils from the same locality recorded by the Professor:—

'With the portion of the vertebra above described there was associated the extremity of a spinous process, which gradually expands to a rough obtuse quadrilateral summit. This spine is characterised by having a very rugged and thick ridge, developed from the anterior and posterior surface of what may be regarded as the ordinary spinous process, the sides of which are smooth, except near the summit.

	Inches.	Lines.
'The length of this fragment of spine is	3	8
The transverse diameter of the base .	0	9
The transverse diameter of the summit of the apex	1	6
Antero-posterior diameter of spine .	1	3
Ditto, including the ridges . . .	1	10

'The anterior and posterior ridges are narrower than the surface from which they rise.

'In the Crocodile a thin plate is continued from the anterior and posterior edges of the thicker spinous processes; but the *Streptospondylus* presents an extreme and peculiar development of this structure.

'A portion of a compressed, conical, hollow tooth, with a brown dense glistening dentine, resembling that of the *Megalosaurus*, was associated with the preceding vertebra. The length of this fragment is 2 inches 4 lines, but both ends are wanting. The breadth is 8 lines; the thickness 5 lines.

'If it really belong to the *Streptospondylus*, it confirms the view of the affinity of that genus to *Megalosaurus*, which has been suggested by the characters of the vertebra. This tooth was found associated with the preceding fragment in the oolite at Chipping Norton. With these were likewise found a portion of a broad flat bone, with a convex, rough, articular labrum, nearly two inches thick, and of a fine cancellous structure, and fragments of long bones, with large medullary cavities and compact outer walls, of which the thickness equals about one-third of the diameter of the medullary canal.'

Professor Owen then notices a posterior dorsal vertebra from the jet-rock (lias shale) near Whitby (much more complete than the preceding specimen, and nearly corresponding in size with the dorsal vertebræ of the Honfleur *Streptospondylus* described by Cuvier), in the collection of Mr. Ripley of Whitby; and informs us that the third British formation in which he has determined the remains of the genus is the Wealden, specimens having been obtained from three localities, viz. Tilgate Forest, in Sussex, and Brook Point and Culver Cliff, in the Isle of Wight. The specimens, he observes, differ in size from those already described, being larger than the *Streptospondylus Cuvieri* from the oolite, and he strongly suspects that they indicate a different species, indeed he names it *Streptospondylus major*, but remarks that the means of comparison for the satisfactory establishment of the distinction are as yet wanting. Professor Owen also makes mention of a cervical vertebra associated, as in the Mantellian Collection, with vertebræ of the *Iguanodon* and *Cetiosaurus*, which had been washed out of the submarine Wealden beds at the south side of the Isle of Wight, and thrown on shore near Culver Cliffs and Brook Point: this specimen is in the museum of Mr. Saull, of Aldersgate-street, London. Some idea of the size of this reptile may be derived from Professor Owen's admeasurements, which give 5 inches as the transverse diameter of the posterior concave articular surface in the Wealden, and 6 inches in the Culver Cliff specimen, whilst the transverse diameter of the body across the inferior transverse processes is 6 inches in the Tilgate, and 6 inches 6 lines in the Culver Cliff specimen, the height of the latter from the lower surface of the centrum to the hind part of the base of the spine being 7 inches 9 lines.

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[*] 'Le corps de cette vertèbre, ainsi que des suivantes est beaucoup plus rétreci dans son milieu que dans les Crocodiles connus.'—*Ossem. Foss.*, ed. 1828, tom. v., pt. 2, p. 156.

The Professor further observes that the vertebra from the forest marble alluded to in the note at p. 297 of Dr. Mantell's 'Geology of the South-east of England' is a centrum from the posterior part of the dorsal region of the *Streptospondylus major*.

The foreign localities in which remains of *Streptospondylus* have been found are the Oxford-clay formation at Honfleur, and the Kimmeridge-clay at Havre (Cuv.); and the lias of Altdorf (H. von Meyer).

We have called the form of this extinct Saurian highly interesting, for it presents those transitional characters which, while they beautifully manifest the passage, so to speak, from one specific form to another, are too apt to lead a superficial observer to wild speculations. Professor Owen, in his luminous argument at the close of the valuable Report above quoted, against the transmutation theory—fallacy, we would venture to call it—of Maillet, Lamarck, and their followers, observes that if the three forms of extinct Saurians, *Ichthyosaurus*, *Plesiosaurus*, and *Teleosaurus*, whose changes of specific and generic characters have thus been speculated upon, had actually succeeded each other in strata successively superimposed in the order here set forth, some colour of probability might attach itself to this hypothesis, and there would be ground for searching more closely into the anatomical and physiological possibilities of such transmutations. Those genera however, he observes, appeared contemporaneously on the stage of vital existence: one neither preceded nor came after the other. How the transmutation theory is to be reconciled to these facts is not, he justly observes, obvious nor to these other, viz. that the Teleosaur ceases with the oolite, while the Ichthyosaur and Plesiosaur continue to exist to the deposition of the chalk, and disappear together alike unchanged; the Ichthyosaur manifesting as little tendency to develop itself into a Plesiosaur as this to degrade itself into the more fish-like form of the Enaliosaurian type.

'If,' continues the Professor, 'it were urged that the *Streptospondylus*, or crocodile with ball-and-socket vertebræ, of which the remains occur in later secondary strata, when the Teleosaur had ceased to exist, might be a modification of the apparently extinct amphicœlian crocodile, in which the vertebræ had undergone a progressive development analogous to that by which the biconcave joints of the vertebræ of the tadpole are actually converted into the ball-and-socket joints of those of the mature frog, the facts of both geology and anatomy again oppose themselves to such an hypothesis; for the remains of the *Streptospondylus* occur likewise in the Whitby lias, which is the earliest formation characterized by remains of the *Teleosaurus;* and the modification of the vertebral structure by which the *Streptospondylus* differs from its antient contemporary, and which it retains unaltered throughout the whole series of oolitic strata, is no approximation to the ball-and-socket structure of modern crocodiles, which first appears in the *Mosasaurus* and the Eocene crocodiles, but is the very reverse. As reasonably might we infer that the Teleosaur was an intermediate form between the *Streptospondylus* and modern crocodiles, and that the anterior ball had first subsided, and a sub-biconcave type of vertebræ had been produced before the posterior ball which characterizes the vertebræ of recent crocodiles was finally developed. If the present species of animals had resulted from progressive development and transmutation of former species, each class ought now to present its typical characters under their highest recognised conditions of organization; but the review of the characters of fossil reptiles taken in the present Report proves that this is not the case. No reptile now exists which combines a complicated and thecodont dentition with limbs so proportionally large and strong, having such well-developed marrow-bones, and sustaining the weight of the trunk by synchondrosis or anchylosis to so long and complicated a sacrum, as in the order *Dinosauria*. The Megalosaurs and Iguanodons, rejoicing in these undeniably most perfect modifications of the Reptilian type, attained the greatest bulk, and must have played the most conspicuous parts in their respective characters as devourers of animals and feeders upon vegetables that this earth has ever witnessed in oviparous and cold-blooded creatures. They were as superior in organization and in bulk to the crocodiles that preceded them, as to those which came after them.'

There is not the slightest ground for affirming that the procœlian gavial of the present day is in any respect more highly organised than the opisthocœlian gavial of the oldest lias. If the differences of vertebral structure in these Crocodilians were contrasted in reference to their relative approximation to the vertebral structure of the higher animals, the resemblance of the ball-and-socket joints of the spine of the *Streptospondylus* to those of certain mammals would give precedence in organic perfection to the primæval gavial. If therefore the extinct species, in which the Reptilian organization culminated, were on the march of development to a higher type, the *Megalosaurus* ought to have given origin to the carnivorous mammalia, and the herbivorous should have been derived from the *Iguanodon*. But where is the trace of such mammalia in the strata immediately succeeding those in which we lose sight of the relics of the great Dinosaurian Reptiles; or where indeed can any mammiferous animal be pointed out whose organization can by any ingenuity or licence of conjecture be derived, without violation of all known anatomical and physiological principles, from transmutation or progressive development of the highest reptiles? If something more than a slight inspection be bestowed upon the organic relics deposited in the crust of the globe, we learn that the introduction of mammalia on that crust is independent of the appearance of the highest forms of reptiles. The small insectivorous mammals of the lower oolite* are contemporary with the most antient Dinosaur, and are anterior to the *Iguanodon*. The period when the class of reptiles flourished under the widest modifications, in the greatest number, and of the highest grade of organization, is passed; and since the extinction of the Dinosaurian order it has been declining. The *Reptilia* are now in great part superseded by higher classes. Pterodactyles have given way to birds; Megalosaurs and Iguanodons to carnivorous and herbivorous mammalia; but the sudden extinction of the one and the abrupt appearance of the other, are alike inexplicable on any known natural causes or analogies.'

Our limits will not allow us to quote more of this well digested argument, to which we refer those who are interested in this inquiry; but we must not omit the following propositions laid down by Professor Owen in the course of the discussion:—

'The fossil reptiles, like the fossil fishes, approximate nearest to existing species in the tertiary deposits, and differ from them most widely in strata whose antiquity is highest.

'Not a single species of fossil reptile now lives on the present surface of the globe.

'The characters of modern genera cannot be applied to any species of fossil reptile in strata lower than the tertiary formations.

'No reptile with vertebræ articulated like those of existing species has been discovered below the chalk.

'Some doubt may be entertained as to whether the *Ichthyosaurus communis* did not leave its remains in both oolitic and cretaceous formations; but with this exception no single species of fossil reptile has yet been found that is common to any two great geological formations.

'The evidence acquired by the researches which are detailed in the body of this Report permits of no other conclusion than that the different species of reptiles were suddenly introduced upon the earth's surface, although it demonstrates a certain systematic regularity in the order of their appearance. Upon the whole they make a progressive approach to the organization of the existing species, yet not by an uninterrupted succession of approximating steps. Neither is the organization one of ascent, for the reptiles have not begun by the type of organization by which at the present day they most closely approach fishes; nor have they terminated at the opposite extreme, where we know that the reptilian type of structure made the nearest approach to birds and mammals.

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* *Thylacotherium* and *Phascolotherium*. [MARSUPIALIA, vol. xiv., p. 464, seq.]

'Thus, though a general progression may be discerned, the interruptions and faults, to use a geological phrase, negative the notion that the progression has been the result of self-developing energies adequate to a transmutation of specific characters; but on the contrary support the conclusion that the modifications of osteological structure which characterise the extinct reptiles were originally impressed upon them at their creation, and have been neither derived from improvement of a lower, nor lost by progressive development into a higher type.'

STRETTON. [SHROPSHIRE.]

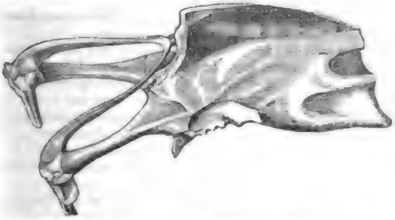
STRIGATELLA. [VOLUTIDÆ.]

STRI'GIDÆ [OWLS, OWL TRIBE], the family name for the nocturnal birds of prey, the *Ægolians* of Vieillot.

This natural family have large heads and great projecting eyes directed forwards, and surrounded with a circle or disk (more or less developed according to the nocturnal or comparatively diurnal habits of the species) formed of loose and delicate feathers; a raptorial beak; crooked claws; and a downy plumage, generally spotted, powdered, or barred with different shades of brown and yellow.

ORGANIZATION.

Mr. Yarrell, in his paper on the *Anatomy of Birds of Prey* (*Zool. Journal*, vol. iii.), points out the diminished extent of surface and power in the sternum of the Owls as compared with that of the Peregrine Falcon. [FALCONIDÆ, vol. x., p. 163.]

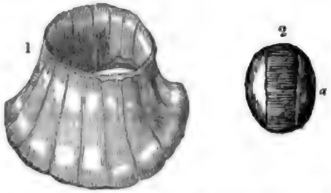


Sternum of Wood Owl, Strix Stridula. (Yarrell.)

And he observes, that from the loose and soft nature of the plumage in these birds, as well as their deficiency in muscle and bone, rapid flight is denied them as useless, if not dangerous, from the state of the atmosphere at the time they are destined to seek their food; but, he adds, they are recompensed for this loss, partly by their acute sense of hearing, from an extension of the posterior edge of the cranium forming a conch, coupled with a very large external orifice; and partly by the beautifully serrated exterior edge of the wing primaries, which, allowing them to range without noise through the air, enables them to approach unheard their unsuspecting victim, which falls a prey to the silent flight and piercing eye of an inveterate enemy. He further remarks, that some increase and variation will be found in the strength and form of such of the owls as depart from the type of the true nocturnal bird. In the snowy owl and short-eared owls, which are described as occasionally taking their food by day, the furcula, Mr. Yarrell observes, is stronger and less angular in proportion than in the wood and barn owls. The trachea, he tells us, of the different species of owls so nearly resembles the same part in the falcons, that a separate description is unnecessary, and the same may be said generally of the œsophagus, stomach, and intestines, as the similarity of food would appear to require. Mr. Yarrell found the two cœcal appendages considerably developed in the species of Strix; in the Barn Owl (*Strix flammea*), as well as in the Short-eared owl, they are, he states, small at their origin, afterwards dilated, and each 1¾ inch in length. The crop is large, and the stomach or gizzard is considerably muscular notwithstanding the nature of their living prey.

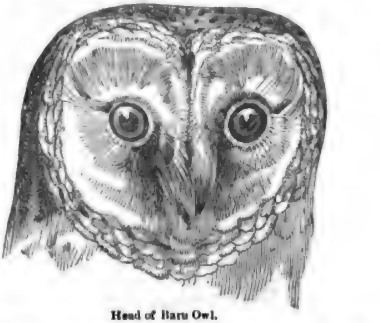
Brain, Nervous System, and Senses.—The brain is well developed in this family, and the senses of sight, hearing, taste, and smell, especially the two former, are enjoyed in a considerable degree of perfection.

Sight.—Mr. Yarrell observes (*loc. cit.*) that the external form of the bony ring in the Golden Eagle [FALCONIDÆ, vol. x., p. 165] will be found to extend through all the species of every genus of British birds, except the owls, in all of which it is concave. The bony ring of the Snowy Owl has fifteen plates forming the circle, and they are considerably lengthened. The transparent cornea being placed as it were at the end of a tube is thus, he remarks, carried forward beyond the intervention of the loose and downy feathers of the head.



1, Bony ring of a Snowy Owl. 2, Crystalline lens of the same bird, *a*, the anterior surface, less convex than the posterior one. (Yarrell.)

It is this position of the eyes, observes the same author, giving a particular fulness and breadth to the head, which has gained for the owl the intellectual character universally awarded to it. The concave facial disk of feathers with which they are surrounded materially aids vision by concentrating the rays of light.

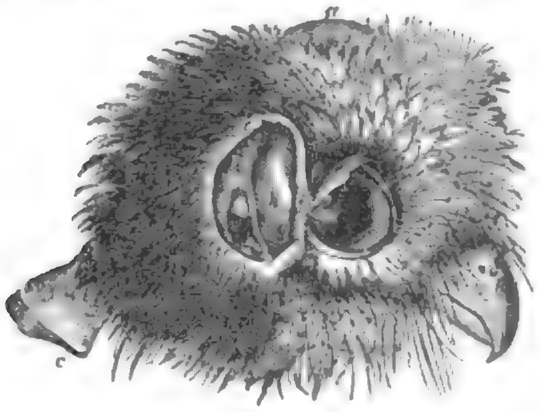


Head of Barn Owl.

Mr. Yarrell goes on to observe, that the extent of vision enjoyed by the Falcons is probably denied to the Owls, but their more spherical lens and corresponding cornea give them an intensity better suited to the opacity of the medium in which their power is required to be exercised. 'They may be compared,' says he, 'to a person near-sighted, who sees objects with superior magnitude and brilliancy when within the prescribed limits of his natural powers of vision, from the increased angle these objects subtend.'

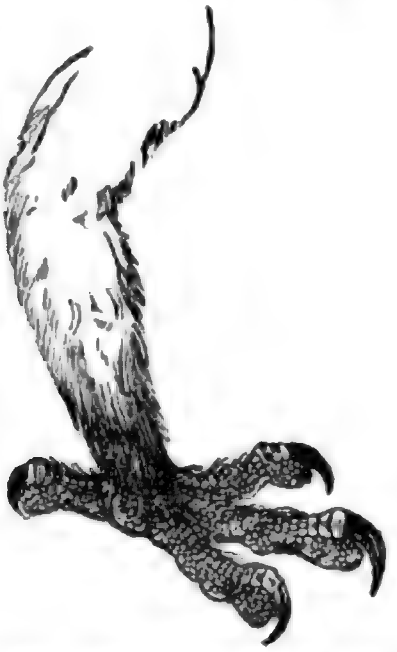
In the museum of the Royal College of Surgeons in London, No. 1755 of the *Physiological series* of preparations, is the eye of the Great Horned Owl (*Bubo maximus*), from which the cornea, humours, and a lateral section of the tunics have been removed, showing the remarkable prolongation of the anterior segment of the eye, which assumes in consequence a tubular form. The horny plates of the sclerotica are coextended with this segment to maintain its peculiar shape, and to afford a firm basis for the support of a very large and prominent cornea. The marsupium may be observed to be of small proportional size, consisting of seven slightly converging plicæ. The sclerotica, forming the posterior segment of the eye, is very thin. The vitreous and crystalline humours of the eye of the same species are prepared in No. 1749 of the same series, to show that the vitreous humour has a distinct capsule, part of which is reflected from its outer surface. No. 1750 is the crystalline lens of an owl, showing its great convexity adapted to the small distance at which objects are visible to this nocturnal bird at the time when it goes in quest of food. A longitudinal section of the crystalline lens of an owl, showing its form and laminated structure, is prepared in No. 1751. No. 1798 shows the eyeball (*membrana nictitans*) and its muscles, with the external eyelids and Harderian gland of the Great Horned Owl. In consequence of the limited motion of the eyeball, arising from its bulk as compared with the orbit, the muscles are of small size. Those of the *membrana nictatans* are, on the contrary, well developed. Bristles are placed in the puncta lachrymalia, and in the duct of the Harderian gland. No. 1799 is the right side of the head of the Horned Owl (*Otus auritus*), showing the three eyelids in situ. The two horizontal are provided with plumose cilia; the third, or nictitating eyelid, is more obliquely placed in the owls than in other birds, and sweeps over the eye downwards as well as outwards, in which motion it is usually accompanied by the upper eyelid. The tarsal cartilage is nevertheless found only in the lower eyelid. A white bristle is passed through the duct of the Harderian gland, and a black one through one of the puncta lachrymalia and the lachrymal duct to the nose. (*Catalogue*, vol iii.)

Hearing.—This sense appears to be very acute in the *Strigidæ:* they not only look, but listen for prey. No. 1581 of the same series, in the same museum, is a section of the head of the last-mentioned species, showing the organ of hearing of the right side. The membrana tympani is lodged, in this tribe of birds, at the bottom of a wide but moderately deep external meatus, which is guarded by an interior fold of integument, and further provided with a well developed auricular circle of feathers, which together fulfil the functions of an external concha. The drum of the ear is very thin and transparent; its vibrations are conveyed to the labyrinth by a single ossiculum, as in reptiles. The membrane closing the foramen ovale, to which the basis of the columella is attached, the vestibule, and the three semicircular canals, are shown; the two smaller and external canals are laid open where they open into each other in the middle of their course. Bristles are placed in both Eustachian tubes, which communicate together at their nasal terminations, as in the crocodile.



Head of a young White or Barn Owl. (Strix flammea.)

The down pressed backwards and forwards to expose the auditory passage and operculum. *a*, cranium; *b*, bill perforated by the nostril; *c*, neck; *d*, eye; *e*, termination of external skin surrounding the orifice of the ear; *f*, anterior flap, or opercular fold of the ear; *g*, part of the tympanic or quadrate bone; *h*, membrana tympani. (*Cat. Mus. Coll. Chir.*, vol. iii.)



Foot [illegible] ite or Barn Owl. (Strix flammea.)

Smell and Taste.—These senses appear to be developed nearly as they are in the *Falconidæ*. No. 1481 of the series in the same museum shows the tongue, larynx, and lower jaw of a horned owl injected. The tongue exhibits little vascularity, except at the membranous space intervening between the retroverted papillæ on its base and the glottis. The orifices of numerous glands may be observed on each side of the frænum linguæ. (*Catalogue*, vol. iii.)

Touch much the same as in the *Falconidæ*. Like theirs, the feet of the owls are formed for clutching and trussing their prey, in aid of which the external toe of the latter is capable of being directed either forward or backward.

Systematic Arrangement and Natural History.

Zoologists are generally agreed in the position assigned to the owls. In Belon and Gesner we find them next to the diurnal birds of prey. In the Work of the former the cuckoo indeed intervenes; but the external similitude between that species and the birds of prey accounts for the intervention. In Gesner the Shrikes come between the diurnal and nocturnal predacious birds.

Willughby divides the birds of prey into the diurnal and the nocturnal, placing in the last subdivision of the former the Butcher-Birds and Birds of Paradise. The latter he separates into two sections,—1, the horned or eared; 2, those without horns.

Brisson places the owls in the second section of his third order, which consists of birds with a short and hooked bill. This second section is defined as comprising species the base of whose bill is covered with feathers directed forwards.

The genus *Strix* stands among the *Accipitres* in the 'Systema Naturæ,' between the genera *Falco* and *Lanius*, which last concludes that order of Linnæus.

Latham places the owls at the end of the birds of prey, and so do Lacépède, Duméril, and Meyer. Illiger, on the contrary, makes the *Nocturni* the first of his order *Raptatores*. Cuvier makes them follow the *Diurnes;* and they immediately precede the *Passereaux*, among which last the Butcher-birds hold the first place in the first family, *Dentirostres*. Vieillot arranges the owls with the family name of *Ægolians*, under his second tribe (*Nocturni*) of his first order *Accipitres*.

M. Temminck places them at the end of his first order (*Rapaces*); and, in his 'Manuel' of European birds, divides the family of Owls into two divisions,—1st, the *Chouettes*, properly so called; 2nd, the *Chouettes Hibous*.

The 1st division, or *Chats-huants*, he subdivides into two sections, placing in the first section the *Accipitrine Owls*, or those which see well and pursue their prey by day; and in the second section the *Nocturnal Owls*, which hunt in no light stronger than twilight or moonlight, and conceal themselves during the day.

In the first section of the first division M. Temminck places the following species—*Striges Lapponica, Nyctea, Uralensis*, and *funerea*.

In the second we find *nebulosa, Aluco, flammea, passerina, Tengmalmi*, and *Acadica*.

Under the second division, *Chouettes Hibous*, distinguished by two tufts of feathers situated more or less forward upon the front, and capable of erection (whence their English appellation of Horned Owls) he arranges *Striges brachyotus, Bubo, Otus*, and *Scops*.

Mr. Vigors, who makes his first order (*Raptores*) consist of the families *Vulturidæ, Falconidæ, Strigidæ*, and *Gypogeranidæ*, says, in his paper 'On the Natural Affinities that connect the Orders and Families of Birds,' that if we search for the connection between the *Falconidæ* and the *Strigidæ*, we shall not fail to find their affinity apparent, as is usual, in the less typical part of the two groups. 'In the latter family some species may be observed gradually approaching the *Falcons* in their diurnal habits and the lateral position of the eyes; and, at the same time, deserting their own congeners in losing the large orifice to the ear, the disk that surrounds the face, and the egrets that decorate the head of the type of the family. The genus *Surnia*, Dumér., which includes the "*Chouettes Eperviers*" of the French naturalists, is the most accipitrine of the group. In addition to the approximation already pointed out, the bill and tail of this genus, more lengthened than those of the *Owls* in general, give it a still stronger resemblance to the *Falconidæ*. The group of *Buzzards* among the latter family appears to come most closely to the *Owls* in their slow and heavy flight, the softness of their plumage, and their slothful and cowardly habits. The genus *Circus* of Bechstein in particular, of which our *Hen Harrier* gives a familiar example, may be observed to possess a peculiar elongation and erection of the face-feathers, which bears some resemblance to the disk that encircles the face of the *Strigidæ*, and it may therefore be particularised from among those groups, at least, which are most known to us, as exhibiting the nearest approach to *Surnia*.'

The same author observes, in the same paper, that when we search among the *Perchers* [INSESSORES] for that point where they approximate the *Owls*, we find in the *Caprimulgus* of Linnæus [GOATSUCKERS] a group whose general appearance and habits point out the affinity. 'The nocturnal and predatory manners of this genus, the hawking flight, the legs feathered to the talons, the large ears and eyes, the very disk that surrounds the face, and the pectination of the external quill-feathers, observable in some of the species, the general softness of the plumage, together with its peculiarly striking colour and markings, produce a similarity between it and *Strix* that has attracted the eye of the common observer no less than of the naturalist. The provincial names of this genus have generally a reference to this resemblance; while the earlier scientific describers of the different species have for the most part ranked them with the *Owls*. I know not whether the singular character observable in some of the species of this family, the serrated nail of the middle toe,[*] may not be cited as an additional proof of their approach to the *birds of prey*. The strong talons of the latter are lost in *Caprimulgus;* but a construction of similar import (for the serration of the nail appears capable of being applied to the purposes of seizure only) preserves, though faintly, the resemblance. May we not almost venture to affirm that this apparently trivial appendage is an instance of that beautiful shading by which Nature softens down the extremes of her neighbouring groups, one of those minute and delicate touches by which she marks at once an affinity and deviation? But while we may discern at a glance the general approximation of these two families, we must at the same time acknowledge that they stand in need of an intermediate link to give them a closer connection. The weakness of the bill and of the legs and feet of the *Caprimulgus* still keeps it at some distance from the *Owls*, in which the same members are comparatively strong; while the wide gape of its mouth serves to divide the families still further. A connecting link has been however supplied by an Australasian group, *Podargus* of M. Cuvier, which harmonises these discrepant characters. We have an opportunity of observing, among the specimens in the collection of the Society, how far the bill of this extraordinary genus combines the different forms of that of the two genera, and how far the legs, still maintaining the characteristics of *Caprimulgus*, such as the unequal length of the toes, are related to those of *Strix* by their superior robustness. Here indeed there is a beautiful gradation of affinities. All the front toes of *Caprimulgus* are united by a connecting membrane as far as to the first joint; those of *Strix* are divided to the origin; while those of *Podargus* partake of the characters of both, in having the middle toe connected with the outer, but divided from the inner. Again, as I have already remarked, *Caprimulgus* has the nail of the middle toe dilated and serrated; *Strix* has it, generally speaking, undilated and entire at the margin; but in *Podargus* the same part displays the singular dilatation of the one, and the marginal integrity of the other. It is difficult to say to which of these groups it comes nearest, until further and more accurate accounts than we at present possess of its food and economy may determine its actual situation. At present it remains osculant between the two families, and may decidedly be pronounced the immediate passage from the *birds of prey* to the *Perchers*.' (*Linn. Trans.*, vol. xiv.) In the 'Portraits d'Oyseaux, 1557, the *Strix Caprimulgus, Fur nocturnus* (Goatsucker), immediately follows the *Owls*.

Mr. Swainson states that the divisions of the *Strigidæ* made by modern ornithologists can all be referred to one or other of the following groups:—1, Typical *Owls*, having the facial disk very large and complete, with large ears and (in general) an ample operculum; 2, Horned *Owls*, furnished with egrets and a large facial disk, but having only small or moderate-sized ears; and 3, *Diurnal* or *Hawk Owls*, where the conch of the ear is comparatively small, and is destitute of an operculum: the head has no egrets, and the facial disk is imperfect or obsolete. The first he considers the typical group; the second, the subtypical; and the third, the aberrant group.

The *Striginæ*, or typical owls, are, Mr. Swainson thinks, well represented by the common white species. The head is, he remarks, uncommonly large, and the facial disk of great circumference; the extent of the latter is marked by a dense semicircle of rigid narrow feathers, forming a sort of collar, with turned ends, lying close upon each other in the manner of scales. The aperture of the ear, which is within this collar, is large, measuring, he says, in the Brown Owl, more than an inch in length. This is protected by an operculum, which is sometimes much larger (as in *Strix flammea*) than the aperture, and sometimes nearly of the same size. He does not however regard these differences as *generic*. Owls of this group are, he observes, eminently nocturnal, and their geographic distribution, as is usual in all pre-eminent types, is very wide; the white owl, under slight variations of colour, having been found in all the temperate parts of America, in the sultry groves of India, and even in Australia. Without attempting to arrange the subgenera of this group in their natural order of succession, a task, he remarks, of great difficulty, he proceeds to enumerate such of the subordinate groups as appear to him either to lead to or represent the other genera. He makes it the primary distinction of the birds of this group, that two out of the three primary characters, viz. the facial disk, the operculum, and the great development of the ear, should be found in all; hence he includes in it the common long and short-eared owls of Britain, as aberrant forms or subgenera, representing the rasorial or crested type of the genus. Mr. Swainson finds a third type in the *Strix Tengmalmi*, to which, he thinks, we should probably refer the various small species of Europe (still but imperfectly known under the name of *Strix passerina*), together with those of temperate America. These latter owls, he observes, are known by their small size; short feet, thickly covered with feathers to the root of the claws; and by the operculum being long and narrow, the conch forming almost a semicircle. This he considers to be the tenuirostral division of the genus, and gives it the subgeneric appellation of *Scotophilus*. *Strix cinerea*, with its long tail, holds, in his opinion, an intermediate station between *Strix Tengmalmi* and *Strix stridula*, and becomes the type of his subgenus *Scotiaptex*, the length and graduated shape of the tail separating it both from *Scotophilus* and *Strix*.

Mr. Swainson retains the antient name of *Asio* for the second genus, remarking that *Noctua* has already been appropriated by Linnæus to an extensive group of nocturnal lepidopterous insects. Here he places the true Horned Owls, furnished with conspicuous egrets above the eyes, and with large disks and ears. The facial disk, in this group, is still large, but it is, he observes, more or less imperfect, especially above the eyes. The grand character of this division is the possession of egrets. Mr. Swainson has little doubt, judging from published figures, that all the subgeneric groups exist, but he here notices two only. The Great White Horned Owl (*Heliaptex Arcticus*), in his opinion, evidently intervenes between *Asio Virginianus* and *Nyctia candida*. 'It is, in fact,' continues Mr. Swainson, 'so closely connected with the latter, that, but for its egrets, both would stand in the same genus: the facial disk has now almost entirely disappeared; the head is not much bigger in proportion than that of a falcon of the same dimensions; and the ears are very small. Like the Great Cinereous Owl, which it seems to represent, its tail, although not much graduated, is longer than usual. Last of all come the little *Scops* Owls, a diminutive group in point of size, but of which there are many species. We are disposed to believe that these may form a subgenus of themselves, although we cannot at present detect any very prominent character by which they are separated from their congeners. They seem to differ indeed from the great horned owls above mentioned, by the superior length of their legs, and by the nakedness of their toes. From the hornless passerine owls of Europe (*Strix Tengmalmi*, &c.), which they seem to represent, they are at once known by the diminished size of their ears, and by their egrets; while, from the corresponding group in South America (*Nyctipetes*;

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[*] 'The common *Barn-Owl* (*Strix flammea*, Linn.) possesses the same character of a serrated *unguis*, and some other species of the *Strigidæ* exhibit somewhat the rudiments of it, thus establishing still more closely the affinity of the groups under consideration.'

they are immediately recognised by the last of these characters. For the present therefore we may retain the group until the whole genus is properly analysed. Several species, apparently belonging to the subgenus *Scops*, are found in South America, and one in Western Africa. One of the most remarkably horned species is the *Asio superciliosus*; and there are several from India which have the *tarsi* or legs nearly naked.'

Mr. Swainson then comes to the aberrant group, composed, as usual, of three divisions, which he views as genera. In this group he places *Nyctea*, *Nyctipetes*, and *Surnia*.

Mr. Swainson rejects the genera *Noctua*, *Bubo*, and *Ulula*, and still hesitates at admitting *Syrnium*, being uncertain whether the brown owl of Britain is really one of the types of the genus *Strix*. On the other hand he proposes *Scotiaptex*, *Scotophilus*, *Heliaptex*, and *Nyctipetes*.

In the following table the author gives his arrangement of the entire family:—

Strigidæ.—*The Owls.*

		Genera.
1, Typical group.	—Ears large, operculated, no egrets.	Strix.
2, Subtypical.	—Ears smaller, no operculum, egrets.	Asio.
	Ears small, no egrets or operculum, disk imperfect.	
3, Aberrant.	—Head small, claws feathered, tail short.	Nyctea.
	Head large, claws naked, tail moderate. . . .	Nyctipetes.
	Head small, claws feathered, tail wedged. . . .	Surnia.

The same author observes that we know too little of the birds composing these groups to admit of their analogies being traced among other families, at least with precision. Nevertheless, he notices the indications of such analogies: 'Thus,' says he, 'the lengthened and more conic bill of the barn owl reminds us of the *Conirostres*; on the other hand the bill of *Asio Virginiana* (Virginianus) is described by Dr. Richardson as very strongly curved from the base, and with its cutting margin very obtusely lobed in the middle—a structure peculiarly belonging to dentirostral types. The short tail and piscatorial habits of the *Nyctea candida* sufficiently designate the aquatic type. The long-legged burrowing owl obviously represents the grallatorial order of birds and the gliriform quadrupeds; but whether it is the type of *Nyctipetes*, or one of its subgenera, we know not; while in the long-tailed hawk-owls of the genus *Surnia* we trace that great development of tail so conspicuous in rasorial types.' (*Classification of Birds*, vol. i.)

The following is the arrangement in the *Synopsis* at the end of the second volume of the work:—

Strigidæ.

Genera.

Strix, Linn. (Typical Owls.)

Subgenera:—*Strix*; *Scotiaptex*; *Scotophilus*; *Otus*.

Asio, Antiq. (Horned Owls.)

Subgenera:—*Heliaptex*; *Scops*. (Scops Owls.)

Nyctia, Sav. (Eagle Owls.)

Subgenera not defined.

Nyctipetes, Sw. (Sparrow Owls.)

Subgenera not defined.

Surnia, Dum. (Hawk Owls.)

Subgenera not defined.

The Prince of Canino, in his *Geographical and Comparative List of the Birds of Europe and North America*, gives the following arrangement of the—

Strigidæ.

Subfam. *a.* Surninæ.

Genera.—Surnia, Dum.; *Nyctea*, Bonap.; *Glaucidium*, Boie; *Athene*, Boie (*Nyctipetes*, Sw.); *Scops*, Sav.

Subfam. *b.* Buboninæ.

Genera.—Bubo, Cuv. (*Asio* and *Heliaptex*, Sw.); *Syrnium*, Cuv. (*Scotiaptex*, Sw.).

Subfam. *c.* Ululinæ.

Genera.—*Otus*, Cuv.; *Brachyotus*, Gould; *Ulula*, Cuv.; *Nyctale*, Brehm (*Scotophilus*, Sw.).

Subfam. *d.* Striginæ.

Genus, *Strix*, Linn.

The *Strigidæ* form the third family of the order *Accipitres* in the Prince's method. The *Falconidæ* compose his second family of that order. His fourth family, the first in his order *Passeres*, consists of the *Caprimulgidæ*.

Mr G. R. Gray makes the *Accipitres Nocturni* the second suborder of his first order *Accipitres*. His third family, the first of that suborder, is formed of the *Strigidæ* which are thus subdivided by him:—

Subfam. 1. Surninæ.

Genera.—*Surnia*, Dum. (*Syrnia*, Steph., *Strix*, Gm.); *Accaba*, Wagl. (*Surnia*, Cuv., *Strix*, Shaw); *Nyctea*, Steph. (*Noctua*, Cuv., *Nyctia*, Sw.); *Athene*, Boie (*Nyctipetes*, Sw., *Strix*, Daud.); *Huhua*, Hodgs.

Subfam. 2. Buboninæ.

Genera.—*Scops*, Sav. (*Scops*, Sav., *Asio*, Briss., *Otus*, Less., *Strix*, Linn.); *Lophostrix*, Less., *Ketupu*, Less. (*Cultrunguis*, Hodgs., *Strix*, Gm.); *Bubo*, Sibb. (*Feliceps*, Barr., *Asio*, Antiq., *Ulula*, Bonap., *Heliaptex*, Sw., *Ascalaphus*, J. Geoff., *Strix*, Linn.).

Subfam. 3. Ululinæ.

Genera.—*Syrnium*, Sav. (*Scotiaptex*, Sw., *Ulula*, Briss., *Strix*, Linn.); *Otus*, Ray (*Asio*, Briss., *Brachyotus*, Gould, *Strix*, Linn.); *Urrua*, Hodgs.; *Nyctalops*, Wagl.; *Ulula*, Cuv. (*Strix*, Gm.); *Glaucidium*, Boie (*Strix*, Linn., *Noctua*, Cuv., *Athene*, Boie); *Nyctale*, Brehm (*Scotophilus*, Sw., *Nudipedes* et *Ptilipedes*, Less., *Strix*, Bechst., *Athene*, Boie); *Ninox*, Hodgs.

Subfam. 4. Striginæ.

Genera.—*Strix*, Linn; *Pholidus*, J. Geoff. (*Strix*, Horsf.); *Bulaca*, Hodgs.

Geographical Distribution of the Family.—Very wide; extending as high as the Polar Sea, where *Strix Nyctea* is recorded by E. Sabine as having been seen on the islands in the summer months, and by James Ross as having been observed about Victoria Harbour throughout the winter, where several pairs had bred in the preceding autumn; and as low at least as Port Famine in the Straits of Magellan (*Strix rufipes*, *Strix nana*, &c., King). Species are found in Europe, Asia, Africa, America, and in Australia.

Food.—Birds and quadrupeds, and even fish (in the case of *Strix nyctea* and *Strix flammea*), according to the size of the species. Hares, partridges, grouse, and even the turkey, are attacked by the larger horned owls of Europe and America; while mice, shrews, small birds, snakes, and crabs suffice for the inferior strength of the smaller *Strigidæ*. Mr. Yarrell states that the short-eared owl (*Strix brachyotus*) is the only bird of prey in which he ever found the remains of a bat.

The species are numerous, and the British Museum contains a very fine collection of them. Our limits will not permit us to do more than notice a very few. The larger horned owls are described in the article BUBO.

EUROPEAN OWLS.

The common white or barn owl (*Strix flammea*) claims our first attention, from its typical nature.

Description.—*Male.*—Upper parts bright yellowish, varied with grey and brown zig-zag lines, and sprinkled with a multitude of small whitish dots; face and throat white; lower parts in some individuals rusty white, sprinkled with small brown dots; in others bright white, marked with small brownish points; in others again without the slightest appearance of spots; feet and toes covered with a very short down, more scanty on the toes; iris yellow. Length about thirteen inches.

In the *Female* all the tints are brighter, and more developed.

Young.—Covered with a thick white down, and remain long in the nest. Mr. Blyth states that the first set of feathers grows very slowly, and is not moulted till the second autumn.

Varieties.—Whitish, or entirely white.

This is the *Effraie*, *Fresaie*, and *Petit Chathuant Plombé* of the French; *Barbagianni*, *Alloco Commune e Bianco*, of the Italians; *Schleierkauz*, *Perlschlierkautz*, and *Perl-Eule* of the Germans; *De Kerkuil* of the Netherlands; *Barn Owl*, *White Owl*, *Church Owl*, *Gillihowlet*, *Howlet*, *Madge Howlet*, *Madge Owl*, *Hissing Owl*, and *Screech Owl* of the modern British; and *Dylluan wen* of the antient British.

Geographical Distribution.—Very wide. Common in England and Ireland, less common in Scotland. Not common in the Orkneys, but present in some of the islands. Found in Denmark, but said not to inhabit Sweden or Norway; generally spread over temperate Europe; found in Madeira; common in Loraine; extending in Africa from the north to the Cape of Good Hope; met with in India, Japan, and Australia?[*] African and Japanese individuals are, M. Temminck tells us, precisely similar to those of Europe; and those of North America (where it is found in the United States, but does not appear to visit the Fur-countries) differ only in having some slight tints of more sombre hue. Those of South America (the *Yellow Owl*) are different.

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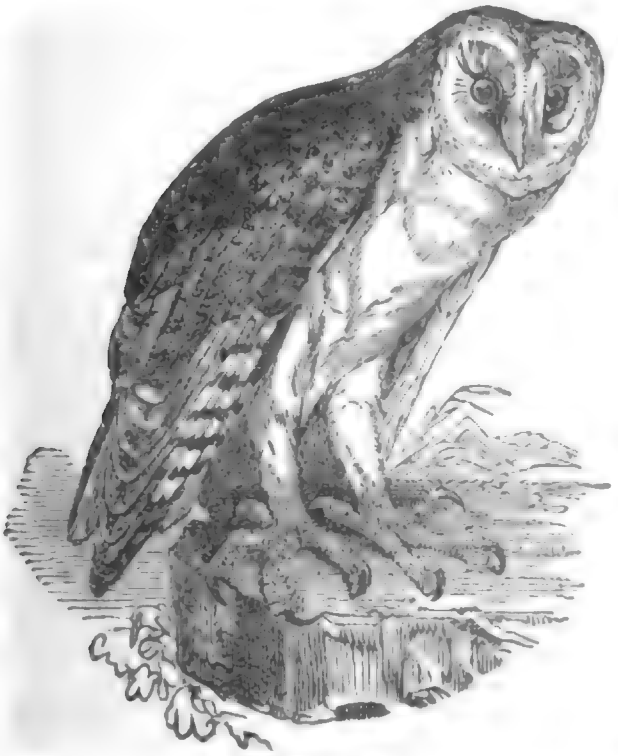
[*] See post p. 122.

Habits, Food, &c.—Montagu says that this species is never known to hoot. Mr. Yarrell states that it screeches, but does not *generally* hoot. Sir W. Jardine declares that he shot one in the act of hooting; and that at night, when not alarmed, hooting is their general cry. It snores and hisses, and, like other owls when annoyed or frightened, snaps its bill loudly. Rats, mice, shrews, young birds, and beetles form their food, and the mice especially suffer when the white owl has a young brood to sustain. It has been seen to catch fish. This owl frequents churches, old buildings, and barns, often breeding in the latter, as well as in hollow trees near farmyards and villages. The nest is but a rough one, and the female lays three or four white eggs more oval than those of the brown or ivy owl, and not so large. Young have been found so late as July, September, and even December. Mr. Blyth, in the *Field Naturalist's Magazine* (vol. i.), throws some light upon this. 'A nest of the barn owl, last summer,' says he, 'in this neighbourhood (Tooting) contained two eggs, and when these were hatched two more were laid, which latter were probably hatched by the warmth of the young birds; a third laying took place, after the latter were hatched, and the nest at last contained six young owls of three different ages, which were all reared.' Mr. Yarrell states that he has frequently been told by boys in the country, that they had found eggs and young birds at the same time in this bird's nest. The food is generally swallowed whole, and the bones and fur or feathers rejected in pellets called castings, as indeed is generally the case with this family.

In captivity the Barn-Owl is sociable with other birds, but will sometimes, like the dogs, hide what remains of its meat.



Strix flammea.

Surnia Uralensis.—*Description.*—Face whitish, tail much graduated, much longer than the wings; all the plumage striped with large longitudinal spots and streaks.

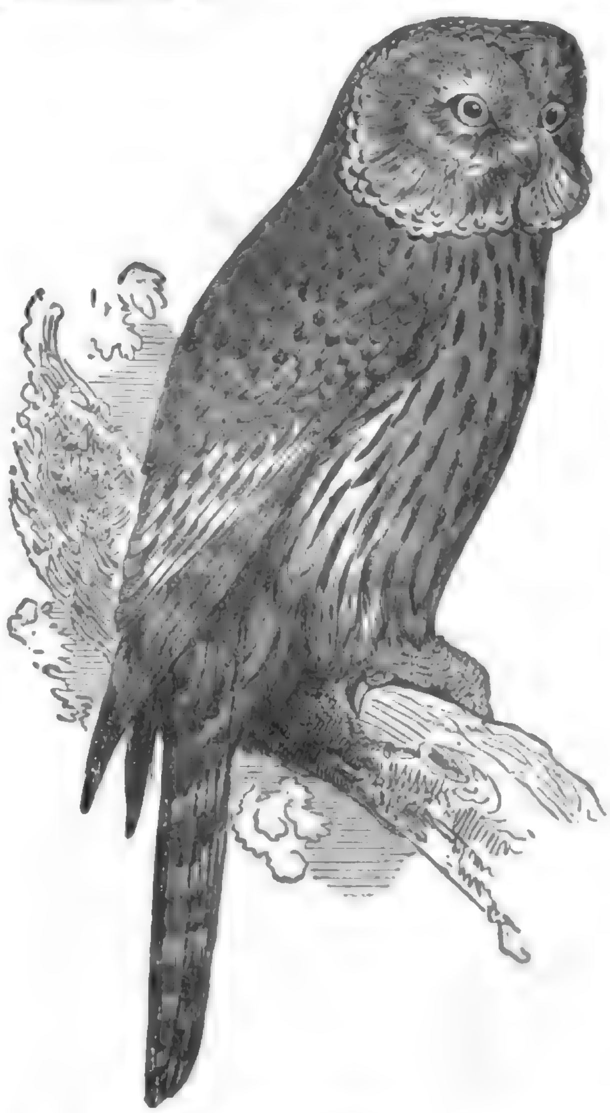
Old of both Sexes.—Head of considerable size, face very large, well feathered, greyish white, marked with some blackish hairs; a large circle of white feathers spotted with brownish black, takes its origin on the forehead and frames in the whole face; top of the head, nape, back, and wing-coverts marked with great longitudinal spots, which are disposed on a whitish ground; throat, front of the neck, and all the lower parts whitish, marked on the middle of each feather with a large longitudinal brown stripe; quills and tail-feathers banded with brown and dirty white alternately; seven of these bands may be counted on the tail; beak yellow nearly hidden in the long hairs of the face; iris brown, tarsi and toes covered with white hairs marked with small brown points; claws very long, yellowish. Length of tail ten inches and some lines; total length about two feet

Young of the Year.—All the ground-colour of the plumage bright brownish-grey; the spots and stripes on all the lower parts ashy-brown; upper parts irregularly spotted with ashy-brown and light red, and variegated with oval white spots; wings and tail transversely banded with grey, the seven bands of the tail whitish ash.

This is the *Strix Uralensis* of Pallas; *Strix liturata* Retz; *Strix macroura*, Natterer; *Strix macrocephala*, Meisner; *La Chouette des Monts-Urals*, Sonnini; *Ural Owl*, Latham; *Die Ural Habichtseule*, Bechstein; *Habichtseule*, Naumann; *Uralischer und Grosskopfiger Baumkautz*, Brehm.

Geographical Distribution.—Arctic regions of the Old World, Lapland, North of Sweden, Norway and Russia, Livonia and Hungary, and Japan. Very rare in the eastern parts of Germany; very accidentally found elsewhere. Mr. Gould regards it as one of the rarest European Owls.

Habits, Food, &c.—Leverets, rats, mice, ptarmigan, and small birds. The nest is formed in the holes of trees, often near the habitations of man. Mr. Gould states that the number of eggs is two; M. Temminck says three or four; they are pure white.



Surnia Uralensis.

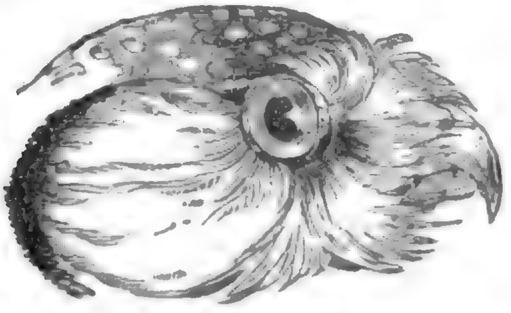
Surnia funerea.—*Description.*—*Male.*—Forehead dotted with white and brown; a black band takes its origin behind the eyes, includes the orifice of the ears as in a frame, and terminates on the sides of the neck; upper parts marked with brown and white spots of various forms; on the borders of the wings are similar white spots disposed on a brown ground; throat whitish; the other lower parts white, transversely striped with ashy brown; at the insertion of the wings a great spot of blackish brown; tail-feathers ashy brown, striped at considerable distances with transversal narrow zigzags; bill yellow varied with black spots according to age; iris bright yellow; feet feathered to the claws. Length of tail six inches and some lines. Total length upwards of fourteen inches (Temm.); Richardson says eighteen inches

The colours of the female are less pure than those of the male, and she is rather larger.

This is the *Strix Ulula*, Linn.; *Strix funerea*, Gmel.; Forst.; *Strix Hudsonia*, Gmel.; *Strix Canadensis et Freti Hudsonis*, Briss.; *Strix Hudsonia*, Wils.; *Strix nisoria*, Meyer; *Chouette de Canada et Chouette Epervière, ou Caparacoch*, and *Chouette à longue queue de Siberie*, Buffon; (*Eul.* 463, a very good figure of this species, under the erroneous name of the Ural Mountains Owl); *Chouette Epervière*, Sonn.; *Sperbereule*, Meyer; Naum.; *Habichtseule*, Bechst.; *Plattköpfige* and *Hochköpfige Habichtseule*, Brehm.; *Hawk-Owl* of Pennant and Wilson; *Little Hawk-Owl* of Edwards; *Canada Owl* of Latham; *Paypaw theecawsew*, or *Cobadecootch* of the Cree Indians; *Theechazza* of the Copper Indians and Chepewyans; and *Ood no hæoot* of the Esquimaux.

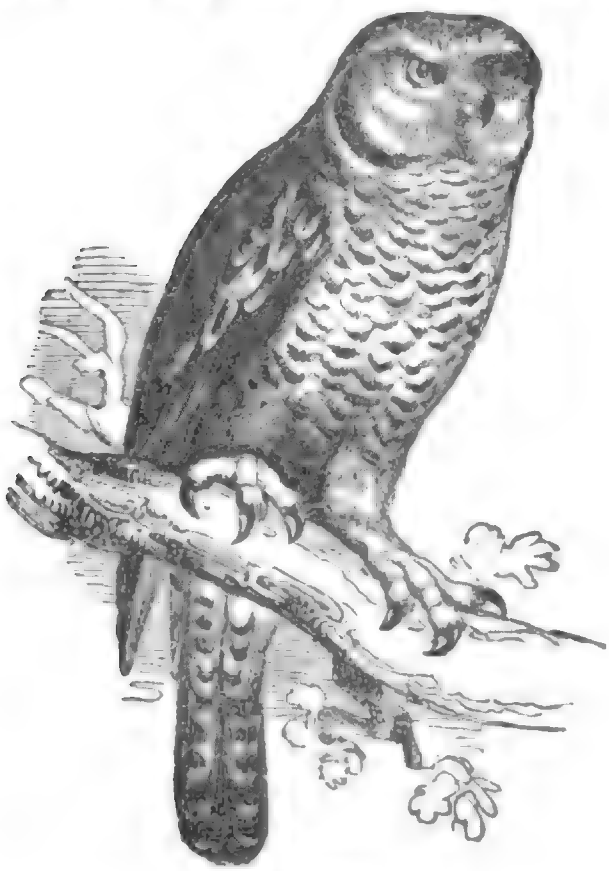
Geographical Distribution.—The Arctic Circle and Arctic regions of both continents; sometimes seen as a bird of passage in Germany, more rarely in France, but never in the southern provinces. In Britain it does not appear to have been seen; but one was taken in a collier a few miles off the coast of Cornwall in 1830.

Habits, Food, &c.—The visual organs of this species are more able to bear the light of day, at least in dull weather, and, like the Snowy Owl, it hunts frequently in the daytime. The smaller head and less perfect facial disk, combined with these habits, have obtained for it the name of *Hawk-Owl*.



Profile of Hawk-Owl.

Dr. Richardson says that 'It remains all the winter in high northern latitudes, and is rarely seen so far south as Pennsylvania, and then only in severe winters. Wilson saw only two specimens in the United States. It is a common species throughout the Fur-countries from Hudson's Bay to the Pacific, and is more frequently killed than any other by the hunters, which may be partly attributed to its boldness and its habit of flying about by day. In the summer season it feeds principally on mice and insects; but in the snow-clad regions, which it frequents in winter, neither of these are to be procured, and it then preys mostly on ptarmigan. It is a constant attendant on the flocks of ptarmigan in their spring migrations to the northward. It builds its nest on a tree, of sticks, grass, and feathers, and lays two white eggs. When the hunters are shooting grouse, this bird is occasionally attracted by the report of the gun, and is often bold enough, on a bird being killed, to pounce down upon it, though it may be unable, from its size, to carry it off. It is also known to hover round the fires made by the natives at night.' (*Fauna Boreali-Americana.*)



Hawk Owl.

Surnia nyctea.—*Description.*—Head small in proportion, bill black, entirely hidden by the hairy feathers at its base; plumage snow-white, but more or less variegated with transverse brown spots or stripes; the younger the bird is, the larger and more numerous are these spots and stripes. Very old individuals are pure white, without any brown spot; iris fine orange yellow; feet very well covered, so as to look almost woolly to the claws; tail rounded, not much exceeding in length the extremity of the wings. Length 24 or 25 inches. Female considerably larger than the male.

Young at the time of departure from the nest.—Covered with brown down; the first feathers bright brown.

This is the *Strix nyctea* of Forster, Latham, and Gmelin; *Strix candida* of Latham; *Strix nivea* of Daudin; *Chouette Harfang* of Buffon; *Chouette Blanche* of Le Vaillant; *Alucco Diurno* of 'Stor. degl. Ucc.;' *Schneekauz* of Bechstein; *Sneeuwuil* of Sepp; *Nordicher Schneekautz* and *Schnee Eule* of Brehm.; *Ermine Owl* and *Snowy Owl* of Latham; *Great White Owl* of Edwards; *Snow Owl* of Wilson; *Wapow Keetho* or *Wapohoo* of the Cree Indians; and *Ookpeeguak* of the Esquimaux.

Geographical Distribution.—Arctic regions of the Old and New World, Iceland, Sweden, Norway, Lapland, and the north of Europe generally. The Shetland Isles possess it, but, some think, in winter only. In the Orkneys it appears to be accidental. It has been shot in Scotland, England, and Ireland, and has been occasionally seen in Germany: in Holland a young bird was seen in the winter of 1802. It does not appear to have been seen in France. Dr. Richardson states that it frequents in summer the most arctic lands that have been visited, but retires with the ptarmigan, on which it preys, to more sheltered districts in the winter. 'Even in the latter season however,' says that author in continuation, 'it is frequently seen within the confines of the Arctic Circle; though it is not very uncommon at the same period in Canada and the northern parts of the United States; and now and then it has been known to wander as far south as Florida. . . . It hunts in the day; and indeed unless it could do so, it would be unfit to pass the summer within the Arctic Circle. When I have seen it on the barren grounds, it was generally squatting on the earth, and if put up, it alighted again after a short flight; but it was always so wary as to be approached with great difficulty. In the woody districts it shows less caution, and, according to Hearne, has been known to watch the grouse-shooters a whole day for the purpose of sharing in the spoil. On such occasions it perches on a high tree, and when a bird is shot, skims down, and carries it off before the sportsman can get near it. It preys on lemmings, hares, and birds, particularly the willow-grouse and ptarmigan. Mr. Hutchins says that it eats carrion; and Wilson informs us that it is a dexterous fisher, grasping its finny prey with an instantaneous stroke of the foot as it sails along near the surface of the water or sits on a stone in a shallow stream. I have seen it pursue an American hare on the wing, making repeated strokes at the animal with its foot; but on that occasion, through the intervention of an Indian, it was driven from its quarry. It makes its nest on the ground, and lays three or four white eggs, of which two only are in general hatched. In winter, when this owl is fat, the Indians and white residents in the Fur-countries esteem it to be good eating. Its flesh is delicately white.' (*Fauna Boreali-Americana.*) M. Temminck states that it builds its nest on scarped rocks, or on the old pines of the glacial regions; and that it lays two eggs, marked with black spots, according to M. Vieillot, but white, according to all other naturalists. William Bullock appears to have been the first who recognised this species as a British bird during his visit to the Orkneys and Shetlands in the summer of 1812. He states that one, wounded on the Isle of Balta, disgorged a young rabbit whole; and that one in his possession when he wrote, had in its stomach a sandpiper with its feathers entire.

N.B. The large white owl of Africa is no longer considered to be identical with this species.

Specimens in different stages of plumage are generally to be seen in the garden of the Zoological Society in the Regent's Park.

The following are also European species:—*Bubo maximus**, *Bubo Ascalaphus*, *Otus vulgaris**, *Otus brachyotos**, *Scops Aldrovandi**, *Surnia cinerea*, *Ulula nebulosa*, *Syrnium Aluco**, *Noctua nudipes** (Gould—*Strix nudipes*, Auct.), *Noctua Tengmalmi**, and *Noctua Passerina** (Gould—*Strix passerina*, Auct.).

Those marked * are in the Catalogue of British Birds. Mr. Yarrell gives *Strix passerina* and *Noctua nudipes*, Gould, as synonyms.

Asiatic Owls.

Example, *Strix badia*, Horsf.

Description.—General colour of the upper parts of the head, back, wings, and tail, chesnut-brown, with a bright fulvous lustre irregularly diffused over it, showing itself more strongly in particular patches; on the under parts, from the neck to the vent, the brown colour is greatly diluted, and the fulvous lustre alternates with patches of Isabella yellow. All the parts dotted with brown; ornamental collar round the neck, consisting of a compound series of delicate white plumes, terminated by a band of deep chesnut, the accidental derangements of which exhibit a beautiful alternation of the two colours; circle about the eyes and the forehead of a pale brown tint; plumes which bound the collar above and below nearly white; bill yellowish, moderate; feet thickly covered with fulvous silky plumes; toes brownish, and nearly naked, claws yellowish; quills and tail-feathers broadly banded transversely with blackish brown. Total length from the bill to the extremity of the tail, to which the wings almost reach, eleven inches; to the end of the claws, twelve inches.

This is the *Wowo-wiwi* or *Kalong-wiwi* of the Javanese.

Dr. Horsfield, from whose *Zoological Researches* the description is taken, states that this species, whose head is proportionally large, has a general resemblance to *Strix flammea* in the distribution of its colours and external marks. The upper parts are, he observes, generally dark, and the lower of a paler hue. The neck is surrounded by a loose ornamental collar; the plumes encircling the eyes are rigid, and disposed with perfect regularity, and the legs are entirely covered. A resemblance also exists, he adds, in the lustre of their covering.

Locality.—Java, in the closest forests of the district of Pugar, and the ranges of low hills south of the capital of Surakarta. (Horsf.)

Habits, Food, &c.—The habits of this species are nocturnal. Dr. Horsfield, *loc. cit.*, speaking of *Strix Javanica* (which, he says, his specimens show to be merely a variety of *Strix flammea*), remarks, that it is the only species of this division which is occasionally found near villages and dwellings. 'It is not however a favourite with the natives; various superstitious notions are also in Java associated with its visits; and it is considered in many parts of the island as portending evil. The other species of this division are by no means common, and the *Strix badia* is one of those that are most rarely met with. It never visits the villages, but resides in the closest forests, which are the usual resort of the tiger. The natives even assert that the *Wowo-wiwi* approaches this animal with the same familiarity with which the Jallak (the Pastor Jalla of our catalogue) approaches the Buffalo, and that it has no dread to alight on the tiger's back.' Dr. Horsfield adds, that it is never seen in confinement.

The same author states that eight species of owls from Java have been arranged in the museum at the India House; three eared-Owls, and five smooth-headed.

African Owls.

Example, *Strix Capensis*, Smith.

Description.—Red brown above, scantily sprinkled with small white spots, pale ochreous red below, marked with small heart-shaped spots; face yellow-brown; cervical collar pale buff-orange, with many of the feathers, particularly of its inferior portion, tipped with brown; quills subochreous, banded with brown; eyes brownish-black; bill and feet livid or straw-yellow; legs long, upper half of the tarsi covered with feathers, lower half and toes covered with small flat circular scales, upon which are a few strong rigid bristles, claws long, dark horn-colour, slightly covered and pointed. Length 16 inches. The whole of the plumage has a silky gloss.

Female considerably larger than the male, and with the colours less clear.

Young.—Down of the nestlings dull cream-yellow, plumage of the upper parts during the first year darker than in adult birds. (Smith.)

Dr. Smith states that the few specimens which he saw were obtained near Cape Town, close to Table Mountain, in the rocky precipices of which they were said to have concealed themselves during the day. He adds, that the colonists recognise this bird as distinct from the *Doodvogel* (*Strix flammea*), which occurs abundantly throughout the whole of South Africa, and that it is at once to be distinguished by its size from *Strix badia* of Horsfield, the species to which it is by colours most nearly allied.

Dr. Smith also figures and describes another typical owl, *Athene Capensis*, described by him under the name of *Noctua Capensis*, in the *South African Quarterly Jouvnal*, 2nd series, 1834.

The length of this species is 9½ inches, and the bird from which the description was taken was shot in the depths of one of the forests of the eastern district of the Cape Colony. It was the second specimen of the species he had seen; the first was also killed in a forest of the same district in 1824.

The same author figures and describes in the same work (*Illustrations of the Zoology of South Africa*) an eared owl, *Otus Capensis*; total length from tip of bill to tip of tail, 15 inches; general colour, brown above, and dappled beneath on the lower parts; the female rather larger than the male, and the colours the same in both. He states that this is a rare bird in the south of Africa, and, as far as he knows, has never been found but in marshy situations. 'It passes the day among the rushes, reeds, or long grass, and five or six individuals are sometimes found congregated together. When disturbed, they fly only a short distance before they attempt to conceal themselves again, and it is not before they have been several times flushed in succession that they seek safety in a prolonged flight. They feed upon mice, lizards, and water-insects.'

American Owls.

Our limits will only permit us to notice, in addition to the species above recorded, which are common in Europe and America, the well-known burrowing little owl (*Noctua cunicularia*). Mr. Darwin states that this species, on the plains of Buenos Ayres, exclusively inhabits the holes of the bizcacha or viscacha [Chinchillidæ, vol. vii., p. 88]: but that in Banda Oriental it is its own workman. 'During the open day, but more especially in the evening,' says this acute observer, 'these birds may be seen in every direction, standing frequently by pairs on the hillocks, near their burrows. If disturbed, they either enter the hole, or, uttering a shrill harsh cry, move with a remarkably undulatory flight to a short distance, and then turning round, steadily gaze at their pursuer. Occasionally in the evening they may be heard hooting. I found in the stomachs of two which I opened, the remains of mice, and I one day saw a small snake killed and carried away. It is said these latter animals are their common prey during the daytime. I may here mention, as showing on what various kinds of food owls subsist, that a species that was killed among the islets of the Chonos Archipelago had its stomach full of good-sized crabs.' (*Journal of Researches in Geology and Natural History.*)

Australian Owls.

Mr. Vigors and Dr. Horsfield, in their *Description of the Australian Birds in the Collection of the Linnean Society* (*Linn. Trans.*, vol. xv.), record three species of owls belonging to the genera *Noctua* and *Strix*.

Noctua.

Example, *Noctua Boobook*.

Description.—Brown above, with a few yellowish-white spots; white beneath, varied with ferruginous spots; toes hairy.

This is the *Strix Boobook*, *Boobook Owl* of Latham.

According to Mr. Caley, 'The native name of this bird is *Buck-buck*. It may be heard nearly every night during winter uttering a cry corresponding with that word. Although this cry is known to every one, yet the bird itself is known but to few; and it cost me considerable time and trouble before I could satisfy myself respecting its identity. The note of the bird is somewhat similar to that of the European *cuckoo*, and the colonists have hence given it that name. The lower order of the settlers in New South Wales are led away by the idea that everything is the reverse in that country to what it is in England; and the *cuckoo*, as they call this bird, singing by night, is one of the instances which they point out.'

Noctua maculata, described by the same authors, much resembles the species just noticed, but they are inclined to consider it distinct.

Strix.

Example, *Strix flammea*?

Mr. Vigors and Dr. Horsfield observe that this bird varies from our European species in the buff colour being considerably darker, and the spots on the *abdomen* being larger and more deeply marked than is usual in our own. They add however that in our species there is considerable variety; and as they had an opportunity of examining a single specimen only from New Holland, and that in an inferior condition, they did not wish to state with any confidence an opinion as to the identity of these birds.

FOSSIL OWLS.

Remains of fossil owls have been found in the gypsum of the Paris basin (first lacustrine portion of the tertiary series, Eocene of Lyell) in company with extinct species of extinct genera of *Pachydermata*, and extinct species belonging to existing genera of *Carnivora*, *Marsupialia*, *Rodentia*, and of other birds referrible to the Buzzard, Quail, Woodcock, Sea-Lark (*Tringa*), Curlew, and Pelican, Reptiles (fresh-water tortoises and crocodiles), and Fishes. Two kinds of owl belonging to existing species occur in the gypsum cavities at Köstritz, together with sheep or roe, fox, weasel, squirrel, field-mouse, common rat, hamster, bat, mole, hare, rabbit, frog, domestic cock, and man (existing species), mixed confusedly with the bones of the extinct animals, rhinoceros, &c. (*Reliquiæ Diluvianæ*, p. 168.)

STRIKE, a term much employed by modern geologists, after the example of Professor Sedgwick, to denote the direction of a horizontal or level line, in the surface of inclined or vertical strata, mineral veins, dykes, &c. If the strata be vertical, their *strike* corresponds with the surface *direction* of the beds; the same happens if the strata be inclined at any angle to the horizon, provided the surface of the ground be level; but in general the outline of the edges of the strata differs from the strike. The dip, or line of greatest inclination of strata, is always at right angles to the strike, so that in conical or elliptical elevations of strata the strike is a curved line, continually varying in direction. But, generally, viewed on a large scale, irregularities of this nature vanish, and a whole great mountain-region, as North Wales, South Wales, or North Devon, manifests one predominant general strike, corresponding with one, or more than one *axis of movement*, upon which the displaced strata have been bent or broken.

STRING-COURSE, a projecting *course* of masonry forming a *string* or horizontal line on the face of a wall, and consisting of a series of mouldings, as in Gothic, or a flat surface (either plain or enriched), as in Italian architecture. In both styles, string-courses admit of great variety, and contribute very much to decoration, while they are in themselves essential members, inasmuch as they serve to define the internal division of the building, corresponding with the floors of the several stories; and by separating one tier of windows from another, to mark each as a distinct portion of the general composition, complete as regards itself, though secondary to the other. While they separate, they serve also to connect and combine the successive stages of a building; and to produce a due mixture of horizontal with perpendicular lines.

In Gothic architecture, the upper surface of a string-course is almost invariably splayed or sloped in order to shoot off rain, the projection being usually such that the wet would else lodge upon it. The string-course itself consists sometimes of only a few narrow and plain mouldings, at others of a variety of them separated by one or more considerable hollows. In the later or perpendicular style of Gothic, the string-course is frequently made a broad tablet, not only richly moulded, but ornamented with sculptured blocks, heads of animals, shields, &c. placed at intervals in the principal cavetto or hollow; besides which, additional carved ornament is occasionally introduced on the surfaces between the other mouldings. In some instances the string course is so enlarged as to become a sort of friese or horizontal pannel filled up with a pattern of tracery, or with lesser pannels, &c. carved on it; of which kind East Barsham Manor-house, and the parsonage at Great Snoring, afford some fine examples.

In Italian architecture, the string-course (*Fascia*, Ital.; *Cordon*, French; *Band*, German) is either quite plain, or more or less decorated according to the character of the floor to which it belongs. That which crowns a basement floor is seldom more than a *plat-band* or plain surface, while the upper ones form ornamental fascias, enriched with guilloches, frets, &c. either with or without mouldings. The Travellers' and Reform club-houses, London, are remarkable for their beauty, in regard to these members, and for the richness and finish which they contribute to the respective designs.

STROBILO'PHAGA, M. Vieillot's name for the *Corythus* of Cuvier, which has the priority. [**FRINGILLIDÆ**, vol. x., p. 482.]

STRO'MBIDÆ, a family of marine testaceous gastropods, belonging to the *Alata* of Lamarck and the *Angyostomata* of De Blainville.

The genus *Strombus* of Linnæus is placed in the *Systema Naturæ* between *Buccinum* and *Murex*; and is divided into the following sections:—

* *Digitati*; the lip with linear laciniæ.

Species:—*Strombi Fusus*, *Pes Pelecani*, *Chiragra*, *Scorpius*, *Lambis*, *Millepeda*.

* * *Lobati*.

Species:—*Lentiginosus*, *Gallus*, *Auris Dianæ*, *Pugilis*, *Marginatus*, *Luhuanus*, *Gibberulus*, *Oniscus*.

* * * *Ampliati*.

Species:—*Lucifer*, *Gigas*, *Latissimus*, *Epidromis*, *Canarium*, *Vittatus*, *Succinctus*, *Spinosus*, *Fissurella*, *Dentatus*.

* * * * *Turriti*; with a very long spire.

Species:—*Tuberculatus*, *Palustris*, *Ater*, and *Lividus*.

Lamarck's family of *Alata*, or Winged Zoophagous Trachelipods, stands between the *Canalifera* and *Purpurifera*. The *Alata* consist of the genera *Rostellaria*, *Pterocerus* (or, as Lamarck incorrectly writes it, *Pterocera*), and *Strombus*.

Cuvier arranges *Strombus* next to *Turbinella* and at the end of his *Pectinibranchiate Gastropods*. He defines the genus *Strombus*, Linn., as comprising shells with a canal which is either straight or inflected towards the right, the external border of whose aperture dilates with age, but always preserves a sinus towards the canal, under which the head of the animal passes when it extends itself. The greater part have, he adds, this sinus at some distance from the canal.

Cuvier nearly follows Lamarck in the subdivisions of the genus.

Of the *Strombi*, properly so called, he says, that the external border or lip dilates into a wing, which is more or less extended, but not divided into digits. Their foot is small in proportion, and their tentacles carry their eyes on a lateral pedicle, stouter than the tentacle itself. The *operculum* is horny, long, and narrow, carried on a slender tail.

The *Pterocerata* he characterises as having the external lip divided in the adult into long and slender digitations, varying in number according to the species. The animal is the same as in the *Strombi* properly so called.

The *Rostellariæ*, he remarks, have, in general, a second canal reascending along the spire and formed by the external lip and by a continuation of the columella. In some the lip is still digitated. Their animal resembles that of *Murex*, but carries only a very small operculum (*Strombus Pes Pelecani*—*Rostellaria Pes Pelecani*, Lam.; *Aporrhais*, Petiv.). Others again have no more than dentilations on the edge of the lip (*Strombus Fusus*); and others have the lip entire (*Hippochrenes*, Montf.).

Mr. Swainson defines the *Strombidæ*, *Wing-Shells*, which, in his arrangement, stand between the *Turbinellidæ* and the *Volutidæ*, thus:—

'Outer lip dilated, or thickened internally, or detached from the preceding whorl by a sinus; operculum small.'

He makes the family consist of the following subfamilies:—

1. *Strombinæ*.

Subfam. Character.—Outer lip considerably dilated, but never toothed; spire rarely longer than the aperture, with a sinus near the base.

Genera:—*Aphorrais*, Da Costa (*Aporrhais*, we suppose,

is meant); *Pterocerat*, Lam.; *Strombus* Linn.; *Strombidea*, Sw.; *Rostellaria*, Lam.

2. *Coninæ.*

Subfam. Character.—Shell coniform; the spire very short, pyramidical or truncate; outer lip slightly detached above, but without a basal sinus.

Genera:—*Terebellum*, Lam.; *Coronaxis*, Sw. (with the subgenera, *Coronaxis*, Sw.; *Puncticulis?* Sw.; *Tuliparia*, Sw.; *Cylindrella*, Sw.; and *Conilithes*, Sw.); *Conus*, Linn. (with the subgenera *Conus*. Linn.; *Dendroconus*, Sw.; *Textilia*, Sw.; *Theliconus*, Sw.; and *Leptoconus*, Sw.); *Conella*, Sw.; and *Conorbis*, Sw.

3. *Columbellinæ.*

Subfam. Character.—Shell small; outer lip considerably thickened within, where the margin is invariably either toothed or striated; the top gibbous, the margin generally inflexed; inner lip doubly toothed, *i.e.* internally and externally; aperture narrow, generally ringent; operculum minute.

Genera:—*Conidea*, Sw.; *Columbella*, Lam.; *Pusiostoma*, Sw.; *Crassispira*, Sw.; *Nitidella*, Sw.

4. *Pleurotominæ.*

Subfam. Character.—Shell turreted, subfusiform; the base channelled, and often much produced; outer lip never thickened, but detached at the top from the whorl by a slit or sinus.

Genera:—*Brachytoma*, Sw.; *Pleurotoma*, Lam.; *Clavatula*, Sw.; *Clavicantha*, Sw.; *Tomella*, Sw.

5. *Cerithinæ.*

Subfam. Character.—Shell clavate, generally mucronate; the spire very long; the outer lip considerably dilated; the base either truncate or forming a short recurved channel.

Genera:—*Potomis*, Brong.; *Pirena*, Lam.; *Terebralia*, Sw.; *Rhinoclavis*, Sw.; *Cerithium*, Lam.

Mr. J. E. Gray makes the *Strombidæ* (the first family of his section *Ctenobranchiata*, Order 1, *Zoophaga*) include the following genera: *Strombus*, *Terebellum*, *Pteroceras*, *Rostellaria*, and *Seraphys*.

In this article the *Strombidæ* will be confined to the genera and subgenera *Strombus*, *Pteroceras*, and *Rostellaria*.

Strombus.

Generic Character.—*Animal* spiral, slightly compressed, furnished with a *proboscis*, at the extremity of which is the mouth opening longitudinally, and containing a lingual riband furnished with sharp points curved backwards; *tentacles* cylindrical, obtuse, and short; *eyes* carried upon two peduncles, which are cylindrical and stout, longer than the tentacles, and placed at their external side; *foot* rather small, but enlarged forwards; *mantle* forming in front a canal, which is generally rather short; orifices of the anus and oviduct behind.

Shell thick, oval, oblong, subinvolved, conical in front and behind; spire moderately elevated; aperture long and narrow, terminated anteriorly by a canal more or less long or removed; right lip dilated, and with a sinus a little behind the canal; columellar or inner lip simple, but sometimes callous.

Operculum horny, long and narrow, with a terminal summit, and composed of elements imbricated, as it were. (Rang.)

M. Rang considers that the variations in the shell lead to the establishment of two subgenera, *Strombus* and *Pteroceras*.

M. de Blainville divides the genus *Strombus* into the following sections:—

α. Species whose external lip becomes much dilated with age, and offers a number of digitations variable in number. (Genus *Pteroceras*, Lam.)

Example, *Strombus Scorpius*.

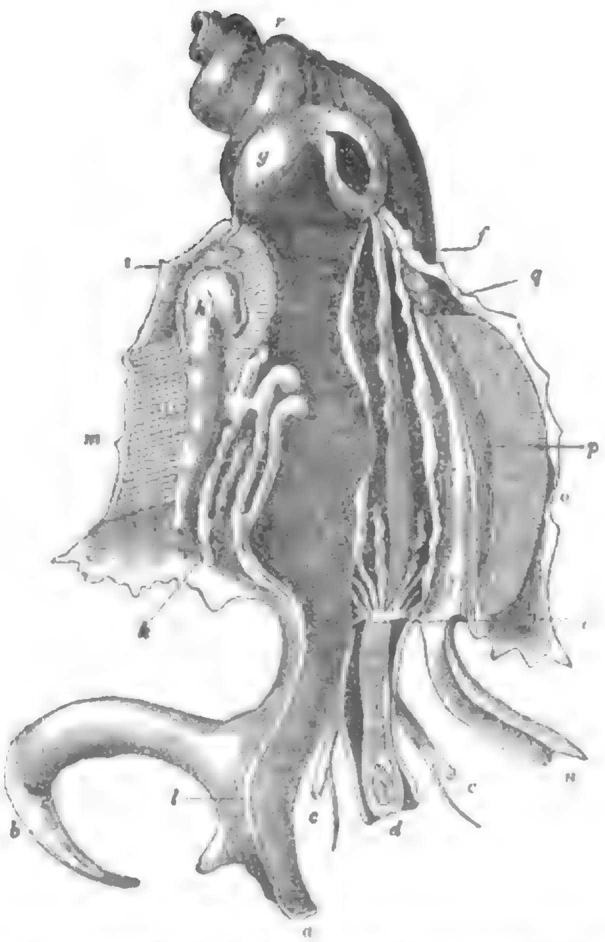
β. Species whose right lip is much dilated, but without digitation.

Example, *Strombus tricornis*.

γ. Species whose external lip is thick, and but little or not at all dilated.

Example, *Strombus Auris Dianæ*.

δ. Species whose right lip is not dilated, and very delicate, which makes them resemble the Cones. (Non-adult Strombi.)



Animal of Strombus lambis; *Pteroceras lambis* of modern authors. (female.)

a, the foot seen in its anterior part with its groove; b, the operculum fixed at its posterior division; c, c. ocular tubes with their tentacles; d, the proboscis open to show the tongue; e. the cerebral ganglion behind which are two long salivary glands; f, digestive tube entering a large stomach; g, the stomach partially opened, and showing the orifice of the œsophagus; h, the intestine become filiform before it forms the very voluminous rectum i. the first part of the uterus; k, second part of the uterus, forming meanders before opening into the groove which leads on the right side of the foot; l, the groove which does not exist in the males; m, follicles of viscosity; n, respiratory siphon; o. large branchia and its vein which goes to the heart; p, small and rudimentary branchia; q, the heart; r. the liver and the ovary united to the extremity of the tortillon, or turbinated part of the body. (*Voyage of the Astrolabe.*)

Subgenus Strombus.

See the generic character above given for the *animal*.

Shell with a simple wing, and a very short canal, which is truncated or notched.

Operculum.—See the generic character above stated.

The species are extremely numerous, and many of them are gigantic in size, the well-known *Strombus Gigas* of the West Indies for example. Like some others of the turbinated testaceans, the animals of the genus Strombus occasionally produce pearls. Mr. Wood, in his 'Zoography,' relates that he saw a pink pearl which was taken from the body of the animal of *Strombus Gigas*, which is fished for the table off the island of Barbadoes. The pearl was discovered by chance, while the men were employed in cleaning the fish. Its weight was 24 grains, but it would have been more valuable if it had been round. The same author states that only four of these pearls had been discovered in the vast numbers of shell-fish that are annually brought to market in that part of the world, though he has reason to believe that this is in some measure owing to the carelessness of the negroes, who clean their fish without consideration, and have probably in their hurry returned many a pearl to its native element with the refuse of the animal. This pearl was exactly of the same colour as the interior coat of the shell, and like it in every respect except in figure.

Geographical Distribution of the Genus, Habits, &c.—The seas of warm climates; many from those of India, and some from those under and near the equator. Carnivorous. Species have been found at depths varying from 0 to 13 fathoms.

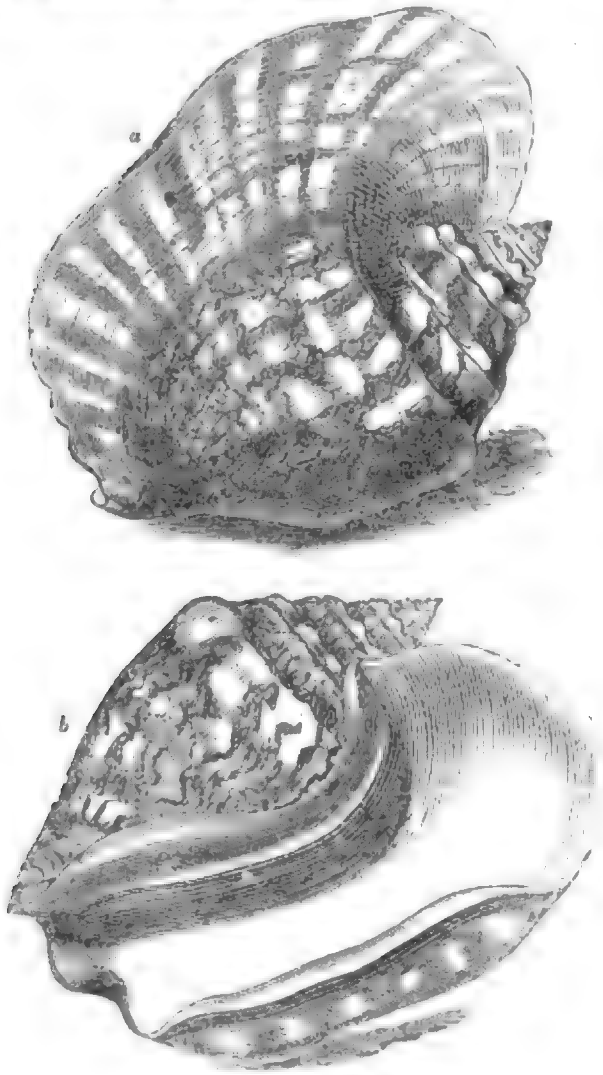
M. Deshayes, in his Tables, makes the number of recent *Strombi* forty-five. M. de Blainville reckons them at fifty-two; of these *Strombus Gigas* is noted as found both recent and fossil (tertiary).

Example, *Strombus latissimus*.

Description.—Shell turbinated, ventricose, smooth on the back, somewhat wrinkled on the wing, brown orange spotted with white; the spire short and nodulous; the external lip very broad, rounded above, projecting beyond the spire, the anterior margin sharp, but the side of it very thick; the aperture smooth and white, tinged with rose colour.

Locality.—East Indian Seas.

This fine and somewhat rare species grows to a large size, from five to ten or more inches in length.



Strombus latissimus.
a, seen from above; *b*, seen from below

We have selected this species because it is one of those that leads to the next subgenus.

Pteroceras.

Animal.—See the generic character above stated, and the cut and description of the animal, p. 123.

Shell with the wing digitated, and furnished forwards with an elongated canal.

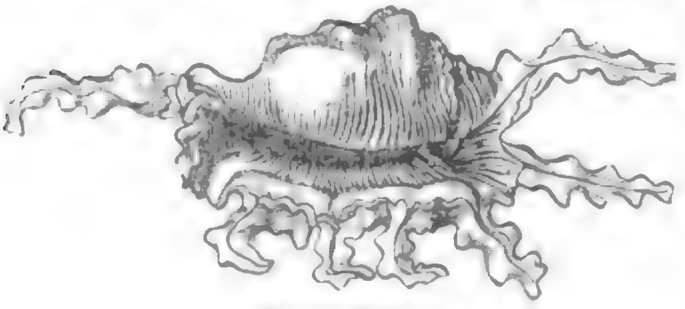
Operculum.—See the generic character above.

Geographical Distribution of the Genus, Habits, &c.—The Indian seas. Carnivorous. *Pterocerata* have as yet been only noticed as littoral.

The *Pterocerata* are very much less numerous than the *Strombi.* M. Deshayes, in his Tables, makes their number seven; no fossils.

Example, *Pterocerus Scorpius.*

Description.—*Shell* ovate-oblong, gibbous, tuberculate: transversely rugose and knotty, seven fingered, white spotted with rufous, the fingers rather slender, and knotted at intervals throughout their length, the anterior ones and the tail the longest, and curved; aperture violaceous-red wrinkled with white.



Pteroceras Scorpius.

Locality.—East Indian Seas.

Rostellaria.

This genus is placed between *Pleurotoma* and *Fusus* among his Siphonostomata by M. de Blainville. M. Rang arranges it between *Pleurotoma* and *Strombus.* Cuvier places it under the latter genus.

Generic Character.—*Animal* imperfectly known, but bearing a considerable resemblance to that of *Murex*, according to Cuvier.

Shell fusiform or subturriculate, with an elevated pointed spire; aperture oval, canal projecting, and terminating in a pointed beak; external lip simple, dentated, digitated, or very much dilated, furnished with a sinus near the canal, and having generally a second canal ascending upon part of the spire.

Geographical Distribution of the Genus, Habits, &c.—The Asiatic Seas, if we except *Rostellariæ Pes Pelecani* and *Pes Carbonis* (genus *Aporrhais*), which are found in the Mediterranean and other European seas. A very fine specimen of *Rostellaria rectirostris* was brought up in the mud lying on the fluke of an Indiaman's anchor, in the Straits of Macassar. Carnivorous.

The number of recent species enumerated by M. Deshayes in his Tables is seven recent, and, of these, three, *Rostellariæ Pes Pelecani, Pes Carbonis*, and a new species, are noted as being found both living and fossil (tertiary).

M. de Blainville thus divides the genus:—

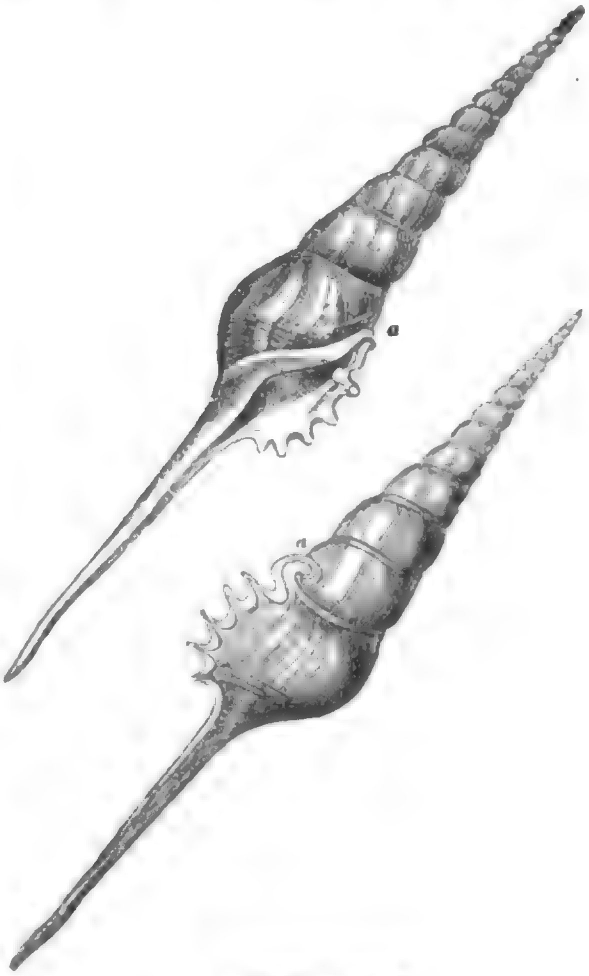
α Species whose external lip is digitated.

Example, *Rostellaria curvirostris.*

β. Species whose external lip is dilated and not dentated.

Example, *Rostellaria Macroptera* (genus *Hippochrenes* of De Montfort—fossil).

Rostellaria curvirostris (*Strombus fusus*, Linn.), the *Spindle* of collectors, is by far the most common of the Asiatic species. We illustrate the genus by *Rostellaria rectirostris*, Lam., a name which suits this rare species well when the beak is curtailed, as it most frequently is. In a very fine specimen, as far as the beak is concerned, now in the British Museum, that usually mutilated part is much longer and better preserved than it is generally seen, and from its recurvature the name of *recurvirostris* would be more apt. Indeed it is by no means clear that there are



Rostellaria rectirostris.

no two species of this long-beaked kind of *Rostellaria*, one much darker than the other, and not so slender.

Description.—Shell fusiform-turreted, smooth in the middle, squalid white; the whorls rather convex, the last transversely sulcated below, the upper more convex and cancellated; external lip toothed on the margin; beak very long, slender, very straight.

Such is Lamarck's description; but those unfaded specimens which we have seen have been of different hues of brown. The lip terminates above in an elegantly turned canal or volute upon the bottom whorl of the spire, *a a* in the subjoined cut. Some specimens that we have seen have been of a deep brown, approaching to black in the inside of the outer lip. In the young shells the external lip is not dentated. Lamarck gives the length of the adult as 5 inches 10 lines, but the shell above noticed as being in the British Museum, and which has the longest beak we ever saw in the species, is of much greater length. The shell is called by collectors the *Chinese Spindle.*

Fossil Strombidæ.

Strombus.

Lamarck records but one fossil species, *Str. Conalis* (Grignon). M. de Blainville remarks that when he wrote (1825) only five species of true *Strombi* had been found fossil, one of which, from the Plaisantin, is an analogue, according to Brocchi.

M. Deshayes, in his Tables, makes the number of fossil *Strombi* (tertiary) nine, *Str. Gigas* being, as already stated, both recent and fossil.

Rostellaria.

Lamarck records the following fossil species:—*Rostellaria macroptera* (*Strombus amplus*, Brand; *Hippochrenes macropterus*, Montf.), from St. Germain-en-Laye; *Rostellaria columbata*, from the same locality, and *Rostellaria fissurella*, from Grignon and Courtagnon.

Defrance notices fifteen fossil species; one identical from the Plaisantin, and an analogue from Grignon.

M. Deshayes, in his Tables, records the number of fossil (tertiary) *Rostellariæ* as eight; three species, as above stated, being both recent and fossil.

Mr. Lea (*Contributions to Geology*) describes and names two species, *Rostellariæ Lamarchii* and *Cuvieri*, from the Claiborne Beds, Alabama (tertiary).

Dr. Mantell (*Organic Remains of the County of Sussex*) records *Rostellaria Sowerbii* from the arenaceous limestone or sandstone of Bognor; and *Rostellariæ Parkinsoni*, *calcarata*, and a species 'with two processes' very closely resembling *R. Pes. Pelecani* (genus *Aporrhais* of some authors), from the Shanklin sand.

Professor Phillips (*Organic Remains of the Yorkshire Coast*) notes *Rostellariæ Parkinsoni* from the Speeton Clay; *composita*, from the Bath and inferior oolite; *bispinosa* from the calc. grit and Kelloways rock; and *trifida* from the Oxford clay.

Professor Sedgwick and Mr. Murchison (*Structure of the Eastern Alps*) record *Rostellariæ costata*, *granulata*, and *lævigata* from the Gosau deposit and its equivalents in the Alps.

Dr. Fitton (*Strata below the Chalk*) gives the following species in his well digested Stratigraphical and Local table: *Rostellariæ buccinoides*, from the gault, Kent; *calcarata* from the gault, Kent, the lower green-sand of Sussex, Isle of Wight, and Norfolk, and from Blackdown; *carinata*, from the gault of Kent, Surrey, and South Wilts; *elongata*, from the gault of Kent; *marginata* from the same locality; *macrostoma* from Blackdown; *Parkinsonii*, from the gault of Kent, the lower green-sand of Sussex and the Isle of Wight, and from Blackdown; *retusa* from Blackdown; *doubtful* from the lower green-sand of Kent; very like *Pes Pelecani* from the lower green-sand of Sussex; and a new species from Blackdown.

STRO'MBOLI. [Lipari Islands.]

STRÖMHOLM, CANAL OF. [Sweden.]

STROMNESS. [Orkney Islands.]

STROMNITE. [Strontium.]

STRONSA. [Orkney Islands.]

STRÖNSTED. [Sweden.]

STRO'NTIUM, a peculiar metal found in combination with oxygen and carbonic or sulphuric acid, and forming the carbonate and sulphate of strontia. From the very considerable resemblance existing between barytes and strontia they were once supposed to be identical. Crawford and Sulze noticed a difference between them, and in the year 1792 Dr. Hope established sufficient differences to prove that they were completely distinct bodies, and the newly discovered body was named *Strontia* or *Strontites*, from Strontian in Scotland, the place in which it was discovered.

Strontium was procured from the carbonate of strontia by Davy in 1808; the method adopted is that which we have described for obtaining barium [Barium] from the carbonate of barytes. Its properties have been but imperfectly examined; it has not a very high lustre, is heavier than sulphuric acid, appeared fixed, difficultly fusible, and not volatile. When exposed to the air it attracted oxygen, and became converted into strontia; when thrown into water, it decomposes it with great violence, producing hydrogen gas, and forming with the water a solution of strontia.

Oxygen and Strontium, as just mentioned, readily unite, constituting the *protoxide*, or *strontia*, which exists largely in nature, and the *peroxide*, which is entirely an artificial product. The simplest mode of procuring the protoxide, or strontia, when required to be free from water, is to dissolve the native carbonate in nitric acid, and to decompose the crystallized nitrate obtained at a red heat; or the sulphate of strontia, which is a much more common substance, may be converted by the well known means first into sulphuret and then into nitrate. The properties of strontia are, that it has a greyish-white colour; its specific gravity is between 3 and 4; it is very infusible, not volatile, has an acrid taste, and has an alkaline reaction on vegetable colours. On comparing these properties with those of barytes, it will be observed that there is considerable resemblance between them, but they differ in one remarkable respect, namely, that strontia, unlike barytes, is not poisonous. When exposed to the air it attracts carbonic acid, and is reconverted to the state of carbonate.

Strontia is composed of—

One equivalent of oxygen . .	8
One equivalent of strontium . .	44
Equivalent . . .	52

Strontia and Water combine to form at least two compounds: when a small quantity of water is poured upon strontia, it slacks, gives out heat, is rendered white; and becoming a hydrate, it is fusible at a white heat, but does not part with its water.

It consists of—

One equivalent of water . .	9
One equivalent of strontia . .	52
Equivalent . . .	61

According to Davy, strontia is soluble in about two hundred times its weight of water at common temperatures. The solution is called *Strontia water*, and is occasionally employed as a chemical reagent; it acts energetically as an alkali on vegetable colours and in saturating acids. In boiling water strontia is much more soluble than in cold. As the solution cools, crystals, the primary form of which is a right square prism, are deposited, and these appear to consist of—

Ten equivalents of water . .	90
One equivalent of strontia . .	52
Equivalent . . .	142

Peroxide of Strontium may probably be obtained, as the peroxide of barium is, by passing oxygen gas over strontia at a red heat, or by heating it with chlorate of potash. It appears to contain two equivalents of oxygen to one of strontia, but is not an important compound.

Neither azote nor hydrogen unites with strontium.

Chlorine and Strontium combine to form only one compound, consisting of—

One equivalent of chlorine . .	36
One equivalent of strontium . .	44
Equivalent . . .	80

The best mode of procuring this salt is to dissolve carbonate of strontia in dilute hydrochloric acid, and to evaporate the solution to its crystallizing point, the chloride containing water then separates in long slender crystals, which consist of 1 equivalent of chloride 80 + 1 equivalent of water 9. When exposed to heat the water is expelled, and a solid white chloride remains. The crystals deliquesce in a moist atmosphere, are soluble in twice their weight of water at 60°, and still more so in boiling water; this salt is soluble also in alcohol, and the solution when burning exhibits the peculiar red flame characteristic of the compounds of this base.

Chloride of strontium may be more directly, but less eligibly, prepared than in the mode now described, by passing chlorine gas over heated strontia; oxygen gas is expelled, and chloride of strontium remains.

Fluoride of Strontium is an insoluble pulverulent compound.

Sulphuret of Strontium may be formed either by heating the native sulphate with charcoal, or by fusing strontia and sulphur in a green glass tube. It dissolves in hot water, and as the solution cools crystals of sulphuret of strontium are formed. They appear to contain water, independently of which they are probably composed of—

One equivalent of sulphur	16
One equivalent of strontium	44
Equivalent	60

This compound is used for the preparation of the salts of strontia, the sulphate being a much more common substance than the carbonate, which is preferable however when obtainable.

We shall now describe three oxisalts of strontia, two of which exist in nature, and the third is occasionally employed in chemical researches.

Carbonate of Strontia: Strontianite.—This was the first discovered compound of strontia; it occurs crystallized and massive. Primary form a right rhombic prism. Cleavage parallel to the lateral faces of the primary form. Fracture uneven. Hardness, scratches carbonate of lime, but is scratched by fluor-spar. Colour white, greenish, greyish, and brown. Streak white. Lustre vitreous. Transparent, translucent. Specific gravity 3·605.

Before the blow-pipe it fuses, and gives a purple light. Dissolves with effervescence in dilute nitric acid, and the solution is precipitated by sulphuric acid.

Massive Varieties.—Amorphous, globular. Structure fibrous, sometimes granular.

Found at Strontian in Scotland, Braunsdorf in Saxony, and in Peru.

Analysis by Klaproth:—

Carbonic acid	30·
Strontia	69·5
Water	0·5
	100·

Stromnite, or *Barystrontianite*, or *Barytiferous Carbonate of Strontia*, is a mineral found at Stromness in Orkney. It occurs massive. Structure fibrous. Hardness 3·5. Specific gravity 3·7. Lustre somewhat pearly. Translucent on the edges. Colour greyish and yellowish white. It is soft and brittle. Effervesces with acids, but does not melt before the blow-pipe.

According to Dr. Traill, who discovered this substance, it consists of—

Carbonate of strontia	68·6
Sulphate of barytes	27·5
Carbonate of lime	2·6
Oxide of iron	0·1
Loss	1·2
	100·

Carbonate of Strontia may be artifically obtained by several processes; as by exposing strontia water to the air, or by adding an alkaline carbonate to it; or by decomposing any soluble salt of strontia, by means of an alkaline carbonate, &c. In whatever mode obtained, it is a colourless insipid powder, quite insoluble in water, decomposed by acids with effervescence, and by exposure to a high temperature. It is used for preparing the various salts of strontia, and is composed of—

One equivalent of carbonic acid	22
One equivalent of strontia	52
Equivalent	74

Sulphate of Strontia: Celestin.—Exists largely in nature. It occurs crystallized and massive. Primary form a right rhombic prism. Cleavage easy, parallel to the base of the primary form, but less so in the direction of the lateral faces. Fracture conchoidal, uneven. Scratches carbonate of lime, but it is scratched by fluor-spar. It is brittle. Colour white, bluish, reddish-white. Transparent; translucent. Lustre vitreous. Specific gravity 3·858.

The *Massive Varieties* are nodular, tabular, and amorphous. Structure columnar, fibrous, granular.

It is not acted upon by acids. Before the blow-pipe it decrepitates and fuses into a white friable enamel. The powder becomes phosphorescent on a hot iron.

According to Klaproth it consists of—

Sulphuric acid	42
Strontia	58
	100

This substance occurs near Bristol, in Sicily, at Bex in Switzerland, &c.

Sulphate of Strontia and Barytes: Grunerite.—This mineral is found in Hanover. It occurs massive. Its structure is radiated. Hardness 3·0 to 3·5. Colour white, with sometimes a shade of blue. Translucent. Lustre vitreous. Specific gravity 3·76.

Sulphate of Strontia may be obtained artificially, by adding sulphuric acid, or a sulphate, to any soluble salt of strontia. It is a colourless, insipid, heavy powder, insoluble in water, and dissolved only by strong sulphuric acid, from which it is precipitated by water. It is composed of—

One equivalent of sulphuric acid	40
One equivalent of strontia	52
Equivalent	92

Nitrate of Strontia is procured by dissolving the carbonate in dilute nitric acid, or by decomposing the sulphuret of strontium with it. The solution is colourless, and by evaporation yields crystals, which are composed of—

One equivalent of nitric acid	54
One equivalent of strontia	52
Equivalent	106

It crystallizes in octohedrons, is soluble in five parts of water at 60°, and in half a part at 212°. It is insoluble in alcohol, but when finely powdered and mixed with it, the alcohol burns with a beautiful red flame.

Under peculiar circumstances a hydrate nitrate of strontia is formed, containing four equivalents of water. The form of this is an oblique rhombic prism.

The salts of strontia are occasionally used in chemical investigations, and in giving a purple flame to fire-works.

STROPHE (στροφή) is a set of verses composed according to a certain system of metres. The word is derived from στρέφω, 'to turn,' as in the lyric, especially the choral poetry of the Greeks, this part of a poem was sung during the movements and dances of the chorus. In modern times such a combination of verses, written either in the same or in different metres, is commonly designated by the Italian name stanza. The division of a poem into strophes was however applied by the antients only to lyric poetry, and here one strophe seldom exceeded the number of four verses, with the exception of the dramatic and other choruses, in which a strophe sometimes contains a considerable number of verses. However different the metre of the several verses may be, there is always a unity of rhythm in them which characterises a strophe as an artistic whole. The various kinds of strophes were designated by the antients by various names which either indicated the number of verses they contained, such as disticha, tristicha, tetrasticha, &c., or were derived from the name of their inventors, or from the characteristic metre in which they were composed, such as the Alcaic, Sapphic, Choriambic strophe, &c. Again, strophes in which all the verses are of the same metre are called monocola, and those consisting of verses of two, three, or four different metres, are called dicola, tricola, or tetracola. The choral poems of the Greeks generally consisted of three main parts, strophe, antistrophe, and epode. The antistrophe always corresponds in its metre with the strophe, and thus forms a second stanza, equal to the first; the epode differs from both, and forms the concluding stanza of a chorus. (G. Hermann, *Elementa Doctr. Metr.*, p. 433, ed. Glasgow.)

STROPHO'MENA, M. Rafinesque's name for the brachiopodous fossil shell described by Dalman under the name of *Orthis*. [BRACHIOPODA, vol. v., p. 313.]

STROPHO'STOMA, the name given by M. Deshayes to a fossil shell somewhat resembling *Anostoma*, with the aperture reflected towards the spire. [HELICIDÆ, vol. xii., p. 110.]

STRO'PHULUS is an eruption of pimples upon the skin, which frequently occurs in infants whose health is disordered by the irritation of teething or any other cause. Dr. Willan describes the following forms of the disease:—

1. S. intertinctus, of which the vulgar name is red-gum or red-gown. The eruption in this form consists of vivid-red distinct papulæ, scattered in varying numbers over the cheeks, the arms, the backs of the hands, or, in some cases, the whole body. After an uncertain duration the papulæ disappear, the cuticle separating in scurf; but very frequently the fading of one eruption is rapidly followed by the appearance of another, which passes through similar stages, and generally spreads further over the skin. A few of the papulæ in each eruption sometimes assume the character of small pustules, a little fluid being formed in their apices: but this commonly disappears without bursting. The origin of the eruption may usually be traced to disorder of the digestive organs, by a gentle correction of which it may be cured. A sudden repulsion of it by exposure to the cold, or any injudicious remedies, may bring on diarrhœa, and even severe general illness. In itself it is a disease of no importance.

2. S. albidus differs from the preceding only in the colour of the papulæ, which consist of minute whitish specks, slightly elevated, and usually surrounded by a pale ring of red. They appear in the same situations as those of the first variety, are referrible to a similar origin, and require no other treatment.

3. S. confertus is often called the tooth-rash, and the rank red-gum. It occurs only during the process of teething, and consists (in children of three or four months old) of small closely-set papulæ, less vivid but more permanent than those in S. intertinctus. Their usual seat is on the cheeks and sides of the nose; sometimes they extend to the forehead and the arms, and sometimes large papulæ appear upon the loins. If the eruption occurs when the infant is eight or nine months old, it generally assumes a severer form: one or two extensive patches appear on the arms, shoulder, or neck, the papulæ in each being hard, large, and set so closely, that the whole surface of the skin seems bright red. These usually continue for a fortnight, spreading slowly from one part to another, and then fade, leaving the part, after the exfoliation of the cuticle, rough and discoloured for a week or two longer. A similar, but more obstinate and painful form of eruption, sometimes appears on the lower extremities and the lower part of the trunk. It is never advisable however to adopt any active treatment for the remedy of this variety of the disease. It commonly continues during the whole of the early period of dentition; but it affords in some measure a safeguard against more serious disorders, and disappears soon after the first teeth have cut through the gums.

4. The S. volaticus is characterised by small circular clusters of from six to twelve bright-red papulæ, which break out successively in many different parts of the body, remaining in each for about four days, and then becoming brown and disappearing with scurf. The complaint generally lasts three or four weeks, and passes in successive eruptions over a considerable part of the body. It is attended by slight fever and general disturbance of the system, and is most common in children of from three to six months old.

5. S. candidus is distinguished by the papulæ being larger than in any other variety. Their surfaces are smooth and shining, and, their bases not being inflamed, they seem paler than the adjoining skin: they usually last for about a week, and disappear in the same manner as those in the preceding forms. An eruption of this kind is most common in children a year old, who have shortly before its appearance suffered from some acute disease. It requires no active treatment. like all the other varieties of the disorder, it ceases with the irritation from which it has its origin.

STROUD, a parliamentary borough in Gloucestershire. It includes an extensive district, comprehending the parishes of Stroud, Bisley, Painswick, Pitchcomb, Randwick, Stonehouse, Leonard Stanley (excepting a detached portion called Lorridge's farm), King's Stanley, Rodborough, Minchinhampton, Woodchester, Avening, and Horsley; and extending into the four hundreds of Bisley, Dudstone and King's Barton, Longtrees, and Whitstone; its greatest length is about 10 miles from north to south, and nearly the same distance from east and west; its area and population, according to the returns of 1831, were as follows:—

Bisley Hundred.	Area.	Houses.			Population.	
	Acres.	Inhab.	Uninhab.	Building.	Families.	Persons
Stroud .	3990	1746	165	33	1859	8607
Bisley .	7980	1264	116	3	1264	5896
Painswick	6510	837	118	..	886	4099
Dudstone and King's Barton Hundred.						
Pitchcomb	500	43	4	..	43	224
Longtrees Hundred.						
Avening	4660	500	45	3	507	2396
Minchinhampton	4880	1116	153	..	1131	5114
Rodborough	1390	431	67	1	436	2141
Woodchester . .	1180	187	23	1	189	885
Horsley .	4460	799	125	13	836	3690
Whitstone Hundred.						
King's Stanley . .	1740	464	55	2	514	2438
Leonard Stanley	910	184	12	..	184	942
Stonehouse	2260	516	17	8	554	2469
Randwick	1260	203	29	..	215	1031
Total .	41,740	8290	929	64	8618	39,932

From this is to be taken the detached portion of the parish of Leonard Stanley, which is excluded from the borough, but is not distinguished from the rest of the parish in the Population Returns. It has an area of about 300 acres. In the Report of the Parliamentary Boundary Commissioners, it was proposed to include the parish of Eastington, but the Boundary Act did not include it. It adjoins the eastern extremity of the borough.

The borough of Stroud comprehends an important part of the west of England clothing district, drained by the branches of the Stroudwater, which joins the Severn between Gloucester and Berkeley; 'the peculiar features of the district are, the situation of the mills on streams in deep ravines; the scattered and irregular manner in which the houses are built on the hill sides; and the contrast between the high land (in many cases either wood or common, with few inhabitants) and the valleys studded with houses and thickly peopled.' (*Boundary Commissioners' Report.*) It comprehends the market-towns of Stroud, Minchinhampton, and Painswick. Stroud, which gives name to the borough, is 111 miles west by north of the General Post-office, London, viz. 81 miles by the Great Western Railway to Swindon, 18 miles by branch to Cirencester, and 12 miles from Cirencester to Stroud by coach road; the distance by the coach road through Maidenhead, Henley, Abingdon, Faringdon, Lechlade, and Cirencester is 105 miles. Stroud is 9½ miles south of Gloucester. Minchinhampton is 4 miles south-east of Stroud; and Painswick about the same distance north, on the road to Gloucester.

Stroud stands in a picturesque valley at the junction of two of the streams which form the Stroudwater (sometimes called the Frome), a stream celebrated as possessing superior excellence for the dyeing of scarlet cloth. This quality led to this district being early chosen by clothiers and dyers. The town has been greatly improved in modern times; the streets are paved, and contain many good houses. The church is a large building of various dates; it consists of a nave, chancel, and side aisles, with a tower and spire at the western end. A new church has lately been erected in the parish capable of accommodating 1000 persons; and there are places of worship for Baptists, Independents, and Wesleyan Methodists. The market, which is on Friday, is well supplied, and there are two yearly cattle-fairs. It is one of the polling-places for the eastern division of the county. Petty-sessions for the division are held here. The living of Stroud is a perpetual curacy, of the clear yearly value of 132*l*.

Minchinhampton and Painswick, as well as the village of Bisley, are described elsewhere. [GLOUCESTERSHIRE.]

Rodborough is a village one mile south-west of Stroud. The church, formerly a chapel to Minchinhampton, 'has a tower with pinnacles; and a nave, chancel, and south transept: amidst many alterations, some antient features remain. (Rickman.) The Independents have a place of worship. Nailsworth is a chapelry, partly in Avening and partly in Horsley parish. The village of Nailsworth is about two miles south-west of Minchinhampton, and extends into Minchinhampton parish. It has several dissenting meeting-houses. A customary market is held on Saturday. Horsley is about two miles south-south-west of Nailsworth, and six south of Stroud. It has a church and two dissenting meeting-houses, a national school, and a small house of correction. Petty-sessions for the district of Longtree are held in turn at Horsley, Rodborough, and Tetbury, the last being out of the borough. King's Stanley, three miles south-west of Stroud, has some antiquities, as the remains of a Roman camp, and of a residence of the Mercian kings. Several Roman altars and other antiquities were dug up about two miles from the camp. Leonard (or St. Leonard) Stanley, four miles west-south-west of Stroud, has some remains of a priory of Benedictines, dedicated to St. Leonard. The conventual church, now parochial, is partly of early English architecture. The convent kitchen is used as a dairy. Leonard Stanley was formerly a market-town; it is now a scattered and irregular village, but has a considerable share in the clothing manufacture. Stonehouse, four miles west of Stroud, has an antient church which retains many of its antient features, though much modernised: the north door is Norman. Woodchester, two miles south-west of Stroud, was probably a Roman station. Interesting remains of a Roman villa have been discovered here, especially a large tessellated pavement, 48 feet 10 inches square, very richly and elaborately ornamented, and far superior to anything of the kind discovered in Great Britain.

The number of persons engaged in manufactures, almost entirely of woollen cloth, in 1831, was 2539. The Stroud canal, or Stroudwater navigation, passes through the borough. It commences in the Severn near Framiload, between Gloucester and Berkeley, and runs eastward eight miles to Wallbridge, near Stroud, where it joins the Thames and Severn Canal, which runs by Stroud, 30 miles eastward to the Thames at Lechlade. The Stroudwater navigation was formed under acts passed between 1730 and 1776; the Thames and Severn Canal under acts passed from 1783 to 1813.

All the parishes in the borough are in the archdeaconry of Gloucester and diocese of Gloucester and Bristol; and all, we believe, except Pitchcomb, in the rural deanery of Stonehouse: Pitchcomb is in the deanery of Gloucester.

The parishes comprehended in the borough (including the detached part of Leonard Stanley, which we have no means of distinguishing) had, in 1833, eighty-seven day-schools of all kinds, with 3245 scholars, viz. 1304 boys, 970 girls, and 971 children of sex not distinguished: six of these day-schools were also Sunday-schools, and were attended on Sunday by 480 children. There were forty-four Sunday-schools, beside the six just mentioned, with 6132 scholars of both sexes.

The borough returns two members to parliament: the number of electors on the register in 1835-6 was 1295; in 1839-40 it was 1202. (*Parliamentary Papers.*)

STROUD. [Rochester.]

STROZZI, an historical family of Florence, of the period of the republic, which produced many distinguished men both in learning and politics. The Strozzi are mentioned in the beginning of the fourteenth century by the chronicler Dino Compagni as belonging to the Guelph and Neri party, of which they became one of the leading families. After the revolt of the lower orders, in 1378, was suppressed, Tommaso Strozzi joined Salvestro de' Medici, Benedetto Alberti, and Giorgio Scali, in supporting the popular government against the burgher aristocracy, at the head of which were the Albizzi and some of the Strozzi themselves, who, on suspicion of a conspiracy against the existing government, were seized in 1379, and summarily put to death. A fresh insurrection, in 1381, upset both Tommaso Strozzi and Giorgio Scali: Strozzi escaped, but Scali was beheaded. Tommaso Strozzi retired to Mantua, whither a branch of the Strozzi was thus transplanted.

In the following century the most conspicuous of the family was Palla Strozzi, who filled several high offices: he was at the siege and surrender of Pisa in 1406. He was afterwards employed on several missions: he was sent, together with Cosmo de' Medici, to the congress of Ferrara in 1432, when peace was concluded between the duke of Milan on one side, and Florence and Venice on the other, through the mediation of duke Nicholas of Este. Shortly after this a civil strife broke out between the rival families of the Medici and the Albizzi, and Palla Strozzi joined the party of the latter. The Medici, from the time of Giovanni, father of Cosmo, had taken the popular side, especially in the business of the catasto or census, by which taxation upon property was fixed in proportion to the value of each citizen's property. This measure had been strenuously opposed by the grandi, or older wealthy families, who, having had hitherto the government in their hands, had never paid their proper share of the public burthens, which fell chiefly on the inferior citizens. The Albizzi, who were at the head of this burgher aristocracy, became jealous of the popularity of the Medici. In 1434 they contrived by means of money to have the Gonfaloniere, and the majority of the signori or executive, elected from among their friends. Cosmo de' Medici was then sent for to the town palace by the new Gonfaloniere, and put in prison. He was charged with sundry misdeeds; among others, with having, together with his friends, by their machinations and intrigues, 'caused the republic to undertake an impolitic war against Lucca, which had nearly proved the ruin of the state.' (Fabbroni, *Vita Cosimi Medicei.*) A parliament, or general assembly of the people, was assembled in the square, surrounded by armed men of the Albizzi party: the parliament appointed a balia, or dictatorial commission, which found Cosmo guilty of the various charges brought against him, and sentenced him to banishment, together with his brother Lorenzo and several of his friends. This was the summary mode of settling state matters in the Florentine republic. Rinaldo degli Albizzi, who had himself countenanced the war against Lucca, was most inveterate against Cosmo, and proposed to put him to death; but the more moderate of his party, and Palla Strozzi among others, thought banishment was enough. After a twelvemonth, a reaction took place in favour of the Medici: an executive was chosen from among their friends. Rinaldo degli Albizzi now proposed to his friends to resort to arms to prevent the new executive from taking their seats of office, and to oblige the signoria that was going out to appoint a balia which would appoint an executive favourable to them. Palla Strozzi, too honest or too weak for a partizan, opposed the proposal of Rinaldo as too violent and illegal, and advised to wait and watch the acts of the new executive. This was the ruin of the Albizzi; for the new governors began by imprisoning the late Gonfaloniere, and he summoned the Albizzi to appear at the town palace. Upon this Rinaldo summoned his friends to arms; but many of them declined to obey his call; and Palla Strozzi, after several messages, came out with two armed followers; at which Rinaldo broke out in bitter words of reproach, and Strozzi, after a brief retort, turned his horse's head and went home. Rinaldo remained in uncertainty; he parleyed with his enemies; whilst the signoria had time to send for troops from the country, which occupied all the strong posts in the city. The usual parliament was then assembled, and a balia was appointed, which condemned the Albizzi, Strozzi, and many others to exile, A.D. 1435. Palla Strozzi went to Padua, where he spent the remainder of his life in studious retirement. He died at Padua in 1462, at ninety years of age. 'On arriving at Padua, he devoted himself entirely to study, and found in it a harbour from past storms. He took into his house John Argyropulos and another learned Greek, and allowed them a good salary to read to him Greek works. Argyropulos read to him Aristotle on natural philosophy, and the other read to him other works. Palla Strozzi was himself well acquainted with Greek, and he translated into Latin the works of John Chrysostomus.' (Tito Vespasiano Strozzi, in Méhus's *Life of Ambrosius Traversari.*)

Before his exile, Palla Strozzi had exerted himself to encourage learning in his native city of Florence. Together with Coluccio Salutati and Niccolo Nicoli, he engaged Manuel Chrysoloras to come from Greece to Italy, about 1396; and Strozzi defrayed in great part his expenses, and caused him to be retained at Florence as professor of Greek. Books however were still wanted; and Strozzi sent to Greece for them, and obtained many volumes at his own expense. Among other books, he got the 'Politics' of Aristotle, the 'Cosmography' of Ptolemy, with the maps, the 'Lives' of Plutarch, and the works of Plato. About the year 1428 Palla Strozzi was chosen, with Giannotti Mannetti, to reform the University of Florence, and they established new chairs, and gave a fresh vigour to that institution. It was by Palla Strozzi's advice that Filelfo was engaged as professor with the stipend of 300 crowns, and the new professor soon after had nearly 400 pupils. Strozzi was about to form a public library at Santa Trinita, in the centre of Florence; he had purchased many books, and had engaged amanuenses to transcribe others for the purpose, when the unfortunate civil factions of 1434-5, and his own exile, prevented the execution of his plan. But yet Palla Strozzi, with Salutati, Manetti, and others, must be considered as having greatly contributed to the revival of classical studies in Italy, before the brilliant æra of the Medici, to whom the whole merit has been commonly attributed. Thomaso Sarzana, afterwards Pope Nicholas V., of illustrious memory, was for a time a guest of Palla Strozzi at Florence, and improved himself in his society. Filelfo was a great friend of Palla, and the friendship was permanent. Timoteo Maffei of Verona, Paolo Cortese, Ercole Strozzi, and others, wrote eulogies of Palla Strozzi.

A collateral branch of the Strozzi lived at Ferrara in the 15th century. Its progenitor was Nanni or Giovanni Strozzi, a Florentine, who removed to Ferrara, and became a distinguished captain in the service of the Marquis Nicholas of Este, was ennobled, and acquired considerable wealth. Nanni left four sons, all of whom applied to literature; but the most distinguished of them was Tito Vespasiano Strozzi, who studied under Guarino da Verona, and became a distinguished scholar and Latin poet. Some of his 'Carmina' were published by Aldus Manutius, and they contain his own biography; others are still inedited. Tito Vespasiano filled several judicial and administrative offices at Ferrara. He was appointed by the duke president of the Council of the Elders, and was sent ambassador to Rome in 1484. As an administrator however it appears from some contemporary chroniclers that he was very unpopular. (*Diario Ferrarese*, in Muratori, *Rer. Ital. Script.*, xxiv.) He died about 1508, and his tomb is in the church of Santa Maria del Vado at Ferrara.

Ercole Strozzi, son of Tito Vespasiano, rivalled and perhaps surpassed his father as a poet. He wrote both Latin and Italian: some of his Latin verses are published together with those of his father. He began a poem in praise of Duke Borso of Este, which he left unfinished. He was a friend of Bembo, Giovio, and other illustrious contemporaries, and Ariosto (*Furioso*, c. 42) has placed him among the excellent poets of his age. The mode of his death was tragical. He had just married Barbara Torella, of a noble family of Ferrara, when, on the 6th of June, 1508, he was murdered one evening as he was returning home, and his body was found on the road with twenty-two stabs, and wrapped up in his mantle. Giovio says that a personage of high rank, whom he does not name, was through jealousy the author of the murder. The Duke Alfonso of Ferrara was suspected. Some of the Latin elegies of Ercole Strozzi resemble those of Ovid in ease and pathos, and in one of them he seems to foretel his own death. He was buried in the same church as his father. His widow, who was also a poet, wrote a sonnet on his death, which is in the 'Raccolta dei Poeti Ferraresi.'

Of the main stock of the Strozzi family which remained at Florence, the most celebrated was Filippo Strozzi, who figured at the period of the fall of the republic. Filippo acted an ambiguous part; he was ambitious, and had great influence through his connections and his great wealth, being possessed of large funds in various banking-houses in several countries of Europe. He was at times the friend and at others the rival of the Medici. He married Clarice, daughter of Piero de' Medici and niece of Leo X., a haughty ambitious woman, who ill brooked to see two illegitimate scions of the family, Alessandro and Cardinal Ippolito, placed by Pope Clement VII. to rule over Florence. Filippo and his wife were the instigators of the popular movement of May, 1527, in which the republic was restored and the two young Medici were reduced to a private condition. Filippo Strozzi was a supporter of the new gonfaloniere Capponi and of the moderate party, in opposition to the violent men who wished to proscribe all the friends of the Medici, and drive matters to extremities. In 1529, by the treaty of Barcelona, between Charles V. and Pope Clement, it was agreed to make Alessandro, the spurious and even dubious son of Lorenzo, duke of Urbino, son of Piero, duke of the Florentine state, and Charles V. agreed to give him in marriage his natural daughter Margaret. An army of mixed Imperial and Papal troops was sent against Florence, which was obliged to surrender, after an obstinate resistance, in which several members of the Strozzi family distinguished themselves, in August, 1530, and Lorenzo Strozzi, brother of Filippo, was one of the commissioners who signed the capitulation on the part of the Florentines. Filippo, who was then at Rome, took part in the various conferences held there by the friends of the Medici in the presence of Pope Clement, concerning the sovereignty to be given to Alessandro. Filippo Strozzi returned to Florence and appeared to be on good terms with the new duke, to whom he even lent money to build a citadel to overawe the city. But Strozzi and his family were too wealthy and too ambitious to be long subservient to a young upstart whose character was despicable. The sons of Filippo were fiery and restive, and his daughter Luisa, who had married Luigi Capponi, having been publicly insulted by one of the duke's courtiers the latter was assailed one evening and roughly handled by some unknown men. Her brothers, being suspected, were arrested, but afterwards liberated by an order from Pope Clement. The unfortunate Luisa died soon after of poison. Filippo and his sons left Florence for Rome, where Paul III., Clement's successor, felt not the same interest as his predecessor for the Duke of Florence. Cardinal Ippolito de Medici, an illegitimate son of Giuliano, duke of Némours, being piqued at having been set aside for his cousin Alessandro, encouraged the Florentine malcontents, who assembled at Rome under his auspices, and among whom Filippo Strozzi and his sons were conspicuous. Cardinal Ippolito however died suddenly, not without suspicion of poison. In the year 1535, when Charles V. landed at Naples on his return from the Tunis expedition, Filippo Strozzi and other Florentine emigrants appeared before him and complained of the tyrannical and dissolute conduct of Duke Alessandro, who repaired to Naples with his counsellor Guicciardini, in order to answer their charges. Filippo Strozzi offered large sums of money to the courtiers of Charles, to obtain the removal of Duke Alessandro. At last the emperor decided that the duke should remain, but should give a complete amnesty to the political emigrants, who however resolutely refused the boon, and dispersed themselves among various towns of Italy. Filippo Strozzi repaired to Venice.

In 1537 Duke Alessandro was murdered by his relative Lorenzino de' Medici, who was a descendant of Lorenzo, the brother of Cosmo the elder; upon which the partisans of the Medici contrived to have young Cosmo, another descendant of the same branch, elected prince of Florence, with the approbation of Charles V. The Florentine emigrants were now reduced to despair, and being excited by the agents of France and of Pope Paul III., they resolved to try once more the chance of arms. Filippo Strozzi repaired to Bologna, with his son Piero, a young man of rash courage, who had served in the French armies, and with Baccio Valori, Anton Francesco degli Albizzi, Prior Salviati, and others; from thence they made an irruption into the Florentine territory with about 4000 French and Italian mercenaries. The attempt was badly conducted, and a party of the invaders who had taken possession of the castle of Montemurlo, situated between Prato and Pistoja, allowed themselves to be surprised by the soldiers of Cosmo joined by Spanish troops in the emperor's service, and were totally routed. Piero Strozzi was lucky enough to escape, but Filippo and the other leaders were taken and carried to Florence, where most of them were immediately beheaded. Filippo Strozzi was imprisoned in the very fortress which his money had helped to raise. He was there kept as a prisoner of the emperor, under the care of his lieutenant Don Juan de Luna. Charles V., although he hated Filippo Strozzi and all his family as enemies and partisans of France, still hesitated concerning his doom, as Pope Paul and other great personages interceded for him; Duke Cosmo however was eager for his death. The emperor told the pope that he would spare him if he could show that he was innocent of the murder of Duke Alessandro. Filippo Strozzi was at Venice when the murder was committed at Florence, and it appears certain that he had no previous understanding with Lorenzino: he was astonished and for a time incredulous when the latter told him what he had done, but when he was convinced of the truth, he praised Lorenzino for his deed, and extolled him as another Brutus. However Filippo Strozzi was examined, and put to the torture in presence of Cosmo's chancellor and of Don Juan de Luna; but although he suffered cruelly, being of a weak and sensitive frame, he denied all participation in the murder, and Don Juan de Luna at last ordered the torture to cease. Duke Cosmo however seized upon Giuliano Gondi, an intimate friend of Filippo, who, being under the torture, said that he had heard from Filippo that he was privy to the murder. The depositions were sent to the emperor, who ordered Don Juan de Luna to deliver his prisoner into the hands of Cosmo. Filippo, being informed of this, preferred killing himself to being put to death by the executioner. He wrote a declaration of his motives, inscribed 'Deo Liberatori,' in which he said that after having been already cruelly tortured, and in order to avoid being induced, through the violence of renewed torments, to accuse some of his innocent relations and friends, as had lately been the case with the unfortunate Giuliano Gondi, he had determined to put an end to his existence, and that he recommended his soul to God, begging of his mercy to give him at least a place with Cato of Utica and other virtuous men who had died in a like manner. He then requested his sons to fulfil his testament, and to repay Don Juan de Luna, the Spanish commander of the fortress, for the many accommodations he had granted him, and to bury his body in Santa Maria Novella by the side of his wife, if it should be permitted; otherwise it might lie wherever they would put it. And lastly, addressing the emperor, he entreated him to inform himself better concerning the condition of poor Florence, and to provide better than he had hitherto done for its weal, unless he intended to ruin the city altogether. He signed this remarkable paper, which was found in his bosom after his death, 'Philippus Strozzi jamjam moriturus,' and added as an epigraph the line from Virgil—

'Exoriare aliquis nostris ex ossibus ultor.'

He then seized a sword which had been left, perhaps by a friendly hand, in his prison, and cut his throat. His end excited a feeling of compassion, mixed with horror, all over Italy. Whatever judgment we may form of the character of Filippo Strozzi, in which ambition and weakness were predominant ingredients, we cannot help compassionating him in his death. The mode of his trial was barbarous and illegal: if he had been tried and executed, like his companions, as a rebel or disturber of the public peace caught with arms in his hands, the sentence would have been plausible, but he was kept in prison for a twelvemonth, and then tried for a deed of which he was innocent. Strozzi was generous and accomplished, was well acquainted with classical literature, and he translated Polybius's treatise 'On the mode of forming Encampments,' and also some apophthegms of Plutarch. Many have mistaken him for a real patriot, which he was not; and Charles V. had well judged him, as well as the other leaders of the Florentine emigrants, when he said to Antonio Doria, who was pleading their cause at Naples in the time of duke Alessandro, 'You little understand these men, Antonio; they do not wish the liberty of their country, but their own greatness; for if we were to remove the duke, they would become themselves lords of Florence, in spite of the other citizens, who really love the liberty of their city, but who could not resist the influence and wealth and power of these ambitious leaders.' (Varchi; Segni; Adriani; the *Life of Filippo*, by his brother Lorenzo Strozzi; and Botta, *Storia d'Italia*.) A curious MS. was discovered not many years since in the possession of the cavalier G. F. Uguccioni of Florence, which is an inedited history by Gian Girolamo de Rossi, a friend of Filippo Strozzi, which contains several particulars concerning his untimely end. (*Antologia di Firenze*, No. 127, July, 1831.) The author says that Cardinal Cibo and Cosmo's mother were the great instigators of Filippo's death, because they thought that his great wealth was dangerous in his hands, but would be less so when divided among his children. Filippo had still at his death 50,000 scudi, or crowns, of income, chiefly in the banks of France, which his enemies could not touch, after the emperor had confiscated the funds which he possessed in Spain, Germany, and Italy.

Piero Strozzi, son of Filippo, after escaping from Tuscany, returned to France, where he was patronised by Henry II. and his consort Catherine de' Medici, and rose to high rank in the French army.

In 1553 he was sent, with the title of 'Lieutenant of the King in Italy,' to Siena, which republic was then at war with Cosmo, duke of Florence, and where there was already a French auxiliary force, joined by a number of Florentine emigrants. His brother Leone Strozzi went also with a French naval force to the coast of Piombino, but was killed while attacking a small fortress near the shore. Piero Strozzi mismanaged the defence of Siena; his great object being to attack Florence, he neglected the main matter, which was to defend Siena; he made useless incursions into the Florentine territory. Being defeated, after a desperate fight near Marciano, by the marquis of Marignano, he retired to Montalcino; and the city of Siena, after sustaining the horrors of famine was obliged to surrender to duke Cosmo, in April, 1555. Piero Strozzi, who in the meantime had been made marshal of France by Henry II., retired to Rome. Soon after, pope Paul IV. having quarrelled with king Philip II. of Spain, the latter sent the duke of Alba from Naples to attack Rome in 1556, and Piero Strozzi was entrusted by the pope with the defence of the city. Strozzi stood out bravely against the Spaniards, till the arrival of the duke of Guise with a French army obliged the duke of Alba to withdraw to Naples. After this Strozzi returned to France, and repaired to the French camp in Picardy to fight against the Spaniards and English. In 1558 he and the duke of Guise took Calais from the English, but shortly after Piero Strozzi was killed by a musket-shot at the taking of Thionville. His son Philippe attained high rank in the French service, and was killed in 1582, in the Azores Islands, whither he had been sent with an expedition by Henry III., or rather by queen Catherine de' Medici, to favour the claims of Don Antonio, claimant of the crown of Portugal against Philip II. of Spain.

Giambattista Strozzi, son of Lorenzo and nephew to Piero, was born at Florence in 1551, and was celebrated during a long life for his learning, his upright character, and his encouragement of useful knowledge. His house was a kind of school, to which young men fond of study resorted, and he gave them lessons gratuitously, and held disputations with them on various subjects of science. Those who were assiduous but poor he supplied with books, board, and other necessaries; and by so doing he greatly reduced his property. He was very intimate with the grand-duke Ferdinand I. and his son Cosmo II. When Urban VIII. was elected pope in 1623, he invited Giambattista Strozzi to Rome, gave him apartments in the Vatican, and delighted in his conversation; and when Strozzi departed to return to Florence, the pope sent him a letter, in which, among other expressions of esteem, he said that he wished that every town of Italy possessed a man like him. After his return to Florence he became blind, but continued to receive in his house and converse with studious men who resorted to him from all parts. He died in 1634, at eighty-three years of age. He was an elegant writer both in prose and in verse; some of his poems and dissertations have been published, but most of his works remain in MS. He began a poem entitled 'L'America,' concerning the discoveries of his countryman Amerigo Vespucci, but left it unfinished. Professor Rosini has inserted many interesting particulars of the life of Giambattista Strozzi, in his historical novel 'La Monaca di Monza.'

There are several other individuals of the name of Strozzi, belonging to various branches of the family, who became known in different parts of Italy for their learning. Francesco di Soldo Strozzi, a Florentine, but residing at Venice, translated into Italian Xenophon's 'History of Greece,' Venice, 1550, and also Thucydides, which last he dedicated to duke Cosmo, Venice, 1545, reprinted in 1563, but of which a much better edition was published at Verona in 1735. Oberto Strozzi of Mantua, a descendant of Tommaso above mentioned, was a patron of literature; he lived in the sixteenth century, and was a friend of Berni, Mauro della Casa, and other learned men. He founded a poetical academy at Rome, called 'dei Vignajuoli,' about 1534, which assembled in his own house, and whose meetings are recorded in high terms by Marco Sabino, in his dedication to Strozzi of the poetical 'Istituzioni' of Mario Equicola, in 1541.

Giulio Strozzi, born at Venice about the latter part of the sixteenth century, wrote poems; among others an epic, entitled 'Venezia Edificata.' He afterwards went to Rome, when he and Cardinal Deti founded an academy called Degli Ordinati, in opposition to that of the Umoristi. Strozzi was made Papal prothonotary, and died at Rome. Ciriaco or Chirico Strozzi, a Florentine, lived in the sixteenth century; he was professor of philosophy and of Greek at Bologna, and afterwards at Pisa, where he died in 1565. He composed a supplement to the 'Politica' of Aristotle, to supply the loss of the ninth and tenth books. Pietro Strozzi, also a Florentine, lived in the seventeenth century, and wrote a theological and controversial work, 'De Dogmatibus Chaldæorum,' with the view of converting the Nestorians of Mesopotamia to the church of Rome. (Tiraboschi; Pignotti; Fontanini.)

The palace Strozzi at Florence, built by the architects Da Majano and Pollajolo, in the time of the republic, is a remarkable specimen of the massive and stern style of Tuscan architecture of the middle ages. After the lapse of nearly four centuries it appears as perfect as if it were a recent structure. The colossal entablature which crowns the building is much admired.

STRUENSEE AND BRANDT have acquired celebrity from their extraordinary rise to rank and power, and still more so from their common fate. Their names are inseparably blended in history, and the life of the one can hardly be told apart from that of the other.

JOHN FREDERICK COUNT STRUENSEE was born at Halle in Saxony, on the 5th August, 1737. His father, a divine of some eminence, respected alike for his good qualities and for the orthodoxy of his principles, was professor of theology at the university of Halle, and his mother was the only daughter of John Samuel Karl, physician in ordinary to the king of Denmark. Both his parents took great pains in educating young Struensee, who, after the ordinary course of studies at the school attached to the orphan-house of Dr. Franke, entered the university in 1754, and applied himself to physic. The extraordinary talents which he possessed, and the facility with which he acquired everything bearing upon the science he had chosen, were strongly counterbalanced by licentious habits and a loose way of thinking on matters of religion. Being however under the control of his father, he obtained, with some distinction, his degree of doctor in medicine in 1757. In the same year his father was made pastor primarius at the principal church of Altona, where young Struensee himself obtained the appointment of public physician. Singular success attended him in the practice of his profession, and shortly after his arrival a few literary productions procured him the reputation of an author. He remained in this situation after his father's removal to Rendsburg in 1760, where he had been appointed superintendant-general of Sleswig and Holstein. It is to Struensee's stay in Altona that we must ascribe his knowledge of politics, little as it was, which he so ably employed afterwards in the days of his greatest prosperity. Here also he laid the foundation of that pernicious system of licentiousness which was at once the stimulus of his ambition and the cause of his ruin. It does not appear when he left Altona; but in 1768 we find him appointed to attend the king of Denmark, Christian VII., in his tour through Germany, France, and England. Struensee soon insinuated himself into the good graces of the king, with whose profligacy the loose principles and easy manners of his new physician were in perfect accordance; and such was the ascendency he gained over his royal master, that, shortly after his introduction to him, he ventured to promise Brandt, whose acquaintance he made at Paris, to use his influence in order to procure his recal from banishment. About the same time he met Count Rantzau, who afterwards played so conspicuous a part in the revolution which involved his ruin. At Paris a frequent intercourse with D'Alembert and Voltaire confirmed him in his infidelity, while the profligacy of the higher ranks gave exemption from the fear of scandal. We must not omit that it was during this journey of Christian VII. that the degree of D.C.L. was conferred on the king by the university of Oxford, and that of M.D. on Struensee. Soon after their return to Copenhagen the king himself presented Struensee to the queen Caroline Matilda, the posthumous daughter of Frederic, Prince of Wales, and sister of George III., and promoted him to the rank of privy counsellor. It appears however that the queen did not receive this new favourite of her husband with any marks of attention. It was only through the address with which Struensee reconciled her with the king, from whom she had been alienated in consequence of his excesses, that he became as acceptable to her as to her husband. He received every day from both of them new marks of consideration and esteem, and in 1770, having inoculated the crown-prince (Frederic VI., born in 1768), he was entrusted with his physical education. In his capacity of lecturer to the king, Struensee found ample opportunities of realising his ambitious plans. In order to supplant Count Bernstorff, or rather, to deprive him of his seat in the council of state, he recommended Count Rantzau-Aschbach. Soon afterwards he obtained the recal of his friend Enewold von Brandt, who was raised to the dignity of maître des plaisirs and director of the plays, instead of the old favourite Count von Holk. Brandt's polished manners, his easy address, and his lively conversation, were qualities well calculated to promote his favour with the court, where it was of the greatest importance to Struensee that none but his friends should have any influence. It was chiefly through Brandt that he finally succeeded in dismissing Count Bernstorff from the service; many other men of quality were obliged to leave their situations, and the queen dowager Juliana Maria soon found herself without power, neglected by her friends, and slighted by her enemies. The triumph of Queen Caroline was complete; the king behaved to her with deference, and Struensee was now constituted first minister with almost unlimited power. Thus matters stood at the end of 1770, when of the two parties striving for the power which the king had almost resigned, that of the young queen under the guidance of Struensee obtained a decisive victory. In order to be in perfect security, Struensee assigned to Brandt the special office of amusing the king and preventing him from having any conference with his ministers.

It was about this time that the king, urged by Struensee, dissolved the council of state, and instituted in its place a commission of conference (*Commissions conferenz*), which consisted of the presidents of the several branches of public administration. This measure brought all the power into the hands of the prime minister, by whom the members of this new council had been appointed. It changed at the same time the whole Danish constitution by depriving the nobility of their hereditary influence in the affairs of the government, created a universal feeling of disapprobation, and brought much popular odium on Struensee. So limited were the powers of this new chamber, that it could assemble only at certain times, and might be dismissed by the minister; in fact, its members had neither rank, power, nor influence. The imprudence with which this measure was carried into effect could not but prejudice the queen's cause. Among the many enemies which it created, few were so exasperated as Count Rantzau, who, with his seat in the council of state, lost all his power and authority. In order to revenge himself, he joined the queen dowager at Friedensburg. This sudden change in the administration had however the desired effect. Struensee's authority became paramount, and no one ventured to oppose him. The ministers were removed one after the other. All affairs were carried on under the immediate direction of Struensee, and all papers passed through his hands before their ratification by the king. He soon found however that notwithstanding his qualifications for managing the foreign affairs of the kingdom, he had no present means of restoring the exchequer and regulating the home department, both of which had long been declining under the administration of persons utterly devoid of prudence and unacquainted with the resources of the country. His brother C. A. Struensee, member of the college of finance, assisted him in his intended improvements; but the taxes which he imposed produced great destitution among the lower classes, a circumstance which, joined to the despotism exercised over them by a foreigner, increased the number of malcontents and the dissatisfaction of the people. All this time the king was surrounded by libertines, by whom the court was plunged into a profligacy which offended the nation. Meanwhile the attachment of the queen to Struensee exceeded, in appearance at least, the bounds of all moderation. In July, 1771, she was delivered of a princess, and her fears of the infamous reports which were likely to spread from the court of the queen dowager at Friedensburg tended only to place her after this event still more in Struensee's power. This power he shamefully abused. He was raised to the dignity of a count, together with his friend Brandt, and there is reason to believe that much of the enormous wealth of which he died possessed was wrung from the queen's weakness. But though the queen's fears made her silent, it was not so with the press. Its comments on Struensee's proceedings could not be silenced, except by revoking the freedom which he had granted only two years before with the hope of obtaining popularity. This proceeding, as well as the many slights he offered to his former friends, raised the indignation of the people to the highest pitch, and even those who were most attached to him treated him with reserve and coldness. At this crisis too his mental powers began to fail; the daring which had founded his administration, and the quickness in planning and boldness in exe-

cuting which sustained it, gave place to a weak and vacillating fear of his daily increasing difficulties. An unimportant mutiny of 300 sailors who had not received their pay had already shaken Struensee's firmness, and was followed by a revolt of the life-guards, whom he had dismissed without any cause.

On this occasion Struensee acted in a manner unworthy of a man in power; he acceded to all the demands of the revolted soldiers, and sought to conciliate them by various means. This disclosure of his weakness of character, to which succeeded measures evidently calculated to secure his personal safety, led the English ambassador to warn the queen of the approaching downfal of the favourite. The regard he felt for her made him even go farther, and request that she would remove Struensee from the court, in order to prevent the catastrophe which he foresaw. But all his entreaties were in vain. The queen trusted too much to Struensee's prudence, who now made some changes in the department of police, with the view of securing himself against any danger. But the purport of those measures was too manifest. The people naturally enough concluded that Struensee was conscious of having slighted the nation, and they began to see that the prime minister was only a fortunate adventurer, whose career was drawing to a close. The partisans of Juliana Maria and her son Prince Frederic regarded this as an opportunity for a coup d'état too favourable to be neglected. They planned a conspiracy with so much secrecy that nothing whatever transpired which could have put Struensee on his guard. Early in the morning of the 17th January, 1772, Queen Matilda, Struensee and his brother, Brandt, and all their friends and adherents, were arrested. The evening before a ball had been given in the royal palace. Struensee, conscious of his own unpopularity, had, according to his custom, surrounded the palace with guards on whose fidelity he thought he could rely. General Eichstädt, who had been gained over by the opposite party, changed the soldiers, substituting his own dragoons in their place. That evening the young queen danced much, and closed the ball with Prince Frederic, about one o'clock. At three in the morning, Colonel Köller, an old enemy of Struensee, sent his officers into the palace, telling them that he had orders from the king to arrest the queen. At the same time the conspirators—the Queen Dowager, Prince Frederic, Rantzau, Köller, Güldberg, and Eichstädt—went into the king's bedchamber, and forced him to sign the order for the seizure of Struensee and his partisans. The unfortunate queen was brought to Kronenburg, where she was confined until the end of May, 1772, when she was set at liberty through the influence of the English government, and was removed to Zelle.

Meanwhile a special commission was formed, in order to try Struensee. The charge, consisting of nine heads, was given to the fiscal-general on the 22nd April, 1772. During Struensee's imprisonment, Dr. Münter succeeded in converting him from scepticism to Christianity: the narrative of his conversion was published, first at Copenhagen, in 1788, and translated into English by the Rev. Mr. Wendeborn, and republished in 1826 by Thomas Rennell. By the sentence, which was pronounced on the 25th April, 1772, Struensee was to be deprived of all his dignities and beheaded. His right hand was to be cut off, his body quartered and broken on the wheel, and his head and hand were to be stuck up on a pole. This sentence was confirmed by the king in every point; and, on the 28th April, Struensee was decapitated, after witnessing the death of his friend Brandt. Struensee was undoubtedly a man of great abilities, capable of great application to business, rapid and decisive in his resolutions, as well as enlarged and patriotic in his views; but he neither possessed the profound policy, the active vigilance, nor the superior judgment requisite for maintaining him in his sudden elevation. Towards the close of his ministry he acted without foresight or address, as if, with the difficulties which augmented around him, he lost his presence of mind and strength of understanding. Voluptuousness was the source of his misfortunes; ambition only contributed to hasten and complete them. His ignorance of the language of the country which he for some time ruled made him commit many mistakes which otherwise he would have avoided. Nevertheless the charges brought against him are heavy, especially that of peculation; he had on various occasions used the public money for the purposes of himself and his friends, and on one occasion he took 60,000 dollars to remunerate himself for his services, and gave an equal sum to Brandt. He also brought the court of Denmark into habits of dissipation, which, from thence, spread throughout the capital. His friend Brandt was formerly chamberlain to Christian VII.; but having calumniated Count Holk, the then favourite of the king, he was banished from court. Struensee, as above stated, recalled him in 1770, and from that period his life was but a copy of that of the prime-minister. He was violent and imprudent, and once so much forgot himself as to strike the king. This crime was forgiven by Christian VII.; it was therefore not this insult to the king's majesty which brought him to the block. That imprudent act served indeed as a pretext on which to found the accusation, but it was not his real crime; he merely suffered for his political and private connection with Struensee. The sentence pronounced on him was similar to that of his friend.

(Jens Kragh Höst, *Der geheime Cabinetsminister Graf Struensee und dessen Ministerium*, which is the best book on the subject; *An Authentic Elucidation of the History of Counts Struensee and Brandt*, 1788, a book containing many unfounded and incorrect assertions; Falken Skiold's *Mémoires*, Paris, 1826; and *A Narrative of the Conversion and Death of Count Struensee*, by Dr. Münter London, 1826, containing also Struensee's famous confession.)

STRUENSEE, CARL AUGUST VON, brother of the foregoing, was born at Halle, on the 18th of August, 1735, and entered the school of the orphan-house and the university of that town. The wish of his father was that he should study theology; but although he was matriculated in the theological faculty, young Struensee chiefly applied his mind to mathematics and philosophy. In 1756 he was appointed a lecturer at the university of Halle; his lectures on mathematics and Hebrew were well attended, and procured for him some reputation. As early as 1757 he obtained a professorship at the military academy of Liegnitz. The scantiness of pupils which the war had occasioned gave him leisure to study the application of mathematics to the science of war, and in 1760 he published his 'Rudiments of Artillery' (3rd edition, Leipz., 1788). This work procured him the favour of Frederic II., who sent him a great number of young officers whom he was to form for the service. In 1771 appeared his 'Rudiments of Military Architecture,' the third volume of which appeared in 1774; they were republished at Leipzig in 1786. This was the first good book on the subject published in Germany. Meanwhile his brother, who had lately made his appearance at the court of Copenhagen, invited him to that city in 1769. Here he was raised to the dignity of counsellor of justice, and such was his application in the performance of his duties and the judgment with which he avoided all party strife, that after the downfal of his brother he was set at liberty after a short imprisonment, and permitted to return to his country. Frederic II. received him with kindness, and offered to him the yet vacant place at the academy of Liegnitz; but he refused the offer, and retired to his country-seat of Alzenau, in the neighbourhood of Haynau in Silesia, where he pursued his political and mathematical studies. Here he translated Pinto's 'Essays on Political Economy' (1776), to which he added, in 1777, a second volume containing Essays of his own. These were augmented and republished in three volumes, Leipzig, 1800. It was here also that he wrote 'A Short Description of the Commerce of the principal European States,' a work which was completed by Sinapius, and contains very important notices on the trade of the Prusso-Polonic states. Upon this he was raised to the rank of counsellor of finances, and appointed at Berlin director of the maritime trade. In this capacity he distinguished himself by his extraordinary zeal and his politic measures, and soon effected a rise in the trade, which had much suffered under former administrations. For these services he was made a noble, and received the name of Karlsbach in 1789; two years afterwards he was appointed minister of state and president of the board of excise, in which situation he died, on the 17th of October, 1804.

He was a man of clear and enlarged views, remarkable presence of mind, firm principles, and strict order. He showed himself able to appreciate talent, and this circumstance contributed very much to the amelioration of the departments over which he presided; yet he is not free from the charge of nepotism. He shrank from innovation, and abstained from reforming even where his judgment convinced him that it was necessary to do so. His youngest brother was director of the bank at Elbing about 1777.

STRUMA. [SCROPHULA.]

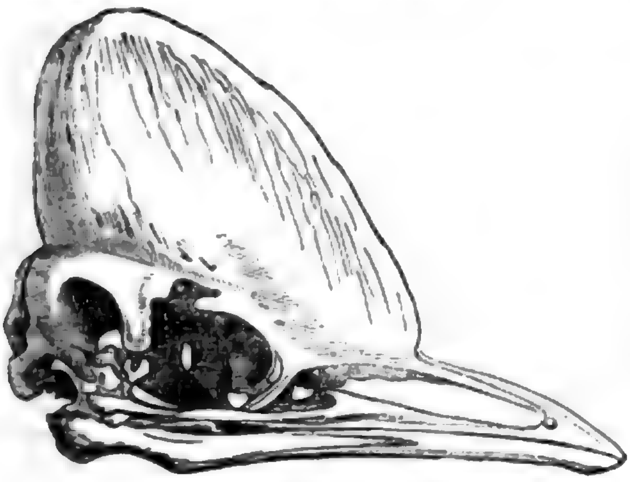
STRUTHIOLA'RIA. [SIPHONOSTOMATA, vol. xxii., p. 54.]

STRUTHIO'NIDÆ, a natural family of terrestrial birds, in which the locomotive energy is thrown into the lower extremities, the wings being in no case adequate to raising the body into the air, and in the majority of instances merely rudimentary. In this respect the genera which compose it are the very reverse of the Humming-birds, Swallows, Albatrosses [ALBATROSS; PETRELS, vol. xviii., p. 46, &c.], Tropic-birds, and Man-of-War bird; for in the latter the moving-power resides in the highly developed wings, whilst the feet, especially in the Man-of-War Bird [PELECANIDÆ, vol. xvii., p. 386], are feeble.

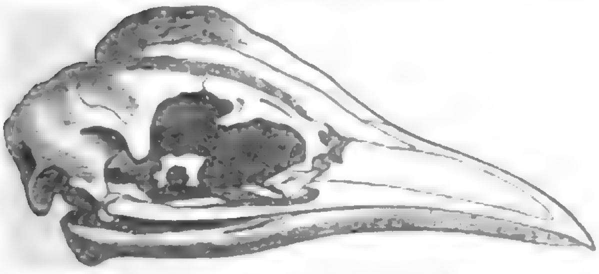
The *Struthionidæ* consist of the Ostrich, American Ostrich (*Rhea*), Cassowary, New Holland Cassowary, or Emu, the DODO (too probably extinct), and that extraordinary bird the *Kivikivi*, or Apteryx, of New Zealand.

Organization.*

Skeleton.—The most remarkable modifications of the *Skull* in this family occur in the Asiatic Cassowary and the *Apteryx*. In the former the bony crest, which is so highly developed in the adult, is hardly perceptible in the young bird, but increases with age, as in the HORNBILL and the Guinea-hen. [PAVONIDÆ, vol. xvii., p. 340.]



Skull of Asiatic Cassowary (adult)



Skull of Asiatic Cassowary (young).

In *Apteryx*, according to Professor Owen, the skull is chiefly remarkable for its smooth expanded elevated pyriform cranial portion, the total absence of supra-orbital ridges, the completeness and the thickness of the inter-orbital septum, the great development of the ethmoid, the small size of the lachrymal bones, and the expansion of the nasal cavity behind these bones. The tolerably semicircular occipital region differs from that of other *Struthionidæ* in the greater relative extent of its base, and in the comparatively slight lateral sinuosities due to the temporal depressions. There is no vertical notch at the upper part of the single hemispherical tubercle in the basi-occipital for articulation with the atlas, as in the *Ostrich* and *Emu*, but it is entire, as in *Rhea;* the plane of the occipital foramen also has the same aspect as in that bird, in which it is more nearly horizontal than in the *Ostrich*. The supra-occipital plate forms a somewhat angular projection, corresponding with the small cerebellum, and is bounded on each side by a vertical vascular groove terminated by a foramen above and below; the ex-occipitals extend outwards and downwards external to these grooves in the form of obtuse processes compressed in the antero-posterior direction, and are slightly convex behind and concave in front, where they form the back part of the wide meatus auditorius externus. The occipital bones, and also the surrounding bones, were anchylosed together. The angle between the posterior and superior regions of the cranium can hardly be said to be produced into a ridge. The superior region is smooth, convex, and separated from the temporal depressions by a narrow ridge, rather more marked than the occipital ridge. The sagittal suture crosses a little behind the middle of the upper part of the cranium. In one cranium Professor Owen found the left half of this suture persistent; but in another, that of a male, all the sutures were obliterated. The persistent sutures were more denticulated than those in the skull of a young *Ostrich*. The superior region is continued into the lateral regions by a continuous curvature, so that the upper part of the small orbital cavity is convex, and its limits undefinable, there being no trace of supra-orbital ridge, nor of antorbital or postorbital processes. This structure, Professor Owen observes, is quite peculiar to the *Apteryx* among birds, but affords a very interesting resemblance between it and the monotreme *Echidna*. The slender zygomatic process sent forwards by the temporal bone most resembles that of *Rhea* in its small relative development. Between the frontal bones, which gradually contract to their junction with the nasal bones, a small part of the ethmoid may be traced. The narrow frontal region is traversed by a mesial longitudinal depression. The ethmoid bone is remarkably expanded; its cells, instead of being restricted to a narrow vertical septum of the orbits, as in the diurnal *Struthionidæ*, occupy not only the ordinary orbital space, but extend outwards for more than two lines beyond the lateral boundaries of the anterior part of the frontals. A small process extends from the frontal to the side of the expanded ethmoid, anterior to the orbital foramina, which are distinct and remarkably wide apart, and the ethmoid, which is nine lines in breadth, is also supported anteriorly by a similar anchylosed conjunction with the lachrymal bone. The Professor remarks that the nearest approach to this peculiar structure of the *Apteryx* is made by the *Ostrich*, in which last the interorbital septum, though much thinner than in the *Apteryx*, is also occupied by ethmoidal cells, and is thicker than in any of the other large *Struthonidæ*. The *Ibis*, he observes, offers a striking contrast with the *Apteryx* in this respect, the interorbital osseous septum being almost entirely absent; and it also differs widely in all the other parts of the cranium already noticed. In the posterior region of the skull of the *Ibis* the long covering of the cerebellum is, as he states, in great part defective: in the superior part, the cranial parietes above the cerebral hemispheres form two convexities separated by a middle longitudinal depression, and the narrow space between the supra-orbital ridges is occupied by the impressions corresponding to the nasal or supra-orbital glands; the whole cranium also is much higher and shorter in proportion to its breadth than in the *Apteryx;* and Mr. Owen remarks that the *Ibis*, in thus differing from the *Apteryx*, deviates also from the other *Struthionidæ*.

The base of the skull of *Apteryx* exhibits all the peculiarities characteristic of the Struthious birds. The body of the sphenoid sends out two processes on each side externally; the posterior of these abuts against the tympanic bone, and the anterior one by a flattened oval articular surface against the pterygoid bone. Professor Owen points out that the latter processes exist, but are much more feebly developed in the *Ibis*, and that in most other birds, including the *Grallæ*, they are wanting, whilst they are well developed in the Lacertine *Sauria*. A compressed vomerine process is continued forwards from the anterior part of the basi-sphenoid, and this process is anchylosed to the under part of the expanded and cellular ethmoid.

The olfactory depressions in the interior of the cranium are proportionally larger than in other birds, and the olfactory nerve, instead of being continued along the upper part of an interorbital septum by a bony canal or groove to the nasal cavity, immediately passes by many perforations through a cribriform plate to the complex and extensive pituitary surface of the ethmoid bone.

Both internally and externally the optic foramina are distinct and half an inch apart; they are perforated not in the sphenoid ala, but in the inflected margin of the frontal bone. 'In these peculiarities the *Apteryx* differs from all the rest of its class; each optic foramen however transmits not only the optic nerve and ophthalmic artery, but also the third, fourth, first branch of the fifth, and sixth nerves, as in most other birds. Of these nerves the fifth is the largest, and it is continued forwards to the nasal canal, through two foramina, one circumscribed externally by the process already mentioned, which extends from the frontal to the ethmoid; the other, by the corresponding process of the lachrymal. The pituitory fossa, or sella turcica, is a very deep semi-oval depression; the common internal orifice of the two carotid canals communicates with its posterior part. On each side of the anterior part of the floor of the cranium, which supports the medulla oblongata, there is an oblique slightly curved groove, terminated at its anterior extremity by the *foramen rotundum*, at its posterior by the *foramen ovale*. These *foramina* are situated between the basilar and alar elements of the sphenoid; they are nearly of equal size, and are relatively longer than in the diurnal *Struthionidæ*. The foramen rotundum is not only distinct, but is farther apart from the *foramen opticum* than in any other bird. The petrous bone projects internally in the form of a thin semicircular plate of bone, commencing at the foramen ovale and extending backwards to the foramen auditorium internum, which it overhangs: this plate gives attachment to the tentorium. There is not any corresponding bony ridge developed from the upper wall of the cranium in the line of origin of the falx, as in many of the gallinaceous birds. The anterior or cerebral division of the cranial cavity is larger in proportion to the posterior than in most other birds.'

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* The anatomy of *Apteryx* is entirely taken from Professor Owen's paper in the second volume of the 'Transactions' of the Zoological Society of London.

The tympanic bone is trihedral, subcompressed, and sends forwards into the orbit a process longer and more slender than that in the larger *Struthionidæ*: its upper articular surface is a transversely extended convex condyle, playing in a corresponding cavity internal to the base of the zygomatic process. The opposite and expanded extremity presents two distinct articular convexities for the lower jaw, the inner being the largest; a small but deep depression for the reception of the deflected extremity of the jugal bone exists above the external convexity. Between the orbital process of the tympanic and the transverse process of the sphenoid bones, the posterior extremity of the pterygoid bone is securely wedged in, and, advancing forwards, expands, as in the other *Struthionidæ*, into a thin plate of bone, which is bent upon itself with its concavity turned inwards, and is continued by anchylosis into the palatine bones, so that the limits between them are indefinable. So also the palatine bones are confluent with the maxillaries: the former are pierced by two narrow elliptical posterior nasal foramina, about three lines in length, over which the external margin of each palatine bone arches from without inwards. These overarching laminæ gradually approach each other, as they advance forwards, and meet about an inch anterior to the nasal foramina, from which an imperforate plate of bone, with a narrow median fissural impression, and composed of the confluent palatal processes of the maxillary and intermaxillary bones, is continued to the end of the beak, the limits between those bones being indicated by two fine oblique lines arising at the outer margin of the roof of the mouth, about two and a half inches from the apex of the beak. The jugal style in *Apteryx* consists of a single slender, compressed, twisted bone, anchylosed with the maxillary bone in front, and terminated behind by an obtuse deflected extremity, which is received into a corresponding vertical cavity in the upper part of the outer process of the tympanic bone. In the full-grown Ostrich this bone is separable into a zygomatic and malar portion. By the mode of attachment adopted in *Apteryx*, the tympanic bone offers increased resistance to the pressure transferred to it by the lower jaw, at the same time that it gives additional strength to the upper mandible. As in the other *Struthionidæ*, it is continued backwards in the same line with the upper maxillary bone, and is not bent downwards at its junction with the maxillary, as in the *Ibis* and other *Grallæ*. The superior maxillary bone is singular, presenting the form of an elongated triangular plate of bone nearly perfectly flat, imperforate, and continued with the intermaxillary by uninterrupted ossification. Of the *Struthionidæ*, *Rhea* comes nearest to *Apteryx* in the structure of this part of the skull; but in *Rhea* large *foramina* perforate the maxillary plate, which sends upwards on each side a process to join the lachrymal. The superior maxillary bones of the *Ibis* are slender round styles, with a wide interspace between them. Two compressed plates of bone, descending obliquely forwards from the anterior extremities of the frontals, and articulated below to a small depression in the maxillary plate, each pierced by a single small foramen, represent the lachrymal bones in *Apteryx*. The continuous bony piece formed by the frontal, nasal, and intermaxillary bones is too strong to admit of any elastic yielding movement between the upper jaw and cranium. The nasal and the upper or mesial portions of the intermaxillary bones form an elongated depressed narrow process, convex above, with external margins bent inwards beneath the long nasal passages, of which they form the outer and part of the lower boundaries.

The usual ornithic characters, with the Struthious modifications traceable in the individual peculiarities, are presented in the lower jaw of *Apteryx*. 'The transversely expanded angular and articular extremities offer the inwardly extended process for the attachment of the *pterygoidei* muscles; the superior transverse plate, behind the articular surfaces, is thin and concave towards the *meatus auditorius externus*, and is lined by the mucous membrane of that passage, of which it forms part of the bony parietes. There are two distinct narrow oblique articular surfaces, concave in the longitudinal and convex in the transverse directions; the internal one is the largest, and behind this there is a small excavation, into which a small process of the air-sac lining the tympanum is continued; and this is the only part of the skeleton not immediately concerned in the formation of the organs of hearing or smelling into which air is admitted. The entry to the air-cells, in the lower jaw of the *Ostrich*, is situated in the part corresponding to the above depression or sinus in the jaw of *Apteryx*. Traces of the compound structure of the lower jaw are very evident in that of the *Apteryx*, and the limits of the angular, articular, and coronoid pieces may be in part defined.' There is a linear vacancy, bounded by the surangular and angular pieces behind, and by the bifurcate commencement of the mandibular or dentary piece in front; the surangular is compressed, and sends upwards a very slightly elevated coronoid ridge. A second narrower fissure occurs between the thick opercular or splenial element and the upper fork of the mandibular piece. The opercular piece reaches to the posterior part of the symphysis, as in the *Ostrich*, and the rest of the lower jaw in front of this part is formed by the two anchylosed mandibulars. In the extent of this anchylosed symphysis, the *Rhea* makes the nearest approach to the *Apteryx* among the *Struthionidæ*, and the two impressions which diverge from the back part to the front of the symphysis are present in both the *Rhea* and *Emeu*, as in the *Apteryx*. The lower jaw of the *Apteryx* differs from that of the *Ibis* in its greater posterior expanse, its more depressed form, the lower coronoid plate, the narrower fissure between the angular and surangular pieces, and the absence of the mesial furrow, extending in the *Ibis* to the end of the symphysis.'

Vertebral Column.—The number of the *cervical* vertebræ in the *Ostrich* is eighteen, in the *Cassowary* sixteen (true), in *Rhea* sixteen (not fourteen, as Cuvier states), in the *Emeu* nineteen, in the *Apteryx* fifteen only; and in the latter there are nine dorsal, and twenty-two remaining vertebræ in the lumbar, sacral, and caudal regions: the spinal column of *Apteryx* is relatively stronger, especially in the cervical region, than it is in the larger *Struthionidæ*. The length of the cervical region, the vertebræ of which present the usual ornithic characters, is seven inches; that of the *dorsal* region four inches, and that of the portion of the column behind the dorsal vertebræ included between the ossa innominata, three inches. The structure of the vertebræ is minutely detailed by Professor Owen, who observes that the close resemblance of the bird to the reptile in its skeleton is well exemplified in the young *Ostrich*, in which even when half grown the costal appendages of the cervical region continue separate and moveable, as in the *Crocodile*: those the Professor found anchylosed to the first fifteen vertebræ in *Apteryx*.

The nine caudal vertebræ of *Apteryx* are deeper and project farther below the posterior portions of the iliac bones than in the other *Struthionidæ*. The spinal canal is continued through the first five of these vertebræ, which, as they descend, progressively increase in lateral and diminish in vertical extent, and are all moveable upon each other except the two last, which combine to form a vertebra analogous to the expanded terminal vertebræ in other birds, but which in *Apteryx* exceeds the rest only in its greater length, and gradually diminishes to an obtuse point. Professor Owen proceeds to remark that in the *Ostrich* the corresponding vertebra is expanded for the support of the caudal plumes, but that in *Apteryx* it offers the same in conspicuous development as in *Rhea* and the *Emeu*.

The first dorsal *rib* in *Apteryx* is described as a slender style about an inch in length, and the rest as remarkable for their breadth, which is relatively greater than in any other bird; the *Cassowary*, in this respect, is stated to approach nearest to the *Apteryx*. 'The second, third, fourth, and fifth ribs are articulated with the sternum through the medium of slender sternal portions; that of the sixth also reaches the sternum, but is attached only to the external rib anterior to it, and a considerable interspace exists between its unattached extremity and that of its corresponding vertebral rib. In the first simple and floating rib, the part corresponding to the head and neck, as usual, is not developed, and it is attached to the transverse process by the part analogous to the tubercle. In the second rib a short and strong cervix terminated by a hemispherical head is given off below and in front of the tubercle, and works in a corresponding socket at the anterior margin of the vertebra. The head and tubercle, with the points of the vertebræ to which they are attached, intercept large foramina corresponding to the vertebral foramina in the cervical region. Immediately below the tubercle the rib suddenly expands, and then gradually narrows to its lower end; the neck of the rib increases in length in the third and fourth pairs, and diminishes in the last two; the sixth rib begins to lose its breadth, and the rest become narrower to the last. The bony appendages to the vertebral ribs are developed in the second to the eighth inclusive: they are articulated by a broad base to a fissure in the posterior margin of these vertebral ribs a little below their middle part; those belonging to the third, fourth, fifth, and sixth ribs are the longest, and overlap the succeeding rib: these processes are not anchylosed in the specimen described. The *Rhea* comes nearest to the *Apteryx* in the size of these costal appendages. The first four sternal ribs are transversely expanded at their sternal extremities, which severally present a concave surface lined with smooth cartilage and synovial membrane, and playing upon a corresponding smooth convexity in the costal margin of the sternum, which thus presents four enarthrodial joints with capsular ligaments on each side. This elaborate structure is not however peculiar to the *Apteryx* among birds, but relates to the importance of the movements of the sternal ribs, which are the centres upon which the respiratory motions hinge,—the angles between the vertebral and sternal ribs, and between these and the sternum, becoming more open in inspiration when the sternum is depressed, and the contrary when the sternum is approximated to the dorsal region in expiration.'

In the *Struthionidæ* we look in vain for the deep crista or keel which so strongly marks the well-developed ornithic character, especially in the diurnal birds of prey, the larger sea-birds above alluded to, and the humming-birds. Such a foundation would be worse than useless where there is none of the machinery of flying to be worked, and the utmost demand on the anterior extremities goes no farther than their aid in balancing the body when the bird runs. We accordingly find that in the larger *Struthionidæ* (Ostrich, Cassowary, &c.) the breast-bone presents a plane and uniformly arched shield-like surface, not unlike, in some of the family, the Cassowary and Emeu for instance, to a Highlander's target on a reduced scale. But in the *Apteryx* this low development is reduced to its lowest grade. In its small size, and in the total absence of a keel, it resembles, Mr. Owen observes, that of the Struthious birds generally, but differs in the presence of two subcircular perforations on each side of the middle line, in the wide anterior emarginations, and in the much greater extent of the two posterior fissures. The anterior margin, he tells us, presents no trace of a manubrial process, as in the *Ostrich*: on the contrary, the wide interspace between the articular cavities of the coracoid is deeply concave; in the extent of this interspace, he remarks, the *Rhea* most resembles the *Apteryx*, but its contour is almost straight; whilst, in the *Cassowary*, the space is narrower, but deeply notched. The articular surface for the coracoid is an open groove, which in the fresh state is covered with articular cartilage; and, external to the groove, the anterior angles of the sternum are produced into two strong triangular processes with the apex obtuse. The thickened costal margin, when viewed anteriorly, presents an undulating contour, from the presence of the four articular convexities, for the sternal ribs and the intermediate excavations. The sternum of the *Emeu*, Mr. Owen remarks, presents a similar appearance. The breadth of each sternal perforation is, he adds, nearly equal to that of the intervening osseous space, and in the specimen described they were not quite symmetrical in position. The posterior notches equal in extent one half the entire length of the sternum, and the external boundaries of these notches curve towards each other. These notches exhibit a slight want of symmetry in form, position, and extent.

There is no true *furcula* in the *Struthionidæ*, but the *Ostrich* and *Cassowary* have on each side of the front of the chest an elongated flat bone consisting of a rudiment of the furcula, with the clavicle and scapula consolidated into one piece. The two branches of this rudimentary furcula are very short, and never united in the African *Ostrich*, but anchylosed with the bones above mentioned. In the *Cassowary* there are merely two little processes from the side of the clavicle: these are the rudiments of the branches of the fork. In the *Emeu* two very small thin bones are attached to the anterior edge of the dorsal end of the clavicles by a ligament, and are directed upwards towards the neck: there they are fastened to each other by a ligament, but have no connection with the sternum. In the *Apteryx* the *scapula* and *coracoid* are anchylosed; and a small perforation anterior to the articular surface of the humerus indicates the separation between the coracoid and rudimental clavicle, of which, Professor Owen states, there is not otherwise the least trace. The coracoid, he adds, is the strongest bone; and its inferior expanded extremity presents an articular convexity, adapted to the sternal groove before described. The third rib is reached by the scapula, which is a simple narrow plate of bone, one inch in length, slightly curved, and expanded at both ends, chiefly at the humeral articulation.

The true *wing bones* are best developed among the Struthious birds in *Rhea*; the next best development is in the *Ostrich*: in the *Cassowary*, *Emeu*, and *Apteryx*, the lowest development of these bones is exhibited. In the latter the *humerus* is a slender, cylindrical, styliform bone, one inch and five lines in length, and slightly bent. At the two extremities it is slightly expanded, but most at the proximal end, which supports a transverse oval articular convexity, covered with smooth cartilage, and joined by a synovial and capsular membrane to the scapulo-coracoid articulation. Beyond each end of the humeral articular surface is a small projecting tuberosity. The distal end of the humerus is articulated by a true but shallow ginglymoid joint with the rudimental bones of the antibrachium, and both the external and internal condyles are slightly developed. The slender *radius* and *ulna*, each nine lines in length, are almost straight and cylindrical. Above the articular surface of the ulna a feebly developed *olecranon* is projected. A minute carpal bone, two metacarpals, and a single phalanx, which supports the long curved obtuse alar claw, complete this rudimental hand, which is seven lines in length, including the claw, and that measures three lines and a half. To the ulna and metacarpus a few short and strong quill-feathers are attached by ligament.

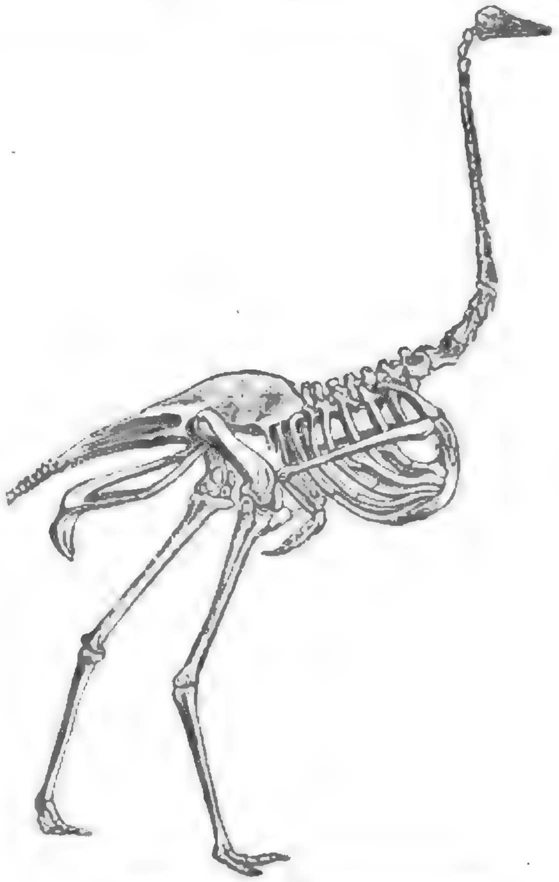
Strongly contrasted with the flattened sternum and the dwindled anterior extremities are the strongly developed *pelvis* and posterior limbs of the *Struthionidæ*. The pelvis of the ostrich bears some resemblance to that of the extinct quadrupedal *Mylodon*, of which there is now a noble skeleton in the museum of the Royal College of Surgeons. In this part of the osseous system we have ample fulcra for those powerful muscles which render the larger Struthious birds swifter than the swiftest. The iliac bones of *Apteryx* resemble those of the rest of the tribe in size and shape, and are four inches and three lines in length. There is a slight anterior concavity on the outer surface, and this concavity passes into a convexity posteriorly, the two surfaces not being separated by the transverse elevation which exists above the acetabulum in the four large *Struthionidæ*. Between the posterior extremity of the ilia and the first three caudal vertebræ, a distinct epiphyseal piece of bone is wedged in. The ischium extends backwards parallel with the sacrum, in the form of a thin plate of bone, which slightly expands to its free and truncated extremity. The pubic element is a slender bony style, connected by ligament to the end of the ischium, but attached by bone at its acetabular extremity only. A short pointed process extends from the anterior margin of the origin of the pubis. In comparing the pelvis of *Apteryx* with that of the large

Struthious birds, Professor Owen observes that the ischia do not meet below the sacrum, as in the *Rhea*, but are more distant from that and the iliac bones than in any of the *Struthionidæ;* the pubic bones, he remarks, are not joined together at their distal extremities, as in the *Ostrich;* nor are the extremities of the ischia anchylosed to the superincumbent ilia, as in the *Cassowary*. It is the *Emeu*, he adds, that comes nearest to the *Apteryx* in the structure of the pelvis, but it also differs in the complete bony boundary of the foramen, which transmits the tendon of the obturator internus, and which is completed posteriorly by ligament in *Apteryx*. The acetabulum, he observes, communicates, as usual, by a wide opening with the pelvis, and a surface covered with a cushion of thick cartilage is continued from its posterior and upper part.

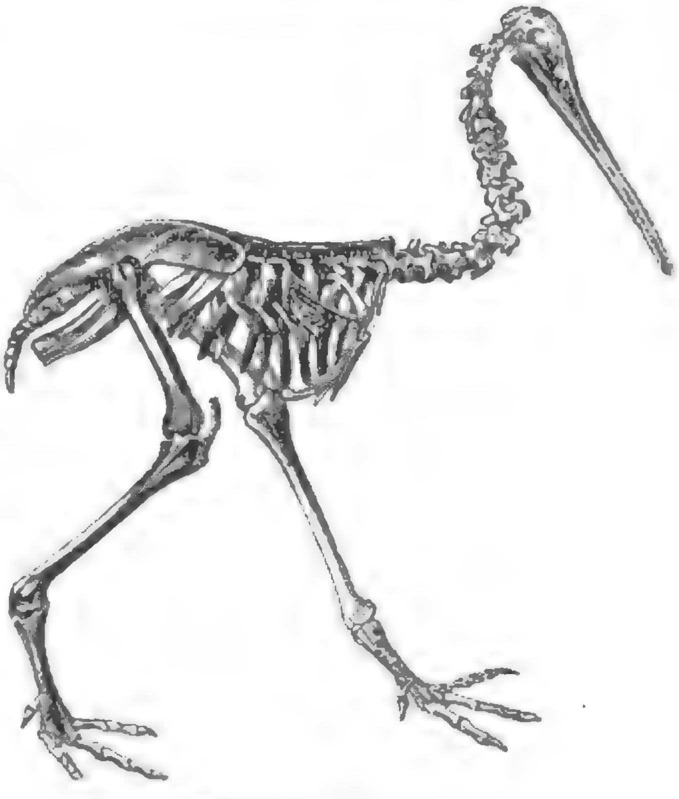
The great length of leg in the *Struthionidæ* is produced, as in the true wading-birds, by the tibia and common bone of the tarsus and metatarsus; for the femur is comparatively of short dimensions.

The fibrous capsule of the hip-joint of *Apteryx* is very strong; the synovial membrane is reflected from it upon the upper margin of the trochanter and upper part of the short neck of the femur, as well as upon the ligamentous bridge, continued from the upper and extended margin of the acetabulum to its anterior part. The very large *ligamentum teres* is short, and consists of an infundibular process of synovial membrane, reflected from the circumference of the acetabular perforation to that of the depression on the head of the femur: this synovial sheath encloses two distinct ligaments, which are twisted about each other like the crucial ligaments of the knee-joint. One of the ligamentous bands passes from the upper margin of the acetabular perforation to the lower edge of the femoral depression.

The small round head of the *femur* (which last possesses in *Apteryx* the usual ornithic character, and is three inches nine lines in length) is supported on a very short and thick neck, placed at right angles to the great and single trochanter, and presents at its superior part a large depression for the strong and complicated ligamentum teres; its shaft is slightly bent with the convexity forwards, and this is increased by a thickening at the anterior part of the middle of the shaft. The condyles are separated anteriorly by a wide and deep groove, and, behind, by a triangular depression. The outer condyle is the largest, and has an external groove for the articulation of the head of the fibula: the inferior compressed border of the condyle is wedged in between the tibia and fibula. Two angular and strong ridges are developed from the anterior part of the expanded head of the *tibia*, which is five inches in length: the external one affords attachment to the fascia and to the expanded tendon of the rectus femoris latissimus; to the internal ridge is affixed the ligament of the small cartilaginous *patella*. The knee-joint is very complex. The broad and thin internal lateral ligament gives origin to part of the soleus, and is attached to the internal semilunar cartilage. This fibro-cartilage divides at its anterior extremity into three ligaments: one broad and thick, going to the posterior surface of the rotular cartilage, and representing the ligamentum mucosum; the other two inserted at the interspace of the condyles. A very strong ligament arises from the inner edge of the tibia beneath the internal semilunar cartilage, and is also attached to the same interspace. A strong external lateral ligamen extends between the outer condyle and the head of the fibula; and beneath or within this there is a second ligament, which passes from the outer *condyle* to the external semilunar cartilage. From the anterior parts of this cartilage a thick ligament extends to the back part of the ligamentum patellæ. From the back part of the external semilunar cartilage a posterior crucial ligament extends to the condyloid interspace; and, lastly, a strong ligament arises from the fore part of the head of the tibia, and passes upwards and backwards, to be inserted, with the preceding ligament, into the back part of the interspace of the condyles. The head of the tibia sends down an angular ridge posteriorly: the shaft is rounded, slightly compressed, converging to a ridge externally, to which ridge the *fibula* is attached in two places, beginning half an inch below the head of the fibula, and continuing attached for ten lines; then again becoming anchylosed, after an interspace of nine lines. In one specimen, Professor Owen found the fibula also anchylosed to the tibia by its expanded and thick proximal extremity; in descending it rapidly diminishes in size, and gradually disappears towards the lower fourth of the tibia, whose distal end presents the usual trochlear form, but the anterior concavity above the articular surface is in great part occupied by an irregular bony prominence. A small cuneiform tarsal bone is wedged into the outer and back part of the ankle-joint. The strong anchylosed tarso-metatarsal bone is two inches three lines in length, and the upper articular surface is formed by a single broad piece. Professor Owen points out that the original separation of the metatarsal bone below into three pieces is plainly indicated by two deep grooves on the anterior and posterior part of the proximal extremity; and that the intermediate portion of the bone is very narrow anteriorly, but broad and prominent on the opposite side. The bone is flattened from before backwards, and expands laterally as it descends, dividing at its distal extremity into



Skeleton of Ostrich. (Pander and D'Alton.)



Skeleton of Apteryx. (Owen.)

three parts, with the articular pulleys for the three principal toes. The surface for the articulation of the fourth or small internal toe is about half an inch above the distal end, on the internal and posterior aspect of the bone. A small ossicle attached by strong ligaments to this surface gives support to a short phalanx, which articulates with the longer ungueal phalanx.

In the *Ostrich* the number of toes is two only; the *Cassowary* and *Emeu* have each three. The *Apteryx*, and, according to the figures and remains, the *Dodo*, have a fourth. In the *Apteryx* the number of phalanges of the three greater toes follows the ordinary law; the inner toe having three, the middle four, and the outermost five phalanges.

Digestive System.—Though proper salivary glands can hardly be said to exist in birds, they have various glands for secreting a copious supply of mucus for the defence of the tender lining of the mouth and fauces. In the ostrich there are two flattened bodies at the upper and back part of the palate, which may be compared to tonsils. Their surface is covered with innumerable foramina from which a tenacious mucus may be pressed.

The crop in the *Struthionidæ* is of great size. The bulbus glandulosus or proventriculus is situated before the entrance of the œsophagus into the proper stomach, and is so large and so modified in form in some of the species, the ostrich for example, as to give it the appearance of a second stomach; indeed Valisnieri, in his 'Anatomy of the Ostrich,' calls it the first stomach. Mr. Lawrence found the œsophagus of an ostrich which he dissected dilated into an immense bag capable of holding several pints of water, and five or six times larger than the gizzard itself, which was placed on the right and anterior part of this dilatation. The glands did not surround the tube, so that, Mr. Lawrence observes, the term 'zone' would be here inapplicable. They formed, he tells us, a long but narrow band, commencing at the termination of the œsophagus, and running along the front of the bag towards the gizzard. This band measured about twelve inches in length and not more than three at its greatest breadth. The size of the individual glands varied: they were largest in the middle, and decreased towards either margin of the band. Some of them equalled a large pea, and their openings were in proportion. They were arranged in close apposition to each other, and the inner surface of the pouch was covered by a continuation of the insensible lining of the gizzard, which separated very easily from the surface. The cæca in the ostrich are characterized by a remarkable spiral valve, and the villi in its small intestine are rather flat thin laminæ than villi; but they are at the same time long and numerous, presenting a very elegant structure. The large intestine of the ostrich presents a remarkable deviation from the structure usually seen in birds; for the surface of that intestine is in them generally uniform on its surface, whereas in the ostrich the large intestines, which are very long, have numerous transverse folds, like the valvulæ conniventes of man.

In the museum of the Royal College of Surgeons in London, No. 533 of the Physiological Series shows a portion of the gizzard, with the pylorus of the ostrich, exhibiting the valvular structure at that part, adapted to prevent the escape of the contents of the gizzard until they have been sufficiently comminuted, if alimentary, or diminished in size by friction of pebbles, &c. swallowed for the purposes of trituration. No. 533 A is the stomach of an Emeu (*Dromaius Novæ Hollandiæ*) laid open. The gastric glands, of large size, are seen scattered over the whole inner surface of the proventriculus, and terminating towards the gizzard by two oblique lines. Between the proventriculus and gizzard intervenes a considerable space, which may be termed the membranous portion of the stomach, in contradistinction to the muscular part or gizzard. The entrance and outlet of the latter cavity, which are closely approximated in all birds, are here of such large size and so blended together, that the membranous portion of the stomach appears to pass into the intestine by a continuous canal, and the gizzard seems to be simply a lateral dilatation: its parietes are thickest at its commencement; at the remainder they are comparatively weak and thin. A portion of the thick cuticle which lined this cavity is left. A circular valve intervenes between the stomach and duodenum; the latter commences by a considerable dilatation. No. 533 B is the stomach of a Cassowary (*Cassuarius galeatus*) laid open, and constructed on the same type as the preceding. The gastric glands are dispersed over the proventriculus with a similar degree of uniformity; but they are smaller, and their lower boundary is transverse. The cuticular lining being here preserved, shows that the membranous part of the stomach is lined with a thin layer of that substance, which commences just where the glandular part terminates. The gizzard has a similar lateral position, out of the direct passage of the food, as in the Emeu; but is evidently more muscular. Its inner surface is thrown into irregular longitudinal rugæ. The pylorus is protected by a similar circular valve; but the commencement of the duodenum is still more capacious than in the Emeu, reminding one of the pyloric cavity in many of the *Grallatores*. Beyond this dilated part the duodenum presents some transverse rugæ, analagous to valvulæ conniventes. 533 C is the stomach of the Nandu or American Ostrich (*Rhea Americana*, Lath.) laid open. Here a very different type of structure presents itself. The gizzard is more capacious, and, as in the gallinaceous birds, is continued directly from the proventriculus, with the intestine arising near the entry. The parietes of the gizzard, though strongly muscular, are not remarkable for their thickness; the cuticular lining is very thick, and is here well preserved, showing its irregular surface so well adapted for triturating. The gastric glands are more complex than in the preceding preparations, and are aggregated in a mass of a circular form; their orifices are very conspicuous. The pylorus is protected by a projecting valve irregularly ribbed. The duodenum is of moderate width, and has been, here, partially inverted to show the peculiar flocculent character of its lining membrane. 533 D is a longitudinal section of the membranous and muscular parts of the stomach of an ostrich (*Struthio Camelus*, Linn.). The parts have been minutely injected, and the cuticle, which separates very readily after death, has been almost entirely removed, showing the vascular surface beneath. The gizzard, as in the preceding species, is a direct continuation of the membranous part, but its parietes are much thicker. The slit-like form of the pylorus, and its ribbed valve, may be seen on one side of the preparation; and on the opposite side is seen the duodenum laid open to show its villous inner surface.

Sir Everard Home, who presented the preparations above mentioned, thus describes the stomach of the ostrich:—'In the African ostrich the gastric glands are similar in structure to those of the American, only the processes belonging to each gland are much more numerous: they are in general twenty or thereabouts. The cardiac cavity into which they open is not only very large, but is continued down in the abdomen below the liver to a considerable length, and then is bent up to the right side, and is there connected with a gizzard, the digastric muscle of which is as strong as in granivorous birds in general. This gizzard is situated so high up, as to be nearly on a level with the termination of the œsophagus. The cardiac cavity is everywhere lined with a thin cuticle, except where the ducts of the gastric glands open. Their orifices occupy an oval space on the left side, extending from the top to the bottom of the cavity, and about four inches broad. The size of the gizzard is small, when compared to that of the bird. The grinding surfaces do not admit of being separated to any great distance from one another. On one side there are two grooves, and two corresponding ridges on the other. Beyond the cavity of the gizzard is an oval aperture with six ridges covered with cuticle, which oppose the passage of the contents of the cavity till they are reduced to a small size. In the Cassowaries and American ostrich the stones and other hard bodies which those birds swallow, must, from their weight, force their way into the gizzard, which has a cavity adapted to receive them; but in the African ostrich all such substances must remain in the cardiac cavity, both from its being the most depending part, and from the cavity of the gizzard being too small to admit of their entering it. The cardiac cavity, in the instance which I examined, contained stones of various sizes, pieces of iron, and halfpence; but between the grinding surfaces of the gizzard there were only broken glass-beads of different colours, and hard gravel mixed with food.' (*Lect. on Comp. Anat.*) No. 533 E of the series above noticed is a bottle containing a great quantity of pebbles from an ostrich's gizzard, and No. 533 F is another, containing pebbles and an iron nail, from another gizzard of the same kind. No. 677 to 683 both inclusive are preparations showing the flattened elongated villi, the vascularity of the villous membrane, the veins and arteries and other phenomena of the small intestines of the ostrich.

No. 684 is also a portion of the small intestine of the same kind injected, and showing two processes of peritoneum going off at right angles to the mesenteric process, from the sides of the intestine and trunks of the great vessels. A portion of the peritoneal coat has been removed from one end of this preparation to show the external longitudinal and internal circular layers of the muscular tunic. No. 818 is the pyloric end of the stomach and commencement of the duodenum of an ostrich, showing the entrance of an hepatic duct close to the pylorus, and in a direction inclining to that orifice. The thick cuticle of the gizzard and the valvular structure of the pylorus are also well displayed in this preparation.

The tongue of the *Apteryx* is short; but short as it is, it is more developed than in other Struthious birds. The lining membrane of the *pharynx*, behind the *glottis*, forms two elongate, square-shaped, smooth, thick, and apparently glandular folds or processes, the obtuse free margins of which project backwards like lappels into the *pharynx;* beyond which the lining membrane is produced into close-set, narrow, somewhat wavy, longitudinal folds: the œsophagus is continued through the thorax and diaphragm to the proventriculus without forming any partial dilatation or crop. The *proventriculus* is a narrow elongated cylindrical cavity in the axis of the œsophagus, of which it is an immediate continuation. The gastric glands, narrow elongated follicles, are developed around its whole circumference, and are closely packed together; they are mostly bilobed, but sometimes more subdivided at their cæcal or outer extremities. The longitudinal rugæ of the lining membrane gradually subside at the entry of the proventriculus, where they run into each other, and so form a general reticulate surface, in the meshes of which the orifices of these glands are situated. The epithelium lining the glandular part of the stomach is gradually condensed towards its lower part into a cuticle, which, as it passes into the muscular compartment, assumes a brown colour and a callous hardness, and forms a stratum about one-third of a line thick. In the Cassowary and Emeu, observes Professor Owen in continuation, the proventriculus is marked off from the stomach by a circular strip of *epithelium*, whiter and thinner than the rest, from one to two lines in width, as is well shown in Sir Everard Home's *Comparative Anatomy* (pl. li., lii.). In this structure the Apteryx, though it resembles these species in the arrangement of the gastric glands, does not participate. Its muscular stomach does not present the characteristic subcompressed shape of a gizzard; but in its regular, oval, rounded form resembles the membranous stomach of carnivorous birds. It is small for the size of the bird in its contracted state; but when distended with food, Mr. Owen found that it measured 2¼ inches in length, and two inches across at the widest parts. The muscular fibres are not *digastric* and *lateral*, as in the true gizzard; but, instead of being arranged in well-defined masses, radiate from two tendinous oval centres, measuring about two-thirds of an inch in the longest diameter. The pyloric passage is narrow, leading from the left side of the muscular stomach into the *duodenum*. A transverse crescentic ridge of the lining membrane defends the pylorus, but there is no distinct sphincter. The cuticle is continued into the duodenum about three lines beyond the pylorus, but the Professor found no dilatation of this part constituting a pyloric pouch, as in the Emeu and Ostrich. In one Apteryx there was a very short cæcum, the remnant of the ductus vitello-intestinalis, attached to about the middle of the small intestine, and from the same relative position of the intestinal tube in a small female specimen there extended an obliterated duct three lines long, which expanded into a still persistent subglobular vitelline sac, about an inch in diameter, but collapsed, and with wrinkled parietes. In a large male the intestinal canal measured four feet, independently of the cæca, each six inches in length: the rectum was four inches long. The lining membrane of the rectum, which is beset with minute short villi or points, together with glandulæ solitariæ, that become numerous and large at the terminal half of the rectum, is thrown, when it is contracted, into longitudinal folds; but there is no trace of the transverse or spiral valvulæ conniventes, characterising the cæca and rectum of the Ostrich and Rhea; and, in this respect, the Apteryx resembles the Cassowary and Emeu. The liver presented nothing extraordinary. In two of the specimens there was a gall-bladder, as in the Emeu and Cassowary; in the third it was wanting, as is usually the case in the Rhea and Ostrich. In the Apteryx without a gall-bladder there were two long ducts terminating in the same part of the duodenum. The *pancreas* consisted, as usual, of two elongated subtrihedral lobes; and the *spleen* was about the size and form of a hazel-nut.

Circulatory and Respiratory Systems.—In the same series of the museum above noticed, No. 923 exhibits the ventricles of the heart of an ostrich (*Struthio Camelus*) laid open to show the valves at the auricular and arterial orifices. In the right ventricle the auricular orifice is guarded by two valves, as in the crocodile; but the one on the right side is here much the largest, and both valves are muscular. A single artery, the pulmonic, arises from this ventricle, there being no vessel analagous to the visceral or left aorta of reptiles: its orifice is provided with three semilunar valves. The left auricular aperture is provided with two membranous valves, that on the right side of the orifice, which corresponds to the single valve of the crocodile, being the largest. The orifice of the aorta, which is situated directly behind that of the pulmonary artery, and, as it were, on the top of the septum, is provided with three semilunar valves. The muscular parietes of the ventricles are dense and compact; those of the left are of extraordinary thickness: the right ventricle is remarkable for the smoothness and evenness of its inner surface. No. 923 A is a transverse section of the ventricles of the heart of an American ostrich (*Rhea Americana*), showing the relative thickness of their muscular parietes, and their different form, the right appearing to be composed of a partial separation of some of the exterior fibres of the left ventricle. No. 923 B is the heart of an Emeu (*Dromaius Novæ Hollandiæ*) prepared chiefly to show the structure of the auricles. The veins of the body terminate, as in reptiles, by three principal trunks, which, with the coronary vein, unite to form a membranous sinus. Two fleshy semilunar valves are situated at the communication of the sinus with the auricle: they are fixed by their lower extremities to the floor of the auricle, but attached by the opposite ends to strong fleshy columns, which afterwards branch out into the musculi pectinati. The inferior valve is analogous to the Eustachian valve in the heart of Mammalia. The left superior cava opens into the sinus below the orifice of the inferior cava, and a small semilunar fold or valve intervenes between them. Whatever impediment therefore there may be to the free passage of the venous blood through the respiratory system, regurgitation from the auricle to the venous sinus is as carefully guarded against as in the Reptilia. The two pulmonary veins unite, and terminate in a single trunk in the left auricle: a large semilunar fold separates the muscular part of the auricle from the vein. The ventricles are laid open, showing on the right side the two fleshy valves, and on the left the two membranous valves placed at the auriculo-ventricular orifices. Of the great vessels arising from the heart, the left and most anterior is the pulmonary artery; the two next are the left and right *arteriæ innominatæ*, each giving off the carotid and subclavian of its corresponding side; the fourth vessel is the aorta, which winds over the right bronchus, like the right aorta in Reptilia. In the Ostrich the pulmonary cells of the lungs are of large size, as is shown in No. 1127 of the same series.

With reference to this part of the organization, we would call attention to Nos. 1155 and 1156 of that series, the first being a section of the trachea of an Ostrich, showing the rings narrow and entire, as in the rest of the birds, but retaining their cartilaginous texture. One of the longitudinal muscles of the trachea is left attached to this preparation The second exhibits another section of the same trachea, from which the posterior part of the tube has been removed to show the thinness of the rings and the smoothness of the lining membrane. Both the lateral longitudinal muscles analogous to the *sterno-thyroidei* of Mammalia are preserved: these regulate the length of the air-tube, and accommodate it to the varied and extensive motions of the neck. (*Cat.*, vol. ii.)

In Apteryx the heart is surrounded by a wide and thin pericardium, which is attached to the concave side of the sternum and the margins of the anterior wide fissure of the diaphragm, through which the ventricular portion of the heart protrudes into the abdomen, in the posterior concave interspace of the two great lobes of the liver. Professor Owen remarks, that it requires only that a central *aponeurosis* should have been continued from the anterior margin of the diaphragm, between the heart and liver, to have completely separated from the thorax the proper abdominal viscera, as in the Mammalia; for the respiratory organs are confined entirely to the thorax. The heart presents the usual ornithic form; but the right auricle appeared, when distended, of uncommon size. The three veins terminated in it in the usual manner; but the inferior cava has a much greater relative capacity than either of the superior cavæ, in consequence of these having to return to the heart little more than the proportion of venous blood brought back by the jugular and internal thoracic veins in other birds. There is no peculiarity of structure in the auricles of the heart; but the resemblance to the Emeu in the disposition of the valves of the right auricle is very close. The posterior valve, which forms part of the boundary of the foramen ovale, seems, Professor Owen observes, to be represented in Mammalia by the muscular ridge called the *annulus ovalis;* the anterior valve is obviously the analogue of the *Eustachian* in man and mammalia generally: the Professor found the principal deviation from the ornithic type of the structure of the heart in the valve at the entry into the right ventricle. This is characterised in birds, generally, by its muscularity and its free semilunar margin; but in the Apteryx it is relatively thinner, in some parts transparent and nearly membranous: a process moreover extends from the middle of its free margin, and is attached by two or three short *chordæ tendineæ* to the angle between the free and fixed *parietes* of the ventricle. In this mode of connection is perceived an approach to the mammalian type of structure analogous to that which the *Ornithorhynchus*, among mammalia, offers, in the structure of the same part to the birds; for, adds Professor Owen, the right auricular ventricular valve in the Ornithorhynchus is partly fleshy and partly membranous. In the left auricle, and in the valves between it and the left ventricle, there was nothing worthy of note; the two membranous flaps were unequal, presenting the usual characteristic of the mitral valve in birds. With regard to the *aorta*, the principal difference observed in the Apteryx was the equality of size in the carotids: in the Emeu, Professor Owen found the right carotid larger than the left. The descending or third primary division of the aorta presents, as in the Emeu and other Struthionidæ, more of the character of the continuation of the main trunk than in other birds, in consequence of its greater size and thicker tunics, relating to the diminished supply of blood transmitted to the rudimental anterior extremities, and the increased quantity required for the powerfully developed legs. 'The aorta,' continues the Professor, 'arches over the right bronchus as usual, and is continued down the thorax to the interspace of the crura of the diaphragm, through which it passes into the abdomen, in a manner remarkably analagous to that which characterises the course of the aorta in the Mammalia. The Apteryx, in fact, seems to be the only bird in which the limits of thoracic and abdominal aorta can be accurately defined; but, in thus establishing this distinction, we observe a remarkable difference from the mammalian arterial system, in the fact that some large and important branches, which in the latter are given off from the abdominal aorta, arise in the present bird above the diaphragm, through which they pass by distinct and proper apertures to the abdominal viscera, which they are destined to supply.'

Professor Owen did not observe any modification of that condition of the venous system which usually characterises the class of birds. The inferior cava did not perforate the diaphragm, but entered the posterior part of the pericardium just above the anterior fissure of the diaphragm, receiving close to its termination the two large hepatic veins. Professor Owen remarks that there exists the same disposition of the renal veins which regulates the quantity of blood transmitted to the lungs or the liver respectively, as in other birds; and that this disposition has been erroneously supposed to indicate that the urine was secreted from the venous blood in birds, as in reptiles and in fishes; but, he observes, the end attained by the venous anastomoses in question bears a much closer relation to the peculiar necessities and habit of life of the bird, and, so far as he knows, has not hitherto been explained.

There was not any trace of the extension of air-cells in the interspaces of the abdominal viscera; and Professor Owen was not less gratified than surprised to find *a complete and well-developed diaphragm* separating the abdominal from the respiratory cavity. This septum did not present any large openings corresponding to those by which the air is continued into the abdomen in the other struthious birds, but was here perforated only for the transmission of the œsophagus and large blood-vessels. 'The diaphragm of the Apteryx,' proceeds the Professor, 'differs from that which characterises the class Mammalia in the following points: first, in the greater relative extent of the anterior or post-sternal interspace; secondly, in the greater proportion of tendinous or aponeurotic tissue, which enters into its composition, thirdly, in being perforated by three different large arteries, and not by the vena cava or splanchnic nerves; and lastly, in the different relative positions of the œsophageal and aortic openings. The plane of the diaphragm is more horizontal, or rather, more parallel with the axis of the trunk, than in the Mammalia generally; but some of the aquatic species, as the *Dugong*, present a position of the diaphragm almost similar to that of the *Apteryx*. The origins of the vertebral or lumbar portion of the diaphragm are by two well-developed crura, which are attached to slight prominences on the sides of the last costal vertebra. These crura are almost entirely tendinous; they expand as they advance forwards, and distribute their aponeurotic fibres in a manner remarkably analogous to the disposition of the fleshy fibres of the lesser muscle of the diaphragm in Mammalia. The mesial fibres decussate in front of the aorta; the lateral ones arch outwards; the rest diverge to constitute the great central tendon. Here they cross each other in various directions, and form distinct and regular decussations around the orifices through which the cœliac artery, with the anterior splanchnic nerve, and the mesenteric artery and nerves, pass into the abdomen; the most noteable decussation is formed by two broad bands immediately behind the large œsophageal aperture, which is separated only by a very narrow transverse chord from the anterior fissure through which the pericardium protrudes and the inferior vena cava passes; the two broad decussating bands expand to form the anterior boundary of the diaphragm, and are inserted into the lateral processes of the sternum. The muscular or costal part of the diaphragm is formed, as in the Ostrich, by a number of separate, broad, and thin fasciculi, which come off from the third, fourth, fifth, sixth, and seventh vertebral ribs, near their junction with the sternal ones. These fasciculi expand, and are gradually lost upon the dorsal surface of the aponeurotic part of the diaphragm, but do not form a conspicuous expanse of muscle, nor constitute the entire thickness or substance of the diaphragm at any point. They are consequently invisible on the abdominal side of the diaphragm, and the aponeurosis of the diaphragm, together with the almost aponeurotic cellular layer of the peritoneum, with which it is continuous, requires to be reflected inwards to bring the digitations representing the great muscle of the diaphragm into view.'

Professor Owen, after adverting to the long recognised existence of a diaphragm in a rudimental condition in birds, and Hunter's beautiful figure of the costal portion of that of the Ostrich (*Cat. Mus. Coll. Chir.*, vol. ii., pl. xxvi., *Physiol. Series*), observes that in this, as well as in the other large Struthious birds, there is also a *pars vertebralis*, or analogue of the lesser muscle of the diaphragm, which rises by two tendinous crura from the last dorsal vertebra, and in the Emeu, by a double origin on each side. Nevertheless, he remarks, their diaphragm is incomplete; first, by reason of an arrest of its centripetal development, which leaves a permanent defect of union in the mesial plane; and, secondly, by the large perforations for the abdominal air-cells.

Professor Owen found the mechanism of respiration in the *Apteryx* essentially the same as in other birds, and he states that a more muscular diaphragm than it possesses would be unnecessary as a part of the mechanism. As in the Mammalia, the abdominal surface of the diaphragm is principally in contact with the liver, spleen, and stomach; but its thoracic surface does not support the heart, and it is separated from the lungs by the interposition of a series of small but well-marked air-cells. No thoracic serous sac or pleura could be traced. 'Thus,' says Professor Owen, 'although the respiratory organs are confined to the chest, and the Apteryx offers the only known instance in the feathered race of a species in which the receptacular part of the lungs is not continued into the abdomen, yet the Struthious type is strictly preserved, and the march of development has only been restricted, not changed.'

Brain, Nervous System, and Senses.—The brain and nervous system appear to be, generally speaking, well developed in the Struthious birds. No 1322 and No. 1323 in the Physiological Series of the *Mus. Coll. Chir.*, exhibit the brain of an Ostrich minutely injected, and the section of the cerebellum removed from the brain. Nos. 1352 to 1357, both inclusive, are preparations of the spinal chord of the same bird. The original description of No. 1355, which shows the sacral and caudal portions, is as follows:—'The part of the medulla which lies in the loins and tail of an Ostrich. That part which lies in the loins is considerably larger than those which belonged to the neck and back; and then it becomes pretty fast smaller to the tail. This swelling in the loins is owing perhaps to this bird having such large thighs and legs; and when we consider that this bird, having such small wings, must have the whole progressive motion performed by the legs, and the legs are therefore longer in proportion to the size of the bird than in birds in common, we must see why the medulla ought to be large at this part in this bird.'

Touch.—No. 1401 of the same series is a strip of cutis from the foot of the Ostrich, showing the papillæ or coarse villi on that part: they are very closely set, and about a quarter of an inch in length, placed parallel to one another, and perpendicular to the surface which is applied to the soil in walking.

Taste tolerably well developed. Nos. 1474 to 1476, both inclusive, show the tongue, &c. of certain Struthionidæ. The two first exhibit those parts in the Ostrich; No. 1475 is the tongue, os hyoides, and larynx of a Rhea, in which bird the tongue is relatively larger than in the Ostrich, which has that organ of so small a size that it has been taken for an epiglottis. The tongue of the Rhea is studded over with minute black specks, which are the orifices of muciparous glands. In No. 1476, showing the same parts in a Cassowary (*Cassuarius galeatus*), the tongue is seen to be thin, flat, and serrate on the edges.

Smell.—The olfactory system is well developed in the Struthionidæ. In the Apteryx it appears to be altogether larger than in other birds. Professor Owen observes that the nocturnal habits of the Apteryx, combined with the necessity for a highly developed organ of smell, which chiefly compensates for the low condition of the organ of vision, produce the most singular modifications which the skull presents, and, he adds, that we may say that those cavities which in other birds are devoted to the lodgement of the eyes, are, in the Apteryx, almost exclusively occupied by the nose.

Sight.—The eye is well formed, and the sight piercing in the Struthionidæ generally; but, in the Apteryx, the eye has less development than appears in the rest of the family, the reasons for which are above assigned. It presents a remarkable deviation from the construction characteristic of birds generally, in the total absence of the *pecten* or *marsupium*, a privation compatible with the nocturnal habits and restricted locomotion of this species. 'The eyeball,' says Professor Owen, 'is relatively much smaller than in other birds; its antero-posterior diameter is three lines; its transverse diameter four lines. The cornea transparens is very convex, and two lines in diameter. The sclerotic is thin, but the margin supporting the cornea is strengthened by a circle of small osseous plates. The choroid is a delicate membrane; its pigment is of a light brown colour. The ciliary processes commence at the ciliary ring, each process having at its origin a slight linear rising, which becomes gradually wavy and tortuous as it approaches the lens, anterior to the circumference of which it projects freely to a small extent. The iris in the specimen examined was one-third of a line in breadth. The optic nerve terminates by a small round aperture. The lens is two lines in breadth, and nearly one line at the thickest part, being thus more convex than in other birds. The external appendages of the eye presented no peculiarities, except the very great strength of the orbicularis palpebrarum; the membrana nictitans had the usual trochlear muscles: its free margin was black.'

Hearing.—This sense appears to exist in considerable perfection in the Struthious birds.

Renal and Genital System.—No. 1195 of the Physiological Series in the museum of the Royal College of Surgeons presents the kidneys of an ostrich, of an elongated flattened form and lobulated, but with the divisions not extending so deeply into the glandular substance as in most other birds: the anterior lobe, which is the largest, is nevertheless completely separated from the rest. The substance of the different lobes has a convoluted disposition like that of the reptiles, but is more compact. The renal arteries sent off from the aorta are shown on one side, and the corresponding veins joining the inferior cava on the opposite, where also the testes and supra-renal glands are seen: bristles are placed in the ureters. No. 2456 shows the testicles of a cassowary (*Cassuarius galeatus*) of a more elongated form than in the fowl. They are relatively small, the bird having died before the season of sexual excitement. No. 2468 is the penis of an Emeu (*Dromaius Nov. Holl.*), resembling in structure that of the anserine birds: the elastic ligamentous substance which enters into its composition is also disposed so as to retract it into a spiral figure. 2469 is the penis of an Ostrich injected, showing the two fibro-cartilaginous substances, commencing by separate crura, and forming the principal part of the body of the penis, between which and along the upper surface of the penis is continued the groove representing the urethra; the true corpus cavernosum is situated on each side of this groove; the part which is reflected back from the extremity of the penis, and seems to represent the glans, consists of the elastic ligament which effects the retraction of the penis. At the commencement of the urethral groove the papillæ are preserved, on which the vasa deferentia terminate: bristles are passed through these papillæ. No. 2470 is a transverse section of the injected corpus cavernosum from the same penis. The Ostrich from which the present and preceding preparation were taken stood eleven feet high. (*Cat. Mus. Coll. Chir.*) The penis is exposed and the groove exhibited when the bird discharges its urine. No. 2734 shows the cloaca and termination of the oviduct, ureters, and rectum, with the urinary bladder and clitoris of an Ostrich. (*Catalogue.*)

The kidneys of the Apteryx are situated symmetrically, and lodged, as in other birds, in the irregular hollows of the back part of the cavity of the pelvis. Each kidney is divided into five lobes by oblique fissures extending into the posterior surface of the gland: the middle lobe is the largest. The lobes appear to have a compact and even surface, but their cerebriform convolutions can, Professor Owen states, be readily unravelled. The tortuous ureter emerges from the inner side of the posterior extremity of the kidney, and, after a course of an inch and a half, terminates in the upper and back part of the uro-genital cavity. The oval and yellow supra-renal bodies were of homogeneous texture, each three lines in length, and adhering closely to the vena cava. The testes were of a subcompressed oval figure. The vasa deferentia are formed by the union of numerous most minute efferent tubules, which pass from the testes, without forming an epididymis, into a soft amorphous substance of a grey colour, which lies between the testes and the bright yellow supra-renal body. The vas deferens formed by the greater part of the tubules perforates the corpus Wolffianum. The penis, which projects from below the external orifice of the urethro-sexual cavity into the vestibular or outer compartment of the cloaca, rapidly diminishes to a point, and its extremity is spirally retracted. An urethral or rather seminal groove traverses the upper, or what, if the penis were drawn out of the cloaca and bent forwards along the abdomen, would be its under surface, and is continued to the end of its spiral extremity: the margins of the groove are not beset with papillæ, but simply wrinkled transversely, as in the Emeu and Ostrich. Immediately above the base of the penis there is, on each side, a considerable plexus of arteries and veins, over the base of which plexus muscles cross, which would, Professor Owen thinks, impede, if not arrest, the current of the blood in the veins, and he observes that they might be termed *compressores venarum penis*, as they fulfil the same office as the *compressores* described by Douglas in the dog. Nothing deserving particular remark appears to have been observed in the female organs, though the careful statement of the detail in Professor Owen's paper well deserves the student's attention.

The myology of *Apteryx* by that author is now before the Zoological Society of London, and we understand that the neurology of the bird by the same hand is also to be laid before that Society.

Systematic Arrangement and Natural History.

The place assigned to the Struthious birds by zoologists generally will be found in the articles Birds and Grallæ. Mr. Vigors observes that those species of Tetraonidæ which exhibit a weakness or a deficiency in the hinder toe lead us at once to the three-toed groups of the *Struthionidæ* with the bills of which, more particularly that of *Rhea*, those of some species of *Tinamus* correspond. Mr. Vigors includes in the family the *Brevipennes* of Cuvier, together with the genus *Otis* [Bustard] of Linnæus, which Mr. Vigors observes evidently agrees with them in their principal characters. It corresponds also, he adds, with the order *Cursores* of Temminck, with the exception of the genus *Cursorius*, Lath., which, he thinks, possesses more of the characters of the *Wading* than of the *Gallinaceous* order; but with which, he remarks, the present family will still be found to preserve its affinity by means of the circular disposition which, he conceives, is seen to prevail throughout the divisions of ornithology. The chief genera comprised in the *Struthionidæ* are the *Rhea*, which, in Mr. Vigors's opinion, unites this family with the last; *Struthio*, Linn., which having but two toes, and thus carrying the character of the group to the extreme, may be considered the type; *Casuarius*, Brisson; *Dromiceius*, Vieill.; *Otis*, Linn.; and *Didus*, supposed to be extinct. [Dodo.] In this arrangement the *Struthionidæ* stand between the *Tetraonidæ* and the *Cracidæ* in the order Rasores. *Apteryx* was not sufficiently known when Mr. Vigors wrote. Mr. Swainson arranges the family in the same order between the *Tetraonidæ* and the Columbidæ, and he comprises under the *Struthionidæ* the genera *Otis* and *Struthio*, the latter comprehending the subgenera *Casuarius*, *Dromiceius*, *Apternyx* (Apteryx), and *Rhea*. From this family Mr. Swainson entirely excludes the *Dodo*, which was, in his opinion, the rasorial type of the *Vulturidæ*.

Mr. G. R. Gray makes the *Struthionidæ* the first family of the order *Cursores*, Temm., the sixth order in Mr. Gray's arrangement, and includes under it the following subfamilies and genera:—

Subfam. 1. Struthioninæ.

Genera.—*Struthio*, Linn.; *Casuarius*, Briss.; *Dromaius*, Vieill.; and *Rhea*, Briss.

Subfam. 2. Apteryginæ.

Genus.—*Apteryx*, Shaw.

? Subfam. 3. Didinæ.

Genus.—*Didus*, Linn.

Subfam. 4. Otinæ.

Genera:—*Otis*, Linn.; *Tetrax*, Leach; *Sypheotides*, Less.; *Chlamydotis*, Less.; and *Eupodotis*, Less.

The *Struthionidæ* are placed in Mr. Gray's arrangement between the *Tinamidæ*, the last family of his *Rasores*, and the *Charadriadæ* [Plovers], the first family of his *Grallatores*.

Amongst the *Mammalia* the Marsupialia make the nearest approximation to the *Ovipara;* and amongst the birds the *Struthionidæ* approach the most closely to the *Mammals* and the *Reptiles*.

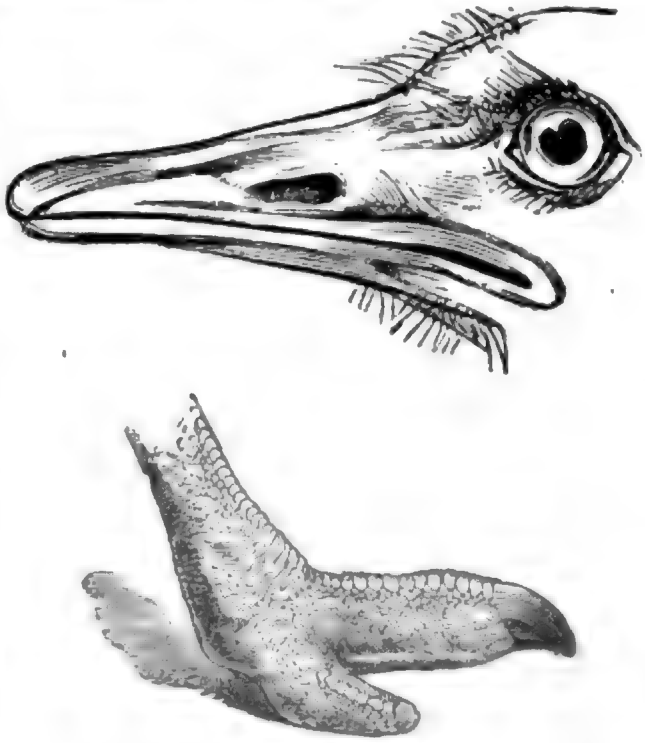
This approximation of the Struthious birds to the *Mammalia* especially cannot fail to strike the physiologist. In the first and typical genus, *Struthio*, it is strongly manifested.

Struthionidæ of the Old World.

Struthio. (Linn.)

Generic Character.—*Bill* moderate, obtuse, straight, depressed at the point, which is rounded and unguiculate; mandibles equal and flexible; nasal fossæ longitudinal, prolonged half way down the bill, open. *Feet* very robust; toes two only, stout and strong, directed forwards, and connected at their base by a strong membrane, the internal toe considerably larger than the external, and furnished with a thick and hoof-like claw, external toe clawless. Wings useless for flight, furnished with long soft undulating plumes, and armed with two spurs, or rather two plumeless shafts, not unlike a porcupine's quill. *Head* and upper half of the neck scantily covered with a thin down, through which the colour of the skin is visible.

It would be a needless occupation of space to give a minute description, which is so well known in these days of zoological societies and menageries. The Ostrich is generally understood to be the bird designated by the terms *Joneh* or *Jaanah* and *Rinonim*, in the Scriptures (*Levit.*, xi. 19; *Deut.*, xiv. 15; *Job*, xxx. 29; *Isai.*, xiii. 21; xxxiv. 13; xliii. 20; *Jer.*, l. 39; *Lament.*, iv. 3; *Mic.*, i. 8; *Job*, xxxix. 13). In many of these passages, *Jer.*, l. 39, and *Isai.*, for instance, our version reads 'Owls,' and in *Levit.* does not mention the Ostrich, but the general opinion seems to be in favour of the Ostrich being intended. It is the *Neamah* of the Arabs, *Thar edsjanmel* (Camel-bird) of the Orientals, Στρουθοκάμηλος (Struthocamelos) of the Greeks, *Struthiocamelus* of Pliny and the antient Italians, *Struzzo* and *Struzzolo* of the modern Italians, *Strauss* of the Germans, *Autruche* of the French, and *Struthio Camelus* of Linnæus.



Head and Foot of Ostrich.

Food, Habits, &c.—The approximation in the digestive organs of the ostrich to the structure of some of these parts in the Ruminantia, especially in the additional ventricle of the bird, is still further strengthened by the bisulcous foot, which may not be inaptly compared to that of the camel, and probably led in no small degree to its appellation of Camel-Bird, to which, moreover, its height, lengthened neck, habit of frequenting the desert, and patience under thirst may have contributed.

The food of the ostrich consists of vegetable substances only, but seeds and grain appear to be preferred, and it is consequently a most unwelcome neighbour to the cultivator of the soil, on whose crops the bird commits great devastation. Its iron-eating propensities have long been celebrated, and indeed it picks up and swallows any mineral substance, metallic or not, with indiscriminating voracity. Nor is this propensity confined to the devouring of minerals; for leather, hair, cordage, and wood do not seem to come amiss. In the stomach of one of these birds Valisnieri found a farrago of grass, nuts, cords, stones, glass, brass, iron, tin, copper, lead, wood, and among the stones one weighing more than a pound.

Perrault took from an ostrich's stomach seventy *doubles*, the greater part of which were worn down three-fourths of their substance by collision against each other or the pebbles found with them: those which were bent were worn and polished on the convex side, while they remained entire on the concave surface. These copper pieces had tinged everything in the stomach with green. This eagerness for picking up everything, whether or not it can be assimilated or can assist in the grinding down of the food by the action of the stomach, to which no doubt the polishing and wasting of the pieces of money mentioned by Perrault were due, is often fatal to the ostrich. Too great a quantity of copper or iron thus taken into the stomach has caused the death of the bird. Valisnieri saw one killed by swallowing a quantity of quick-lime; and one kept in the Gardens of the Zoological Society of London was first deformed and afterwards died from swallowing part of a parasol. Some of the heterogeneous contents found in the stomachs of these birds are preserved in the Museum of the Royal College of Surgeons (*ante*, p. 137).

Their speed is great. The swiftest greyhound cannot overtake them; and even the Arabian and his horse are obliged to have recourse to cunning as well as speed to close the chase, by throwing a stick dexterously between its legs, or otherwise to disable it. In its flight it spurns the pebbles behind it like shot against the pursuer. Nor is this its only mode of annoyance. Dr. Shaw, who gives a pretty account of the airs which the ostrich plays off in a domesticated state, fanning itself with its expanded wings, and seeming to admire its own shadow, states, that though tame and tractable to those familiar with them, these birds were often very fierce to strangers, especially those of the poorer sort, whom they would try to run down and attack with their feet. They are capable of striking with great force, and the same author gives a melancholy account of a person whose belly was ripped up by a stroke from the pointed and angular claw. The European sportsman, after riding so that the bird shall pass within shot, dismounts and brings it down with the rifle.

The strength of the ostrich is great. Adanson mentions the rapidity with which a large tame one ran, first under the weight of two little blacks, and afterwards under two full-grown negroes, while a smaller bird carried with equal facility one full-grown negro.

The general opinion is that the ostrich is not polygamous: *quære tamen.* The number of eggs does not seem to be correctly ascertained. From twenty to thirty, and thirty-eight with thirteen others scattered around the inartificial nest—a mere pit in the sand, which is thrown up so as to form an elevated edge round it, about three feet in diameter—have been found together. Some have made the number eighty; others reduce it to ten. This is the number that Le Vaillant would assign to a single female, although he disturbed one from the nest containing the thirty-eight eggs surrounded by the thirteen others. This nest he watched, and saw during the day four females successively sit upon them; and towards the close of the evening a male took his turn of incubation. This then was probably a common nest in which several females had laid their eggs.

The passage in *Job* (xxxix. 14) will occur to every one, and there is no doubt that within the torrid zone the heat of the sun's rays renders the incubation of the female unnecessary, excepting perhaps at night; but in cooler latitudes she performs the maternal office with assiduity, and even in the warmer climates, where an officious determination to sit would in all probability endanger the vitality of the eggs, she watches over them; and indeed the hunters have learned from her actions, and doubling back in her flight to one particular spot, where to seek for the nest. If, as has been asserted, the outlying eggs are intended to serve for the nourishment of the young, it is a proof of provident care for her offspring on the part of the mother.

Utility to Man.—The flesh of the ostrich when young is good and palatable, and the eggs are considered a great delicacy. Both Europeans and natives agree in this last opinion. The Hottentot, who abstracts the egg from the nest with a long stick, that the hen may not take alarm at the human touch, and not abandon the nest, but go on laying, as the common hen will do to a great extent when her nest is robbed, buries them in hot ashes. They are said to be excellent when eaten with a sufficient quantity of butter. The brains of hundreds of these birds not unfrequently made a dish at the insane Roman suppers; and Firmus is said to have eaten a whole ostrich at a meal. The flesh of the bird was prohibited by the Mosaical law as unclean, and the Arabs regard it in the same light; but many of the barbarous tribes of the interior of Africa feed on it without scruple. The well-known plumes form a material article of commerce for the head-dress of European ladies, &c.

There is in the noble and admirably arranged zoological gallery of the British Museum a fine and well-preserved series of young ostriches. Not the slightest trace of a nail is observable on the external toe of any of them, any more than on that of the adult bird. The usual height of the ostrich is from seven to eight feet, but it has reached to eleven feet (*ante*, p. 140).

Geographical Distribution.—Africa. Scarcely known beyond the limits of the Arabian deserts.

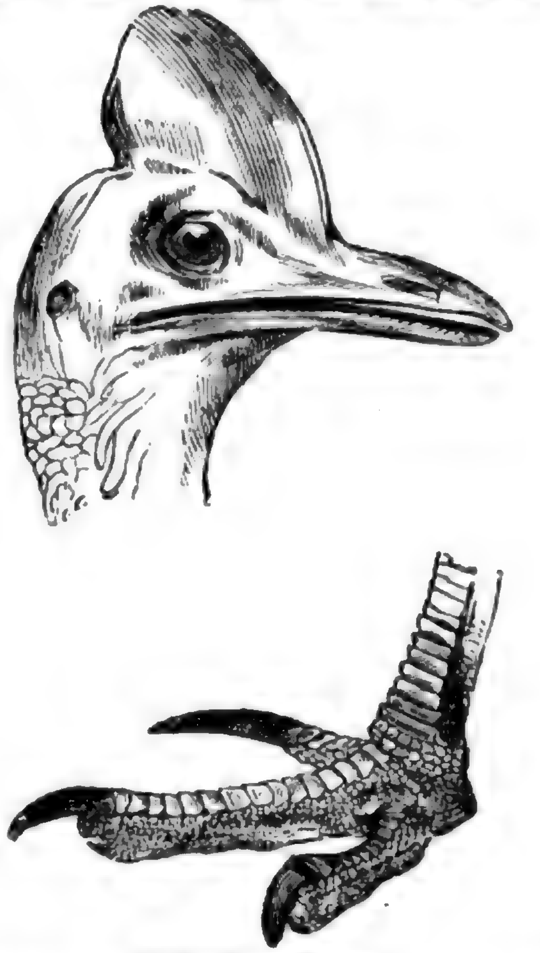
Casuarius. (Briss.)

Generic Character.—*Bill* straight, carinated above, rounded and bent at the point; upper mandible slightly vaulted; the edges depressed, and notched or jagged towards the extremity; the lower mandible rather angular below towards the point; nasal fossæ nearly as long as the bill. *Head* helmeted. Front of the *neck* naked, and furnished with two wattles. *Toes* three. Wings entirely unfit for flight, furnished with five round naked pointed quills.

Example. *Casuarius Emeu.*

Description.—Bill compressed laterally, the head surmounted with a bony prominence covered with a horny substance; skin of the head and the upper part of the neck naked, tinged with cœrulean blue and flame-colour, with pendent wattles like those of a turkey-cock; wings furnished with some stiff featherless quills; nail of the internal toe much the strongest. 'It is,' says Cuvier in continuation, 'the largest of the birds after the ostrich,* from which it differs sufficiently in its anatomy, for it has short intestines and small cæca, wants the intermediate stomach between the crop and the gizzard, and its cloaca does not exceed that of other birds in proportion.

This well-known bird was named *Emeu* by the early Portuguese navigators. It is the *Emeu* vulgo *Casoaris* (the latter appearing to be the Malayan appellation) of Bontius, the *Struthio Casuarius* of Linnæus, *Casuarius galeatus* of Vieillot, and *Cassowary* of the British naturalists, who now apply the term *Emeu* to the New Holland Cassowary (Dromaius, Vieill.). Its height when erect is about five feet.



Head and Foot of Cassowary.

Geographical Distribution.—The peninsula of Malacca and the great chain of islands to the south and east. Bontius notes it from Ceram and the other neighbouring Molucca Islands. M. Lesson observes that it is very common in the islands of the Asiatic Archipelago, and especially at New Guinea. It is frequently seen alive in our menageries, and is common in museums.

Food, Habits, &c.—This species, which is characterised by M. Lesson as 'stupid and massive,' feeds on seeds and herbage according to him; but Cuvier says that it eats fruits and eggs, but no grain. Bontius states that he does not think it should be placed among the birds: 'Alæ enim ad currendum pro velo, non ad volandum inserviunt.' He adds, that when irritated, it does not rush forward to the attack, but turns itself obliquely, kicking backwards at the enemy. Cuvier observes that the featherless quills serve the bird for offensive weapons. Bontius remarks that the eggs are very different from those of the ostrich, by reason of their thinness and colour, for their shell is greenish, ornamented with numerous tubercles of a deeper green (saturè viridibus): he adds that they are eaten by the natives. Cuvier relates that the bird lays a small number of green eggs, which it abandons, like the ostrich, to the heat of the climate.

Didus. [Dodo.]

By the kindness of Professor Owen, we are enabled to give the following interesting additions to the evidences of the existence of this interesting form:—

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* But see post, p. 145.

'Whilst at the Hague, writes the Professor to Mr. Broderip, 'in the summer of 1838, I was much struck with the minuteness and accuracy with which the exotic species of animals had been painted by Savery and Breughel in such subjects as Paradise, Orpheus charming the Beasts, &c., in which scope was allowed for grouping together a great variety of animals. Understanding that the celebrated menagerie of Prince Maurice had afforded the living models to these artists, I sat down one day before Savery's Orpheus and the Beasts, to make a list of the species which the picture sufficiently evinced that the artist had had the opportunity to study alive. Judge of my surprise and pleasure in detecting in a dark corner of the picture (which is badly hung between two windows) the *Dodo*, beautifully finished, showing for example, though but three inches long, the auricular circle of feathers, the scutation of the tarsi, and the loose structure of the caudal plumes. In the number and proportions of the toes, and in general form, it accords with Edwards's oil painting in the British Museum; and I conclude that the miniature must have been copied from the study of a living bird, which it is most probable formed part of the Mauritian menagerie.

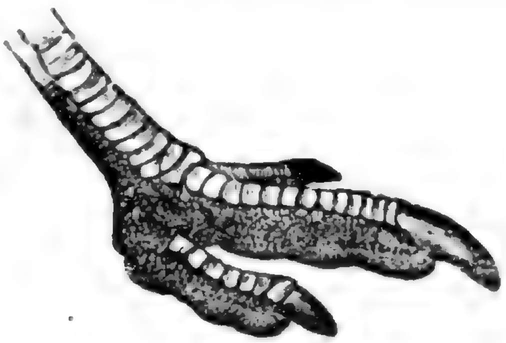
'The bird is standing in profile, with a lizard at its feet. Not any of the Dutch naturalists to whom I applied for information respecting the picture, the artist, and his subjects, seemed to be aware of the existence of this evidence of the Dodo in the Hague collection.

'I think I told you that my friend Professor Eschricht of Copenhagen had written to inform me that the *skull of a Dodo* had been lately discovered in the museum at Copenhagen: it had before formed part of the museum of the Duke of Gottorp.'

AMERICAN STRUTHIONIDÆ.

Rhea. (Briss.)

Generic Character.—*Bill* straight, short, rather soft, furnished at its base with an obliterated membrane, slightly depressed, moderate, the point rounded, bent, and unguiculated; upper mandible with its back elevated, notched towards the end; lower mandible flat below; nostrils large, longitudinal. *Wings* improper for flight, the phalanges furnished with plumes and terminated by a spur. *Head* completely feathered. *Feet* three-toed, all the toes furnished with claws.



Foot of Rhea.

In this genus the wing is better developed than in any of the Struthious birds, but it is still useless as an organ of flight.

Till lately the only species known was *Rhea Americana*, the *Nhandu-Guaçu* of the Brazilians. (Marcgrave; Piso.) It is described as haunting the banks of rivers and having the same propensity for swallowing iron and stones as the African ostrich, running so swiftly and cunningly, aided by its wings, as not only to evade the pursuit of dogs, but the weapons of the barbarians. The females are said to lay eggs like other ostriches, but smaller, in the sand; and it is added that the males sedulously perform the function of incubation: 'Salaces sunt admodum, mentulamque aliquantum aduncam vibrant sæpe, donec reperta femella eam rigidissimè ineant, suppressamque diu immobilem teneant.' (Piso.) The same author states that these American ostriches are fond of flesh, the best fruits, and the little fishes washed to the bank; nor do they spare the grey amber, if they can gain possession of it on the shore. He adds that their flesh is approved of and solid, equalling that of our swans and geese.

This American ostrich is the *Struthio Rhea* of Linnæus, the *Tuiju* of Lacépède; but we owe the perfect knowledge of a second species to Mr. Darwin, who has given a figure and ample descriptions of the bird and its habits in the 'Zoology of the Beagle,' and in his 'Researches in Zoology and Natural History;' but before we proceed to notice *Rhea Darwinii*, we must give his valuable account of the habits of *Rhea Americana*.

'This bird,' says Mr. Darwin, 'is well known to abound on the plains of La Plata. To the north it is found, according to Azara, in Paraguay, where however it is not common; to the south its limit appears to be from 42° to 43°. It has not crossed the Cordillera; but I have seen it within the first range of mountains on the Uspallata plain, elevated between six and seven thousand feet. The ordinary habits of the ostrich are well known. They feed on vegetable matter, such as roots and grass; but at Bahia Blanca I have repeatedly seen three or four come down at low-water to the extensive mud-banks, which are then dry, for the sake, as the Gauchos say, of catching small fish. Although the ostrich in its habits is so shy, wary, and solitary, and although so fleet in its pace, it falls a prey, without much difficulty, to the Indian or Gaucho armed with the bolas. When several horsemen appear in a semicircle, it becomes confounded, and does not know which way to escape. They generally prefer running against the wind; yet at the first start they expand their wings, and, like a vessel, make all sail. On one fine hot day I saw several ostriches enter a bed of tall rushes, where they squatted concealed till quite closely approached. It is not generally known that ostriches readily take to the water. Mr. King informs me that in Patagonia, at the bay of St. Blas and at Port Valdes, he saw these birds swimming several times from island to island. They ran into the water, both when driven down to a point, and likewise of their own accord, when not frightened: the distance crossed was about two hundred yards. When swimming, very little of their bodies appears above water, and their necks are extended a little forward: their progress is slow. On two occasions I saw some ostriches swimming across the Santa Cruz river, where it was about four hundred yards wide, and the stream rapid.

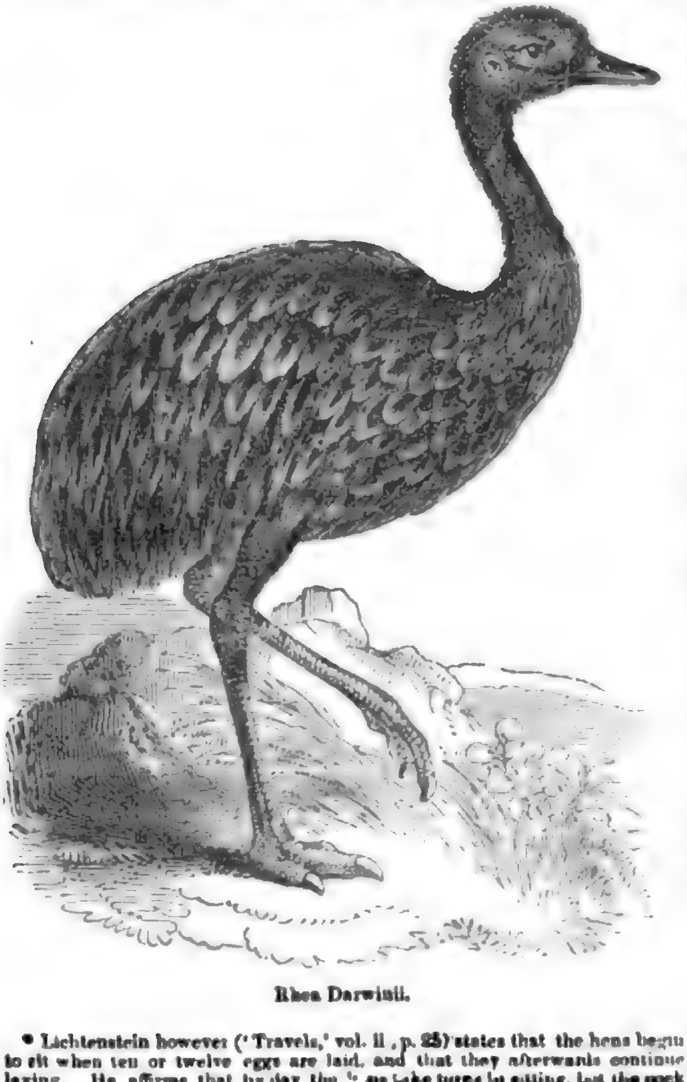
'The inhabitants who live in the country readily distinguish, even at a distance, the male bird from the female. The former is larger and darker coloured, and has a longer head. The ostrich, I believe the cock, emits a singular deep-toned hissing note. When first I heard it, standing in the midst of some sand-hillocks, I thought it was made by some wild beast, for it is a sound that one cannot tell whence it comes or from how far distant. When we were at Bahia Blanca in the months of September and October, the eggs were found, in extraordinary numbers, all over the country. They either lie scattered single, in which case they are never hatched, and are called by the Spaniards huachos, or they are collected together into a shallow excavation which forms the nest. Out of the four nests which I saw, three contained twenty-two eggs each, and the fourth twenty-seven. In one day's hunting on horseback, sixty-four eggs were found; forty-four of these were in two nests, and the remaining twenty scattered huachos. The Gauchos unanimously affirm, and there is no reason to doubt their statement, that the male bird alone hatches the eggs, and for some time afterwards accompanies the young. The cock when on the nest lies very close; I have myself almost ridden over one. It is asserted that at such times they are occasionally fierce, and even dangerous, and that they have been known to attack a man on horseback, trying to kick and leap on him. My informer pointed out to me an old man, whom he had seen much terrified by one chasing him.'

Mr. Darwin, after having referred to the passage in Burchell's 'Travels in South Africa,' in which that traveller remarks, that having killed a male ostrich with dirty feathers, it was said by the Hottentots to be a nest bird, and referring to the male emu's habit of taking care of the nest, proceeds as follows:—

'The Gauchos unanimously affirm that several females lay in one nest. I have been positively told that four or five hen birds have been actually watched and seen to go, in the middle of the day, one after the other, to the same nest. Although this habit at first appears very strange, I think the cause may be explained in a simple manner. The number of eggs in the nest varies from twenty to forty, and even to fifty; and, according to Azara, seventy or eighty. Now, although it is most probable, from the number of eggs found in one district being so extraordinarily great in proportion to that of the parent birds, and likewise from the state of the ovarium of the hen, that she may in the course of the season lay a great number, yet the time required must be very long. Azara states that a female, in a state of domestication, laid seventeen eggs, each at the interval of three days, one from another. If the hen were obliged to hatch her own eggs, before the last was laid the first probably would be addled; but if hens, as is stated to be the case, combined together, then the eggs in one collection would be nearly of the same age. If the number of eggs in one of these nests is, as I believe, not greater, on an average, than the number laid by one female in the season, then there must be as many nests as females, and each cock-bird will have its fair share of incubation; and this during a period when the females probably could not sit, on account of not having finished laying.[*] I have before mentioned the great numbers of huachos, or scattered eggs; so that in one day's hunting the third part found were in this state. It appears odd that so many should be wasted. Does it not arise from some difficulty in several females associating together, and in finding a male ready to undertake the office of incubation? It is evident that there must at first be some degree of association between at least two females, otherwise the eggs would remain scattered at distances far too great to allow of the male collecting them into one nest. Some authors believe that the scattered eggs are deposited for the young birds to feed on. This can hardly be the case in America, because the huachos, although often addled and putrid, are generally whole.'

Variety of Rhea Americana.—It would appear that there is a white or albino variety of this species, for a Gaucho told Mr. Darwin that he had once seen a snow-white one, and that it was a most beautiful bird.

Rhea Darwinii was described by Mr. Gould, at a meeting of the Zoological Society of London. It is smaller, and the general tinge of the plumage is light brown in place of grey; each feather being conspicuously tipped with white. The bill is considerably smaller, and, especially, less broad at its base; the culmen is less than half as wide, and becomes slightly broader towards the apex, whereas in the *R. Americana* it becomes slightly narrower: the extremity of both the upper and the lower mandible is more tumid in the latter than in *R. Darwinii*, and there are other differences.



Rhea Darwinii.

The first notice Mr. Darwin received of this species was at the Rio Negro, in Northern Patagonia, where he repeatedly heard the Gauchos talking of a very rare bird, called *Avestruz Petise.* They described it as being less than their common ostrich, which is there abundant, and with differences of colour, and said that it was more easily caught by the bolas than the other species. The eggs of the small species appeared more generally known, and it was remarked, with surprise, that they were very little less than those of the common *Rhea*, but of a slightly distinct form, and with a tinge of pale blue. Some eggs that Mr. Darwin picked up on the plains of Patagonia agreed pretty well with this description, and he doubted not that they were those of the *Petise.* He states that this species occurs most rarely in the neighbourhood of the Rio Negro; but that about a degree and a half farther south they are tolerably abundant. One Gaucho however told him that he recollected having seen one, many years before, near the mouth of the Rio Colorado, which is north of the Rio Negro. They are said to prefer the plains near the sea. Mr. Darwin goes on to state, that when at Port Desire, in Patagonia (lat. 48°), Mr. Martens shot an ostrich. Mr. Darwin looked at it, and forgetting at the moment the subject of the Petises, thought it was a two-third grown one of the common sort. The bird was skinned and cooked before Mr. Darwin's memory returned: but the head, neck, legs, wings, many of the larger feathers, and a large part of the skin had been preserved. This constitutes the specimen in the museum of the Zoological Society.

'Among the Patagonian Indians in the Strait of Magellan,' says Mr. Darwin in continuation, 'we found a half-bred Indian, who had lived some years with this tribe, but had been born in the northern provinces. I asked him if he had ever heard of the Avestruz Petise. He answered by saying, 'Why there are none others in these southern countries.' He informed me that the number of eggs in the nest of the Petise is considerably less than with the other kind, namely, not more than fifteen on an average; but he asserted that more than one female deposited them. At Santa Cruz we saw several of these birds. They were exceedingly wary: I think they could see a person approaching, when he was so far off as not to distinguish an ostrich. In ascending the river, few were seen; but in our quiet and rapid descent, many, in pairs, and by fours or fives, were observed. It was remarked by some of the officers, and I think with truth, that this bird did not expand its wings, when first starting at full speed, after the manner of the northern kind. The fact of these ostriches swimming across the river has been mentioned.'

In conclusion, Mr. Darwin remarks, that *R. Americana* inhabits the eastern plains of South America as far as a little south of the Rio Negro (lat. 41°), and that *R. Darwinii* takes its place in Southern Patagonia; the part about Rio Negro being neutral ground.

We have said that we owe the perfect knowledge of this smaller species to Mr. Darwin. There is no doubt that others have seen it. Dobrizhoffer (1749) clearly was aware of its existence. In his account of the Abipones, he says, 'You must know moreover that Emus differ in size and habits in different tracts of land; for those that inhabit the plains of Buenos Ayres and Tucuman are larger, and have black, white, and grey feathers; those near to the Strait of Magellan are smaller and more beautiful, for their white feathers are tipped with black at the extremity, and their black ones in like manner terminate in white.' Those ostriches which Wallis saw at Batchelor's river (lat. 53° 54′) in the Strait of Magalhaens, were doubtless Petises. Mr. Darwin notices these instances, and further remarks that the distinguished French naturalist M. A. D'Orbigny, when at Rio Janeiro, made great exertions to procure this bird, but did not succeed. 'He mentions it,' says Mr. Darwin, 'in his "Travels" (vol. ii., p. 76), and proposes (in case, I presume, of his obtaining a specimen at some future time, and thus being able to characterize it) to call it *Rhea pennata.*' Now Mr. Gould has characterized it from the specimen brought home by Mr. Darwin (1837), who liberally presented his valuable zoological collection to the Zoological Society of London, and has given the interesting account of its habits and geographical distribution above quoted. Mr. Gould's name therefore must have the preference

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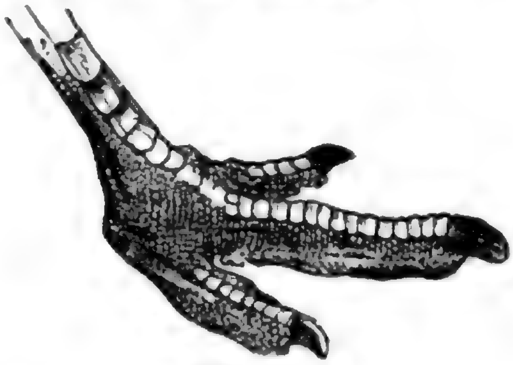
[*] Lichtenstein however ('Travels,' vol. ii., p. 25) states that the hens begin to sit when ten or twelve eggs are laid, and that they afterwards continue laying. He affirms that by day the hens take turns in sitting, but the cock sits all night.

Rhea Americana has been exhibited alive in the Gardens of the Zoological Society of London, and specimens of both species are, we believe, to be seen in the museum of that Society and in the British Museum.

AUSTRALIAN AND NEW ZEALAND STRUTHIONIDÆ.

DROMAIUS. (Vieill.)

Generic Character.—Bill straight, with the edges very much depressed, rounded at the extremity, slightly carinated above. *Nostrils* large, protected by a membrane and opening above about the middle of the bill. *Head* feathered. *Throat* nearly naked. *Feet* three-toed



Foot of Emeu.

This is also the genus *Dromiceius* of Vieillot, *Tachea*, Flem., and the form is placed by Latham under the genus *Casuarius*, and by Temminck under *Rhea*.

The *Emeu*, *Emu*, or *New Holland Cassowary*, *Dromaius Novæ Hollandiæ* of authors, *D. ater* of Vieillot, and *Dromiceius Australis* of Swainson, *Parembang* of the natives, has become quite familiar to us from the frequency of its exhibition in menageries, and its breeding so readily in a state of domestication. The following is Mr. Bennett's description of this species:—'In size and bulk the *Emeu* is exceeded by the African Ostrich alone. It is stated by travellers to attain a height of more than seven feet, and its average measurement in captivity may be estimated at between five and six. In form it closely resembles the ostrich, but is lower on the legs, shorter in the neck, and of a more thickset and clumsy make. At a distance its feathers have more of the appearance of hair than of plumage, their barbs being all loose and separate. As in the other ostriches, they take their origin by pairs from the same shaft.[*] Their general colour is a dull brown, mottled with dirty grey, the latter prevailing more particularly on the under surface of the bird. On the head and neck they become gradually shorter, assume still more completely the appearance of hairs, and are so thinly scattered over the forepart of the throat and around the ears, that the skin, which is of a purplish hue, is distinctly visible. This appearance is most remarkable in the older birds, in which these parts are left nearly bare. The wings are so extremely small as to be quite invisible when applied to the surface of the body. They are clothed with feathers exactly similar to those of the back, which, it should be observed, divide as it were from a middle line, and fall gracefully over on either side. The colour of the bill and legs is of a dusky black; and that of the iris dull brown. There appears to be but little difference in colour between the two sexes; but the young, on first quitting the shell, have a much more elegant livery. A brood of these has lately (1831) been hatched at the Society's garden, in which the ground colour is greyish-white, marked with two longitudinal broad black stripes along the back, and two similar ones on either side, each subdivided by a narrow middle line of white. These stripes are continued along the neck without subdivision, and are broken on the head into irregular spots. Two other broken stripes pass down the fore part of the neck and breast, and terminate in a broad band passing on either side across the thighs. As in the fully-grown bird, the bill and legs are of a dusky hue.'

Food, Habits, &c.—The food of the Emeu consists of vegetables and seeds, but chiefly of fruits, roots, and herbage. In a state of nature it is very fleet and affords excellent sport in coursing with dogs, which are however rather shy of their game, in consequence of the powerful kicks that the bird can inflict, so powerful that the settlers say it can break the bone of a man's leg by striking out with its feet. Well-trained dogs therefore, to avoid this infliction, run up a-breast and make a sudden spring at the neck of the bird. Though the Emeu has bred so frequently in captivity, the mode of making the nest in the wild state does not appear to be well known, though it is generally supposed to be a mere hollow excavated in the earth. The dark green eggs are six or seven in number. The birds appear to be tolerably constant in pairing, and the male bird sits and hatches the young, whilst the female watches and guards the nest. The Emeu can produce a hollow drumming sort of note, well known to those who have attended to its manners in captivity. These birds will, like the *Rhea*, take water. Captain Sturt, when descending the Murrumbidgee, in Australia, saw two of them in the act of swimming. They appear to be gregarious, and not very shy in some localities, for Major Mitchell in his excursion towards Port Phillip found them very numerous on the open downs, and their curiosity brought them to stare at the horses of the party, apparently unconscious of the presence of the riders. In one flock he counted thirty-nine, and they came so near that the gallant traveller, having no rifle with him, was tempted to discharge a pistol at them, but without effect.

Geographical Distribution.—Widely diffused over the southern part of New Holland and the neighbouring islands; but gradually disappearing before the encroachment of civilized man. They have also been observed on the west coast (Swan River). Captain Flinders found them in abundance at Port Phillip and King George's Sound, and D'Entrecasteaux at the latter place. Flinders and Péron saw them in numbers at Kangaroo Island.

Utility to Man.—The flesh of the Emeu, particularly the hind quarters, is generally described to be good and sweet eating.

But one species of *Dromaius* has hitherto been recorded: but the indefatigable zoologist Mr. Gould has arrived at the safe conclusion that a second species has existed, if it does not still exist, though he has his fears that it may be extirpated. Two specimens at least, he kindly informs us, exist in the museums; one at the *Jardin des Plantes*, and the other in the Linnean collection. Mr. Gould, to whom we may look for a speedy publication of the characters of this new and most interesting addition to the *Struthionidæ*, has in his MS. designated this smaller species as *Dromaius parvulus*, and has placed that name on the bird in the Paris Museum. By his liberality we are permitted to lay this valuable information before our zoological readers. Mr. Gould believes that portion of Australia called New South Wales to be the habitat of *D. parvulus*.

The *Dromiceius Novæ Zealandiæ* of M. Lesson is no other than the highly curious bird which we must next describe, and which he himself on the next page gives to his readers under its proper name of

Apteryx. (Shaw.)

'If,' writes Professor Owen, 'The *Apteryx* of New Zealand were to become extinct, and all that remained of it, after the lapse of one or two centuries, for the scrutiny of the naturalist, were a foot in one museum and a head in another, with a few conflicting figures of its external form—one representing it in the attitude of a terrestrial bird; another, like that in Dr. Shaw's 'Miscellany,' portraying it erect like a Penguin—the real nature and affinities of this most remarkable species would be involved in as much obscurity, and would doubtless become the subject of as many conflicting opinions among the ornithologists of that period, as are those of the Dodo at the present day.'

In 1812 Captain Barclay, of the ship Providence, brought a specimen from New Zealand, and presented it to Dr. Shaw, who figured it as above noticed. When Dr. Shaw died, this specimen came into the possession of the present Earl of Derby, the president of the Zoological Society of London, then Lord Stanley, and then distinguished, as he is now, for the value and beauty of his collection both of living animals and preserved birds, and his munificent patronage of zoology. M. Temminck placed it with the Dodo among the *Inertes*, but still hardly anything was generally known of the bird till Mr. Yarrell, in 1833, described and figured the Earl of Derby's original specimen, collecting in his paper, in the first volume of the 'Transactions' of the Zoological Society, all that had been previously made known on the subject. M. Lesson, in the *Zoologie* of the *Voyage*

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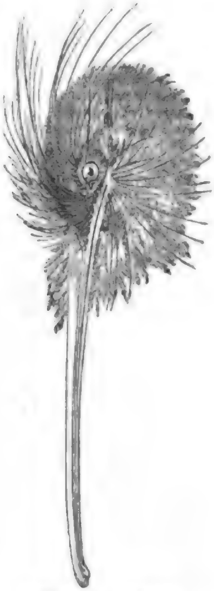
[*] N.B. This is not quite correct. In the African Ostrich the feathers have no accessory plume, neither have those of the Apteryx. A tuft of down represents the accessory plume in the Rhea. In the Emeu this plume equals the original feather, so that the quill supports two shafts. In the Cassowary, besides the double feather, there is also a second accessory plume, so that the quill supports three distinct shafts and vanes. (Owen.)

de la Coquille (1828), had noticed the existence of 'a bird without wings,' fragments of which were brought by the natives, which appeared to him to be those of the Emeu, and he says that M. Kendal had confirmed this idea by affirming the existence of Cassowaries analogous to those of Australia in the woods of New Zealand. He adds that the natives call the bird *Kivikivi*, and hunt it with dogs, and that he doubts not that the bird is the *Apteryx Australis* of Shaw.

In the 'Voyage de l'Astrolabe,' M. d'Urville states that it was in the Bay of Tolaga, or Houa-houa, on the east coast of the most northern of the two islands of New Zealand, that he obtained the first positive intelligence as to the nature of the *Keivi*, as he writes it, from observing a mat or dress (natte) adorned with the feathers of the bird, which is one of the first objects of luxury to the natives. According to them, he adds, the *Keivi* is a bird of the size of a small turkey, but, like the ostrich and cassowary, deprived of the faculty of flight, common in the neighbourhood of Mont Ikou-Rangui, and is hunted at night with torches and dogs. M. d'Urville concludes by remarking that it is probable that these birds belong to a genus closely approximating to the cassowaries, and that he believes that it has already received the name of *Apteryx* from some authors; and he mentions a second time the dresses of the chiefs on solemn occasions as being ornamented with the feathers, and refers to the following note in Cruise's *Journal of a Residence in New Zealand* (1822):—'The Emu is found in New Zealand, though we were never fortunate enough to meet with one. The natives go out after dusk with lights, which attract their attention, and they kill them with dogs. Their feathers are black, smaller and more delicate than those of the Emu of New Holland; and a mat ornamented with them is the most costly dress that a chief can wear.'

MM. Quoy and Gaimard, in the *Zoologie* of the same voyage, allude to the bird, which they found it impossible to obtain, but brought back the mantle of a chief covered with its plumes.



Bill of Apteryx. (Owen.)

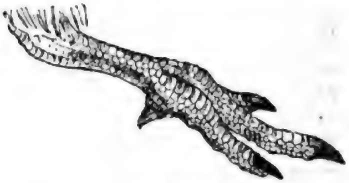
Mr. Gould, who has given beautiful and accurate figures of the bird in his grand work *The Birds of Australia*, states that since Mr. Yarrell wrote, he had become acquainted with five additional specimens, and had obtained further information respecting the history of the species. Two of these, from which his figures are taken, were presented to the Zoological Society by the New Zealand Company; and that Society possesses a third but imperfect specimen, presented by Alexander MacLeay, Esq., of Sydney. Two others have been recently added to the collection of the Earl of Derby, one of which his lordship liberally presented to Mr. Gould.

Description.—Face and throat greenish brown; all the remainder of the plumage consisting of long lanceolate hair-like feathers of a chestnut-brown, margined on each side with blackish brown; on the lower part of the breast and belly the feathers are lighter than those of the upper surface, and become of a grey tint; bill yellowish horn-colour, its base beset with numerous long hairs; feet yellowish brown. (Gould.)

This is the *Apteryx Australis* of Shaw; *Apteryx* of Temminck; *Apterous Penguin* of Latham; and *Kivi-Kivi* or *Kiwi-Kiwi* of the aborigines of New Zealand.

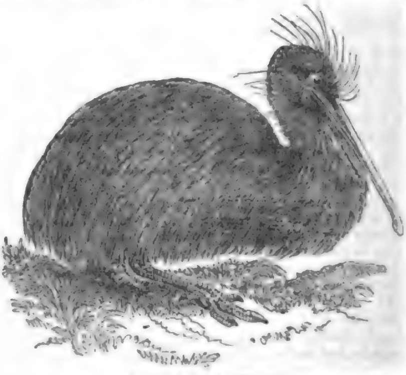
The length from the point of the bill to the end of the tailless body is about thirty-two inches; but the bill is much longer in some individuals than in others, and it is not satisfactorily made out whether this difference of length is to be attributed to difference of age or sex; but it has been supposed that the female has the longest bill.

The toes are four in number; the three anterior ones are unconnected. The hind toe is placed on the inner flattened surface of the tarsus; is directed backwards, and almost perpendicularly downwards; it measures only 1¼ inch, and of this the claw or spur measures ¾ of an inch. In the size and position of this toe the *Apteryx* corresponds with the *Dodo*.



Foot of Apteryx.

Food, Habits, &c.—Worms, insects, especially the larvæ of *Lepidoptera*, and probably snails, appear to be the food of this species. Mr. Gould states that the favourite localities of the bird are those covered with extensive and dense beds of fern, among which it conceals itself, and when hard pressed by dogs, the usual mode of chasing it, it takes refuge in crevices of the rocks, hollow trees, and in the deep holes which it excavates in the ground in the form of a chamber. In these latter situations, Mr. Gould tells us, it is said to construct its nest of dried fern and grasses, and there deposits its eggs, the number and colour of which have not been clearly ascertained.



Apteryx Australis. (Gould.)

Mr. Short, in a letter to Mr. Yarrell, states that when undisturbed, the head is carried far back in the shoulders, with the bill pointing to the ground; but when pursued, it runs with great swiftness, carrying the head elevated like the ostrich. Its habits are said to be almost exclusively nocturnal, and the natives usually hunt it by torchlight, seeking for it with the utmost avidity, the skins being so highly prized for the dresses of the chiefs, and indeed the natives can be rarely induced to part with them. The feathers are also used for artificial flies in angling, after the European manner. When attacked, it vigorously defends itself, striking rapidly and dangerously with its powerful feet and sharp spur, with which it is also said to beat the ground, in order to disturb the worms, on which it feeds, seizing them with its bill the instant they make their appearance.

Geographical Distribution.—The *Apteryx* is said to inhabit all the islands of New Zealand, particularly the southern end of the middle island. (*Birds of Australia.*)

FOSSIL STRUTHIONIDÆ.

In November, 1839, Professor Owen exhibited, at a meeting of the Zoological Society of London, the fragment of the shaft of a femur, six inches in length, and five inches and a half in its smallest circumference, with both extremities broken off. This bone of an unknown struthious bird of large size, presumed to be extinct, was put into the Professor's hands for examination, by Mr. Rule, with the statement that it was found in New Zealand, where the natives have a tradition that it belonged to a bird of the Eagle kind, which has become extinct, and to which they give the name 'Movie.' Similar bones, it is said, are found buried in the banks of the rivers.

After a minute description of the bone, Professor Owen proceeds thus:—'There is no bone of similar size which presents a cancellous structure so closely resembling that of the present bone, as does the femur of the ostrich; but this structure is interrupted in the ostrich at the middle of the shaft, where the parietes of the medullary, or rather air-cavity, are smooth and unbroken. From this difference, I conclude the Struthious bird indicated by the present fragment to have been a heavier and more sluggish species than the ostrich; its femur, and probably its whole leg, was shorter and thicker. It is only in the ostrich's femur that I have observed superficial reticulate impressions similar to those on the fragment in question. The Ostrich's femur is subcompressed, while the present is cylindrical, approaching in this respect nearer to the femur of the Emeu; but its diameter is one-third greater than that of the largest Emeu's femur with which I have compared it. The bones of the extremities of the great *Testudo Elephantopus* are solid throughout. Those of the crocodile have no cancellous structure like the present bone. The cancellous structure of the mammiferous long bones is of a much finer and more fibrous character than in the fossil. Although I speak of the bone under this term, it must be observed that it does not present the characters of a true fossil; it is by no means mineralized: it has probably been on or in the ground for some time, but still retains most of its animal matter. It weighs seven ounces twelve drachms avoirdupois.

'The discovery of a relic of a large struthious bird in New Zealand is one of peculiar interest on account of the remarkable character of the existing Fauna of that island, which still includes one of the most extraordinary and anomalous genera of the struthious order; and because of the close analogy which the event indicated by the present relic offers to the extinction of the Dodo of the island of the Mauritius. So far as judgment can be formed of a single fragment, it seems probable that the extinct bird of New Zealand, if it prove to be extinct, presented proportions more nearly resembling those of the *Dodo* than of any of the existing *Struthionidæ*. Any opinion however as to its specific form can only be conjectural; the femur of the Stilt-bird (*Himantopus*) would never have revealed the anomalous development of the other bones of the leg; but so far as my skill in interpreting an osseous fragment may be credited, I am willing to risk the reputation for it on the statement that there has existed, if there does not now exist, in New Zealand, a struthious bird nearly if not quite equal in size to the ostrich.' (*Zool. Proc.*, 1839.)

The account of the bones found buried in the Isle of France and the island of Rodriguez will be found in the article DODO, vol. ix., p. 52.

And here we close an abridged account of perhaps the most interesting family in the whole class of birds, hoping however that no material omission will be found, whilst, through the kindness of friends, we have been enabled to present our readers with some information not previously published. When we look at the bisulcous ostrich, with its large ventricle between the crop and the stomach, and its vast receptacle where the urine accumulates, as in a bladder, we may well excuse the antients for their doubts as to the place of the animal. 'The name of Camel-Bird, by which it was known not only to the Greeks and Romans, but also to the nations of the East; the broad assertion of Aristotle that the ostrich was partly bird and partly quadruped; and that of Pliny, that it might almost be said to belong to the class of beasts, are,' as Mr. Bennett well says, 'but so many proofs of the popular recognition of a well authenticated zoological truth.' In the *Cassowary*, the *Emeus*, and the *Apteryx*, the covering of the body becomes something between feathers and hair; in the *Cassowary* and *Emeu* the wing is dwindling rapidly; and in *Apteryx* this great characteristic of the birds is reduced to a mere rudiment; while in all, the lower extremities, with which they kick like quadrupeds, are most highly developed.

STRUTT, JOSEPH, an artist and antiquary of considerable merit, was born at Springfield, in Essex, Oct. 27, 1749. His father was the owner of a mill at Springfield. At the age of fourteen the son was apprenticed to the unfortunate William Wynne Ryland, the engraver, and afterwards became a student of the Royal Academy, where he tried his talent at painting in oil. In 1771 he became a student in the reading-room of the British Museum, the manuscript stores of which gave a new bias to his pursuits, and where he conceived, and obtained the chief embellishments for, most of the literary labours which he afterwards executed.

In 1773 he published his first work, 'The Regal and Ecclesiastical Antiquities of England, containing the representations of the English monarchs from Edward the Confessor to Henry VIII.,' a thin volume in quarto; a new edition of which he published, with a Supplement, in 1793.

In 1774 he published the first volume 4to. of what he called '*Horda-Angel-Cynnan*, or a complete View of the Manners, Customs, Arms, Habits, &c. of the Inhabitants of England, from the arrival of the Saxons;' the second volume of which appeared in 1775, and the third in 1776.

In 1777 and 1778 he published his 'Chronicle of England,' in 2 vols. 4to. He had intended to bring this work down to his own time in six volumes, but not meeting with the encouragement he looked for, he stopped at the Norman Conquest.

His next work was 'A Biographical Dictionary, containing an Account of all the Engravers from the earliest period to the present time, illustrated by engravings,' 2 vols. 4to., London, 1785 and 1786; a work very creditable to his judgment and industry.

In 1790 an asthmatic complaint rendered a country residence necessary, when he retired to Bacon's farm in Hertfordshire, where he employed a part of his time in engraving a series of plates in illustration of 'Pilgrim's Progress.' Here he remained for four or five years.

In 1795 he returned to London, and began collecting materials for his 'Complete View of the Dress and Habits of the People of England from the establishment of the Saxons in Britain,' the first volume of which he published in 1796, and the second in 1799.

In 1801 he published the last work he lived to complete, on 'The Sports and Pastimes of the People of England,' 4to.; reprinted in 1810, 4to., and again in 8vo. edited by William Hone, in 1830.

He died, in narrow circumstances, in Charles Street, Hatton Garden, October 16th, 1802. He left some manuscripts in the possession of his son, from which 'Queen Hoo Hall,' a romance, and 'Antient Times,' a drama, in 4 vols. 12mo.; and 'The Test of Guilt, or Traits of Antient Superstition, a dramatic tale, with the Bumpkin's Disaster, &c.' 4to., have been since published.

Nichols, in his 'Literary Anecdotes,' whose account we have principally followed, enumerates (vol. v., p. 685, 686) a considerable number of single plates which Mr. Strutt engraved and published, as well as a few paintings in oil and drawings.

STRUVE, GEORG ADAM, was born at Magdeburg, on the 26th of September, 1619. His father, the proprietor of Wandesleben, was judge in the supreme court of the duchy of Magdeburg. The family of Struve came originally from Brunswick, in which the grandfather of the subject of this sketch possessed an equestrian fief. Some of the ancestors of the mother of G. A. Struve had occupied high judicial offices, and others had pursued, with success, the career of University honours.

Struve's father was too much occupied by his judicial duties to superintend the minute details of his son's education; but his mother laboured anxiously to instil devotional feelings into his infant mind. He received instruction in the first elements of Latin, and other branches of knowledge, at the lyceum of Magdeburg, until he attained his eleventh year. In 1630 he was sent to the gymnasium of Schleusingen, where he remained till 1636. His principal tutor was Reyher, a man of great reputation as a teacher, who, besides grounding him thoroughly in Greek and Latin, imparted to him some notions in philosophy and belles-lettres.

His family had suffered much during these six years from the destruction of Magdeburg by Tilly's army, and the devastation of the district in which their property lay. They led an unsettled life for several years, sometimes in one town, sometimes in another, till the storm of war having drifted into other provinces, they ventured again to take up their abode at Magdeburg. Not long after their return, Georg Adam arrived at the house of his parents a few days sooner than he was expected. Six years had so completely changed his appearance, that he was received as a stranger both by his parents and sisters, who did not recognise him until he declared himself.

In June, 1636, Struve entered the University of Jena. The taste which he had acquired for literature and science, under his schoolmaster, prompted him, although the law was his professional study, to devote a good deal of time to the philosophical classes. He attended the lectures of Philip Herst upon ethics; of Daniel Stahl upon logic and metaphysics; of Johann Zeisold upon physics; and of Johann Michael Dehlerr upon oratory and history. These were branches of knowledge which the jurists of his day were only in a few rare instances beginning to cultivate, but he found, in after-life, advantage from this preliminary intellectual discipline. Even at this early age, if we may credit the narrative of his son, he had become aware of the important lights which a study of history was calculated to throw upon the doctrines of law, and the advantage a lawyer might derive from cultivating a logical precision in the statement of his arguments and an elegant diction. So strong was his sense of the latter requisite, that, in addition to the public lectures on rhetoric, he attended private classes for practical exercise in oratory. Seeing also how much depended in law upon precision of language, he extended his inquiries into the field of philology.

All these pursuits however were carried on in subordination to his legal studies. He attended the lectures of Peter Dieterich, Erasmus Ungebauer, and Ortholph Fomman. The last-mentioned was a relation of Struve's mother, and the young man had been confided to his superintendence, a trust which he conscientiously discharged by a watchful direction of his private studies. Struve had no relish for the wild merriment which then, even more than in modern times, was characteristic of the German student. He seems to have been of a quiet and even timid disposition, for a fright that he got from some soldiers, when a marauding party plundered Jena, soon after his arrival at the University, impaired his health sensibly for several years. His irreproachable conduct prepossessed the professors in his favour; and the distinguished appearance he made in a disputation which he maintained, in the philosophical faculty, on his thesis 'De Victoria et Clade,' in 1638, raised great expectations of his future eminence. He quitted Jena on the 11th of September, 1639, and his public certificate from the heads of the University was more than usually flattering.

He remained upwards of a year in his father's house for the purpose of re-establishing his health, which had not yet recovered from the effects of the shock above alluded to. In the year 1641 he entered himself at the University of Helmstädt, where he remained till April, 1645. Hermann Conring was then in the vigour of life: Struve attended during the summer of 1641 his lectures on the history of antient Germany, to which the 'Germania' of Tacitus served as a text-book. In the winter of the same year he heard Rudolph Diephold's lectures upon 'genealogia historica,' as a supplement or continuation of Conring's; whose lectures upon politics he attended at the same time. In 1642 he was a member of a class to which Conring expounded the 'Politics' of Aristotle. Heinrich Hahne, at that time the most esteemed civilian in Germany, had ceased to lecture, but Struve was fortunate enough to be selected as his amanuensis on some occasions, and heard the 'Pandects' explained by his colleague Wesenbeck. His relation with Conrad Horn was more intimate, for his father had placed him under the immediate control of that professor, who exercised him, along with his other pupils, unremittingly in private disputations. In January, 1642, Struve maintained a public disputation in the juridical faculty, on a thesis 'De Damnis, illis præcipue quæ ex dolo, culpâ, aut casu proveniunt, harumque correctionibus et præstationibus.' And in July, 1643, he maintained one in the philosophical faculty, on a thesis 'De Ducibus et Comitibus Imperii Germanici.' In February, 1645, he again supported a juridical thesis 'De Vindicta Privata;' and having been admitted to the preliminary examinations, received his licence as candidate for the degree of Doctor of Laws.

Two months thereafter, before he had completed his 26th year, he was appointed by Augustus, duke and archbishop of Magdeburg, assessor to the magistrates of Halle, an office which he retained not quite a year and a half. In the month of February, 1646, he received as a matter of course the title of Doctor; and in the December following he was called to fill the chair of law in the university of Jena, left vacant by the death of Fibigius. He was admitted an assessor to the magistracy in January, 1647; and in June, 1648, an assessor to the high court of the circle of Saxony. He continued in the discharge of his judicial and academical duties till 1667. His opinions were in great request both in controversies relating to public and those relating to private rights. The town of Brunswick, being at that time involved in a dispute regarding its privileges with the duke, requested Struve to undertake the management of their legal business; and he, having obtained the consent of the patrons of the university, was appointed, on the 26th of March, 1661, counsel in ordinary to the good town of Brunswick for three years, with an annual salary of 300 dollars, becoming bound to advise its magistrates in writing whenever called upon, and, if necessary, to visit the town four times in the year. The duke and town having settled their dispute by a compromise, this connection was dissolved in December, 1663. At first Struve lectured upon the 'Institutes,' a duty devolving upon the youngest professor. As his seniors died off, he was called in succession to lecture upon the 'Pandects,' the 'Code,' and ultimately upon feudal law. Entertaining from his own experience a high opinion of the benefit to be derived from disputations, he encouraged his pupils to engage in them frequently among themselves under his guidance; and in course of time the idea suggested itself to him of making the young men maintain in succession disputations on all the leading doctrines of the branch of law he might be lecturing upon at the time. From a series of theses impugned and defended in this manner arose his 'Syntagma Juris Feudalis,' first published in 1653, and his 'Syntagma Juris Civilis,' first published in 1658.

He received unexpectedly, in the year 1667, the appointment of privy counsellor to the dukes of Weimar, and transferred himself with his family to the seat of government in the month of December. His discharge of the duties of this office gave so much satisfaction, that when the line of Saxe-Altenburg became extinct in 1672, and doubts were entertained whether the line of Gotha or Weimar had the nearest claim to the succession, he was selected as the ablest person to advocate the cause of his masters. In the conduct of this delicate business he had the merit or good fortune to give entire satisfaction, both to the party for whose interests he acted, and that to which he was opposed. When the territories of the house of Weimar were divided between the brothers, he remained in the service of the duke of Weimar. Notwithstanding the load of public business which devolved upon him during this period of his life, he contrived to find some time for the literature of his profession. He published in 1669 answers to objections which had been urged against some of the doctrines maintained in his 'Syntagma Juris Civilis,' a work which had however been completed before he left Jena. He compiled his remarks on the 'Immo' of Gothofredus, which his son Burkhard Gotthelf published at Frankfort after his death. In 1668 he published 'Jus Sacrum Justinianeum.'

The Ordinarius of the Judicial College of Jena died in 1674; and notwithstanding the active competition of the most distinguished German jurists for so honourable and lucrative an employment, Struve was selected by the patrons of the university as the best qualified for the office, along with which the professorship of canon law was then uniformly held. On the 28th of July, he made with his family a sort of triumphal entry into Jena; for the citizens and the members of the university met him in procession at some distance from the town. The important offices to which he had been appointed he continued to fill till his death, although the active discharge of their duties was interrupted for a time by the affairs of the regency of Jena.

On the death of Duke Bernard, to whose share the duchy of Jena had fallen at the partition of the Weimar territories, his son Johann Wilhelm, a minor, succeeded. His uncle Johann Ernest of Weimar was guardian, but it was deemed expedient that a permanent council of regency should sit at Jena. Struve was appointed president of this body about the end of August, 1680. In virtue of this appointment, the whole burden and responsibility of the general executive government of the territory, the discharge of the consistorial business, and the management of the finances, fell upon his shoulders. He was obliged to relinquish to another the discharge of his professorial duties, reserving however his appellate jurisdiction as ordinarius. So many cares naturally distracted his attention from his own private concerns, which were considerably dilapidated in consequence of his elevation. His pre-eminent position too exposed him to much malevolence; but he laboured indefatigably, and gave satisfaction both to the duke of Weimar, and to the duke of Eisenach, who at his death succeeded him in the regency. The young duke of Jena died towards the close of 1690, not long after a partition was agreed to by the lines of Weimar and Eisenach, and the council of regency being dissolved in consequence, Struve was restored to his academical functions.

His life at Jena, both before and after this interruption, though a busy was a uniform one. As privy counsellor he attended every consultation to which he was summoned by the dukes his masters. As Ordinarius he presided both in the ordinary and appellate tribunals of Jena. He prepared opinions in reply to the cases addressed by numerous applicants either to the Judicial College of Jena or to himself individually. In addition to these occupations, he faithfully expounded to his pupils the doctrines of the canonical law as then received in the courts of the Protestant states of Germany. After the dissolution of the regency, he did not again enter the academical chair, but continued nevertheless, with unabated diligence, to urge on the literary undertakings to which his professional duties had prompted him, and which, even whilst acting as vice-regent, he had not neglected. He prepared a new edition, with notes explanatory of the points in which the Lutheran deviated from the Roman Catholic system of canon law, of Valerius Andrea's treatise on that branch of jurisprudence, which he used as a text-book; but it was not published till 1680, when other cares prevented him from continuing his lectures. The chief ambition of his later life was to bring the canonical law of Protestant Germany into a better and more systematic form. With that view he projected various works; but on account of their extent, and the interruptions he experienced, only fragments of them were completed. A projected 'Jurisprudentia Canonica,' after the model of his own 'Jurisprudentia Romano-Germanica,' remained a mere project. Of a complete 'Commentary on the Five Books of the Decretals,' only that which relates to the fifth book, 'De Delictis,' was published, at Jena in 1691: it appears that his son Georg Gottlieb acted as editor. It was his intention to treat the doctrine of marriage in a much fuller manner in his annotations on the fourth book: valuable materials were collected for the purpose; and he had resolved making his son Burkhard Gotthelf digest them under his own superintendence and direction, but the young man preferred accepting the invitation of his brother at Darmstadt, as has been noticed in the preceding article. The materials for a projected treatise 'De Causis et Beneficiis Ecclesiasticis' were in like manner left unarranged at his death. The materials and plans of the great structure he contemplated alone survived him. He found time, amid all his labours, to compile a system of the common law of the Empire in the German language, a work which was undertaken at the request of Duke Ernest of Gotha, and published in 1689. It was the first German treatise of the kind, and gave a severe shock to the prejudices of most of his contemporaries. The autumn before his death he undertook to prepare an edition of the 'Criminalia' of Carpzovius for a Leipzig bookseller, but death prevented him.

His son remarks that his energy and love of life seemed materially to abate after the shock he received by the death of the young duke. He continued however without intermission the arduous duties of his office, and was seized in court with the illness which carried him off in less than twenty-four hours. It was a maxim which he was fond of repeating, that 'the Ordinarius of Jena ought to die standing.'

Georg Adam Struve was twice married. His first wife was the daughter of Christopher Philip Richter, whom he succeeded as Ordinarius. They were married on the 6th of November, 1648, and lived together fourteen years, during which time she brought him eight children, all of whom died before him except two, Friedrich August, who inherited the property of his maternal grandfather, and died two years after his father, and Johann Wilhelm, a practising lawyer of considerable eminence, long resident in Darmstadt, of whom mention has been made in the preceding article. Conscious that his professional duties incapacitated him from paying the necessary attention to the education of his children, Struve, soon after the death of his first wife, began to look about for a second. His choice fell upon Susanna Berlich, daughter of a distinguished lawyer resident in Dresden. They were married on the last day of October, 1663; and she survived him six years. She brought him seventeen children, of whom four sons and one daughter survived him. Three of the sons, Georg Gottlieb, Burkhard Gotthelf, and Friedrich Gottlieb, embraced the legal profession, but only the second attained to any eminence. Ernst Gotthold was a practising physician in Brunswick. Two of Struve's daughters married lawyers; so that he descended from one line of jurists, and was the progenitor of another.

His published works are—'Syntagma Juris Feudalis,' Jenæ, 1653; ibid., 1659; Frankfort, 1703-4. To the later editions are appended 'Observationes feudales juxta syntagmatis juris feudalis ordinem digestæ;' 'Decas Consiliorum et Responsorum Feudalium,' and 'Centuria Decisionum, quænam res feudales, quænam allodialis.' 'Syntagmata Jurisprudentiæ Civilis,' Jenæ, 1665 (frequently reprinted); 'Jurisprudentia Romano-Germanica Forensis,' Jenæ, 1670; 'Jus Sacrum Justinianeum, sive Progymnasmata ad Titules priores Libri i. Codicis,' Jenæ, 1668, 4to.; 'Evolutiones Controversiarum in Syntagmata Juris Civilis comprehensarum,' Jenæ, 1669; 'Triga Dissertationum: de Vindicta privata et retorsione juris iniqui; de aedificiis privatis; et de annona,' Jenæ, 1670; 'Dissertationes Criminales XVI. in academia Salana publicæ disquisitioni praepositæ,' Jenæ, 1671; 'Decisiones Sabbathinæ, Canonicæ et Practicæ; Selectiones de Conventionibus et Contractis,' Jenæ, 1677, 4to.; 'Notæ et Observationes Theoreticæ, Canonicæ et Practicæ, ad Antonii Matthaei Tractatum de Successionibus,' Jenæ, 1678, 4to; 'Valerii Andreæ Desselii Eretomata Juris Canonici, cum animadversionibus,' Jenæ, 1680 and 1691, 8vo.; 'Dissertatio Juridica de Invocatione Numinis Divini,' Jenæ, 1682, 4to.; 'Jurisprudentz, oder Verfassung der Landüblichen Rechte,' Mersburg, 1689, 8vo.; 'Commentarius ad Librum V. Decretalium de Delictis, Cura Georgii Gottlebii Struvii,' Jenæ, 1691, 4to.

The writings of Georg Adam Struve indicate a mind which, as far as it could see, saw distinctly and correctly. He belonged, notwithstanding his studies in philosophy and history, rather to the race of jurists which preceded him, than to the more accomplished race which succeeded him. His historical erudition is very deficient in critical discrimination; and he labours painfully to torture the doctrines of law into the formulæ of scholastic logic. It was as a practical lawyer that he distinguished himself; a character for which perhaps even the limited range of his mental vision peculiarly qualified him; but towards the formation of which his robust yet tranquil constitution both of mind and body, his clearness of apprehension, self-possession, and moral courage, but above all his high and pure sense of moral rectitude, were invaluable ingredients. His influence in the development of Germen jurisprudence was exercised as presiding judge in an important appellate tribunal; as a consulting lawyer whose opinions were highly valued throughout all Germany; and as a judicious former of the minds of youth. He worked more through the jurists he trained, than by his own works. Georg Adam Struve was one of those robust, quiet, powerful natures which are of more importance in society than nine-tenths of the more glaring personages who engross the admiration of the multitude.

(*Pii Manes Struviani, sive de Vita et Scriptis Georgii Adami Struvii, Illustris quondam Jureconsulti quibus* *justa persolvit moestissimus filius Burcard Gotthelf Struve*, Jenæ, apud Johannem Bielkium, 1705.)

STRUVE, BURKHARD GOTTHELF, third son by the second marriage of Georg Adam Struve, was born at Weimar on the 26th of May, in the year 1671, and was carried to Jena, when his father transferred his residence to that University, on receiving the appointment of Ordinarius of the Judicial College there, in 1674. Great pains were taken with his education by his parents; and in after-life Struve often acknowledged his obligations to Johann Friedrich Durre, who had the charge of his elementary education. An incident mentioned in the Memoir of his father, which he published in 1705, almost leaves the impression that the old gentleman treated him in boyhood like a favourite plaything. The last time Georg Adam Struve presided at the creation of a number of doctors of law, in the year 1680, he commanded Burkhard, then a boy of nine years only, to make his remarks, and put questions with the rest of the assembly.

Not long after this event the boy was sent to the gymnasium at Zeitz, and confided to the care of Christopher Cellarius, rector of the institution. Young Burkhard made himself so useful to his preceptor, both in his private study and in the public library, that he gained his confidence sufficiently to be employed as an assistant upon the corrected and enlarged edition of Faber's 'Lexicon,' which he had undertaken to publish.

Burkhard Gotthelf Struve, having attained his seventeenth year, returned to Jena for the purpose of commencing his university studies, in 1788. His father, who was then engrossed with the labours which fell to his share as president of the regency of the duchy of Jena, had relinquished for a time the active discharge of the professorial office. At the urgent request of his son however he consented to give private instruction, on Wednesdays and Saturdays, to him and eleven of his young associates, in the system of Romano-Germanic law recognised by the tribunals of Germany, and the plan of tuition pursued was to examine the pupils upon the elementary treatise on this branch of law compiled by their instructor, and to exercise them in arguing upon controverted doctrines. Burkhard attended at the same time the prelections of Johann Hartung and Peter Müller in Roman law. He seems however to have been a more assiduous frequenter of the literary classes of Jacob Müller, Andreas Schmidt, and especially of Georg Schubart, then rector of the University, under whose presidency he held, in 1689, a public disputation upon some theses appended to his dissertation 'De Ludis Equestribus.' Not long after he disputed in the juridical faculty on the legal doctrines 'De Auro Fluviatili;' and on both occasions he is said to have impressed his auditory with admiration of his precocious talents. While thus engaged, he did not neglect pursuits more consonant to the tastes of his age, country, and academical associates. He learned dancing, and was for a time a frequent attendant in the fencing-school. Tiring however of these pursuits, he devoted himself with ardour, in his leisure hours, to the study of the French language. In the Memoir of his father, already alluded to, he mentions that about this time he was employed by his father in a collation of his Latin treatise 'Jurisprudentia Romano-Germanica Forensis,' with his work on the same subject in German, to show that the one was not a mere translation of the other, but a different work. The statement which Burkhard drew up on this occasion was meant to be inserted in the pleadings of the publisher of the German work, against whom the publisher of the other had brought an action; but it was published, at a later period, by the bookseller, as a preface to a new edition, without the compiler's knowledge or consent. An exercise of this kind, and the repetitions under his father, were well calculated to impress the leading doctrines of the law upon his memory.

Towards the close of the same year in which he maintained his first public disputations, Burkhard Gotthelf Struve repaired to the university of Helmstädt, for the purpose of studying history under Heinrich Meibom, and civil law under Georg Engelbrecht. After a year's residence at Helmstädt he went to Frankfort on the Oder, in order to profit by the instructions of Samuel Stryk and Peter Schulz. During his abode at Frankfort he engaged in a controversy which led him to appear for the first time in print. An obscure jurist of the name of Schnegas had published, in 1689, a treatise 'De Concursu Creditorum,' in which he attacked some doctrines laid down by the elder Struve, in his 'Institutes of Forensic Law,' regarding the classification of creditors and the right of property in dowry. Burkhard asserted the correctness of his father's views in a pamphlet, which he called 'Struvius non Errans,' and which, to judge by the warmth with which he speaks of the controversy at a much riper age, must have been rather bitter. Schnegas replied in the same strain, but his young antagonist was induced by the advice of older and cooler friends to allow the matter to rest.

In 1691 Stryk having accepted of a chair in the university of Wittenberg, Struve returned to Jena, and was soon after sent to Halle by his father, with a view to his attending the sittings of the supreme court there, in order that he might make himself master of the forms of process. The dry details of legal practice were repulsive to a mind early accustomed to the self-indulgent habits of the abstract student, and to the applause attendant upon skill in mere literary controversy. Instead of frequenting the court, he directed himself almost exclusively to the theory and antiquities of public and feudal law. In such a frame of mind he lent a willing ear to the inducements held out by an elder brother to make a tour to Belgium, and afterwards join him at Darmstadt, where he was established as a practising lawyer. He in consequence visited in succession Gotha, the Hague, Amsterdam, Rotterdam, and Leyden, and was everywhere, on account of his father's reputation, kindly received. He afterwards confessed that his thoughts during this journey were rather distracted by the gaiety and splendour of the towns he visited, than earnestly bent upon extending his knowledge; nor was this very unpardonable in one who had only completed his twentieth year. He did however derive some benefit from the conversation of distinguished scholars in Utrecht and Leyden.

At the request of his brother he repaired to Frankfort to take charge of some business for the transaction of which he required a confidential agent in that town. It was the time of the fair, and the novelty and bustle of the scene left a lasting impression upon Struve's mind. The affairs which required his presence there being arranged, he returned to the Hague, and, the first distraction of travelling having worn off, settled to study. The favourite pursuits of the Dutch literati extended his field of inquiry. On the one hand, the Hague being then a centre of an active diplomacy, his investigations regarding public law were enabled to assume a more practical and real character. The literary pursuits too of his new associates had more of the tone of society than those which prevailed in the German universities. On the other hand, the museums of Holland, and especially the collections of coins and other antiquities, attracted him to inquiries for which his investigations into the antiquities of feudal law had in some measure prepared him During his residence at the Hague he was indefatigable in his visits to all the museums and libraries, and in his study of the periodical literature, which opened in a manner a new world to him. He made for himself a considerable collection of coins and antiquities. While thus engaged, and projecting a tour through Spain and Great Britain, he was seized with a violent illness, which interrupted his pursuits.

On his recovery he rejoined his brother, and was employed by him at various times to conduct actions for him in the courts of Darmstadt, Stuttgard, and Cassel. He was induced about this time by the fair promises of a Livonian nobleman to undertake a journey in his company to Sweden for the purpose of obtaining a more intimate acquaintance with the antiquities of Scandinavia. Struve with this view proceeded to Hamburg, where he was to be joined by his companion. The count not making his appearance however, he returned to his brother, and in the same year (1692) visited Wetzlar, for the purpose of obtaining, by attending the sittings of the imperial court, a more accurate knowledge of the practice of public law. While thus engaged, he was attacked by a more severe illness than the preceding; and some of the symptoms induced a suspicion that it was occasioned by poison. No sooner was he convalescent than he received intelligence of the death of his father, and was obliged to leave Wetzlar in order to look after his share in the inheritance. During the period which elapsed between his quitting the university and his return to Jena, his mind, though stimulated to greater activity and familiarised with objects of greater reality and importance than had previously engaged his attention, had been dissipated and distracted with their multiplicity. To the end of his life he occasionally expressed regret that he had not, in compliance with the request of his father, remained at Jena, to digest under his direction his collections for a commentary on the law of marriage, an occupation which must have contributed to give him more precision and more command over his thoughts.

On his return to Jena, Struve found one of his brothers eagerly engaged in pursuit of the philosopher's stone. He was of a facile disposition, as is apparent from an anecdote he relates in the Life of his father, of his incurring a rebuke by undertaking to solicit privately for a person whose conduct was under judicial investigation. This easiness of temper at first led him to join in his brother's experiments, but the frenzy seized him in turn, and he was soon as zealous an adept as the other. As might have been anticipated, the search after the secret of making wealth ended in beggaring both. The brother was only saved from a gaol by Struve selling the collection of curiosities he had made in Holland, and even a part of his wardrobe. To the intoxication of his golden dreams succeeded a state of miserable depression which lasted for two years. He secluded himself from society, and absorbed himself in the study of the Scriptures and the theological writings of Tauler and Arndt.

When he recovered his elasticity of mind, he found himself unable to encounter the expense of following out the academical career to which his father had destined him. Some time elapsed before any prospect of employment opened to him. In 1695 he published at Frankfort on the Main some notes on the legal doubts of Gothofredus (known among jurists as the *Immo* of Gothofredus), from a manuscript of his father. In 1696 he published a letter to his old teacher Cellarius, 'De Bibliothecarum harumque Præfectis.' At last, in 1697, he was appointed by the patrons of the university of Jena curator of the library. Upon receiving this appointment, he opened private classes, giving instruction, according as his pupils desired, in physics, the elements of the Greek language, Roman antiquities, or history. The number of young men who attended him excited the envy of the established teachers, and drew down upon him the active enmity of Schubart. It was found necessary to provide himself with a legitimation as teacher; and for this end he, in the year 1702, took the degree of Doctor of Law and Philosophy at Halle, the usual fees being remitted at the solicitation of Stryk and Cellarius.

As soon as he obtained his degree, he took measures for having himself enrolled as Doctor Legens at Jena, and his subsequent career was one of uninterrupted success. On the death of Schubart, he was appointed to the chair of history, and he commenced the discharge of its duties in 1704, by publishing a programme 'De Vitiis Historicorum,' and delivering a public oration 'De Meritis Germanorum in Historiam.' His fame as a public teacher attracted many of the young nobility from all parts of Germany, and among others Prince Ernest Augustus, afterwards duke of Weimar. Having received, in 1712, an invitation to the university of Kiel, he was induced to decline it by the patrons of Jena conferring upon him the office of historiographer to the university, the rank of counsellor, and the appointment of extraordinary professor of law. He was promised the succession to the ordinary professorship of feudal law, which he actually obtained a few years later. In 1717 he was appointed a privy counsellor by the reigning prince of Baireuth; and in 1730 he received the same compliment from the Saxon court. He repeatedly filled the office of Dean in the Philosophical Faculty, and was thrice chosen rector of the university. He died on the 24th of May, 1738, having nearly completed his sixty-seventh year.

Struve was thrice married. He was united to his first wife, Anna Elizabetha Bertram, daughter of an assessor in the court attached to the salt-works of Halle, in 1702, who died in 1706, leaving him two daughters. He married in 1707 his second wife, Regina Elisabetha Stäudler, daughter of the town-clerk of Naumburg on the Sala; the year of her death is uncertain; she left no surviving children. In 1724 he married Sophia Maria, widow of Ernest Friedrich Kittoner, a clergyman in Quedlenburg, who brought him no children.

The published works of Burkhard Gotthelf Struve are very numerous. A complete list of them is given in the 'Acta Eruditorum' of Leipzig, published in 1740. The following are the most important, either on account of their subjects and inherent interest, or of the indications they give of the progress and direction of the author's studies:—'Struvius non Errans,' Franc. ad Viad., 1691, 4to.; 'Bibliotheca Numismatum Antiquorum,' Jenæ, 1693, 12mo.; 'Pia Mortis Desideria in Obitum Susannæ Berlichiæ, matris piatissimæ,' Jenæ, 1699, 8vo.; 'Didaci Saavedræ Abriss eines Christlichen Politischen Prinzen,' Jenæ, 1700, 12mo.; 'Antiquitatum Romanarum Syntagma, sive de Ritibus sacris Systema absolutius, adjecta Bibliotheca, Figuris æneis, et Indicibus necessariis,' Jenæ, 1700; et auctior., 1729, 4to.; 'Acta Literaria ex MStis edita et collecta' (17 fasciculi collated, with the date 1713 on the title-page); 'Bibliotheca Juris Selecta,' Jenæ, 1703 (frequently republished, ultimately with additions by Buder); 'Introductio ad Notitiam Rei Literariæ, et Usum Bibliothecarum,' Jenæ, 1704 (contains the 'Dissertatio de Doctis Imposteribus,' published separately by the author in the preceding year); 'Bibliotheca Philosophica in suas classes distributa,' Jenæ, 1704, 8vo. (frequently republished latterly with additions by Kahl); 'Selecta Bibliotheca Historica,' Jenæ, 1705, 8vo. (republished with additions by Buder); 'Pii Manes Struviani, seu de Vitis et Scriptis Georgii Adami Struvii,' Jenæ, 1705, 8vo.; 'Syntagma Juris Publici Imperii Romano-Germanici,' Jenæ, 1710, 4to. (republished in 1711; and again much enlarged, with the title 'Corpus Juris Publici I. R. G.,' in 1738); 'Syntagma Historiæ Germanicæ, à primâ gentis origine ad annum usque 1716,' Jenæ, 1716, 4to. (subsequently published in an enlarged form, with the title 'Corpus Historiæ Germanicæ, à primâ gentis origine ad annum usque 1730, ex genuinis historiarum documentis, coævorum scriptorum monumentis, diplomatibus, et ex actis publicis, illustratum cum variis observationibus et figuris æneis, adjecto indice locupletissimo, et opusculis ad historiam Germanicam facientibus; præmissa est Chrest. Gottl. Buderi Bibliotheca Scriptorum Rerum Germanicarum, easdem universum illustrantium,' Jenæ, 1730, fol. (a German translation of this work has been published); 'Historia Juris Romano-Justinianei, Græci, Germanici, Canonici, Feudalis, Criminalis, et Publici,' Jenæ, 1718, 4to.; 'Einleitung zur Deutschen Reichs Historie,' Jenæ, 1724, 8vo.; 'Corpus Juris Publici Academicum,' Jenæ, 1726, 8vo. (thrice republished); 'Compendium Juris Feudalis,' Jenæ, 1727 and 1737, 8vo.; 'Kurtzer Entwurff zur Einleitung zur Wissenschaft der Staaten von Deutschland,' Jenæ, 1733, 8vo. (the title of this work contains the term 'scientia statistica,' the invention of which has been attributed to Achenwall); 'Corpus Juris Gentium, sive Jurisprudentia Heroica ex Juris Naturæ et Gentium Argumentis petitum, et innumeris exemplis ex actis publicis editis et ineditis, historiarumque monumentis, omnis ævi illustratum' (this work occupied thirty years of its author's life, was left complete, but unpublished, at his death, and appeared at Jena in 1743, edited by J. Aug. Helfeld).

Much of the reputation of Burkhard Gotthelf Struve during his lifetime seems to have proceeded from his personal amiability, and from his usefulness as a general index. His style is heavy, and his thoughts scarcely ever original or striking. His services to the literature of history and jurisprudence are great, but they are mainly the services of an able librarian and index-maker. To him perhaps rather than to Achenwall belongs the merit of having given a more systematic form to the statistical branch of education as taught in the universities of Germany—an important department of information, but too apt to spread out into trivial diffuseness.

(*Nova Acta Eruditorum*, anno 1740 publicata, Lipsiæ, 1740; *Ad Nova Acta Eruditorum quæ Lipsiæ publicantur Supplementa*, Tomus iv., Lipsiæ, 1742; *Pii Manes Struviani, sive de Vita et Scriptis G. A. Struvii*, Jenæ, 1705; *Bibliothèque Germanique*, tomes viii. et xliii., Amsterdam, 1724 and 1738; Martini Lipenii *Bibliotheca Realis Juridica*, Lipsiæ, 1757.)

STRY, THE CIRCLE OF, in the kingdom of Galicia, is bounded on the north and north-east by that of Brzezan; on the south-east by that of Stanislawow; on the west by that of Sambor; and on the south by the kingdom of Hungary. Its area is 2170 square miles, and the population is probably not much under 220,000, of whom 13,000 or 14,000 are Jews. The whole circle is mountainous, and it is only on the north-east and north-west sides that there are some small plains. The valleys between the mountains are however tolerably fruitful. The principal river is the Dniester, which however only flows through the north-east part of the circle; the Stry falls into the Dniester near Zybaczow. There are numerous small rivers and torrents. Agriculture is not carried on to any great extent; the inhabitants grow however corn, rye, barley, and oats, and a considerable quantity of potatoes and flax. The forests are extensive, and the consumption of wood is very great, partly for the salt-works, and partly for the iron-forges. Hassel observes that the number of cattle of all kinds was small, there being in 1817 only 4146 horses, 29,935 oxen, 35,392 cows, and 29,935 sheep. An official table for 1830 shows a very great increase, except in the number of sheep, viz. 10,544 horses, 47,491 oxen, 44,629 cows, and 21,921 sheep. There are no manufactures.

Stry, the capital of the circle, is situated in a tolerably fertile and well cultivated country, on the left bank of the river of the same name, over which there is a wooden bridge. It is surrounded with walls and ditches, and is one of the best towns in Galicia: about half of the inhabitants are Jews. The population is about 6000. There are one Roman Catholic and one United Greek church, a synagogue, a castle, and several schools.

(Blumenbach, *Gemälde der Oesterreichischen Monarchie;* Anonymous, *Historisch-Statistischer Umriss von der Oesterreichischen Monarchie; Oesterreichische National Encyclopädie.*)

STRY'CHNIA, a vegetable alkali obtained from the *Strychnos Nux-vomica*, in which it exists combined with the Igasuric or Strychnic acid. Its properties are, that it is colourless, inodorous, crystalline, unalterable by exposure to the air, and extremely bitter. It requires more than 6660 times its weight of cold water, and 2500 times of boiling water for solution. It is insoluble in absolute alcohol or in æther, but in diluted alcohol it is to a certain extent soluble, and the solution by spontaneous evaporation yields crystals in the form of the octohedron, and of a square prism terminated by four-sided pyramids.

It acts like other alkalis on vegetable colours, and neutralises and forms salts with acids. It is extremely poisonous; one-eighth of a grain is sufficient to kill a dog, and a quarter of a grain produces a decided effect upon a man. As usually obtained, which is by a tedious and complicated process, it is probably mixed with some *brucia*, another extremely powerful vegetable alkali.

It is composed of—

Sixteen equivalents of hydrogen .	16 or	6·8
Thirty equivalents of carbon . .	180 ..	77·0
Three equivalents of oxygen . .	24 ..	10·2
One equivalent of azote . . .	14 ..	6·0
Equivalent . .	234	100·

It is employed in medicine.

STRYCHNIC ACID. This acid, as already noticed, exists in the *Strychnos Nux-vomica* in combination with strychnia. It is soluble both in water and in alcohol, and has an acid rough taste; it produces no change in the solutions of the salts of silver, iron, or mercury, but precipitates those of copper, of a green colour.

STRYCHNOS (from στρύχνος), a name applied by Theophrastus and Dioscorides to a kind of nightshade, and adopted by Linnæus for a genus of plants belonging to the natural order Apocynaceæ. This genus has been made the type of a distinct order by Blume, who has been followed by Link, D. Don, and others. The principal difference that it presents from the order Apocynaceæ, to which it is referred by Von Martius, Brown, and Lindley, is in its peltate seeds and simple succulent fruit. This genus is composed of trees or shrubs, which do not yield a milky juice, and have opposite usually nerved leaves and corymbose flowers; some of the species are possessed of tendrils, and are climbing plants. The calyx is 5-parted; corolla tubular, funnel-shaped, with a 5-parted spreading limb, which is valvate in æstivation; the stamens are 5, inserted into the throat of the corolla; ovary 2-celled, with a single style and capitate stigma; fruit a berry, pulpy inside, with a hard rind; seeds peltate, numerous, attached to a central placenta, with copious albumen, and foliaceous embryo. The species are not numerous, and are found principally in the tropical parts of Asia and America. One has been described by Mr. Brown a native of New Holland.

Strychnos Nux-vomica, Poison-nut or Ratsbane, is characterised by its oval shining leaves 3-5 nerved, and its round smooth berries containing many seeds. The flowers are small, and of a greenish-white colour, and are arranged in terminal corymbs. The fruit, when ripe, is of the size and colour of an orange. Although the seeds of this plant yield an alkaloid, which is a deadly poison, the pulp of the fruit is greedily eaten by many kinds of birds. The wood of this plant is very hard and durable, and on that account is applied to many purposes by the natives on the coast of Coromandel and other places where it grows. For the medical properties of this plant, see the article on that subject.

S. potatorum, Clearing-Nut, has ovate or oval glabrous pointed leaves; a deeply fissured bark, and berries containing only one seed. It is an abundant plant in the woods and mountains of the East Indies. It has shining fruit, which is black when ripe. When full grown, it attains a height of from 15 to 20 feet, and, like the last species, has a very hard wood, which is used for various economical purposes. The English name is derived from the use which is made of the seeds, which, when dried, are sold by the natives for the purposes of clearing muddy water.

S. St. Ignatii, St. Ignatius's Bean, has ovate acute glabrous leaves; pyriform fruit with many seeds, and 4-flowered axillary peduncles. It is a climbing shrub, without tendrils, bearing long drooping white flowers, which have the scent of jasmine. This species is the *Ignatia amara* of Linnæus, but has been referred to the present genus by later botanists. It is a native of Cochin-China, the Philippine Islands, and other parts of Asia. This plant is called *Papeeta* in India, and is used by the native doctors as a remedy in cholera, but is administered in conjunction with Jehiree (*Cocos Maldivica*). When given in overdoses, the symptoms are those of poisoning by strychnia, as vertigo, convulsions, &c., and the remedy used for these effects is lemonade in large quantities, which is said to afford relief speedily

S. colubrina, Snake-wood, or Snake-poison Nut, is a climbing plant with simple tendrils; leaves oblong or oval, obtuse, 3-nerved, shining; ovaries many-seeded. It is a native of the coast of Coromandel and of Silhet. It has small greenish-yellow flowers, and fruit as large as an orange, of a yellowish colour. It is called by the Telingas *Naga Musadi*, and is considered by the Indian doctors as an effectual remedy for the bite of the *Naga* or *Cobra de Capella*, a well-known poisonous snake. For this purpose it is used both externally and internally. It should however be stated as the result of the observation of the most intelligent travellers, that these vegetable remedies are not to be depended on in cases of bites of serpents, and that where danger is apprehended, the only effectual remedy is excising the wound. The wood of this and other species of the genus is brought to this country, and known under the name *Lignum colubrinum*.

S. Tieute, Tjettek or Upas Tieute, has elliptical, acuminate, 3-nerved, glabrous leaves, and simple tendrils, which are thickened opposite the solitary leaves. This plant is a climbing shrub, and is a native of Java, and is said to be the true Upas-tree of that country. It is undoubtedly the most poisonous species of the genus, and yields the greatest quantity of strychnia. There are several other plants which are called by the name of Upas in various parts of Asia. The natives of Java prepare from this species one of the most deadly of the various poisons that are used by barbarous nations, for producing death by the wounds occasioned by their arrows.

S. toxifera, Wooraly, *Urari*, or Poison-plant of Guiana, has a climbing stem, thickly covered with long spreading reddish hairs; coarse, rough, 5-nerved, ovate, or oblong, shortly acuminate leaves; large round fruit. This plant is a native of Guiana, and was lately brought to this country by Mr. Schomburgk. It had long been suspected that the poison used by the American Indians for their arrows was a species of Strychnos, but such is the secrecy with which they gather the plant and prepare the poison, that all inquiries had been frustrated. Mr. Schomburgk's long stay in Guiana has enabled him to decide this point: by bribing some of the natives, he induced them to guide him to a spot where their famous Urari flourished, and on arriving at the place, found it to be the species of Strychnos above described. In the preparation of the poison, the Urari is not the only ingredient, but forms about half of the bulk of the ingredients used. For a full account of the discovery of this plant, and the mode of making the poison, with its effects on the animal economy, the reader is referred to Mr. Schomburgk's account of the Indian arrow-poison.

(*Annals of Natural History*, vol. vii., p. 407.) It is remarkable that the poison prepared from this plant, though destroying life so rapidly when applied to a wound, may be taken into the stomach in doses of several grains without producing any ill effects, and it has even been proposed as a remedy in many diseases. It must be admitted however that it is a dangerous remedy to administer, as by coming in contact with the slightest abrasion of surface or ulceration, it might immediately destroy life.

S. pseudo-quina, Quina do Campo, has short-stalked, ovate, quintupled-nerved leaves, which are callous at the edge and smooth, or nearly so, above. It is a native of Brazil, and forms a scrubby plant about 12 feet high, with a corky bark. Its fruit is a smooth shining berry of a yellow colour, containing only four seeds. This plant is not poisonous, and is remarkable for its bitterness, which gives it a resemblance to the gentians and cinchonas. The fruit of this species is eaten by the native children. The fruit also of a species, *S. brachiata*, is eaten by deer in Peru, and that of *S. spinosa*, a Malagash plant, is greedily devoured by swine.

STRYCHNOS NUX-VO'MICA, *Medical Properties of*. The genus Strychnos, consisting of about twelve species, is remarkable for containing among these some which possess only mild or beneficent properties, while others are endowed with more potent and destructive powers than almost any other members of the vegetable kingdom. This extraordinary difference is presumed to be owing to certain species containing only an extractive, which is tonic and febrifuge, while others contain one or two alkaloids, which are extremely poisonous. This is true as far as the S. Nux-vomica, S. Ignatia, S. Colubrina, and S. Tieuté are concerned, all of which contain either *Strychnia* or *Brucia*, and some both of these alkaloids; but it does not apply to the S. toxifera (Schomburgk), in which no alkaloid has been detected. It must be admitted however that the S. toxifera, though equally fatal with the others, produces death in a different way. Those possessed of an alkaloid destroy life by exciting *tetanic spasms*, while the *wourali*, or *worary*, or *urari* (prepared from the S. toxifera), produces diametrically opposite effects, as the muscles of voluntary motion are *paralysed* by it. The only species strictly officinal is the nux-vomica, *poison-nut*, or *ratsbane*, of which the seeds are employed, and to this attention shall be at present confined.

Strychnos Nux-vomica is a native of Coromandel, Malabar, Ceylon, and other parts of India, growing in sandy places, and attaining the size of a tree, but short, crooked, and sometimes twelve feet in circumference, flowering in the rainy season. The fruit is about the size of a St. Michael's orange, with a bitter astringent pulp, and containing (according to Sir Whitelaw Ainslie) from three to five seeds. The pulp may be eaten, but the seeds are poisonous and officinal; each seed is flattish, or very slightly concave on the side of the umbilicus, convex on the other, thickened at the margin, peltate, about three lines in thickness, and clothed with dense greyish, silky, or velvety hairs, which towards the umbilicus are arranged in concentric circles. The testa or coat is thin, the nucleus white or greyish, hard, horny, or cartilaginous, bipartite or divided by a cavity in the centre; the embryo is near the margin of the seed, and its position is often indicated by a prominent point.

Owing to the hard cartilaginous nature of the seeds, they are extremely difficult to reduce to powder or to slice. Different expedients are adopted to accomplish this. They may be exposed to the vapour of boiling water for two hours, then chopped or sliced, afterwards dried rapidly, and ground in a mill; or they may be boiled in an iron kettle with a small quantity of water, then dried and pounded; or merely steeped in water, sliced very fine, and then dried and pounded. Merck boils them in a close vessel for twenty-four or thirty-six hours with dilute sulphuric acid, by which they are completely softened. The mortar in which they are pounded, or the mill, should be kept covered, as the dust ascending may prove deleterious if inhaled. Old or mouldy seeds should be rejected, and consigned to the fire, but not thrown out, as they are destructive to pigs and other animals. Their freshness and excellence may be judged of from the whiteness of the interior when sliced. The entire seed is devoid of odour, but the powder has a peculiar one, somewhat resembling liquorice: the taste is nauseously bitter. Nux-vomica should never be purchased in the state of powder, as it is frequently adulterated with common salt or even emery-powder.

In Tobago an oil is expressed from the fresh seeds, which is used for burning.

The best analysis of the seeds of nux-vomica is by Pelletier and Caventou (*Annales De Chimie et Physique*, x., p. 142), who found—

Strychnate (or igasurate) of strychnia, 0·4 per cent.; strychnate of brucia; wax; concrete oil; yellow colouring-matter; gum; starch; bassorin; woody fibre; carbonate of lime and chloride of potassium, in the ashes.

It is on the strychnate of strychnia, and, in a less degree, on that of brucia, that the active properties of nux-vomica depend. Strychnia can be separated and purified by the process given above. [STRYCHNIA.]

Five pounds of the seeds yield sixteen ounces of a watery extract, and ten ounces of an alcoholic extract, which however always contains some green concrete oil soluble in æther.

Nux-vomica seems to exert a deleterious influence alike over vegetables and animals; there is however a difference of susceptibility to its action in different classes of animals, since a much larger quantity is necessary to destroy herbivorous than carnivorous animals.

The degree of effect varies with the quantity employed, but it seems to be the same in kind, being confined to the ganglionic system of nerves and the spinal chord, extending as high up as the medulla oblongata, and, according to Flourens, influencing even the cerebellum, but certainly not directly affecting the cerebrum. Hence in fatal cases the intellect is not disturbed till the extinction of life. The decapitation of animals does not hinder the characteristic action of nux-vomica, while, on the opposite hand, the removal of the spinal-marrow completely prevents its peculiar agency, even though artificial respiration be maintained. 'From some experiments of Segalas, it appears also to exhaust the irritability of the heart; for in animals he found that organ could not be stimulated to contract after death, and life could not be prolonged by artificial breathing. Nux-vomica differs from all narcotic poisons, by not exhausting the sensibility. During the intervals of the fits the sensibility is on the contrary heightened, and the faculties acute.' (Christison.)

Three distinct degrees of action may be observed from the use of nux-vomica. In small doses the ganglionic system appears chiefly to be affected, and this so slightly, that any phenomena are observed only in cases of disease, particularly in hysterical and weak persons. The secretions are increased, both of the intestinal canal, the liver, the kidneys, and of the skin, accompanied with an increase of appetite and improved digestion.

It is in the second degree of action that the characteristic effects of nux-vomica begin to appear. The patient experiences a feeling of weight and weakness in the movements of the limbs, inducing him to remain at rest; while his mind is restless, sad, depressed, and anxious for solitude and darkness, as he is peculiarly sensitive to light, noise, or the movement of the surrounding objects. With an augmentation of the dose, these phenomena are increased, and the contact of any external body causes a feeling like an electric shock, the voluntary muscles are no longer under the control of the will, and the individual staggers on the least attempt at walking. At the beginning of these occurrences the pulse is hard and quickened; the gums, cheeks, and eyes reddened, and the respiration more frequent; but when the nervous system is more affected, the hardness of the pulse subsides, the countenance becomes of an ashy paleness, the eyes appear sunken, articulation is difficult and indistinct, breathing is laborious, and accompanied with violent spasms of the larynx, and the other muscles of respiration are irregular in their action. After these symptoms have lasted six or twelve hours, they subside, and a great increase of the secretions is observed to follow; itching of the skin, with much perspiration, even accompanied with an eruption of vesicles or large blebs: the secretions of the serous membranes, of the kidneys, and of the mucous membranes, are sensibly increased, those of the latter sometimes becoming bloody. During this period the patient complains of heat in the stomach and throat, of thirst, of foul taste, and rancid eructations, with nausea, and occasionally even vomiting. While the augmented secretions are taking place, the more prominent nervous symptoms disappear; and in a few days the sufferers recover entirely from the debility and excessive sensibility.

The third degree of action manifests itself by tetanus and asphyxia, occurring in single paroxysms, alternating with paralytic torpor. The paroxysms become longer, and the remissions shorter, in which however, till death close the scene, the intellect remains unaffected. While the voluntary muscles are entirely withdrawn from the control of the will, the pulse sinks and becomes slower, the breathing more and more laborious (' the external muscles of the chest may be felt during the fits as hard almost as bone; and, according to an experiment of Wepfer, the diaphragm partakes of the spasm of the external muscles:' Christison). The belly swells and exhibits blue marks, the countenance is livid, and in a paroxysm of tetanic rigidity the breathing ceases, though the heart's action and the peristaltic motion of the intestines continue for some time; and, if an artery be opened, black carbonaceous blood issues. 'Death however does not always take place by tetanus: in some cases the departure of the convulsions has been followed by a fatal state of general and indescribable exhaustion.' (Christison.) Thus after the spasms have lasted twelve, sixteen, or twenty-four hours, and completely disappeared, the individual has nevertheless died, after being apparently in a state of safety. This has been ascribed to the depressing effect on the heart's action, through the medium of the nervous system, of long continued pain (Alison's *Pathology*); or more probably, according to Dr. Marshall Hall (*Diseases of the Nervous System*, and *Gulstonian Lectures*), to what he terms *secondary asphyxia*. Or the individual may suffer an attack, after the primary symptoms have subsided, of inflammation of the stomach and intestines, which may or may not prove fatal.

Vomiting does not always occur, though the name would seem to imply the frequency of this symptom.

Nux-vomica is important not only for its formidable properties, but for the illustrations it furnishes to certain physiological doctrines. Thus when used in cases where a portion only of the body is paralysed, it excites convulsions in the paralysed part before any action be observed in the sound parts. 'The paralysed parts are the seat of tetanic shocks, of a prickly sensation, and of a perspiration, which is not observed elsewhere. In hemiplegia the sound side of the body remains tranquil, while the affected one is the seat of extreme agitation: the tetanic attacks succeed each other rapidly, and an abundant exudation takes place. Even an anomalous eruption has been observed, while the healthy side has been perfectly free. One side of the tongue is sometimes sensible of a decidedly bitter taste, which is not perceptible on the other. If the dose be augmented, both sides become the seat of tetanic action, though not equally so.' (Magendie.) It is also very remarkable that the contact of any external body with any part of the frame of an individual under the influence of nux-vomica which is supplied with nerves originating from the spinal chord, immediately excites convulsive actions. It is thus thought to support the notion of a distinct or *reflex function* of the spinal chord. (Marshall Hall's *Lectures on the Nervous System*; Grainger, *On the Spinal Chord.*) Certain it is that in persons poisoned by nux-vomica, whether the seeds or bark (false Angustura bark), the mere act of touching the skin to feel the pulse has excited again the convulsive motions. Of these two phenomena, viz. the action of strychnia on the paralysed limbs previous to causing any obvious effect on the sound organs, and of the contact of an extraneous body exciting the tetanic throes, the following explanation has been given by Mr. Grainger:—'Strychnia acts by preference on the paralytic limb or limbs, because the cerebral control is removed from the paralysed limb. If the chord be divided, the pure spinal power remaining, when the skin is touched the limb is retracted, and must be retracted, because the cerebral control is wanting. So when the spinal chord is stimulated by strychnia, it must act on the limb or limbs from which the cerebral power is withdrawn.'

Nux-vomica acts most rapidly when introduced into a vein, and in other instances in the ratio of the absorbing power of the part; but it produces no effect when applied directly to a nerve or to the brain.

In fatal cases the morbid appearances vary according to the period at which death occurs. When death results from asphyxia, the brain is gorged with blood, and the texture softer than natural. When death takes place at a late period, sometimes appearances of inflammation are found in the stomach and intestines; but frequently these are absent. A tetanic stiffness remains in the corpse, till decay commences: this state of rigidity however does not invariably occur.

The powerful properties of nux-vomica, and the rapidity of its action when administered in the state of a pure alcaloid, strychnia, or its salts, have deterred medical men from making so extensive a use of it as its therapeutic qualities entitle it to. The necessity for care in its administration is manifest from the facts, that death resulted, in one instance, merely from a woman grating cheese with a file which had been previously used to rasp seeds of nux-vomica; and in another instance, death ensued from three grains of the alcoholic extract taken at once. The consequence of a salutary dread of its being entertained has been that it is generally employed only as a last resource, instead of being used at an earlier period. It might however be beneficially used, with due caution and careful superintendence, in many cases of hysteria and hypochondriasis, dependent on irregular action of the nerves of the ganglionic system. In cases of hysterical paralysis, accompanied with greatly impaired sensibility, it would be more influential than any other agent in a disease at once tedious and distressing.

In paralysis it has been found more uniformly beneficial than most other remedies, though success has not always attended its employment. It is certainly better suited for some forms of paralysis than for others.

It is most serviceable in cases of paralysis of parts which derive their nerves from the ganglionic system or spinal chord. Hence it is more serviceable in *paraplegia* than in hemiplegia, in palsy of the bladder, of the rectum, and even in some cases of chronic diarrhœa dependent on atony of the intestines. It is more serviceable in the palsies which follow fevers, rheumatisms, repelled eruptions, habitual drunkenness, and exposure to noxious metals, such as lead or mercury, and merely depressed nervous power, than in those which result from effusion of blood. (See Dr. Bardsley's *Hospital Facts.*) Its use is altogether improper immediately after an apoplectic seizure, and indeed whenever vascular fulness or organic disease of the brain is supposed to exist. Though less useful in affections of the nerves which arise from the brain, it has nevertheless proved beneficial in some cases of amaurosis, in which the endermic method of application has been employed, rather than the internal administration of it. Deafness has also been cured by it.

In the Asiatic or epidemic cholera it was of unquestionable service, though its use was generally postponed till a very late stage of the disease, instead of being employed at the commencement, when the premonitory diarrhœa could easily have been checked by it. When employed in paralysis of any of the limbs, an auspicious sign of its beneficial influence is a feeling of formication, and often of sweating, with or without an eruption, and spasmodic twitchings in the limb, while the rest of the body is unaffected.

Though nux-vomica is not, strictly speaking, a cumulative poison, yet it is prudent to suspend the use of it now and then, and upon resuming the employment of it, to return to a small dose, and not employ such a quantity as the patient had already taken; for it must be borne in mind that a person who has once been under its influence is more easily affected than a person using it for the first time.

It was conjectured by Batka, and it has since been proved by Dr. O'Shaughnessy, that the false Angustura bark [GALIPEA] was the bark of the Strychnos nux-vomica; so that in case of poisoning by that article, the same mode of treatment is to be pursued as in poisoning by nux-vomica or strychnia.

In cases of poisoning by nux-vomica, the most prompt treatment is necessary, and still more so if any of the soluble salts of strychnia shall have been taken. 'Nux-vomica is occasionally made the instrument of voluntary death, although no poison causes such torture.' (Christison.) The stomach-pump should instantly be had recourse to, when nux-vomica has been taken in powder, and as it adheres very obstinately to the coat of the stomach, it must be perseveringly used, with plenty of water. Emetics are too tedious in their action to be depended upon. M. Donné has recommended, when strychnia or any of its salts have been taken, to endeavour to form an insoluble salt; and for this purpose proposes chlorine, bromine, or iodine. The tincture of iodine may be procured promptly, but if ten minutes elapse before it be administered, it is unavailing. When the quantity of strychnia taken is not large, nor the symptoms very urgent, vital stimulants or sedatives are often sufficient; and for this purpose wine, brandy, or a mixture of acetous æther and laudanum, or laudanum alone, will remove the present danger. Conium or its tincture offers probable means of antagonising the action of strychnia, as suggested by Dr. Pereira. It is said that the leaves of the Feuillea cordifolia furnish an antidote to nux-vomica and several other vegetable poisons. It must ever be remembered that the danger is not entirely removed, though the spasms may have subsided, and the respiration become easy. Inflammation of the stomach may supervene, which will require the usual treatment, or secondary asphyxia may steal on, and destroy the patient. To prevent this last occurrence, great watchfulness is necessary, especially during the night, and the patient should be frequently awakened, and made to drink freely of green tea. But perhaps the most potent and efficient antidote to the other poisonous strychnias would be the urari poison of South America, as suggested by Mr. Morgan. (See Morgan's *Lecture on Tetanus*, p. 31.) The preparation of this substance, which has been an object of curiosity and interest since the time of Sir Walter Raleigh, has been fully detailed by Mr. Schomburgk. (*Annals of Natural History*, vol. vii.) It is an article of much importance to the natives of Guiana, as much of their means of subsistence depends upon their possessing this poison, in which to dip their arrows for the chase. They employ much mystery in its preparation, and pride themselves on its valuable properties, preferring it, with some show of reason, to gunpowder. 'I know,' said the *amo del curare* (master of poison, or Indian, who knows how to prepare it), 'that the whites have the secret of fabricating soap, and that black powder which has the defect of making a noise, and killing animals when they are wanted. The *curare*, which we prepare from father to son, is superior to anything you can make *down yonder* (beyond sea). It is the juice of an herb, which kills *silently* (without any one knowing whence the stroke comes).' (Humboldt, *Personal Narrative*, 2nd edit., vol. v., p. 517.) The chief if not the only active ingredient is the Strychnos toxifera (Schomb.), and perhaps, in some places, Strychnos cogens (Bentham), the other ingredients (most of which are obtained from climbing plants, lianos, or 'nebbees,' except one bulbous plant, a cissus, and another supposed to belong to the Xanthoxyleæ) are used only to bring the juice to a proper degree of consistency and adhesiveness. Arrows dipped in it have been known to retain their poisonous properties for twenty-seven years. (Iliff, in *Medical Gazette*, vol. xx., p. 261.) The poison when inspissated may be rendered liquid by heat, and is soluble in water, in alcohol, in hydrochloric acid, and in volatile alkaline spirit. It unites with acids without emotion or change of colour. If it be united with alkalis, no ebullition is observable, but it changes its colour from a dark-brown to a yellowish-brown. It possesses a remarkable influence over the blood, after it is taken from a vein. 'A few grains, mixed with as many ounces of human blood, warm from the veins, entirely prevents a separation of serum and crassamentum, and the whole mass continues in a state of fluidity similar to that in which it was drawn, until, after some days, it putrifies.' (Bancroft.) This property seems to point out the propriety of employing it in cholera, in which the separation of the serum from the crassamentum, while the blood was yet in the body, was one of the most remarkable symptoms of that disease. Dr. Hancock is of opinion that it is one of the most potent sedatives in nature, and, could it be safely managed, he had no doubt it might become a valuable remedial agent in the treatment of spasmodic or convulsive disorders. That there are means of controlling its action he was fully persuaded; and such, it appears, are adopted by the Indians of the Rio Negro and Amazon, who were constantly in the habit of shooting monkeys, birds, &c., and after bringing them to the ground, they took means to resuscitate them, and thus carry on a profitable trade with Grand Para and the Brazils. (*Medical Gazette*, vol. xx., p. 281.) The flesh of animals, birds, or fish which have been killed by these poisoned arrows, possesses no deleterious properties when eaten, but is thought to be more delicate than when killed by other means. Like the poison of the viper, which is only noxious when inserted into a wound, and which may be swallowed with impunity, the urari may be taken into the stomach with perfect safety. Its taste is an agreeable bitter, and it has a tonic and febrifuge effect, frequently proving a valuable cure in intermittents. It, as well as the venom of the viper, seems to be disarmed of its virulence by undergoing the process of digestion.

When inserted into a wound, shortly after a quantity of the 'tshittick' poison, prepared in Java from the Strychnos Tieuté (Upas Tieuté; see Sir Stamford Raffles's *History of Java*; Dr. Horsfield's *Plantæ Javanicæ Rariores*, pars 1, and *Annales de Chimia*, vol. xxvi.), it completely stills the convulsions excited by that active agent. (See Morgan's *Lecture on Tetanus*.) As the urari acts upon the brain, producing simple suspension of its functions, and a state of asphyxia by artificial respiration, this state may be recovered from, if the dose has not been too strong, and other circumstances are favourable. (See Brodie, in *Philos. Trans.*, vols. ci. and cii.)

The tshittick poison contains strychnia only, unaccompanied by brucia, and is therefore more rapid in its action than any other strychnos.

On account of the difficulty of preparing the alcoholic extract of nux-vomica of uniform strength, strychnia, or some of its soluble salts, is now generally substituted for it, as these admit of easy subdivision of the dose. Sulphate of strychnia has been used in some cases with great advantage (See Gaskoin, in *Med. Gaz.*, vol. x., p. 316); so also the acetate: but a form of preparation which has proved of service in some long-standing and almost hopeless cases of paralysis, is the hydriodate of strychnia. (See Magendie, *Formulaire*, 8ième edit., p. 244.)

Care must be taken that the strychnia be pure, as a spurious article is vended in France, which contains no trace of strychnia. Bichloride of mercury is a good test for strychnia, but it causes no precipitate from the solution of the acetate of strychnia; but the addition of hydrochloric acid causes a white crystalline precipitate. Sulpho-cyanodide of potassium appears to be the best test for strychnia. (See *British Annals of Medicine*, vol. i., p. 190.)

Strychnia is prepared either from the nux-vomica seeds, in which case it is difficult and expensive to separate it from the brucia, or it is obtained from the St. Ignatius Bean, in which it exists in about three times larger quantity than in nux-vomica. It is also, but rarely, procured from the Strychnos Colubrina. The purest and most easily obtained is furnished by the Strychnos Tieuté, but the rarety of this substance is a practical obstacle to its employment.

Snake-wood. Many substances, in countries infested with serpents, are reputed to be efficacious in counteracting the poisonous bites of these reptiles; one of the most celebrated of these is the root of the Strychnos Colubrina. The strychnia probably acts as an antagonist to the stupifying effects of the poison of the snake, just as arsenic does to the poison of the Coluber carinatus of the West Indies. [Arsenic.]

Strychnos Potatorum, called also S. Tettan Cottay, or Clearing-nut, is a native of India, and is a larger tree than any other species. It is devoid of noxious properties. The fruit, though when very young it is made into a preserve, and eaten, is reckoned emetic by the native doctors. The chief use made of it is to rub the seeds hard for a short time round the inside of an earthen pot, into which water is poured, and in a short time it becomes clear, tasteless, and wholesome, however muddy, brackish, or putrid it may have been: hence its name of clearing-nut. Officers and soldiers, before setting off on a march, provide themselves with a store of these, as water purified by such means is deemed more wholesome than that clarified by alum. The bitter is in this case probably of use, as the inhabitants of Cairo render the muddy waters of the Nile quite clear and drinkable by rubbing bitter almonds on the inside of the earthen jars in which the water is kept. (Niebuhr's *Travels*, vol. i., pp. 71, 72.)

Strychnos Pseudo-china, Quina do Campo, or Field China, is a native of Brazil (St. Hilaire, *Plantes Usuelles de Bresil*, t. 1), and is devoid of strychnia or brucia. It is a remedy of the Sertaneias, being peculiarly fitted for those cases to which the true cinchonas are unsuitable. The taste is at first faintly aromatic, then astringent, and at last slightly bitter. It has no odour. In its properties it resembles Quassia, Menyanthes, or Gentian more than the true cinchonas, with none of which, except the Humalia bark, could it readily be confounded in its physical characters. Mr. Burchell says, however, that even in the proper localities of the cinchonas many strychni are collected. [Cinchona.]

STRYGOCE'PHALUS. [BRACHIOPODA, vol. v., p. 312.]

STRYMON. [AMPHIPOLIS; MACEDONIA.]

STRYPE, THE REV. JOHN, is said to have been of German descent, but he was born in London, 12th November, 1643. After having been six years at St. Paul's school, he was admitted, in 1661, of Jesus College, Cambridge; but he soon after removed to Catherine Hall, where he took his Bachelor's degree in 1665, and his Master's in 1669. In the latter year he was presented to the perpetual curacy of Theydon-Boys in Essex; which however he resigned a few months after, upon being appointed minister of Low Leyton in the same county. Here he continued to reside till within a few years of his death, when he came to live with Mr. Harris, an apothecary at Hackney, who had married his granddaughter. He had been lecturer of Hackney till he resigned that appointment about the year 1724; and he also held along with his Essex living the sinecure of Terring in Sussex, to which he was presented by Archbishop Tennison. He died 13th December, 1737, in the house of Mr. Harris, at the great age of ninety-four.

The history of Strype's long life, in so far at least as it is of any public interest, consists merely of the list of his successive publications. Although his works amount to thirteen large folio volumes, besides octavos and pamphlets, it was not till he had reached his forty-sixth year that he gave any employment to the press, and then he began with a single sermon; nor did he print anything more till five years after. Then, in 1694, appeared, in a folio volume, the first fruit of his researches in ecclesiastical antiquities, his 'Memorials of the most renowned Father in God Thomas Cranmer, sometime Lord Archbishop of Canterbury.' This was followed, in 1698, by an octavo volume entitled 'The Life of the Learned Sir Thomas Smith, principal Secretary of State to Edward VI. and Elizabeth; wherein are discovered many singular matters relating to the State of Learning, the Reformation of Religion, and the Transactions of the Kingdom during his time;' that in 1701 by another octavo volume entitled 'Historical Collections relating to the Life and Acts of Bishop Aylmer' (or Aelmer, who filled the see of London from 1577 to 1594); and that by his 'Life of Sir John Cheke,' 8vo., London, 1705. He published another single sermon in 1708; and the next year he brought out the first volume in folio of his 'Annals of the Reformation and Establishment of Religion,' comprehending the first twelve years of the reign of Elizabeth. Before proceeding further with this work, he produced three more biographical folios as companions to his Life of Cranmer: his 'History of the Life and Acts of Archbishop Grindal,' in 1710; his 'Life and Acts of Archbishop Parker,' in 1711; and his 'Life and Acts of Archbishop Whitgift,' in 1718. Then, digressing to another field of antiquarian investigation, he came forth, in 1720, with his new edition of Stow's 'Survey of London,' in two bulky folios, of which we may safely say that nearly three-fourths consist of his own additions. [STOW.] The next year, 1721, was published what may be regarded as his most important work, his 'Ecclesiastical Memorials, relating chiefly to Religion and the Reformation of it, and the Emergencies of the Church of England, under King Henry VIII., King Edward VI., and Queen Mary I.' in three volumes, folio. Of this work a new edition, though limited, we believe, to a very small number of copies, was brought out at London in 1816, in seven volumes, 8vo. But Strype's labours were not yet closed: another single sermon, in 1724, ushered in a second edition of the first volume of his 'Annals' in 1725; a second folio volume of that work the same year, bringing down the history of the Church of England to A.D. 1580; a third in 1728, embracing the period from 1581 to 1588; and a fourth, in 1731, consisting however only of a collection of papers, which the author's advanced years and infirmities prevented him from reducing into a narrative, in illustration of the remainder of the reign of Elizabeth.

Strype probably spent the first fifty years of his life in collecting the materials of the voluminous works which he gave to the world in the succeeding forty. His books all consist for the greater part of masses of original papers, even so much of them as has the form of being his own composition scarcely ever evincing any real digestion of the facts which he sets before his readers. He claims the merit of great fidelity and accuracy, and probably he may be trusted in general for the correctness of his transcriptions, all of which he professes to have made with his own hand; but, being really what may be called a dull, almost a stupid man, though possessed of a considerable amount of knowledge, he is both apt to miss the essence of events and transactions in his prolix detail of the circumstances, and even occasionally, with all his tediousness, to leave his narrative imperfect by the omission of some particulars which would not have escaped a sharper intellect. We believe every reader or consulter of Strype will have found himself annoyed occasionally by this absence, amid a multitude of superfluities, of the one thing needful. His books however are all curious and valuable for the quantity of information they contain never before published, and not to be elsewhere found; and they must on that account be considered as forming, along with Burnet's 'History,' and even in some respects in a higher degree than that, the foundations of the history of the reformed Anglican church.

STUART FAMILY. The origin of this family is briefly stated under ROBERT II. of Scotland; and the list of kings of Scotland of this family, from Robert II. of Scotland to James VI. of Scotland and I. of England, is given in the article SCOTLAND. The Acts of Settlement, passed in the reign of William III., secured the succession of the House of Hanover to the throne of England, and the descendants of James II. were subsequently excluded from the throne of Scotland also. [GEORGE I.] The chief historical interest that attaches to the House of Stuart after the abdication of James II., is limited to the two invasions of Great Britain by his son and grandson, who are often respectively called the elder and younger Pretender.

STUART, JAMES FRANCIS EDWARD. On the 16th of September, 1701, James II. died; and his son James, Prince of Wales, was immediately acknowledged by Louis XIV. as king of Great Britain, contrary to his promise to King William. The king of France was induced, as Tindal affirms, to take this step, chiefly by the persuasion of Madame de Maintenon, whom Mary of Este had engaged in her favour; and the influence of the Dauphin was added to that of Madame de Maintenon. The king of Spain, the pope, and the duke of Savoy also acknowledged the Pretender, as the Prince of Wales was afterwards called, as king of England.

In 1708 extraordinary preparations were made by Louis XIV. at Dunkirk, but the object of them was kept so secret, that no one in England suspected the intentions of the French. Louis, indignant at the recent attempt of the allied powers upon Toulon, and believing that the discontent of the Scotch with the Union rendered them ready for revolt, was preparing to invade England. The Pretender's claims were the ostensible reason for this attempt; and Louis, in a visit to him at St. Germain's, presented him with a sword mounted with diamonds, begging him never to forget that it was a French sword. The prince repaired to Dunkirk, intending to pass over to the Frith of Forth; but he was taken ill of the measles, and the English fleet had time to get ready. 'In the meantime,' says Cunningham, 'the Pretender wrote to the French king for his directions what to do in this unhappy case. The French king, who was no more concerned about the Pretender's life and affairs than to serve his own turn, answered, that he must not desist from the undertaking nor delay his embarkation; and ordered some men thither to see him on ship-board, though he was hardly recovered of his distemper.' So eager was Louis for the enterprise, that though the Pretender requested only a few days for the recovery of his health, Louis was peremptory, and the fleet put to sea. But this expedition was wholly unsuccessful, partly, as some thought, from the aversion of the Pretender to land in Scotland, partly from storms, which dispersed the French ships, partly from the vigilance of the English admiral, Sir George Byng, but chiefly from the dissensions of Fourbin and Gare, who had the command of the French fleet. It returned, with the Pretender on board, to Dunkirk, and the disappointed prince obtained permission of Louis to engage in the campaign in Flanders. In commemoration of this expedition a medal was struck in England; and the price of 100,000 crowns was set upon the Pretender's head by the English parliament. On the 11th of July, 1708, the Pretender is stated by French writers to have been in the battle of Oudenarde, which was gained by Marlborough; but according to the accounts of Dutch historians, he contented himself with observing the engagement from the steeple of a neighbouring village, and consulted his safety by a timely retreat.

In 1713 the Pretender published a protest which he forwarded to the ministers of the different states at Utrecht, declaring that he could not 'by his silence seem to consent to what was transacting to the prejudice of him and of the lawful heirs of his kingdom;' and that, finding the confederate powers had no regard to his rights, he solemnly protested against all that might be agreed on to his prejudice. No notice was publicly taken of this protest; but the Pretender's friends in England were indefatigable in strengthening his favour with the queen. The jealousy which Anne cherished of the House of Hanover, and her resentment when it was proposed that the Electress Sophia should reside in England, strengthened for a time the influence of Lord Bolingbroke. But the Pretender's stronghold was in the affections of the queen. It has even been surmised that she was cognizant of the expedition against Scotland in 1708. Upon the death of Queen Anne, James, who had been residing at Bar-le-duc, posted to Versailles, where he met with an ungenerous reception from Louis XIV., who had found it most consonant with his interests to acknowledge King George I., and who intimated to the Pretender, through the Marquis de Torcy, that he must quit France. In August, 1714, James sent to the principal nobility of Great Britain a declaration in which he asserted his claim to the throne, and stated his surprise that upon the death of the queen a foreign prince should have been proclaimed king. This manifesto was sent by many of those who received it to the secretary of state; and the ambassador of the duke of Lorraine, in whose territory James was then living, was forbidden the court. A proclamation was made, in which the price of 100,000*l.* was set on the head of the Pretender, who, as his partisans expressed it, had 'no place left for him to flee unto.' Circumstances however had been operating in favour of the Pretender. Many persons had an hereditary attachment to the House of Stuart; some were influenced by hopes and promises of honours; and more, by the outcry that the church was in danger under the Whig government, which was 'the main artifice' of the plot, as George I., in his speech to parliament, after the rebellion had commenced, expressed himself. In 1715 the court of St. James's received information that an open rebellion had broken out in Scotland, headed by the earl of Mar, who had been secretary of state for Scotland when Anne died, and had been one of the first to swear allegiance to her successor. The marquisses of Huntley and Tullibardine, the earls of Southesk and Marischal, with many other noblemen and landed proprietors, joined in the rebellion, and the Pretender's standard was set up by the earl of Mar at Brae-Mar, on the 6th of September, 1715.

Active measures were taken by the English government. Several suspected persons were imprisoned in the castle of Edinburgh; and General Whetham was ordered to form a camp near Stirling. Several vessels at the same time sailed from Hâvre-de-Grace for Scotland, and notwithstanding the efforts of the British navy, one of them reached Arbroath, and supplied the Highlanders with arms and ammunition, which were carried to Brae-Mar. Assurances were also given that the Pretender would shortly arrive. But the news that Louis XIV., who had secretly encouraged the rebellion, was dead, struck a panic among the Jacobites, and for a time suspended their operations. They decided however to proceed in their course, and to urge the Pretender by letter to appear amongst them. The earl of Mar assumed the title of lieutenant-general of the Pretender's forces, and a manifesto, setting forth the national grievances, was published. A scheme was also formed to surprise the castle of Edinburgh, but was defeated.

About the 9th of September the duke of Argyle, commander-in-chief of the English forces in Scotland, marched northward; whilst several Scottish peers, the earl of Sutherland, the duke of Roxburgh, and others, showed their loyalty to King George by raising their clans. A conspiracy was about the same time discovered in England. Colonel Paul, who had a company in the first regiment of foot-guards, was detected in enlisting men for the Pretender's service. In Somersetshire an insurrection was projected, but checked by the government; treasonable designs however were so widely spread in the western counties of England, that at Bath the Jacobites talked openly of the Scotch rebellion as merely a diversion to draw the troops off to the north. General Wade was at last ordered to march to Bath, where he discovered and seized many chests of fire-arms and some pieces of cannon. The university of Oxford was also tainted with Jacobitism, and 'King James's' health is reported to have been drunk there every day. General Pepper being dispatched to Oxford, entered the city early one morning and apprehended sixteen or eighteen persons, whom he conveyed to Abingdon. Cornwall was also disaffected, and a correspondence was now carried on among the conspirators throughout Great Britain. As their communications could not with safety be entrusted to the post, Jacobite gentlemen rode to different parts of the kingdom under the pretence of travelling for pleasure, but in fact to convey letters and intelligence.

The next step which the insurgents took in the north was to proclaim James king at Newcastle-upon-Tyne, and to make an attempt on the town of Newcastle, but finding the gates closed, they retired to Hexham, where they were joined by some Scottish horse. Their numbers were now increased by recruits, who joined them at different towns, and the influence of the earl of Derwentwater, a Jacobite nobleman, gave them additional strength. But the town of Newcastle stood firm, and the rebels, hearing that they were to be attacked at Hexham, withdrew from that place, having first proclaimed the Pretender. On the 12th of October the standard of James VIII. of Scotland was set up at Moffat in Annandale, by the earl of Kenmure; and on the 19th the Scots, under Lord Kenmure, being joined by the English rebels, marched to Kelso.

In the meantime the earl of Mar proceeded to Dunkeld, where the marquis of Tullibardine, and the earl of Breadalbane, joined his troops with 2000 men. They possessed themselves of Perth, and upon this important town being gained, their force was much augmented. The rebel army now assumed a formidable appearance; being the clansmen of rich nobles and chiefs, the soldiers were well armed, and amounted to 12,000, cavalry and infantry. The rebels possessed themselves of Brunt Island, and afterwards of all the towns on the coast between their head-quarters and the mouth of the Firth of Forth. The earl of Mar next attempted to cross the Firth, and to make a descent upon the Lothians, in order to gain over the south of Scotland. Fifteen hundred men succeeded in landing at North Berwick, Aberlady, and other places. Their next attempt was to march to Edinburgh, where they expected to be joined by the people; but the duke of Argyle sending a detachment to prevent their entrance into the capital, the rebels changed their course, and marched into Leith. They then retreated to Seaton House, an old castle about seven miles from Edinburgh, whence the earl of Rothes, with a company of dragoons and volunteers, finding it impossible to dislodge them without artillery, was obliged to retire.

On the 27th of October the Highlanders at Seaton House marched southwards to Kelso, where they were joined by the English and Scottish horse from Nithsdale and Northumberland. Mr. James Murray had arrived in Edinburgh, authorised to make liberal promises of assistance from France, and to declare that he came in the capacity of secretary to the Pretender. It was now expected that all communication would soon be cut off between the duke of Argyle and London; and the earl of Mar was strongly advised to attack Argyle before the arrival of a reinforcement of dragoons from Ireland, which were expected.

It was now that the 6000 men guaranteed by the Dutch to be sent over to England were demanded by the British ministry, and granted by the States. Orders were issued to all the governors of seaports to examine all British subjects who might attempt to pass from the Continent into England; for it was thought that the Pretender, with the duke of Ormond and Viscount Bolingbroke, intended to come into the country. On the 25th of October General Carpenter set out from Newcastle for Kelso, where the Jacobite army lay. The Jacobite commanders proposed to pass the Tweed and attack Carpenter's troops, which were tired with marching; but ultimately the Pretender's forces marched to Jedburgh, and thence towards Dumfries, which they thought of investing. The duke of Argyle was at Stirling with so small a force, that unless he was soon joined by the Dutch or Irish troops, he could not save Dumfries. Everything seemed to favour the enterprise of the Pretender, but divisions in the Jacobite council of war frustrated their plans. The earl of Wintoun, one of the insurgent leaders, opposed the siege of Dumfries, and the English officers urged a march into their own country. Confidence was thus lost, and the men daily deserted. After some loss of time the rebels marched to Brampton in Cumberland, where the Pretender was proclaimed. They then proceeded to Penrith, and thence on the 5th of November to Appleby; next to Kendal and Kirby Lonsdale, and on the 7th to Lancaster, which they entered without opposition. They left Lancaster on the 9th day of the month, for Preston, where they were joined by a number of gentlemen and others of the Roman Catholic persuasion, a circumstance which did not satisfy the Scottish chieftains and Highlanders, who had been led to expect that their forces would be augmented by the high church party.

General Carpenter was now pursuing the Jacobites, but with his dragoons only, in order to save time. He had communicated with General Willes, at Chester; and both generals advanced in concert, to unite their strength and attack the rebels at Preston. General Willes reached Preston first, and found the town strongly barricaded. On the 12th of November Wikes attacked the barricade below the church, which was gained; but the other barricades, which were flanked with Highlanders, were not carried, and the king's troops were obliged to retire that evening. On the following morning General Carpenter and his troops arrived, and the town was completely invested. The Highlanders were indeed eager to make a sally, but they were not allowed to move. A capitulation was determined on, and Colonel Oxburgh went out with a trumpet to propose terms to General Willes. All however that he could gain was a promise that, if the rebels would lay down their arms, he would not allow the soldiers to cut them to pieces, and he would give them an hour to consider of it. No terms were finally made for the Jacobites. General Carpenter entered the town on one side, and General Willes on the other; and they met the rebel troops in the middle of the town. The noblemen and chieftains were put first under guard, and then their followers. The number of the English and Scottish prisoners of all classes amounted to 1489. On the same day that Preston surrendered, the battle of Dumblane was fought between the duke of Argyle and the earl of Mar. The left wing of the rebels, though they fought bravely, was routed; and the duke of Argyle, after pursuing them to the river Allan, returned to the field, where both armies stood looking at each other; towards evening the duke drew off to Dumblane, and the enemy to Ardoch. On the same day news arrived that the pass of Inverness was gained. This important advantage was the result of treachery. Lord Lovat had delivered it to the king's troops.

The principal persons among the rebels were sent to London. On reaching Highgate, they were pinioned with cords, and not allowed to hold the reins of their horses, which were led by a foot-soldier. The prisoners were conducted from Highgate to London, amid crowds of spectators, the drums playing a triumphal march. They were distributed in different prisons; the noblemen were lodged in the Tower.

On the 22nd of December the Pretender landed at Peterhead in Scotland, with a train of six gentlemen, among whom was the marquis of Tynemouth, son of the duke of Berwick. From Peterhead James proceeded to Newburgh, a seat of the Earl Marischal's; and passing through Aberdeen in disguise to Fetterope, he was met there by the earl of Mar, who had left Perth with a troop of horse. James now assumed the state of royalty: he formed a court, and made several peers and created knights. He was also proclaimed with great ceremony before the house where he was lodging.

In January, 1716, the Pretender made a progress through the country, entering Dundee publicly, with the earl of Mar on his right hand, and the Earl Marischal on his left. The people thronged into the market-place to kiss his hand. On the 7th of January he arrived at Scone, and on the 9th of January he made his public entry into Perth, and reviewed some of the troops. He expressed great pleasure at the sight of the Highland dress, which was new to him. In the evening he returned to Scone, where he formed a council, and issued six proclamations. On the 16th of the month, James harangued his council, having previously received addresses from the episcopal clergy of Aberdeen. His council however, being convinced, after the arrival of the Dutch troops, that the army of the Pretender could no longer resist that of Argyle, had resolved to abandon the enterprise and disperse the forces. But wishing to keep their design secret, they acted as if they meant to attack the English army. They began to raise batteries, plant guns, and even destroyed Auchterarder, Blackford, Denning, Muthell, and other places, to prevent their affording quarter and provision to the enemy. The duke of Argyle, having received supplies, marched through Auchterarder, to Tullibardine, whilst the Pretender and his followers retreated to Dundee. Suspicions now arose that the Pretender, together with the members of his council, intended to escape, and to leave the army to their fate; and the report gained ground when the Jacobite army was ordered to march to Montrose, near which several French ships lay at anchor. The rebel troops, possessed with this idea, refused to move. The earl of Mar however succeeded in pacifying them, by the assurance that James was going to place himself at their head, and by declaring that it was intended to make a stand at Aberdeen; and to add to the deception, the horses and body-guard of the Pretender were drawn out before the door of the house where he lodged. James, in the meantime, slipping out by a back entrance, walked to the earl of Mar's lodgings, and proceeded to the sea-shore, where a boat conveyed him and Lord Mar on board a French ship which was then in Montrose road. The boat returned, and fetched seventeen persons of rank, who were acquainted with the Pretender's design. The Pretender reached Gravelines in a few days. The vessel returned in twelve days; and, in spite of the utmost vigilance on the part of Argyle, a very considerable portion of the noblemen and others who were engaged in this unfortunate affair escaped to France.

In France, at this time, there was little comfort for the Pretender and his friends. It was the interest of the duke of Orleans, regent during the minority of Louis XV., to maintain a good understanding with the House of Hanover. Lord Stair, the English ambassador, was urgent in his remonstrances to prevent the Pretender's return to France. On his return from Scotland, James found it necessary to dismiss Lord Bolingbroke, who had acted as his secretary, on suspicion of treachery, and the place was filled by the duke of Ormond.

The earls of Wintoun, Kenmure, and Derwentwater, of Carnwath and of Nithsdale, with lords Widdrington and Nairn, were tried at London. The prisoners of inferior rank were tried chiefly at Lancaster, where many were executed: one thousand of them, upon their petition, were transported to the Plantations in North America.

The countess of Nithsdale and Lady Nairn, waiting their opportunity behind a window-curtain, threw themselves on their knees before the king, as he passed through the apartments of St. James's palace, to beg for their husbands' lives. The king heard their appeal, but was not moved. Lady Derwentwater, with the duchesses of Richmond and Bolton, were introduced by the dukes of Richmond and St. Albans into the royal bed-chamber, where Lady Derwentwater humbly besought mercy for her husband. On the 7th of March, the earls of Derwentwater and Kenmure were beheaded on Tower Hill; lords Widdrington, Carnwath, and Nairn were reprieved. The earl of Nithsdale escaped in woman's attire brought to him by his wife. The earl of Wintoun was condemned to death, but escaped from the Tower.

There were still however proofs of disaffection. On the 29th of May the Jacobites wore oaken boughs; and on the 10th of June, the Pretender's birthday, they displayed white roses. At Oxford the spirit of disaffection was shown more plainly than in any other place. Alarmed by these and other manifestations, in 1716, King George succeeded in forming an alliance with France and the States, the chief object of which was to crush the Jacobite cause. By this treaty it was stipulated that the Pretender was to leave France, and to go beyond the Alps; nor was he to be permitted ever to set foot in France again on any pretext whatever. A renewal of that promise which had been made at the treaty of Utrecht was given; and all protection was withdrawn from James on the part of the French government. The Pretender removed into Italy.

In 1718 the Pretender became the instrument of Cardinal Alberoni's ambitious intrigues. Upon war breaking out between France and Spain, James left Urbino, where he had resided since his expulsion from France, and went to Rome. He was there advised by pope Clement XI. to go into Spain, where a squadron had been for some time fitting out against England. James was received with regal honours at Madrid; and the duke of Ormond, one of his adherents, was appointed captain-general of the expedition which was to invade England, and was authorised to proclaim the Pretender's name at certain places. But a storm dispersed and entirely disabled the Spanish fleet off Cape Finisterre; and a descent which the Spaniards made at Kintail in Scotland (June, 1719), although aided by the Highlanders, was defeated by General Wightman. During the year 1718-19 a marriage was agreed on between the Pretender and Maria Clementina Sobieski, granddaughter of John Sobieski, king of Poland. This princess had a million sterling for her dowry. The court of Vienna however objected to the marriage; and on her way through Tyrol to Italy the princess was seized, and placed in confinement in Innspruck. Not being released, even upon the personal application of her father, she escaped from Innspruck in man's clothes, went to Bologna, and was there married by proxy to the Pretender, who was still in Spain. Two sons, Charles-Edward and Henry, were the offspring of this union. The earl and countess of Inverness were entrusted with the charge of the eldest, styled Prince Charles. They were Protestants, a circumstance which gave great offence to their mother, and to Cardinal Alberoni, by whose counsels she was governed. After six years of married infelicity, or, as Maria Clementina terms it in her letters, 'of injuries and insults,' she withdrew, in 1725, to the convent of Cecilia, whence no intreaties of her husband could draw her, nor could he for many months obtain even an explanation of her conduct. From various letters, which are given in the 'Lockhart Papers,' it seems that, as usual, both parties considered themselves in the right. The Pretender would not part with Lord Inverness: his wife was resolved not to return to him whilst that nobleman and his wife, of whom she is said to have been jealous, remained at court. The followers of James were scandalised at this breach; at length the earl of Inverness was dismissed, and a reconciliation was effected. The earl of Inverness was a Colonel Hay, upon whom the Pretender bestowed that title in 1725, at the same time making him his secretary. He was always called Colonel Hay, except at the Pretender's court, and by the persons corresponding with it. Maria Clementina died in 1735.

In 1722 the Pretender published at Lucca his famous declaration, addressed to his loving subjects of Great Britain, and to all foreign princes and states, to serve as a foundation for a lasting peace in Europe, and signed 'James Rex.' This document, which, amongst other articles, contained a proposal to George I. to resign his crown, was pronounced by the House of Lords to be a false, insolent, and traitorous libel, and was burnt at the Royal Exchange.

The death of George I. produced no improvement in the fortunes of James Stuart, though there were continual cabals in his favour in Great Britain, and a treaty (called the treaty of Vienna) had been formed between the emperor of Germany and the king of Spain in 1725, with a view of restoring the Pretender. James, during the latter years of his life, resided entirely at Rome, where he led a quiet life, although the hope of ascending the throne of England seems never wholly to have left him. Frugal in his household, he saved, out of the pension allowed him by the pope and his share of the Sobieski estate, a sum of money sufficient to defray the expenses of a subsequent invasion of England. The events of the year 1745 belong to the history of his eldest son, rather than to the annals of the Pretender's life. He was the last of the Stuarts that received kingly honours. James Stuart died at Rome in 1765. The character of the Pretender has been variously represented. 'He began the world,' says Lockhart of Carnwath, 'with the general esteem of mankind. Every person, friend or foe, allowed him to be a wise, sober, just, good-natured prince, of great knowledge and application in business; and such as knew him, both foreigners and subjects, concurred in portending the happiness of that people over whom he should rule, and this character he maintained whilst the earl of Mar was at the head of his affairs after their return from Scotland. . . . . But soon after Mar's removal, his majesty's character and affairs appeared in a quite different light; . . . . people soon saw that they were not carried on with the dexterity and secresy as formerly; but that which struck the nail on the head was his allowing these his favourites (which seems to be a curse in a peculiar manner entailed on the royal race of Stuart) to rule under him in so absolute arbitrary a manner, that the prerogatives of a sovereign and a husband were screwed up to a pitch not tenable by the laws of God or man, nor consistent with prudence.' (*Lockhart Papers*, vol. ii., p. 405.) Mr. Leslie a non-juring clergyman, who had opportunities of conversing with the Pretender, praises his affability, good sense, freedom from bigotry, and magnanimity. By the Whig party his temper has been generally represented as morose, sullen, and disposed to tyranny.

Charles Edward Stuart, born on the 31st of December, 1721, bore the title of Prince of Wales among the Jacobites. He served in Spain under Don Carlos, who paid him great respect and attention. He is represented, a few years after this time, to have been a youth of graceful person, generous, affable, and engaging manners, 'to have the spirit of a Sobieski without the timidity of a Stuart;' and, though reared in the effeminate south, to have been capable of encountering difficulties and hardships. In the year 1743 Cardinal Tencin, the prime minister of France, who had received the purple at the recommendation of the Pretender, combined with the Jacobites in England and Ireland to project a fresh invasion of Great Britain. He persuaded the Pretender to surrender his claims to Charles Edward, and, upon his consenting, the prince set out for France, giving out that he intended to make a campaign in Piedmont, but proceeding in the disguise of a courier to Paris, where he arrived on the 20th of January, 1744. The young man was, as Tindal expresses it, 'made a loan of to France,' whose aim was to cover her own selfish designs with the plea of countenancing the Stuart family. Marshal Saxe was appointed to command the expedition; and he, having been in England, and knowing that the towns were rarely fortified, had an idea that the country could be quickly subdued.

The young prince set out for the coast of Picardy, where an army of 15,000 men was assembled, and transports were provided at Boulogne, Dunkirk, and Calais for carrying the troops to England. The army was to land on the coast of Kent, where many Jacobites were expected to rise; and at the same time a squadron sailed from Brest to convoy the transports. But the squadron fled before the British fleet under the command of Sir John Norris, and almost shared the fate of the Invincible Armada. A violent storm destroyed most of the transports, and a great part of the troops were drowned. (1744.) The prince returned to Paris, and waited a more favourable opportunity. But he was not daunted by obstacles, and the period at which the rebellion of 1745 was undertaken was favourable to its success. The king of England was in Hanover, and Scotland was almost destitute of troops. The Highlanders, disaffected, and thirsting for revenge, were ripe for revolt. Towards the end of May, 1745, Charles Edward left Paris for Nantes. William, marquis of Tullibardine, who had been attainted in 1715, Sir John Macdonald, Colonel Strictland, Mr. George Kelly, a clergyman of the Church of England, and Sir Thomas Sheridan, formerly tutor to the young Pretender, with several other gentlemen, accompanied him. On the 5th of July he sailed in La Doutelle, a French vessel, which he had joined from Nantes in a fishing-boat, designing to sail round Ireland, and to land upon the western coast of Scotland. Another ship, the Elizabeth, was ordered to accompany him as a convoy, and on board this vessel the prince had placed 400,000*l.* sterling, with arms for several thousand men. These two ships fell in with a British cruiser to the west of the Lizard Point. A fierce action ensued, and the Elizabeth was so much damaged as to be obliged to put back into Brest. The prince pursued his course to Scotland, saying that he would either die or be crowned. On the 28th of the month he landed at Boradale, a farm belonging to Macdonald of Clanronald, on the shore of the bay of Lochnanuagh. He thence proceeded to the house of Kinlochmoidart, where he was met by several Highland chieftains; and whence the clans were summoned to rise. Many persons here advised the prince to return to France, and wait another opportunity; but he was resolute in remaining. About ten days afterwards the prince set up his standard at Glenfinnin.

At this time Sir John Cope was commander-in-chief in Scotland. At first the news of the rebellion was treated with ridicule, and the government were dilatory in their measures. On the 6th of August a reward of 30,000*l.* was offered, by proclamation of the lords justices in the Gazette, to any person who should secure the eldest son of the Pretender; and on the 31st, George II. returned to London from Hanover. The prince, having heard of the price put upon his person, issued a counter proclamation, offering 30,000*l.* for apprehending the elector of Hanover. On the 27th of August he advanced in hopes of meeting Sir John Cope; but on reaching Garvamore, he found that General Cope had faced about, and taken the route by Ruthven to Inverness. No sooner did the English troops turn their backs upon the Jacobite army, than a common soldier deserted, and carried the news to the other side. The Highlanders instantly put themselves into motion; and on arriving at Garvamore, it was determined that they should march to the south, and enter the low country, thus endeavouring to get possession of Edinburgh before General Cope should arrive there. On the 30th of August they reached Blair Athol, and the duke of Athol, who was on King George's side, retired at their approach. On the 3rd of September they entered Perth, where the Pretender's declarations were read. At Perth great numbers flocked to the Pretender's standard. Among the most considerable were the duke of Perth, Lord Strathallan, and Lord George Murray, who was the younger brother of the marquis of Tullibardine, whose right of primogeniture had been forfeited by his attachment to the exiled Stuarts; his second brother, Lord James, now duke of Athol, having succeeded to his estates and honours. Lord George Murray was a brave, humane, and honourable man; and he possessed a sound judgment in military matters. Having accepted the act of grace which passed after the rebellion of 1715, Lord George was nevertheless not possessed of that entire confidence on the part of Charles Edward which he proved himself eventually to have fully merited.

The reception which the prince met with in the Lowlands was not so cordial as he expected. On the 11th of September he marched from Perth to Dumblane; and, on the 13th, passed the Forth at the ford of the Frew, a few miles above Stirling. Colonel Gardiner's dragoons, which were posted near Stirling, withdrew at his approach. On the 15th instant the rebels arrived within nine miles of Edinburgh, and Gardiner's and Hamilton's dragoons were posted within two miles of it. The city had been hastily fortified; a thousand men had been armed for its defence, in addition to the city guard; and trained bands of mixed Whigs and Jacobites were constantly on duty. Everything was so prepared that the town might have held out for some days before troops which had not a single cannon. 'But,' says an anonymous writer, 'to the lasting dishonour of Scotland, the capital was given up to a handful of half-starved savages, without stroke of sword.'

On the 15th of September, being Sunday, public worship was suspended, and the volunteers were under arms all day. On Monday, until noon, the defence was carried on very vigorously; but about two o'clock a petition was set on foot, praying the magistrates and town-council to call a meeting of the chief inhabitants, to deliberate concerning the propriety of delivering the town up to Charles Edward. About this time, the dragoons first, and afterwards the officers of the crown, left the city, the dragoons taking the route of Musselburgh and Haddington. The result of the public meeting, which was principally composed of Jacobites, was a determination to surrender the town, and place the arms of the volunteers in the castle. A deputation was dispatched to Gray's Hill, about two miles from Edinburgh, where Charles Edward then was. Whilst the terms of capitulation were still under discussion, intelligence came that General Cope had arrived at Dunbar, and would speedily march to the relief of the town. A second deputation was sent, to gain time; and those who composed it returned to the city early in the morning of Tuesday the 17th in a coach. The coach entered at the West Port, and drove down the street towards the Canongate. On the gate being opened, a body of 900 Highlanders, under the command of Lochiel and Sullivan, rushed in: the lord provost and town council, who were waiting the return of the deputation in the street, on hearing of this event, retired to their homes. At noon, Charles, in a Highland dress, attended by the duke of Perth and Lord Elcho, came by Duddingston into the King's Park, and entered through St. Anne's Yard into Holyrood Palace. There was a great crowd assembled to receive him, and the young prince was one whose personal appearance might seem to justify the enthusiasm which he inspired. 'The figure and presence of Charles,' observes Mr. Home, who witnessed his entrance to Holyrood, 'were not ill suited to his lofty pretensions. He was in the prime of youth, tall and handsome, and of a fair complexion.' As he entered the palace there was an expression of languor and melancholy in his countenance: the Jacobites compared him to Robert Bruce; the Whigs declared that he looked like a gentleman and a man of fashion, but not like a conqueror. After dismounting, the prince walked towards the apartments of the duke of Hamilton: when he was near the door, a gentleman moved out of the crowd, drew his sword, and walked up stairs before the prince. This was James Hepburn of Keith, who had been engaged when very young in the rebellion of 1715; a gentleman who is said to have been a model of manliness, simplicity, and honour; but whose hatred of the Union, rather than love of the Stuart race, induced him to sacrifice himself to a notion of national independence.

In the meantime Sir John Cope had marched from Dunbar to Haddington, and thence to Prestonpans and Seaton. A council of war had been held by Charles Edward at Duddingston, where he had proposed to engage General Cope's army. This was agreed on; but when the prince declared his resolution to lead the troops to battle himself, the chiefs remonstrated, and with some difficulty induced him to give up the design. On the next morning (Sept. 21) the Highlanders advanced to Tranent; and to the west of the town continued their march until they saw the king's soldiers encamped near Preston. A loud shout was raised by the English, and returned by the Highland troops. A morass, which was pronounced to be impassable, divided the armies. The afternoon was spent in movements. At night both armies lay down to repose, the Highlanders with the resolution of attacking the king's troops early in the morning During the night, a country gentleman, who knew the ground well, proposed to Lord George Murray to show him a part of the morass whence the rebels might attack their enemies without observation. Lord George referred him to Prince Charles, who was sleeping on the ground with a sheaf of peas-straw under his head. Charles was pleased with the proposal, and before break of day his troops began to move. They marched through a sort of valley, or hollow, concealed by the darkness first, and afterwards by a mist. Charles took his place between the first and second line. At length the morass being passed, the two armies were separated only by a corn-field. The Highlanders, ill armed and without cannon, followed up the advantage which they had gained with wonderful success. A panic seized the king's troops. The Highlanders threw down their musquets, drew their swords, and pursued the enemy. 'In a very few minutes,' says Home, 'after the first cannon was fired, the whole army, both horse and foot, were put to flight. Not one of the soldiers attempted to reload their musquets, and not one bayonet was stained with blood.' All the king's infantry was killed, or taken prisoners, except about 170, who escaped by great speed, or other good fortune. This was called the battle of Prestonpans.

The second line of the Highland troops, commanded by Prince Charles, had kept so near the first as to appear to General Cope all one body. The Prince was only fifty paces behind the vanguard—a proof of courage which his enemies could not deny; but it was a departure from his agreement with the chiefs, who had made conditions that he should not expose himself to imminent danger.

General Cope's conduct was severely censured; but when inquired into by a board of general officers, he was not censured, and the conduct of the soldiery was made to bear the blame. 'His great error,' observes Sir Walter Scott, 'was in drawing up his forces in front of a high park wall, which barred their escape from their light-heeled enemies.' Collecting his dragoons, Cope, with the earls of Loudon and Home, marched to Berwick, where Lord Mark Ker received him with this sarcasm, 'that he believed he was the first general in Europe that had brought the first tidings of his own defeat.'

Great apprehension was now entertained in England lest the prince should immediately march southwards. But Charles and his council did not deem it prudent to appear in England with so small an army, and they resolved to wait some time longer at Edinburgh. The castle of Edinburgh remained still in the possession of the king's troops, commanded by General Guest. At first the garrison was supplied with necessaries from the town, but on the 29th of September orders were given to allow no person to pass into the castle. A letter was that evening sent down by General Guest to the provost of Edinburgh, declaring that unless a free communication was opened with the garrison and the town, the general would commence a cannonade upon the city. The prince, on hearing of this threat, ordered the communication to be re-opened. But the Highlanders having, on the 1st of October, fired at some people who were carrying provisions to the castle, the garrison on the next day began to fire on the houses that covered the prince's Highland guard. Upon this a contest commenced between Prince Charles and General Guest, during which several houses were set on fire, and several persons on both sides killed. The cannonade lasted till the evening of the 5th of October, when Prince Charles at last published a proclamation permitting a communication between the town and the castle. Very few of the inhabitants of Edinburgh joined the Pretender during these destructive reprisals. There was, in fact, a disinclination among the common people to flock to his standard. Lord Kilmarnock and Arthur Elphinstone, afterwards Lord Balmerino, at this time joined the prince, and Lord Ogilvie, eldest son of Lord Airly, arrived in Edinburgh with a regiment of 600 men. These additions, and reinforcements sent by a few other noblemen and gentlemen, chiefly in the neighbourhood of the Highlands, together with supplies of arms and ammunition from France, strengthened the prince's cause.

It was now discussed by the prince's council in what manner their advantage could best be prosecuted. The prince, who was totally unacquainted with the country which he had invaded, could not bear opposition, nor listen to advice. Feuds and intrigues divided his little court; and too great confidence in his own opinion made him positive and resolute, when he ought to have been cautious. Having received all the reinforcements that he expected, he one day suddenly apprised his council that he was resolved to march to Newcastle, and to oppose the progress of Marshal Wade, who had advanced to that town. It was in vain that several of his friends opposed his determination. Three times it was brought before the council, and on the last discussion the prince settled the point by these words: 'I see, gentlemen, that you are determined to stay in Scotland, and defend your country; but I am also resolved to try my fate in England, even if I should go alone.'

On the 31st of October, Charles marched out of Edinburgh, leaving Lord Strathallan to command in Scotland. At Dalkeith House he was joined by the clan Macpherson and some other Highlanders, amounting in all to about 1000 men: this made his whole force about 6500. With one division of his army the prince marched to Kelso, then taking the Jedburgh road, he crossed the Esk, and on the 8th of November reached Brampton in Cumberland. On the next day the other division of the army arrived, and proceeded to invest Carlisle, which surrendered to the duke of Perth on the 15th of November. It was now determined to march directly to London. Before Charles had set foot on English ground, three armies, each of them superior in number to his own, were prepared to oppose his progress: one, under General Wade, at Newcastle; a second, in Lancashire, commanded first by General Ligonier, and afterwards by the duke of Cumberland; and a third, consisting of old regiments, was stationed in the villages near London, and was, in case of need, to have been commanded either by the king or the earl of Stair. The rebel troops nevertheless leaving a garrison in Carlisle, marched forward in two divisions: the first, commanded by Lord George Murray, arrived at Penrith on the 21st of November; the second, or main body, headed by Charles, chiefly composed of Highland regiments, and having the cannon, followed, and advanced from Penrith, by Shap, Kendal, Lancaster, and Garstang, to Preston. On the 29th they reached Manchester, by way of Wigan, and were joined by 200 or 300 of the common people. These men, the only Englishmen who joined the standard of the Pretender, were called the Manchester regiment, and were commanded by Colonel Townley, a Roman Catholic. Preston and Manchester were the only places where ringing of bells or acclamations were heard. From Manchester the rebel army marched to Macclesfield: from Macclesfield the two divisions went by different roads; the one by Congleton, the other to Leek, and from Leek by Ashbourn to Derby, where on the 4th of December (1745) both divisions arrived. During the march from Carlisle to Derby, the prince learned that John Drummond, the duke of Perth's brother, had arrived at Montrose with his own regiment, the royal Scots, Fitzjames's regiment of horse, and the picquets of six Irish regiments in the service of France.

The duke of Cumberland's forces lay at Litchfield, Coventry, and Stafford. It seemed at first to be the intention of the rebels to avoid the duke, and to advance to London; but after halting a day or two in Derby, they altered their intention, chiefly upon the representation of George Murray, and retreated, with the design of meeting Lord Drummond's army, which was coming from the north. The retreat was resolved upon by the advice of Lord George Murray, and much to the dissatisfaction of Prince Charles. The duke of Cumberland now began the pursuit of the rebels, who were only two days' march before him. Lord George Murray, who commanded the rear-guard, defeated the duke's dragoons at Clifton near Penrith in a skirmish, in which the Highlanders fought with their usual courage, and Lord George, bareheaded (having lost his bonnet and wig), was foremost in the encounter. On the 20th of December the Scottish army left Carlisle, and crossed the Esk into Scotland. On this occasion the prince saved one of his men from being drowned by catching him by the hair. The Highland troops marched unmolested by Moffat and Dumfries to Glasgow, where they were by no means welcome. At Glasgow they remained seven or eight days, and the troops then began their march to Stirling, in two divisions. When the troops came near Stirling, the prince took up his abode in a house called Bannockburn. Lord George Murray's division occupied Falkirk. The town of Stirling soon surrendered, and Charles's army, now, by the junction of the forces of Lord Strathallan and Drummond, amounting to 9000 men, attacked the castle of Stirling. On the 16th of the month General Hawley left Edinburgh, which he had entered during Charles's absence, and marched to Falkirk; so that his army was now only seven miles distant from that of the Pretender. Lord George Murray marched at the head of the Macdonalds of Keppoch with his drawn sword in his hand. The Macdonalds began the fight, and repulsed the king's dragoons. 'When the Macdonalds came near the foot of the king's army,' says Home, 'some regiments of the first line gave them a fire; the rebels returned the fire, and throwing down their muskets, drew their swords, and attacked the regiments in the left of the king's army both in front and flank; all the regiments in the first line of the king's army gave way; as did most regiments of the second line. It seemed a total rout; and for some time General Hawley did not know that any one regiment of his army was standing.' General Hawley retreated to Linlithgow, leaving seven pieces of cannon and a quantity of provision, ammunition, &c. upon the field. A strong body of Highlanders, commanded by Lord George Murray, immediately took possession of Falkirk.

The friends of the House of Hanover were greatly dejected on hearing of the defeat; whilst the generals of the rebel party deemed it incomplete, and blamed each other. Charles remained at his quarters that night, and on the following day returned to Bannockburn. Meantime the siege of Stirling Castle proceeded slowly, owing to the superior fire of the castle. On the 30th of January the duke of Cumberland arrived at Edinburgh, whither General Hawley had retired; and on the following day the duke marched against the enemy. Lord George Murray with the clan regiments was now at Falkirk, and Prince Charles was still in the house of Bannockburn. The rebels at first resolved to make a stand, and to give the duke battle; but on the following morning they suddenly raised the siege of Stirling Castle, and retreated. Two explosions were the first signal of this event which reached the duke's ears; these were the powder-magazines blown up by the Highland troops, who retreated in disorder over the river Forth.

The Highlanders marched through Dumblane to Crieff, where the two divisions of their army separated: one, under Prince Charles, marched north by the highland road; the other, commanded by Lord George, proceeded through Montrose and Aberdeen, by the coast road, to Inverness. In the vicinity of that town both divisions approached each other. Charles, suffering his men to straggle about, lodged at Moy, the seat of Mackintosh, about ten miles from Inverness. Here he was saved from a surprise by the presence of mind of a woman. Lord Loudon, who was at Inverness, hearing that the prince had only five or six hundred men with him, set out one evening as soon as it was dark, with a design to seize him. Lady Mackintosh, the wife of Charles's host, is supposed to have been apprised of this attempt by letters from her mother. Without saying a word to Charles, she ordered five or six of the people, well armed, to watch on the road from Inverness, under the direction of a country smith. When Lord Loudon's troops drew near, the smith and his party gave them a shot or two, calling upon the Macdonalds and Camerons to join them. Lord Loudon's men, deceived by these shouts, retreated precipitately to Inverness, and many of them were trampled down in the confusion of their flight. Charles, on the following day, hearing of this skirmish, which was called the Rout of Moy, marched to Inverness. Upon Lord Loudon retreating, he laid siege first to Fort George, and next to Fort Augustus, both of which places he captured. During the months of February and March a desultory war was carried on, until, at the end of March, news was brought that the duke of Cumberland was marching towards Inverness with all his forces. On the 14th of April, Charles retreated from Inverness to Nairn, where he again made a stand. That night the Highlanders slept amid the furze and trees of Culloden wood, about three miles from Nairn. The prince's army was now much dispersed, and many of his best officers were absent. The Master of Lovat, son of Lord Lovat, was, as well as others, recruiting his forces. Lochiel however joined the army of Charles with his regiment; and, on the 15th, the army, reinforced by Keppoch and his regiment, was drawn out in order of battle upon Drummossie Muir, about a mile and a half to the south-east of Culloden House. About two o'clock the men were ordered to their quarters, and Charles, calling together the generals, announced his intention of making an attack upon the duke's army, then at Nairn. When he explained his design, the duke of Perth and John Drummond dissented; and Lochiel remarked, that on the next day the prince's army would be stronger by fifteen hundred men. But the matter was decided, when Lord George Murray seconded Charles's proposal, and urged the advantage of a night attack. Many men had gone to Inverness to get food; and the ranks were thinned: but Charles, bent upon a night attack, ordered the men to march at eight o'clock. At the appointed hour the Highland army advanced in a column, with an interval in the middle, according to a plan of Lord George Murray's, who marched in the front at the head of the Athol brigade. Charles and the duke of Perth were in the centre of the line of march. The night was very dark, and was far spent before the Highlanders reached Kilravock wood, where the officers, finding by their repeating-watches that it was two o'clock in the morning, consulted what was to be done; as Nairn was still more than three miles off, and it would be daylight before they could reach it. The matter was decided by Mr. Hepburn, who, on hearing a drum in the enemy's camp, observed, that if they should retreat they would be pursued; and that they would then be in a worse condition than they now were. The duke of Cumberland had gained intelligence of the attempt, and by five o'clock in the morning his army was on its march. The Highlanders, weary and dispirited, retraced their steps to Culloden, where many of them lay down to sleep. About eight o'clock the duke's forces were seen marching towards them; and about twelve, they were within two miles and a half of the rebels. About one o'clock a heavy cannonade was begun by the king's troops, and continued till two. The Highland regiments suffered severely, and a very inefficient fire was returned from their cannon. Colonel Belford, of the artillery, seeing a body of horse with Charles, who was stationed on a small eminence behind the right of the second line, pointed two pieces of cannon at them; one of Charles's servants, who stood behind him with a led horse, was killed, and the face of the prince was bespattered with dust. The Highlanders now became impatient to attack. A messenger was sent to Locheil, representing the necessity for doing something. Whilst Locheil was speaking to Lord George Murray, the Mackintosh regiment broke out from the line, and drove back the king's troops, sword in hand, but they were mostly brought to the ground by a terrible fire. A few desperate men pressed on, and perished by the bayonet. The Macdonalds and other Highland regiments now retired: it is said that the former were affronted by being deprived of the right, the post of honour, which their clan had possessed from time immemorial. It was in vain that the duke of Perth called upon them to behave themselves, and make a right of the left, declaring that if they did, 'he would henceforth call his name Macdonald.' The Highlanders were dispirited, and their condition became desperate.

At this crisis the duke of Cumberland advanced with the infantry, and the Highlanders fled; some retired to Badenoch, and others to the hills. Many who had fasted all day ran twenty miles without tasting food. The Fraser and Drummond's regiment retired to Inverness. The dragoons pursued and slaughtered the fugitives. When Charles saw, for the first time, his Highlanders repulsed and flying, he advanced to rally them; but Sir Thomas Sheridan dissuaded him from the fruitless attempt. The entreaty would not have availed, according to the testimony of the prince's standard-bearer, if General Sullivan had not led the prince's horse by the bridle from the field. Whilst some Highland troops still kept their ground, Lord Elcho, it is said, rode up to the prince, and exhorted him to make one final attempt to rally, or, at least, to die like one worthy of a crown. The reply was hesitating. Lord Elcho, with execrations, turned from him, for whom he had sacrificed everything, and swore never to see his face again; an oath which he kept.

The rebels are said to have lost about 1000 men; and among these were the bravest and the most devoted to the cause. The prince, after dismissing the troops which followed him, went to Gorthleek, where Lord Lovat was, and whence he sent a farewell message to the remnant of his army, thanking them for their services, but desiring them to attend to their own preservation. He next proceeded to Invergarie, near Fort Augustus, where he took leave of all his followers except Sullivan, O'Neil, and Burke, a servant who knew the country. Charles had now resolved to escape to France. For a time he kept about the islands of North and South Uist, sometimes in fishermen's huts, sometimes subsisting upon the bounty of the islanders; but generally in a state of the utmost privation. Hunted from place to place by the king's troops, his adventures are scarcely equalled by the fictions of any romance. General Campbell searched the island of Barra and South Uist in vain; and Long Island, in which he also took shelter, was surrounded by frigates and sloops of war. In this perilous condition Charles remained until the end of June, when he was delivered from his danger. Flora Macdonald, the daughter of Macdonald of Melton, in the isle of South Uist, was the generous and courageous woman who risked her life to save that of the prince. She had heard of his misfortunes and dangers, and expressed a wish to assist him. Charles was introduced to Flora, who undertook to convey him to Skye as her maid, dressed in female attire. As no one was allowed to go without a passport, she procured one for herself and her supposed maid Betty Burke. On the evening before they were to sail, she and Lady Clanronald met the prince at a place near Ormaclade, on the sea-shore. Whilst they were at supper here, news came that a party of officers and soldiers were searching Ormaclade in quest of Charles. Shortly afterwards, on seeing four armed cutters at a little distance, the ladies and the prince hid themselves among the rocks. About eight in the evening they sailed; and although threatened by a party of the Macleod's militia, who saw them from the shore, they pursued their way to Kilbride in Skye. Here Flora intended to lodge the prince at Mugstot, the seat of Sir Alexander Macdonald, but several of the king's soldiers being in the house, he was sheltered at the house of Macdonald of Kingsburgh, Sir Alexander's factor On the following day Charles changed his attire, and crossed over to Rasay, where he lodged for some time in a cow-house; but growing impatient in this retreat, he returned to Skye, where he was assisted by the Mackinnons, and by their aid sailed to Loch Nevis, a lake in the mainland, where he was put ashore on the 5th of July. Here a number of the king's troops were stationed, and Charles was now enclosed between a line of posts formed by the officers who had notice of his situation. To escape this danger, he was forced, with a friend, to creep up the channel of a brook which was between two of these posts. He was accompanied by Macdonald of Glenaladale, with whom, after surmounting numerous difficulties, he reached the hill of Corado, between Kintail and Glenmoriston. Here he found some of his faithful followers living in a cave: wretched and altered as he was, his brave adherents knew him, and fell upon their knees. 'He had,' says Home, 'a coat of coarse dark-coloured cloth, and a wretched yellow wig, with a bonnet on his head. His brogues were tied with thongs, so worn that they would hardly keep on his feet. His shirt was saffron, and he had not another.' He remained in this cave five weeks and three days; and not even the reward of 30,000*l.* which was offered for his person, would have tempted these poor men, who sheltered the wretched descendant of the Stuarts. He continued his wanderings for many weeks; sometimes becoming so exhausted from fatigue and want of food, that he could not walk without help: at length, after many narrow escapes, he was able to cross Locharkaig, and reach the fir-wood near Achnacarry. Here he heard from his faithful chieftains, Lochiel and Cluny, that they were at Badenoch, where he might with some risk join them. About the 29th of August Charles met his two friends, and was conducted by them to Letternilick, a remote place in the great mountain Benalder, where he remained until a vessel arrived at Lochnanuagh to convey him to France. On the 19th of September he reached Boradale, travelling only by night, and sailed for France on the 20th. he arrived at Morlaix in Brittany, on the 29th of September, 1746. During the wanderings of the prince, the secret of his concealment had been entrusted to hundreds of persons of every age and sex. Flora Macdonald was for some time confined in the Tower, but, being liberated, she found a home for a short time in the house of Lady Primrose, a Jacobite lady. No organised scheme for establishing Charles Edward upon the throne of England was ever afterwards formed.

Charles was received in France with professions of affection from Louis XV.; and, until his departure from France became necessary to ensure peace with England, he was well treated by the French king. In 1748, after the peace of Aix-la-Chapelle, the king of France could not allow him any longer to remain in his dominions. Charles long resisted the attempts made to induce him to leave France; and notwithstanding a letter from his father, recommending him to comply with the wishes of Louis, he remained at Paris. At length Charles, in stepping out of a coach from the Opera, was seized, and sent to Vincennes: and he was afterwards conducted with a guard out of the kingdom. After some delay he repaired to Rome. Charles Edward married a princess of the house of Stolberg in Germany, who survived him, and married Alfieri. [ALFIERI.] The union was not happy, and the latter period of the prince's life was disgraced by habits of intoxication. He had no issue by his wife; but he left a natural daughter, whom he created duchess of Albany, and to whom he bequeathed a considerable property. For many years Charles seems to have cherished hopes of recovering the crown of Great Britain; but at length, when his claims ceased to be sustained by any foreign power, and when the courts of Europe no longer gave him the title of Prince of Wales, he took the title of Count of Albany, and sank into a habit of life strangely contrasted with his former activity. He died on the 31st of January, 1788. Notwithstanding his failings, Charles Edward possessed much energy and fortitude. His brother, Henry Benedict, who was created by the old Pretender duke of York, and afterwards made Cardinal York, was the last representative of the royal house of Stuart. Henry Benedict died at Rome in 1807.

STUART, ARABELLA, or ARBELLA, often styled, both by her contemporaries and by subsequent writers, the Lady Arabella, was the only child of Charles Stuart, duke of Lennox, younger brother of Henry, lord Darnley, the father of James I. James and she therefore were full cousins. Her mother was Elizabeth, daughter of Sir William Cavendish, father of the first earl of Devonshire. The birth of the Lady Arabella has been variously placed; in 1575 (by Oldys, in MSS. referred to by Kippis, 2nd edit. of *Biog. Brit.*), in 1575 or 1576 (Ellis's *Letters*, 2nd series, iii. 64), in 1577 (article 'Arabella,' in *Biog. Brit.*, written by Morant, who however states in a note in the same page that her father died in 1576, and 'left behind him' this his only child). Other accounts of the Lennox family assert that Arabella's mother died, before her husband, in 1574. (Fisher's *Companion and Key to the History of England*, p. 188.) The Lady Arabella also stood in the same degree of relationship to Elizabeth that James himself did through his mother; both were great-grandchildren of Henry VIII.'s eldest sister Margaret; James through his mother, Queen Mary, and her father James V. of Scotland, son of that princess by her first husband; Arabella, by her father, Charles Stuart, and his mother, Margaret Douglas, the daughter of the English princess by her second husband, Archibald Douglas, earl of Angus. She was born in England; and during the reign of Elizabeth that circumstance was openly stated by Parsons, the Jesuit (in his *Conference about the next Succession to the Crown*, published under the name of Dolman, in 1594), as giving her claim to the throne an advantage over that of the Scottish king. At all events she was undoubtedly, before the birth of his son Henry, in February, 1594, the next in order of succession to James; and if he had died without issue, she would have been Elizabeth's heir, upon the same principle that he was so accounted.

The position in which she was thus placed by her illustrious descent, and near connection with the thrones both of England and Scotland, forms the key to the history of the Lady Arabella. While she was yet very young, it is said that her cousin, King James, wished to have her married to her relation, Lord Esme Stuart, whom he looked upon as his heir in case he should die childless, and whom he had created duke of Lennox; but this scheme, which must have been projected before 1583, the year in which Esme, duke of Lennox, died, was defeated by the opposition of Elizabeth. When she grew up, other matrimonial speculations were entertained with regard to her, some by herself, some by others; for a full account of which the reader is referred to the *Biog. Brit.*, and to Mr. D'Israeli's paper on 'The Loves of the Lady Arabella,' in his *Curiosities of Literature* (pp. 357-363, edit. of 1838). She first became an object of general public attention by the manner in which her name was brought forward in 1603, immediately after the accession of James, in the affair of the alleged plot called 'the Main,' for which Sir Walter Raleigh was tried: one of the charges against Raleigh was, that he designed to raise the Lady Arabella to the throne, under the protection of Spain. There is no probability however that any such design ever was entertained; it is at any rate admitted on all hands that the Lady Arabella knew nothing of it. (Howell's *State Trials*, ii. 1-60; Jardine's *Criminal Trials*, i. 389-520; Lingard's *Hist. of Eng.*, ix. 8-18; Tytler's *Life of Raleigh*, pp. 257-301.) But her situation was a sufficiently difficult and dangerous one, without this unfounded suspicion or imputation; the more especially as she appears to have been entirely dependent even for subsistence upon the bounty of the crown. James's wish probably was, that she should remain unmarried; but in February, 1609, a discovery was made of a love affair in which she was engaged with a companion of her childhood, Mr. William Seymour, second son of Lord Beauchamp, the eldest son of the Earl of Hertford; and, although both parties were called before the council, and there sharply reprimanded and warned to take heed of what they were about, their affection disregarding all consequences, they managed to get secretly married very soon after. The marriage was discovered in the summer of the following year, 1610; on which Seymour was immediately committed to the Tower, and the lady placed under custody in the house of Sir Thomas Parry at Lambeth, from which it was some months after ordered that she should be transferred to Durham, there to remain under the charge of the bishop. This marriage probably excited James's alarm and fury the more, inasmuch as the Seymours inherited a claim to the crown which many persons thought better than his own, in virtue of their descent from Mary, the youngest sister of Henry VIII., upon whose representatives that king had settled the succession, in case of failure of his own issue, by a will which an act of parliament had certainly authorised him to make. [HENRY VIII.] The Lady Arabella had scarcely set out on her forced journey to the north, in April, 1611, when she was taken ill, or professed to be taken ill, at Highgate; and here, in consequence, at the house of a Mr. Conyers, she obtained leave to remain, first for one and then for another month. When that term was about to expire, she set out, disguised in male apparel, and, attended by a Mr. Markham, about three o'clock in the afternoon of Monday the 3rd of June, took horse at a little inn about a mile and a half distant, and about six o'clock reached Blackwall, where, going into a boat that was in readiness, she was rowed down the river, and next morning was taken on board a French vessel that waited for her and her husband at Lee. Seymour meanwhile had also contrived to effect his escape from the Tower; but as he did not make his appearance so soon as had been agreed upon, the vessel set sail without him, and he was obliged to make a bargain with a coaster from Newcastle to take him across to Flanders, which he reached in safety. His wife was not so fortunate; a small ship of war was immediately dispatched from the Downs to intercept her, and she was captured in Calais Roads. She and Seymour never again met. She was thrown into the Tower, where sickness and sorrow after some time deprived the poor victim of her senses, and she died insane in her prison, on the 27th of September, 1615. Many of her letters that have been preserved, and which have been printed by Mr. D'Israeli, Ballard (*Memoirs of*

British Ladies), and others, show that the Lady Arabella united no ordinary talent and literary accomplishment to her high spirit and passionate strength of character; and she also appears to have possessed a considerable share of personal beauty. Seymour was not only permitted to return to England the year after the death of his wife, but was the same year created a baronet; and, his father having died previously, he became earl of Hertfort on the decease of his grandfather, in 1621, and in 1640 was made marquess of Hertford, under which title he makes a considerable figure in the history of the civil war, in which he fought on the side of the crown, although he had allied himself to the parliamentary general the Earl of Essex by marrying his sister. He just lived to witness the Restoration, and to be restored by Charles II. to the dukedom of Somerset, which had been forfeited, as it had been acquired, by his great-grandfather the Protector; he died 24th October, 1660. It is worthy of being noted, that to one of his daughters by his second wife, he gave the name of her whom he had first loved and had not forgotten.

STUART, JAMES, frequently distinguished by the name of *Athenian* Stuart, was born in Creed-lane, Ludgate-street, in 1713, of parents in a very humble rank of life, and by the death of his father he was left, at a very early age, the eldest of a family reduced by that event almost to indigence. Beyond this no particulars are known relative to the intervening period before he could at all have contributed to the support of the family by his pencil. In the absence of evidence to the contrary, it may safely be assumed that his education must have been a very slender one; and that, in all probability, he had received very little instruction, if any, in drawing, when the talent he showed for it recommended him to Goupy, who kept a shop in the Strand, and who employed him to design and paint ladies' fans—a branch of art at that time greatly in vogue, and more encouraged than any higher kind of painting. Such was the school in which the future investigator of Athens and its monuments was trained. Fortunately Goupy himself was an artist of some ability, both as an engraver and painter in body colours, and being acquainted with the works of the best masters, his instructions were no doubt advantageous to Stuart. He continued with Goupy till about 1742, when he set out for Italy, for the purpose of improving himself. Little more is known of him during his residence in Italy, than that after staying at Rome nearly seven years, industriously occupied in painting, he embraced the offer made to him by his friend Revett, and Gavin Hamilton, of joining them in an excursion to Greece; though Hamilton, who was probably the originator of the scheme, afterwards declined accompanying them.

Revett (Nicholas, second son of John Revett, of Brandeston Hall, Suffolk) may be supposed to have been better qualified by education for an undertaking which required some knowledge of antiquity, whereas Stuart may be thought to have been very ill prepared. He had however, during his long residence at Rome, applied himself so diligently to the study both of the classical tongues and of archæology, at the College della Propaganda, as to be able to give proof of his proficiency in a Latin dissertation, 'De Obelisco Cæsaris Augusti Campo Martis nuperrimè effosso,' dedicated to Viscount Malton, and printed in 1750, at the pope's expense. Whether either himself or his companion had paid particular attention to architecture is doubtful, or rather, the probability is that they were acquainted with it merely as a collateral branch of art. At all events, it is not a little remarkable that it should have been reserved for two *painters* to show the world what Grecian architecture was, and thereby lead to a complete revolution in architectural taste. Having previously issued a prospectus of their undertaking, and raised funds for their tour, by subscriptions received from England, the travellers quitted Rome in March, 1750; and after passing some time at Venice, made an excursion to Pola in the following July, where they employed themselves three months in making drawings of the amphitheatre, &c., which however formed no part of their original work, and remained unpublished till 1816, when they first appeared in a fourth or supplementary volume, edited by Mr. Joseph Woods. In March, 1751, they reached Athens, where they remained till about the end of 1753; and while there, Stuart met with Mr. Dawkins, a lover of antient art, the companion and patron of Wood (author of 'Ruins of Palmyra'), and who afterwards proved a most liberal patron to Stuart also on his return to England, affording him both encouragement and assistance in preparing his materials for publication. Dawkins himself however did not live to see the 'Antiquities of Athens' in a published form, for he died about two years before the work was brought out.

Stuart and his companion returned to England in the beginning of 1755, but it was not until several years afterwards (1762) that the first volume of the 'Antiquities' was published. Stuart appears to have had by far the greater share in the labour, and the literary part is ascribed entirely to him. The work was well received by the learned, and by artists, notwithstanding that, owing to the delay in bringing it out, the subject had been forestalled by Leroi's 'Ruines,' &c. [Leroi.] The greater care bestowed upon the English work gave it however a permanent architectural value, while the rival one has fallen into disrepute as untrustworthy, and, though by a professional architect, as being more pictorial than antiquarian. Perhaps it was rather an advantage to Stuart, that in examining Grecian architecture he was unbiassed by any previous professional prejudices, and had nothing to unlearn. Still it was not every one who was satisfied with the first portion of the 'Antiquities;' for Winckelmann has spoken of it very disparagingly in a letter to Fuessly, where he hints that it had disappointed many persons both in England and elsewhere. Its success however admits of no dispute. There was considerable encouragement afforded just then to such studies, and it was about the same time that Adam published his work on Diocletian's Palace [Adam], while Wood's 'Ruins of Palmyra' and 'Ruins of Baalbec' had appeared a few years previously, and the 'Ionian Antiquities' somewhat later.

The patronage and encouragement which Stuart received did not cause him to prosecute the continuation of his work very diligently, for the second volume was not entirely completed, and the third only in progress, at the time of his death. Neither was he very eager to avail himself to the extent he might have done of the opportunities afforded him as a practising architect. His patrons, the Marquis of Rockingham, Lord Anson, &c., had aided him so effectually, the latter bestowing on him the appointment of surveyor of Greenwich Hospital, that he was now in easy circumstances, and willingly relaxed from that continued exertion which prudence no longer imposed upon him as a duty. His employment as an architect was consequently by no means so extensive as it might have been, or equal to what his celebrity would have obtained for him. His principal work is the chapel of Greenwich Hospital, as rebuilt by him, after being destroyed by fire; but although beautiful as regards the details, and the individual decorations borrowed from Grecian architecture, it is not, if considered as a whole, very Grecian in character, if only because the numerous arched windows stamp it with a very different one. For Lord Anson he built a mansion in St. James's Square, and also several ornamental structures, in imitation of antique models, in the grounds of that nobleman's seat at Shuckburgh. He also erected Mrs. Montagu's house, Portman-square, and some other private mansions, but none of any particular note for their architecture.

Stuart was twice married. When he had reached the mature age of sixty-seven, he took for his second wife a very young woman, by whom he had five children; among them a son, who entered the navy, and died in 1800. Another boy, who is said to have exhibited an extraordinary talent for drawing, was carried off by the small-pox, not very long before his father's death, which occurred on the 2nd of February, 1788. The second volume of the 'Antiquities' was edited by Newton, in 1790; and the third, by Reveley, in 1794.

Between Stuart and his colleague Revett some differences appear to have taken place relative to the management of their joint publication, which were arranged by Stuart purchasing Revett's share in it, and such materials as he had provided towards the completion. Having got rid of that engagement, Revett undertook a second antiquarian expedition at the expense of the Dilettanti Society, for the purpose of exploring the remains of antient architecture in Ionia. The result of this tour, which occupied him about two years in company with Dr Chandler, was the 'Ionian Antiquities,' the first volume of which was published in 1769. Like Stuart, he afterwards practised as an architect, was employed by Lord le Despencer at West Wycombe, and erected the church at Ayot, St. Lawrence, Herts, but was so far from realising an independence, that he died in very straitened circumstances, in 1804, at the age of eighty-two.

STUART, GILBERT, LL.D., was the son of Mr. George Stuart, who was related to the learned grammarian Ruddiman, and filled the office of professor of Humanity, or Latin, in the University of Edinburgh, with much reputation, till his death in 1793. Gilbert was born at Edinburgh, according to the common account, in 1746; but in 1742, according to Kerr's *Memoirs of Smellie* (i., 499, and ii., 2). He was educated for the profession of the law; but a passion for general literature early took possession of him, and drew him off from his legal studies, so that he never was called to the bar. He first made himself known by his 'Historical Disquisition concerning the Antiquity of the British Constitution,' which he published in 1767, and which was held to have so much merit, that the University of Edinburgh immediately bestowed upon the youthful author the degree of LL.D. In the following year appeared his 'View of Society in Europe, in its Progress from Rudeness to Refinement; or, Inquiries concerning the History of Laws, Government, and Manners.' This work, which reached a second edition in 1778, displayed great reading, as well as ingenuity of speculation. Soon after it first appeared, the professorship of public law in the University of Edinburgh became vacant, and Stuart applied to the crown for the appointment, but unsuccessfully, in consequence, as he conceived, of the interference of the Principal, Dr. Robertson. This notion, and the event out of which it arose, had a great influence on the future course of Stuart's life and literary labours. If Robertson really did use his influence to prevent his appointment to the academical chair, it is believed that his reason was, the character for dissipation and intemperance which Stuart had already established for himself, notwithstanding his occasional hard reading and violent paroxysms of study. From this time he evinced, in addition to his unfortunate habits of life, a temper the most envious, malignant, and revengeful, which went far to destroy all the value of his undoubted learning and talents. On his failure in the matter of the professorship, he left Edinburgh for London, but without leaving behind him his personal resentments, which seem to have comprehended the general body of the literary men of his native city. In London, where he resided from 1768 to 1773, he is understood to have been chiefly employed in writing for the 'Monthly Review.' But he also found time to produce, in 1772, a satirical attack upon the newly published Latin Grammar of Dr. Adam, the rector of the High School of Edinburgh, under the title of 'Animadversions on Mr. Adam's Grammar, by Jo. Rich. Bushby;' and he is also understood to have been the writer of other papers in ridicule both of Adam's book and of himself, which appeared about the same time in the 'Weekly Magazine,' recently begun at Edinburgh by Walter Ruddiman, the nephew of the grammarian. Stuart (and his father, who is believed to have assisted him) had two special reasons for these aggressions: the new grammar was designed to supplant that of their relation Ruddiman, and Adam was besides a great ally of Principal Robertson. In 1772, also, Stuart edited (anonymously) the posthumous work of Francis Stoughton Sullivan, LL.D., entitled 'Lectures on the Feudal and English Laws.'

In 1773 he returned to Edinburgh; and then he and Mr. William Smellie, the printer (a man of talent and considerable literary acquirement), set up together a new monthly periodical, entitled 'The Edinburgh Magazine and Review.' The first number of this publication, which is not to be confounded with the original 'Edinburgh Review' established in 1754, in which Dr. Robertson, Adam Smith, &c. were writers, appeared in October, 1773, the 47th and last in August, 1776. The general spirit of the articles, especially of those written by Stuart, was of such unsparing severity, instigated too, as was conceived, in many cases by his personal resentments, that, notwithstanding the attraction of no common ability, a public feeling was at last aroused against the work, which compelled its conductors to give it up. A list of Stuart's reviews and other communications is given in Kerr's 'Life of Smellie,' i., 403-405. Of the former the most remarkable was an article on the first volume of Henry's 'History of Great Britain,' the first of a series of ferocious attacks on that work by Stuart, of which a full account may be found in Mr. D'Israeli's 'Calamities of Authors.' They were continued in the 'Political Herald' and the 'English Review,' two periodical works in which Stuart engaged when he returned to London some years after this, and the proprietor of which was his countryman Mr. John Murray, the father of the present eminent publisher of the same name. But meanwhile he produced several additional works in his own name while he still remained at Edinburgh; his 'Observations concerning the Public Law and Constitutional History of Scotland,' 8vo., Edinb., 1779 (an attack upon the introductory book of Dr. Robertson's 'History'); his 'History of the Establishment of the Reformation of Religion in Scotland,' 4to., London 1780; and his 'History of Scotland from the Establishment of the Reformation to the Death of Queen Mary,' 2 vols. 8vo., London, 1782, another attack upon Robertson, founded on his alleged unfair treatment of the Scottish queen, whom Stuart zealously defends from all the charges brought against her. These works all drew considerable attention in their day, but they are now little read; the amount of learning and thought which they contain has not proved sufficient to buoy up the large portion of them composed of inconclusive unsatisfactory speculation, and the sophistry of mere passion and party spirit. They are all written however with much force and vivacity of style. Stuart returned once more to London in 1782; and he appears to have been principally employed in conducting the two publications belonging to Mr. Murray, already mentioned, for the next four years. But jaundice and dropsy, brought on and fed by persevering dissipation, had by the end of this space completely undermined his constitution. He returned to Scotland in the spring or summer of 1786, and died in his father's house at Musselburgh, on the 13th of August in that year.

(Kerr's *Memoirs of Smellie;* D'Israeli's *Calamities of Authors;* Chalmers's *Life of Ruddiman.*)

STUBBE, HENRY, was a remarkable example of temporary celebrity followed by nearly complete neglect and oblivion, the consequence of great natural talents and acquired knowledge not being matched with a sufficiency of judgment, and of there chancing to be little or nothing in a considerable mass of literary produce which has not been superseded by later works or by the progress of discovery. He was the son of a clergyman, and was born at Partney, near Spilsbye in Lincolnshire, 28th February, 1631. He spent his early boyhood in Ireland, whither his father had transferred himself and his family on being taken with a fancy for the doctrines of the Baptists; but after his death the breaking out of the rebellion in 1641 drove the widow and her son back to England, upon which young Stubbe was put to Westminster school, then presided over by Busby, with whom he became a great favourite. In 1649 he was elected a student of Christ Church, Oxford; where, although he made himself many enemies by his conceit and arrogance, he is said to have prosecuted his classical studies with such success, that while still an undergraduate he used to discourse in the public schools in very fluent Greek. He had before going to the University attracted the notice of Sir Harry Vane, from whom he received much substantial kindness; and this connection naturally attached him to the parliamentary cause—for which however he used to declare in after-life that he never had had any real affection. But for a considerable time he exerted himself with much seeming zeal on that side in various ways. After he had taken his degree of B.A. he went to Scotland in 1653, and served for a couple of years in the army there; and then, having, on returning to Oxford, and taking his master's degree, been made under-librarian of the Bodleian, he got himself turned out after about two years, both from that office and from his studentship, by a succession of violent pamphlets which he published against the existing condition both of church and state, under the titles of 'A Vindication of Sir Harry Vane;' 'An Essay on the Good Old Cause;' and 'Light Shining out of Darkness, with an Apology for the Quakers.' Upon this catastrophe he betook himself to Stratford-on-Avon, and there practised as a physician till the Restoration, when he presented himself to receive confirmation from the hands of his diocesan, and in 1661 was sent out to Jamaica with the title of his majesty's physician for that island; but, finding the climate not to agree with him, he soon returned and re-established himself at Stratford, from which, after some time, he removed to Warwick, where he continued to reside till he met with his death, by being drowned in attempting to make his way across a river between Bath and Bristol, on the 12th of July, 1676. Stubbe, who seems to have had no principle, began to write against his old political friends and his former political opinions as soon as the king returned; but his only writings after the Restoration that are now remembered are his attacks upon the Royal Society, the principal of which is his answer to Sprat and Glanville, entitled 'Legends no History, or a Specimen of some Animadversions upon the History of the Royal Society; together with the Plus Ultra of Mr. Glanville reduced to a Non Plus,' 4to., 1670. But here too he wasted his powers in a cause with which posterity has not sympathised. Anthony Wood, who was his contemporary at Oxford, has drawn his character graphically enough. He was, Wood says, 'the most noted Latinist and Grecian of his age; was a singular mathematician, and thoroughly read in all political matters, councils, ecclesiastical and profane histories; had a voluble tongue, and seldom hesitated either in public disputes or common discourse; had a voice big and magisterial, and a mind equal to it; was of an high generous nature, scorned money and riches, and the adorers of them; was accounted a very good physician, and excellent in the things belonging to that profession, as botany, anatomy, and chemistry.' Stubbe, with all his vast memory for words and facts, was plainly destitute of the faculty of distinguishing, in a case of any complexity, right from wrong, or truth from falsehood. Wood admits that he altogether wanted even common discretion. 'He was,' he says, 'a very bold man, uttered anything that came into his mind, not only among his companions, but in public coffee-houses, of which he was a great frequenter; and would often speak freely of persons then present, for which he used to be threatened with kicking and beating. He had a hot and restless head, his hair being carrot-coloured, and was ever ready to undergo any enterprise, which was the chief reason that macerated his body almost to a skeleton. He was also a person of no fixed principles; and whether he believed those things which every good Christian doth, is not for me to resolve.' And in fine, Wood concludes by telling us that 'he became a ridicule, and undervalued by sober and knowing scholars, and others too.'

STUBBS, GEORGE, an eminent animal painter and anatomist, was born at Liverpool in 1724, and settled in London. He excelled especially in the portraits of horses. Fuseli observes, 'That his skill in comparative anatomy never suggested to him the propriety of style in forms, if it were not eminently proved by his Phaëton with the Horses of the Sun, would be evident from all his other figures, which, when human, are seldom more than the attendants on some animal; while the style of the animals themselves depended entirely on the individual before him: his tiger, for grandeur, has never been equalled: his lions are, to those of Rubens, what jackals are to lions; but none ever did greater justice to that artificial animal, the race-courser.'

Stubbs completed in 1766 his work 'On the Anatomy of the Horse,' in eighteen tables from nature; and before his death three numbers of another work (which was to have consisted of six), under the title of 'A Comparative Anatomical Exposition of the Structure of the Human Body with that of a Tiger and a common Fowl,' in thirty tables.

There are two pictures by this artist in the Grosvenor Gallery, the property of the Marquis of Westminster: one of them represents Portraits of Brood-Mares in a Landscape; the other, the Grosvenor Hunt. The scene is near Eton Hall, in which portraits of the late Earl Grosvenor, of his brother, and others are introduced. These pictures have been considered the best works of this artist.

Dr. Waagen, speaking of the first of these two pictures, says, 'I was much pleased at meeting with a picture by this artist, of whose merits I had formed a high idea from engravings, and from his work on the Anatomy of the Horse. It represents horses under the shade of noble oaks: besides the great truth and the profound knowledge in the representation of the horse, it is treated with great ability; and the tone of the sky is very good.'

(Fuseli, *Dictionary of Painters*; Young's *Grosvenor Gallery*; Waagen's *Arts and Artists in England*.)

STUCCO, an Italian word adopted in most other languages, and applied as a general term to plaster of any kind used as a coating for walls, and to give them a finished surface; *stuccatura*, or stucco-work, is the term similarly employed for all interior ornamental work in imitation of carved stone, so executed, such as the cornices and mouldings of rooms, and the enrichments of ceilings. Stucco was very much employed by the antients, and not merely for coating columns, &c. constructed of brick, but in many instances for covering stone or even marble; for which last purpose it was applied so sparingly as to be no more than a very thin incrustation, for the purpose, it is now supposed, of being painted upon. Recent inquiries into the subject of *Polychromy*, by Semper and others, have put it beyond doubt that the temple of Theseus at Athens, and other edifices of that period, were so painted. It is not improbable that stucco was used by the antients, in such cases, partly to protect the stone from decomposition, for they had the art of preparing it in the greatest perfection, and rendering their stuccoes and mortars almost indestructible.

The stucco used for internal decorative purposes, such as those above mentioned, is a composition of very fine sand, pulverised marble, and gypsum, mixed with water till it is of a proper consistency. Within a short time after being first applied, it begins to set, or gradually harden, in which state it is moulded, and may at length be finished up with metal tools. Even in buildings of the most sumptuous kind, whatever may be their other materials, though marble may be employed for the floors and columns of rooms, the cornices and ornaments of vaultings and ceilings are almost invariably of stucco-work, or else some other artificial composition, such as papier-maché, which is now beginning to be in request, and which has this advantage, that ornaments cast in it can be affixed with very little trouble to a ceiling or other surface originally left plain. Indeed, were it not for stucco or some substitute, it would be hardly possible to introduce any sort of carved work in such situations, such material as stone being out of the question for flat ceilings.

The stucco employed for external work is of a coarser kind, and variously prepared, being now manufactured wholesale as an article of commerce, ready for use; and of which the different sorts are generally distinguished by the name of *cements*. Adam's or Liardet's cement (so called from being that employed by the Adams [ADAM], who first of all introduced stucco in this country as a substitute for stones, and from Liardet, who obtained a patent for it, in 1773) is an oil-cement, of which the chief ingredients are fine whiting and calcined oyster-shells, well mixed and ground up in a mill with oil. This, if not the cheapest at first, is perhaps one of the best and most economical cements, as the test of about seventy years proves that it will bear this climate for a considerable length without exhibiting marks of decay. Parker's or Roman cement, that now most in vogue, consists chiefly of a preparation of argillaceous limestone found on the coasts of Essex and Kent, and in the Isle of Sheppey. Of Bailey's cement, lime and sharp sand are the principal ingredients; while mastic, or Hamelin's cement, is composed of peroxide of lead and oil. Keene's cement is one of very recent invention, and of very superior quality, taking a surface and polish almost equal to that of the finest marble. It is in fact a species of scagliola, consequently is employed, like that, only for interior decoration.

As an imitation of stone, much will depend upon the skill and care with which stuccoing is executed, on its being made to resemble stone as closely as possible, both as to tint and the grain or surface; and in order to render the deception as complete as possible, it is important, though it is not always done, that lines should be made on the face of the wall, indicating the joints and courses of stone-work. If perfectly well executed, stucco will be nearly equal in appearance to stone, and even superior to that of stone of inferior quality. There are some who protest against the use of stucco externally, altogether, as a spurious and meretricious mode of building with sham material; but it is certain that most of Palladio's edifices, and of what are spoken of as the 'marble palaces' of Venice and Rome, are merely faced with stucco. If too the extensive application of stucco in this country, of late years, for architectural purposes, has given rise to a good deal of paltry and flimsy affectation of finery, it has been favourable to architectural design, and promoted a taste for it, by allowing it to be executed where stone would be too expensive a material, or where, if stone were employed, the same extent and degree of enrichment could not be afforded.

STUHLWEISSENBURG, a county in the kingdom of Hungary, is bounded on the north by Comorn, on the east by Pesth, on the south by Tolna, and on the west by Vesprim. The southern and larger portion of the county is flat, with some inconsiderable hills; the northern part is mountainous, being traversed by some branches of the Bakony and Vertes chains. The whole of the right bank of the Danube is high. The principal rivers are, the Danube which separates it from Pesth, and the Sarwitz. There are many other smaller streams. The Sarwitz, which has a very slow current, makes many stagnant pools and marshes, which cover many thousand acres of land: an expensive canal has however been formed, by which part of the marshes has been drained and rendered fit for agriculture. The area of the county is 1600 square miles, of which 799,853 acres are stated to be useful land, viz. 360,411 acres arable land, 81,060 pasturage, 23,814 vineyards, 8917 garden-land, and 316,651 forests. The soil is extremely fertile: it produces corn, especially wheat of remarkably fine quality; pulse, garden vegetables, and abundance of fruit. Tobacco, woad, and madder are likewise cultivated. Red and white wines are made in considerable quantity, but they are not much esteemed, because they will not keep. The breed of horses, oxen, and swine is good; but the country is chiefly remarkable for numerous flocks of fine sheep. The rams are highly valued, and numbers of them are purchased for other counties. Beasts of prey, especially wolves, and all kinds of game, are found in abundance in the forests. Fish of various kinds are taken in the rivers and lakes. In the Sarwitz and the marshes there are many crabs, tortoises, wild ducks and geese, and other water-fowl. The population is said not to exceed 130,000, who are descended partly from Slavonians, and partly from Magyar and German settlers. The majority are Roman Catholics; but the Protestants, and especially Calvinists, are numerous.

Stuhlweissenburg, the capital of the county, is situated in 47° 12′ N. lat. and 18° 25′ E. long., in a marshy spot near the Sarwitz, and is surrounded with numerous canals for draining the marshes. It has two suburbs, which are surrounded with a deep moat, and connected with the town by bridges. This town has greatly declined from its antient splendour; and though there are several fine buildings, it has on the whole a mean appearance. It was founded in the eleventh century by King Stephen, was for five hundred years the place where the kings of Hungary were crowned, and where many of them were buried, from Stephen I., who died in 1038, to Zapolya, who died in 1540. From this circumstance it was called Alba Regia or Regalis. It is said to be built on the site of the Roman Floriana. When the contest for the possession of Hungary by the house of Austria began, under the emperor Frederick III., Maximilian I., king of the Romans, took the town in 1490, but was not able to retain it against Bathori. In 1543 it capitulated to the Turks under Soliman the Magnificent. The Turks were defeated in 1593, in the vicinity of the town, by Palfy, Nadasli, and Zrinyi, the generals of the emperor Rudolph II.; but still kept possession of it. In 1601 the duke of Mercoeur and General Russworm took it by storm: Hassan Pasha, who attempted to retake it, was defeated in a great battle; but the garrison having mutinied, it again fell into the hands of the Turks in 1602. When the Turks were at length expelled from Hungary by the armies of Leopold I., the town was taken in 1688 by the elector of Bavaria. The empress Maria Theresa made this town a bishop's see in 1772. The principal public buildings are, the court-house, remarkable for its great extent and fine architecture; the episcopal palace; the palace of Count Schmidegg, in which are the post-office, the coffee-house, and assembly-rooms; and of the six churches, the cathedral, and the church of St. Mary, built by Stephen I. with the spoils taken in war. There are also a gymnasium, a seminary, a normal school, a military academy, and a Hungarian theatre. There are some manufactures of coarse cloth and flannel, but the inhabitants depend for subsistence chiefly on gardening and agriculture. The environs are extremely fertile.

(Hassel; Jenny, *Handbuch für Reisende*; Thiele, *Das Königreich Ungarn*; *Statistisch-Geographische Beschreibung der Königreiche Ungarn, Croatien, Slavonien, &c.*)

STUKELEY, THE REV. WILLIAM, M.D., was descended from an antient Lincolnshire family, and was born at Holbeach in that county, on the 7th of November, 1687. From the grammar-school of his native town he went to Bennet College, Cambridge, in 1703. At this time natural science, as connected with the profession for which he was intended, seems to have been his favourite pursuit; and the chief assistant of his studies was Stephen Hales, afterwards celebrated for his physical investigations and discoveries, who was a member of the same college. Hales and he, we are told, were wont to ramble over Gogmagog Hills and the bogs of Cherry Hunt Moor, gathering simples; Stukeley, who was a ready draughtsman, having added a map of the country to a copy of Ray's Latin Catalogue of the Plants growing around Cambridge, which they used to take with them as their guide. The two friends also applied themselves together to anatomy and chemistry, and performed many curious dissections and experiments. (*Account of Hales*, drawn up from materials furnished by Peter Collinson, F.R.S., in *Annual Register* for 1765.)

Having taken his degree of M.B. in 1709, Stukeley afterwards repaired to London, where he attended St. Thomas's Hospital as a pupil of Dr. Mead; and then he settled as a medical practitioner at Boston, in his native county. In 1717 he removed to London; in 1719 he took his degree of M.D.; in 1720 he was admitted a Fellow of the College of Physicians; but although he appears to have continued to rise in his profession, he left the metropolis in 1726, and, returning once more to Lincolnshire, fixed himself at Grantham. Here he soon acquired great reputation. His health however had been for some years giving way, and in 1729, on the persuasion, it is said, of archbishop Wake, he relinquished medicine and took orders. The same year he was presented by lord chancellor King to the living of All Saints in Stamford; and some time after, having become chaplain to the duke of Ancaster, he received from his grace, in 1739, the living of Somerby, near Grantham, which he seems to have held along with his Stamford preferment. But in 1747 he was presented to the rectory of St. George the Martyr, in Queen Square, London, by the duke of Montague, with whom he had become acquainted some years before, when they were brought together as founders of the Egyptian Society; and this brought him once more up to the metropolis, which, or Kentish Town, in the immediate neighbourhood, continued to be his residence for the rest of his life. He died in the rectory-house, on the 3rd of March, 1765, from a stroke of palsy with which he had been attacked a few days before.

The taste for antiquarian research showed itself in Stukeley at an early age, and occupied much of his leisure even when his chief attention was given to other studies. It is only as a writer on British antiquities that he is now remembered. His only medical publication is a tract entitled 'A Dissertation on the Spleen,' which appeared in 1723, and is said to have been well received. But even before this he had published his first antiquarian work, 'An Account of a Roman Temple (the celebrated Arthur's Oven) and other Antiquities near Graham's Dike in Scotland,' 4to., London, 1720. This was followed by his 'Itinerarium Curiosum, or an Account of the Antiquities and Remarkable Curiosities in Nature or Art observed in Travels through Great Britain;' illustrated with copper-plates, fol., 1724. A second volume, or 'Centuria,' as it is designated, was added to this work from the papers and drawings he left at his death ready for the press; and was given to the world, along with a reprint of the former volume, in 1776. It is of all Stukeley's works the one that is now most sought after. His next publications were his two works on the great druidical or supposed druidical remains in the west of England:—the first, entitled 'Stonehenge and Abury, two Temples restored to the British Druids,' fol., 1740; the second, 'Abury, a Temple of the British Druids,' fol., 1743. [Avebury.] A new edition of these two works was published at London, in two vols. folio, in 1838. In 1743 also appeared his 'Palæographia Britannica,' 4to. He produced nothing more except some communications to the 'Archæologia' and the 'Philosophical Transactions,' till, in 1757, he printed, in a separate tract, his account, with extracts, of the work of Richard of Cirencester, 'De Situ Britanniæ,' sent to him as having been recently discovered at Copenhagen, by J. C. Bertram [Richard of Cirencester]; but a more extended account of this work is given in the second or posthumous Centuria of his 'Itinerarium Curiosum,' already noticed. In 1759 appeared, in a quarto volume, one of his most remarkable works, entitled 'Some Account of the Medallic History of Marcus Aurelius Valerius Carausius, Emperor of Britain.' 'I have used his materials,' says Gibbon, in one of his notes, referring to this work, 'and rejected most of his fanciful conjectures.' No antiquarian ever had so lively, not to say licentious a fancy as Stukeley; the idea of the obscure remote past inflamed him like a passion; most even of his descriptions are rather visions than sober relations of what would be perceived by an ordinary eye; and never before or since were such broad continuous webs of speculation woven out of little more than moonshine. He possessed however a great deal of real ingenuity as well as learning; and all his works contain many things that are both curious and valuable, some of them much that would by this time have been irrecoverably lost but for his record of it, although few if any of either his theories or his histories are to be received throughout with implicit faith. His only theological work, we believe, was a collection of Sermons, published in 1760, under the title of 'Palæographia Sacra,' principally occupied with the natural history and botany of the antient world. As a man, Stukeley appears to have been distinguished by a very placid and amiable disposition.

(Hutchinson's *Medical Biography*; *Notice*, by Collinson, in *Annual Register* for 1765.)

STURGEON. [STURIONIDÆ.]

STURIO'NIDÆ, a family of fishes belonging to the section *Chondropterygii*, the species of which are distinguished from others of the section by the gills being free, as in ordinary fishes, thus differing from the second great division of the fishes having a cartilaginous skeleton, such as the Sharks and Rays, in which the gills are fixed, and have their outer margin attached to the skin. The *Sturionidæ*, or Sturgeon tribe, have moreover but one opening to the gills, and this is protected by an operculum.

Four genera are contained in this family, *Accipenser*, *Spatularia*, *Chimæra*, and *Callorhynchus*. To the first of these genera belongs the common sturgeon (*Accipenser Sturio*, Linn.), which is not unfrequently met with in mouths of the English rivers. It is of an elongated form, and has the body protected by numerous indurated plates, which are arranged in longitudinal series; the head is entirely covered by bony plates; the muzzle is elongated, and more or less pointed; and the mouth, which is placed on the under side of the head, is tubular, and destitute of teeth: on the back is a single dorsal fin, which is placed on the hinder third of the fish; the tail is forked, and the upper lobe is the largest, as in the Sharks.

'In the northern part of Europe,' observes Mr. Yarrell, 'this fish is much more numerous than with us, and extensive fisheries are established for its destruction. Caviar is made of the roe of the female; isinglass is obtained from the dense membrane forming the air-bladder; and the flesh, besides being preserved by salting and pickling, is in request for the table while fresh, being generally stewed with rich gravy, and the flavour considered to be like that of veal. The flesh, like that of most of the cartilaginous fishes, is more firm and compact than is usual among those of the osseous families.'

Two species of sturgeon have long been distinguished by the fishermen of the Solway Firth, the one with a blunt nose, and the other with a sharp nose: the latter is the most common of the two; the former has recently been described by Dr. Parnell, in the 'Transactions' of the Royal Society of Edinburgh (vol. xiv., pl. 4), and is introduced by Mr. Yarrell, in the Supplement to his 'History of British Fishes.'

Several very distinct species frequent the rivers of Russia, and will be found described and figured by M. A. Loretzky, in the third volume of the 'Transactions' of the Imperial Society of Naturalists at Moscow. Three species are found in the rivers which flow into the Black Sea, and moreover North America possesses species which are peculiar.

The genus *Spatularia* is distinguished by the enormous prolongation of the muzzle, the sides of which are dilated. The general form of the body nearly resembles that of the Sturgeons; but the gills are more open, and the operculum is prolonged into a membranous point behind; the mouth is deeply cleft, and well provided with small teeth; the lobes of the tail are very nearly equal. But one species of this curious genus is known (*Squalus Spatula*, Mauduit), and that is an inhabitant of the Mississippi.

Genus *Chimæra*, Linn.—Although placed in the present section, the *Chimæræ* differ considerably from the sturgeons, and are in fact very nearly allied to the sharks. 'Though in these fishes there is but one apparent gill-opening,' observes Dr. Richardson, in his 'Fauna Boreali-Americana,' 'the gills in reality adhere by a large part of their borders, and there are consequently five holes communicating with the external gill-opening.' They have a rudimentary operculum concealed by the skin; and their jaws, still more reduced than those of the sharks, are furnished with hard plates, four above and two below, in place of teeth. The males are distinguished by trifid bony appendages to the ventral fins. The eggs are large and of a coriaceous texture, and have flattened and hairy margins. The snout, supported like that of the sharks, projects forwards, and is pierced with pores arranged in tolerably regular lines; the anterior dorsal fin is armed with a strong bony spine, and is placed over the pectorals.

In the genus *Chimæra*, as at present restricted, the snout is conical; the second dorsal fin commences immediately behind the first, and extends to the tip of the tail, which is elongated and pointed, and terminates in a long filament: on the under side, the tail is also furnished with a long but narrow fin. Only one species is known, the Northern Chimæra (*Chimæra monstrosa*, Linn.). This fish inhabits the European Seas, and is said to be frequently caught following the shoals of herrings, on which it preys. It is usually about two or three feet in length, and the general colouring of the body is silvery-white, but the upper parts are mottled with brown.

The next genus differs from *Chimæra* chiefly in having the snout terminated by a largish fleshy appendage. The second dorsal fin is placed over the ventrals, and terminates opposite the commencement of the lower tail-fin. The only species known, until very recently, was the Antarctic Chimæra (*Chimæra Callorhynchus* of Linnæus), an inhabitant of the South Seas. A second species of *Callorhynchus* is described by Mr. Bennett under the name *Cal. Smythi*, in the zoological appendix to Beechy's 'Voyage;' and more recently Dr. Richardson describes a species of the present genus (*C. Tasmanius*),* which he regards as distinct. It is from Port Arthur, Van Diemen's Land.

STURM, JOHN, was born on the 1st of October, 1507, at Schleiden in the Eifel, between Treves and Cologne. In 1524 he went to Louvain, where he devoted himself to antient literature, but after a few years' study he entered into partnership with Rutger Rescius, an eminent Greek scholar, who was forming a printing establishment at Louvain for the printing of Greek authors. The only works that are known to have issued from their press are an edition of Homer, and one of Xenophon's 'Memorabilia Socratis,' which appeared in 1529, 4to. In this year Sturm went to Paris, probably with the intention of forming connections for the sale of his publications. But the very favourable reception which he met with at Paris, and the new world which here opened upon him, determined him not to return to Louvain. He began to occupy himself with teaching, and soon obtained permission to set up a school. Sturm had adopted the Lutheran creed before he left Germany, but took care not to avow it in public. At Paris however it appears to have become known to some persons, and the severe regulations in France against Protestantism at last induced him to go to Strassburg, in which city a gymnasium was just established. The office of rector of the school was offered to Sturm, who entered upon it in 1538. Owing to his exertions and the generous support of the city of Strassburg, this gymnasium soon became one of the most flourishing in all Germany, until, in the year 1566, it was raised to the rank of a university, under the management of Sturm. While he was devoting himself with the utmost zeal to his duties as a teacher and rector, he was no less active in promoting the interests of Protestantism. He was sent on various missions concerning religious matters, and was extremely liberal and kind towards all who suffered for their religious opinions. But he showed nothing of a sectarian spirit, and some of his friends, who were staunch Lutherans, began to suspect him of leaning towards the doctrines of Calvin. They openly attacked him in their sermons, the consequence of which was that he gave up attending them. His silence and perseverance excited their anger and hatred. Various charges were at last brought against him, among which it was alleged that he had not been at church or partaken of the Lord's Supper for twenty years. His enemies at length succeeded, in 1583, in persuading the magistrate of Strassburg, on the pretext of his old age, to deprive him of his office, which was given to Melchior Junius, one of his former pupils. Notwithstanding the honourable appearance of his dismissal, and although he was left in the enjoyment of his former salary, he keenly felt the wrong which was done to him. His strength rapidly declined, and a few years before his death, which took place on the 3rd of March, 1689, he lost his sight.

Sturm was one of the most amiable, benevolent, and earned men of the age. He went so far in his liberal support of persecuted Protestants, that he became involved in great pecuniary difficulties; but he was far from being a vehement sectarian. He appreciated the merits of every man, whatever might be his religious opinions, and he was no less esteemed by Roman Catholic prelates, than by the moderate party among the Protestants. As a teacher he was eminently successful. On account of his great knowledge of rhetoric, and his elegant Latin style, he was called the German Cicero. His works, all of which are written in Latin, are very numerous. The following are the most important:—'De Literarum Ludis recte aperiendis,' Strassburg, 1538, 4to.; 'In Partitiones Ciceronis Oratorias Dialogi Quatuor,' Strassburg, 1539, 8vo.; 'M. Tullii Ciceronis Opera Omnia, editio post Naugerianam et Victorianam emendata à Jo. Sturmio,' Strassburg, 1540, 9 vols. 8vo., often reprinted with corrections and emendations; 'Prolegomena, hoc est, Praefationes in optimos quosque utriusque Linguae Scriptores,' Zürich, 1565, 8vo.; 'De Universa Ratione Elocutionis Rhetoricae Libri Quatuor,' Strassburg, 1576, 8vo. (this work, which in reality only consists of three books, is a very elaborate and systematic commentary on the rhetorician Hermogenes); 'Anti-Pappi Quatuor,' Neustadt, 1580, &c., 4to. (this work contains his theological controversies with Pappus, Osiander, and others). His treatises on education have been reprinted in several collections of works on this subject.

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* 'Proceedings of the Zoological Society,' for March, 1840, p. 29.

(Jöcher, *Allgem. Gelehrt. Lex.*, iv., p. 910, &c.; Saxius, *Onom.*, iii., p. 152; *Biographie Universelle.*)

STURM, JOHN CHRISTOPHER, a German mathematician and natural philosopher, was born at Hippelstein, in Bavaria, November 3, 1635. His father, who was master of the wardrobe to the elector of Bavaria, having been ruined by the wars, the youth was indebted for the benefits of a good education to the benevolence of Daniel Wulfer, a clergyman of Nürnberg, who placed him at a school in that city, where, during eight years, he was engaged in the study of the antient languages and such of the sciences as were then taught. Having made considerable progress, young Sturm was sent by his benefactor to the university of Jena, where he took his degrees; and in 1660 he went to study at Leyden. He remained there only one year, and then he returned to Jena, where he qualified himself for the church. He was appointed to the ministry for one of the parishes in the territory of Ettingen, where he continued to perform the duty till 1669, when, through the interest of his friends, he was appointed professor of mathematics in the university of Altdorf, in Franconia. This post he held during thirty-four years, and it is said that he was the first who introduced, in the gymnasia and the common schools of Germany, the practice of giving instructions in the elements of useful science to the children of the working classes.

Sturm had been educated in the philosophy of Aristotle, but in his visit to Holland he became acquainted with that of Descartes; and, after a vain effort to reconcile the principles of the antient with those of the modern physics, he formed for himself a species of philosophy by selecting whatever, in either, appeared most consonant to nature and reason. This philosophy he endeavoured to introduce into the schools of his country; and though he did not wholly succeed, he contributed much to the general diffusion of a knowledge of the physical sciences in the north of Europe.

He died December 26, 1703, leaving a son, Leonard Christopher Sturm, who became an architect.

The principal works of Sturm are, 'Collegium Experimentale sive Curiosum, in quo primaria hujus seculi Inventa et Experimenta Physico-mathematica An. 1672,' Nürnberg, 1676, 2 vols. 4to.; 'Cometarum Natura, Motus, et Origo, secundum Hevelii et Petiti Hypotheses,' Altdorf, 1677, 4to; 'Mathesis Enucleata,' 1 vol. 8vo.; 'Mathesis Juvenilis,' 2 vols. 8vo., of which the second contains a tract entitled 'Scientia Cosmica, sive Astronomica, Spherica, et Theorica Tabulis comprehensa,' Nürnberg, 1684; 'Physicæ Conciliatricis Conamina,' Nürnberg, 1685; 'Philosophia Eclectica,' Nürnberg, 1685, being a collection of the principal dissertations before published on the different systems of philosophy. Sturm also published a translation in Latin of the 'Hydraulic Architecture' of Bockler; a German translation of Archimedes; and a collection of letters to Dr. Henry More of Cambridge, on the weight and elasticity of the air. In 1684 he published a second part of the collection of discoveries made up to that time; and editions of both parts, together with the letters to Dr. More, were published in 1701 and 1715; these contain many curious experiments.

STURM, CHRISTOPH CHRISTIAN, was born on the 25th of January, 1750, at Augsburg. He studied theology at Jena and Halle, and was subsequently appointed preacher at Magdeburg. In 1778 he obtained the offices of pastor at the church of St. Peter, and of Scholarchus, at Hamburg. His sincere piety, his zeal as a religious instructor of the people, and his learning gained for him the love and esteem of his flock. His leading principle was that a preacher should render his knowledge of true religion and morality fruitful in his own actions before attempting to effect the same in others by his instruction; and his whole life, which is marked by scarcely any incidents, was only characterised by the honest endeavour to carry his principle into practice. He died on the 26th of August, 1786.

Sturm wrote many religious works, which are more of a practical than of a scientific character. The following are the most important:—'Der Christ in der Einsamkeit,' Halle, 1763; 'Der Christ am Sonntage,' 1764, &c.; 'Unterhaltungen mit Gott in den Morgenstunden auf jeden Tag des Jahres,' 1768, 2 vols. 8vo., and often reprinted; 'Betrachtungen über die Werke Gottes im Reiche der Natur und der Vorsehung auf alle Tage des Jahres,' 1785. This work has been translated into most of the European languages, and also into English by Clarke, under the title of 'Reflections on the Works of God,' &c. The numerous editions of this translation show that the work has been very popular in England. Sturm also published a considerable number of sermons, and among them a collection of sermons for children: 'Predigten für Kinder von reiferem Alter,' Leipzig, 1774, 2 vols. 8vo. Sturm also occupies a considerable rank among the writers of sacred poetry, which he published in four collections: 'Gebete und Lieder für Kinder,' 1776; 'Gesangbuch für das reifere Alter,' 1777; 'Lieder für das Herz,' 1787; and 'Gesangbuch für Gartenfreunde,' all of which breathe the purest piety. Many of his sacred songs have been incorporated into the hymn-books which are used in the Protestant churches of Germany.

STURM'S THEOREM. There is a branch of the theory of equations, containing the celebrated theorems of Descartes, Fourier, and Sturm, which it is advisable to place in an article by itself, and the present heading has been chosen because Sturm's theorem is at once the most conclusive and the latest of the three. It has long been a problem of much interest and notoriety to find, in a given equation, how many roots, if any, are contained between two given limits; how many roots are positive, how many negative, how many imaginary.

The first step towards the solution of the preceding problem was made by Descartes, though it is asserted by Cossali and Libri, that Cardan came very near to the same step. The former, after collecting a table of Cardan's cases, and putting them in a form which Cardan did not use (an equation with 0 on the second side), then says that an analyst who should look at this table would be able to rise to Descartes's theorem. This is true enough, but it does not prove that Cardan either could or did make the invention, but the contrary. All the world knows that mathematical discoveries are recognised often enough by analysts of a later day, in rudiments from which the fabricators of them could evolve nothing.

The theorem of Descartes, expressed in his own words, is as follows (*Geometria*, lib. iii.): 'Ex quibus etiam cognoscitur, quot veræ et quot falsæ radices in unaquaque Æquatione haberi possint. Nimirum, tot in ea veras haberi posse, quot variationes reperiuntur signorum + et −; et tot falsas quot vicibus ibidem deprehenduntur duo signa +, vel duo signa −, quæ se invicem sequuntur.' That is, that an equation may have as many positive roots as there are changes of sign in passing from term to term, and as many negative roots as there are continuations of sign; but not more of either kind. It has been doubted whether Descartes knew the true meaning of his own theorem as to the case of imaginary roots; this doubt is as early as the time of Descartes himself, who replies in a letter which we cannot find by means of Rabuel's reference to it. This is however of little consequence, as the following sentence (also from the Geometry) shows in what manner Descartes understood his own words: 'Cæterum radices tam veræ quam falsæ non semper sunt reales, sed aliquando tantum imaginariæ; hoc est, semper quidem in qualibet Æquatione tot radices quot dixi, imaginari licet; verum nulla interdum est quantitas quæ illis, quas imaginamur, respondet.' It would seem then that Descartes not only remembered the limitation of the theorem arising from the possible existence of imaginary roots, but proposed to divide those last roots themselves into two classes corresponding to the true and false (or positive and negative) of the real roots. The next step was made by De Gua (1741), who showed that the roots of an algebraical equation $\phi x=0$ are never all real, unless the roots of the derived equations $\phi'x=0$, $\phi''x=0$, &c. are also all real; $\phi'x$, $\phi''x$, &c. being the derived functions, or differential coefficients, of ϕx. He also showed how to determine the conditions of the reality of all the roots. (Lagrange, *Res. des Equ. Numer.*, note viiii.; Peacock, *Report*, &c., p. 327.)

Descartes's theorem would be perfect if the roots of equations were always real. For example, take $x^2-13x+40=0$. If the roots be real, they are both positive; write $x+6$ for x [INVOLUTION AND EVOLUTION], and we have $x^2-x-2=0$, of which the roots are less by 6 than those of the former equation. But in the second equation, one root is negative and one positive; consequently the roots of the first equation are one greater and one less than 6. In the same manner a more complicated case might be treated.

The theorem of Descartes, and the notion derived from it, that the order of signs of coefficients regulates the signs of the roots; with the step made by De Gua, and the notion derived from it, namely, that the derived functions must be consulted upon the question whether the roots of an equation be real or not; and the common theory of equal roots, namely, that when $\phi x=0$ has m equal roots, $m-1$ of its derived functions (neither more nor fewer) vanish at the same time, or with the same root,—were the hints on which FOURIER was able to make an advance upon his predecessors. The coefficients of the equation are themselves nothing but the *divided* derived functions, on the supposition that $x=0$. Thus, if $\phi x=3x^3-7x^2+11x+4$, we have

$$\phi 0=4,\quad \frac{\phi' 0}{1}=11,\quad \frac{\phi'' 0}{1.2}=-7,\quad \frac{\phi''' 0}{1.2.3}=3.$$

Let ϕx, $\phi_1 x$, $\phi_2 x$, &c. be the function in question and its divided derived functions. If we make x great enough and negative (say infinite and negative), the signs of these functions are all alternate, that is, the series yields nothing but changes of sign in passing from term to term. But if we make x great enough and positive (say infinite and positive), the series yields nothing but permanences of sign. Thus, in the preceding expression we have

	$x=-\infty$	$x=0$	$x=+\infty$
ϕx	−	+	+
$\phi_1 x$	+	+	+
$\phi_2 x$	−	−	+
$\phi_3 x$	+	+	+
	nothing but changes.	two changes.	no changes.

$$\phi x=3x^3-7x^2+11x+4,\ \phi_1 x=9x^2-14x+11,$$
$$\phi_2 x=9x-7,\ \phi\ x=3.$$

Now Descartes's theorem tells us that there *may* be *one* negative and *two* positive roots, and we see that in passing from $x=-\infty$ to $x=0$, or through the whole range of negative quantity, there is *one* change of signs lost; while in passing from $x=0$ to $x=+\infty$, or through the whole range of positive quantity, *two* changes of sign are lost. Fourier's theorem would suggest itself as highly probable to any one who put Descartes's theorem in the preceding form: it is as follows:—When $x=a$, let the signs of ϕa, $\phi_1 a$, $\phi_2 a$, &c. be ascertained, and let this be called the criterion series, or simply the criterion. Then in passing from $x=a$, the less, to $x=b$, the greater (greater and less being understood in the algebraical sense), the criterion never acquires changes of sign, though it may lose them. When m changes of sign are lost to the criterion in passing from $x=a$, the less, to $x=b$, the greater, it follows that there are either m real roots of the equation lying between a and b, or some number, p, of pairs of imaginary roots, and $m-2p$ real roots lying between a and b. If m be odd, there must be at least one real root lying between a and b. And if no changes of sign be lost in passing from a to b, there is certainly no root lying between a and b. For example, examine the preceding function and its derivatives when $x=-1$ and $x=+1$ In the former case the criterion is − + − + (three changes), and in the latter + + + + (no changes). Three changes then are lost to the criterion in passing from −1 to +1: so that there are either three real roots, all lying between −1 and +1; or one such real root and two imaginary roots. Again, in passing from −1 to 0, one change is lost: there is certainly then one negative root between −1 and 0. The remaining roots are then either both imaginary, or positive, and lying between 0 and 1: the least consideration of the equation will show that the former is the case.

Fourier's theorem is proved as follows:—changes of sign take place only when quantities become nothing or infinite; those before us cannot become infinite, and therefore the criterion can never be disturbed except when one or more of the set ϕx, $\phi_1 x$, &c. vanish. Now when any function ψx, vanishes, say at $x=a$, its previous sign must have been the contrary of that of its derived function, and its subsequent sign the same; that is, in passing from $a-h$ to $a+h$, h being very small, $\psi'x\times\psi x$ must pass from negative to positive. An algebraical proof may be given of this, but none which in clearness comes near to the following. The function $\psi'x\times\psi x$ is the derived function or differential coefficient of $\frac{1}{2}(\psi x)^2$, a positive quantity. Now if $\psi a=0$, $\frac{1}{2}(\psi x)^2$ must diminish (being positive) from $x=a-h$ to $x=a$, and increase from $x=a$ to $x=a+h$. But a differential coefficient is negative when its function diminishes with an increase of the variable, and positive when its function increases with an increase of the variable. Consequently $\psi'x\times\psi x$ is negative from $x=a-h$ to $x=a$, and positive from $x=a$ to $x=a+h$; as asserted. We now proceed to the proof of the theorem.

1. When $x=-\infty$, the criterion is + − + − &c. or − + − + &c.; and when $x=+\infty$, it is + + + &c. or − − − &c. This follows immediately from the nature of the functions ϕx, $\phi_1 x$, &c., in which, when x is numerically great enough, the sign is always governed by that of its highest term. Thus, in some place or places, as many changes are certainly lost as there are units in the dimension of ϕx, *neither more nor fewer.*

2. When x passes through a root of ϕx, as many changes are lost as there are roots of ϕx equal to that root. Let there be only one root equal to a, so that $\phi_1 a$ does not vanish. We have then one or other of the following:—

	$x=a-h$	$x=a$	$x=a+h$		$x=a-h$	$x=a$	$x=a+h$
ϕx	(+)	0	(−)	ϕx	(−)	0	(+)
$\phi_1 x$	−	−	−	$\phi_1 x$	+	+	+
	One change lost.				One change lost.		

The signs in parentheses are those which follow from the theorem above proved. $\phi_1 x$ cannot change its sign in the process, for by hypothesis it does not vanish when $x=a$, and we take h so small that there shall be no root of $\phi_1 x$ between $a-h$ and $a+h$. At $x=a-h$, we must have $\phi_1 x\times\phi x$ negative, and at $x=a+h$ we must have it positive, by the theorem; which gives the signs in parentheses as marked.

Now let there be, say five roots equal to a, or let ϕa, $\phi_1 a$, $\phi_2 a$, $\phi_3 a$, $\phi_4 a$ all vanish, $\phi_5 a$ not vanishing. We must have then one or other of the following:—

	$x=a-h$	$x=a$	$x=a+h$		$x=a-h$	$x=a$	$x=a+h$
ϕx	+	0	−	ϕx	−	0	+
$\phi_1 x$	−	0	−	$\phi_1 x$	+	0	+
$\phi_2 x$	+	0	−	$\phi_2 x$	−	0	+
$\phi_3 x$	−	0	−	$\phi_3 x$	+	0	+
$\phi_4 x$	+	0	−	$\phi_4 x$	−	0	+
$\phi_5 x$	−	−	−	$\phi_5 x$	+	+	+
	Five changes lost.				Five changes lost.		

All the signs except those in the lowest line are dictated by the preliminary theorem. Thus $\phi_5 x$, in the first case, is negative by hypothesis; now $\phi_5 x$ is $\phi'_4 x \div 5$, so that $\phi_5 x\times\phi_4 x$ must be negative before $\phi_4 x$ vanishes, and positive afterwards. Hence $\phi_5 x$ continuing negative, $\phi_4 x$ must change from positive to negative. Again, $\phi_4 x\times\phi_3 x$ makes a similar change. The least consideration will show that, the signs in the lowest line being given, those in all the upper ones must be as written.

3. When intermediate functions vanish, changes of sign are never gained, but only lost; and are never lost but in even numbers. Suppose, for instance, that $\phi_1 a$ vanishes, but not ϕa nor $\phi_2 a$. We have then one of the four following:—

	$x=a-h$	$=a$	$=a+h$		$x=a-h$	$x=a$	$x=a+h$
ϕx	+	+	+	ϕx	−	−	−
$\phi_1 x$	−	0	−	$\phi_1 x$	+	0	−
$\phi_2 x$	−	−	−	$\phi_2 x$	−	−	−

No change lost.* *Two* changes lost.

ϕx	−	−	−	ϕx	+	+	+
$\phi_1 x$	−	0	+	$\phi_1 x$	−	0	+
$\phi_2 x$	+	+	+	$\phi_2 x$	+	+	+

No change lost.* *Two* changes lost.

The signs in the middle lines are dictated by the preliminary theorem. Next let $\phi_4 a$, $\phi_5 a$, $\phi_6 a$, $\phi_7 a$ vanish, but not $\phi_3 a$ nor $\phi_8 a$. We have then, by the preliminary theorem, one or other of the four following:—

	$x=a-h$	$x=a$	$x=a+h$		$x=a-h$	$x=a$	$x=a+h$
$\phi_3 x$	+	+	+	$\phi_3 x$	−	−	−
$\phi_4 x$	−	0	−	$\phi_4 x$	−	0	−
$\phi_5 x$	+	0	−	$\phi_5 x$	+	0	−
$\phi_6 x$	−	0	−	$\phi_6 x$	−	0	−
$\phi_7 x$	+	0	−	$\phi_7 x$	+	0	−
$\phi_8 x$	−	−	−	$\phi_8 x$	−	−	−

Four changes lost. Four changes lost.

$\phi_3 x$	−	−	−	$\phi_3 x$	+	+	+
$\phi_4 x$	+	0	+	$\phi_4 x$	+	0	+
$\phi_5 x$	−	0	+	$\phi_5 x$	−	0	+
$\phi_6 x$	+	0	+	$\phi_6 x$	+	0	+
$\phi_7 x$	−	0	+	$\phi_7 x$	−	0	+
$\phi_8 x$	+	+	+	$\phi_8 x$	+	+	+

Four changes lost. Four changes lost.

The same conclusions will be found from other cases, and we have now examined every way in which the criterion can undergo an alteration in the order of the signs of which it is composed. And since, the function being of n dimensions, there are altogether n changes, and n only, to lose, it follows that every pair of signs lost by the vanishing of any of the derived functions, in any internal part of the criterion, shows that there must be two imaginary roots: for there must be n roots only, every root must be accompanied by a change lost at the head of the criterion, and every loss of changes which takes place anywhere else diminishes the number which can take place at the head. Again, since losses other than at the head of the criterion must take place in even numbers, it follows that of any odd number of losses, one must have been effected at the head, or must have arisen from a real root; or if not one, some other odd number.

The manner in which the changes of sign take place is as follows:—When $x=-\infty$, or even when it is numerically greater than any negative root, the criterion presents nothing but changes. Alterations of the criterion consist in: 1, Loss of one or more changes at the head of the criterion (showing real roots); 2, loss of changes in even numbers in the middle of the criterion (showing imaginary roots); 3, elevation of changes, or alteration of their place in a direction towards the head of the criterion. This last takes place only when an *odd* number of derived functions vanishes, the including functions (preceding and following) having different signs. As soon as a root has been passed, there is a permanency + + or − − at the head of the criterion; before another root is arrived at, this permanence must have become a change, since a change there must then be at the head to be lost in passing through the root. Hence it follows that between two roots of $\phi x=0$, there must lie a root of $\phi' x=0$; and this root is either single, triple, quintuple, &c., but not double, quadruple, &c.

For example, let $\phi x=x^4-7x^3+15x^2-10x+2$,
$\phi_1 x=4x^3-21x^2+30x-10$, $\phi_2 x=6x^2-21x+15$,
$\phi_3 x=4x-7$, $\phi_4 x=1$.

There are no negative roots, as is obvious from their being nothing but changes among the coefficients; if we construct the criteria for $x=0$, 1, 2, 3, and 4, we find the following results:—

	0	1	2	3	4
ϕx	+	+	+	−	+
$\phi_1 x$	−	+	−	−	+
$\phi_2 x$	+	0	−	+	+
$\phi_3 x$	−	−	+	+	+
$\phi_4 x$	+	+	+	+	+

When $x=0$, the criterion shows four changes; at $x=1$, it is indefinite, owing to $\phi_2 1=0$. But immediately before $x=1$, $\phi_2 x$ must, by the preliminary theorem, have the sign contrary to that of $\phi_3 x$, or the sign +; consequently, for $x=1-h$, however small h may be, the criterion must be + + + − +. Two changes of sign are therefore lost in passing from $x=0$ to $x=1$, and there are either two real roots between 0 and 1, or two imaginary roots. To try this further, let $x=\frac{1}{2}$, the criterion of which is − + + − +; so that there is one root between 0 and $\frac{1}{2}$, and another between $\frac{1}{2}$ and 1. When $x=1+h$, the criterion is + + − − +, so that there is no root between 1 and 2. Lastly there is one root between 2 and 3, and one between 3 and 4.

The theorem of Fourier, though very convenient in practice, is defective in theory, as requiring an unlimited number of trials. If two roots were very nearly equal, it would require very minute subdivision of the interval in which they are first found to lie, to distinguish them from a pair of imaginary roots. This theorem was not published till 1831, in Fourier's posthumous work, but its author had made his methods known, and among others to M. Sturm, a young Genevese, employed in the bureau of M. de Férussac, editor of the bulletin which bore his name, now a member of the Institute, and enjoying a reputation which may excuse this mention of the circumstances of his private life. Sturm applied himself to the detection of functions which should stand in the place of ϕx, $\phi_1 x$, $\phi_2 x$, &c., in such manner that the criterion formed from them, in the same way as in Fourier's theorem, should never lose a change of signs except in passing through a real root. In this he signally succeeded; and thus, though his theorem presents great practical prolixity of detail, he furnished a complete solution of the difficulty which had occupied analysts since the time of Descartes. This theorem may be proved as follows:—

Let there be any number of functions V, V_1, V_2, ... V_r, the last of which is a constant independent of x, and all but the last functions of x. Let them be connected together by the equations—

$$\begin{aligned} V &= P_1 V_1 - V_2, \\ V_1 &= P_2 V_2 - V_3, \\ V_2 &= P_3 V_3 - V_4, \\ &\cdots\cdots\cdots \\ &\cdots\cdots\cdots \\ V_{r-2} &= P_{r-1} V_{r-1} - V_r. \end{aligned}$$

$P_1 P_2$, &c. being any functions of x, which do not become infinite when $V_1 V_2$, &c. vanish. From this it follows, first, that no two consecutive functions of the set V, V_1, &c. can vanish together; for if V_2 and V_3, for instance, vanished together, the third equation shows that V_4 would also vanish, the fourth that V_5 would vanish, and so on; consequently, V_r, a given constant, also vanishes, which is absurd. Secondly, when any one after V vanishes, the preceding and following must have different signs; for $V_1=0$ gives $V=-V_2$, $V_2=0$ gives $V_1=-V_3$, &c. Now call the signs of V, V_1, &c. the criterion, and let $V=0$ when $x=a$, there being only one root of that value, so that V changes sign in passing from $x=a-h$ to $x=a+h$. Since V_1 does not vanish with V, we have one of the four cases following.—

	$x=a-h$	$x=a$	$x=a+h$	$x=a-h$	$x=a$	$x=a+h$
V	−	0	+	+	0	−
V_1	−	−	−	−	−	−
V	−	0	+	+	0	−
V_1	+	+	+	+	+	+

If V_1 be the derived function of V, only the second or third cases can happen, by the theorem so often used in the preceding part of this article; so that a change of sign will be lost at the head of the criterion for every single root of $V=0$. Nor will any change of sign ever be gained or lost in any other manner; for suppose $x=a$ gives $V_4=0$ for instance, then V_3 and V_5 have different signs, and in passing from $x=a-h$ to $x=a+h$, if each be so small that no root of V_3 or V_5 lies between $a+h$ and $a-h$, we must have one of the eight following cases:—

	$x=a-h$	$x=a$	$x=a+h$	$x=a-h$	$x=a$	$x=a+h$
V_3	−	−	−	+	+	+
V_4	±	0	±	±	0	±
V_5	+	+	+	−	−	−

In no one of these is any change of sign lost, or anything except a change and a permanence when $x=a-h$, and a change and a permanence, in a different order perhaps, when $x=a+h$. Consequently, if in passing from $x=a$, the less, to $x=b$, the greater, it appear that no changes of sign are lost, it is certain that there must have been no real roots of $V=0$ between $x=a$ and $x=b$.

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* Observe that in these cases a change is removed to a higher place in the series, nearer to the head of the criterion.

Now, V_1 being the derived function of V, it remains to find V_2, V_3, &c. Divide V by V_1, which is of one dimension lower, and we have a quotient, say P_1, and a remainder R_1. Then $V=P_1\,V+R$ or $V_2=-R$. Again, divide V_1 by V_2, giving a quotient P_2, and a remainder R_2: we have then $V_1=P_2\,V_2+R_2$ or $V_3=-R_2$; and so on. It appears, then, that V_1 being the derived function of V, we must proceed as in finding the greatest common measure of V and V_1, only changing the sign of every remainder as fast as it is obtained. In order that the last, V_r, may be a finite constant, it is requisite that there should be no equal roots. We must then suppose the equal roots to be separated beforehand, as in the usual method. In fact, this very process of finding the greatest common measure, with or without change of sign in the remainders, will first detect the equal roots, if any. It is important to remark, that at any step multiplication by any positive quantity is allowable, the signs (the only things we have to do with) not being in any case altered by such multiplication.

In INVOLUTION AND EVOLUTION a method of performing the operations required in Sturm's theorem was proposed, which avoids useless writing. Mr. Young (*Math. Dissertations*, p. 143) has since proposed another, of much the same degree of abbreviation. Sturm's theorem however requires so much operation, that there can be little doubt of that of Fourier being a more easy mode of working any particular case. It is not however as a key to the mere numerical solution of equations that either of these theorems must be viewed: the insight which they give into the nature of equations, and still more that which they are likely hereafter to give (for neither is more than a germ), will render them both important steps in the progress of algebra.

Since all that is necessary to the theorem is that the last function V_r should retain one sign, and not vanish, we may stop in the process when we arrive at any function of which all the roots are known, or can be discovered, to be impossible. And it is easily shown that even when there are equal roots, so that the last, V_r, is neither constant, nor always of the same sign, the theorem still remains true, so far as to give the number of *different* roots which lie between any two given limits, without any information as to the number of times which each root should be repeated.

For instance, in the article cited we find

$$V=x^4-3x^3-2x^2+x-3$$
$$V\ =4x^3-9x^2-4x+1$$
$$V_2=43x^2+45$$

We need not go further, for V_2 has none but imaginary roots. Now, when $x=-\infty$, the criterion is $+-+$; when $x=0$, it is $-++$; and when $x=+\infty$, $+++$. Consequently there is one negative root, one positive root, and a pair of imaginary roots.

The following example is from Mr. Young (p. 191): it is an instance given by Fourier in illustration of his own method, and Sturm's is applied to it by Mr. Young, to show the superior certainty of the latter. Of that certainty no one can doubt, but the process exhibited in the page cited is such as will never come into general use unless the work can be made more easy:—

$$V\ =x^7-2x^5-3x^3+4x^2-5x+6$$
$$V_1=7x^6-10x^4-9x^2+8x-5$$
$$V_2=2x^5+6x^3-10x^2+15x-21$$
$$V_3=52x^4-70x^3+123x^2-163x+10$$
$$V_4=-4403x^3+8862x^2-19810x+20531$$
$$V_5=200865x^2+489790x-1169472$$
$$V_6=187355x-270632$$
$$V_7=\text{ a positive constant.}$$

Here the criteria for $x=-\infty$, $x=0$, $x=+\infty$ are

$x=-\infty$ $-+-+++-+$ five changes
$x=0$ $+--++--+$ four changes
$x=+\infty$ $++++-+++$ two changes.

There are then one negative root and two positive roots, and therefore four imaginary ones. The reader will easily find that the positive roots lie between 1 and 2, and the negative root between -1 and -2. The exhibition of the process, leaving out the actual performance of multiplications, has 400 figures in Mr. Young's work. Fourier has merely written down the derived functions, which is done at sight and formed the criteria for $x=-10$, $x=-1$, $x=-h$, $x=0$, $x=+h$, $x=1$, $x=10$, which may all be done at sight also. From this he finds that there must be one negative root between -1 and -10, that there may be two roots between 0 and 1, and two more between 1 and 10. All this might be done before V_4 could be found and written down as above. It is to be hoped either that Fourier's theorem will be completed by the addition of a test for imaginary roots, or that Sturm's functions will be exchanged for others of less complicated operation. But in the meanwhile it must be remembered that Fourier, Sturm, and Horner have, in thirty years, completely changed the aspect of the solution of numerical equations: at the beginning of the period mentioned, it would have been thought too good to expect that any certain method of predicting, or easy one of calculating, the roots of such equations, should be found, after the failure of all analysts from Des Cartes and Newton down to Euler and Lagrange, the best heads of France and England, Germany and Italy. It is a lesson against despairing of the attainment of any result, however illustrious the investigators who have not succeeded, and also against imagining that the hints of preceding ages are exhausted. All the contents of the present article arise out of a new mode of looking at the theorem which Des Cartes gave two hundred years ago.

STURMINSTER. [DORSETSHIRE.]

STU'RNIDÆ, Mr. Vigors's name for the *Starling Family*, belonging to his order INSESSORES.

Linnæus placed his genus *Sturnus*, consisting of only five species, among which the Water-Ouzel appears as *Sturnus Cinclus*, between *Alauda* and *Turdus*, in his order *Passeres*. Cuvier arranges the Starlings between the *Cassiques* (*Cassicus*) and the Crows (*Corvus*).

Mr. Vigors, who assigns to the *Sturnidæ* a place between the *Fringillidæ* and the *Corvidæ*, in his CONIROSTRES, observes that this family embraces a considerable number of groups, approaching each other in their gregarious and migratory habits. They are, he remarks, found in every part of the globe united in large flocks, carrying destruction among the cultivated fields, and following herds of cattle for the sake of the insects or grains which they may pick up from their bodies or in their neighbourhood. 'In addition to the American genus *Icterus*,' continues Mr. Vigors, 'and the contiguous genera *Cassicus* and *Xanthornus* of M. Brisson, together with *Pendulinus*, Vieill., and several corresponding groups, we may observe the genus *Amblyramphus*, Leach, united to the family, as also the *Buphaga*, Linn., and *Pastor* and *Lamprotornis*, which M. Temminck has separated from the *Thrushes*. The whole of the family united by their manners and the straight and conical form of the beak, the ridge of which passes back to some extent over the forehead, may be observed, by those who cast even a casual glance over the three adjoining groups, to hold an intermediate rank between the weaker conformation of the *Fringillidæ* and the more powerful structure of the *Corvidæ*.' And he passes into the family of *Corvidæ* by the genus *Nucifraga*. [NUTCRACKER.]

Such is Mr. Vigors's opinion, expressed in his paper on the *Affinities which connect the Orders and Families of Birds*. (*Linn. Trans.*, vol. xiv.)

Mr. Swainson proceeds from the Crows to the Starlings, but he acknowledges that the unarranged state of the last group prevents him from knowing the genus by which this passage is truly effected. He remarks that the various birds assimilated by ornithologists to our European Starling are generally of the same size, and that they appear in fact like a smaller race of crows, which they very much resemble in manners and in structure; in the latter respect they are, he observes, evidently much weaker; and he goes on to notice their habits of seeking their food generally upon the ground, of living in societies, and of preferring plains frequented by cattle. The three principal groups he thinks well characterised. 'In the first the margins of the bill form a distinct angle at the base, which is very wide; the gape extends beneath the eye, and the tips are slightly notched: these are the true starlings (*Sturninæ*). In the second the bill is shorter, more compressed, and very much resembles that of a thrush, being almost destitute of the basal angle: this subfamily comprehends the true grakles (*Lamprotorninæ*), and is remarkable for the metallic lustre of its dark-coloured plumage. The third or aberrant division includes the boat tails (*Scaphidurinæ*), the hang-nests (*Icterinæ*), and the maize-birds (*Agelainæ*), all of which are characterised by a perfectly entire finch-like bill, more or less conic, but of different lengths.'

In the *Scaphidurinæ*, with which Mr Swainson commences, we have, he remarks, the largest birds in the whole family; those in short which even a scientific observer might easily mistake for real crows. Their name is given to them from the singular structure of their graduated tail, which becomes so concave on its upper surface by the oblique folding on its sides, as to resemble a boat in form. Mr. Swainson, after stating that all the true species of this group are natives of America, and resemble the crows in the glossy blackness of their plumage, expresses his opinion that they are the rasorial division of the family. But, he adds, there is a bird from New Guinea, *Astrapia gularis*, Vieill. [CORVIDÆ, vol. viii., p. 72], which, from exhibiting the greatest development of this structure, might be taken for the type, if its bill and general habit did not evince an approximation to the *Lamprotorninæ*. *Astrapia*, he remarks, had been associated by all writers, except M. Temminck and M. Vieillot, with the Paradise-birds, from the uncommon brilliancy of its plumage.

The next subfamily, or *Lamprotorninæ*, comprise, according to Mr. Swainson, many smaller groups whose characters have not yet been sufficiently investigated; whilst others, which he conceives to belong to this family, have been placed with the crows. He does not seem altogether satisfied with the position which he has assigned to *Astrapia*, for he remarks that this magnificent bird, but for its long boat-shaped tail, would certainly be ranked with this group, of which, after all, he thinks that it may probably prove to be the rasorial genus. He then sums up the chief peculiarities of the grakles, viz. the strong thrush-like bill, generally notched, but never angulated at the base, and the remarkably large and stout feet, and the general blackness of their plumage relieved by the most beautiful metallic lustres of green and blue. The whole group appears to him to be confined to the tropics of Asia and Africa, where, he thinks, they seem to represent the boat-tails. To this group he removes the Australian Satin-birds (*Ptilonorhynchus*, Kuhl), and the Maniots, since the *Pastor musicus* at once shows, in his opinion, the natural stations and affinities of all these birds.

Mr. Swainson finds the passage to the *Sturninæ*, or true Starlings, easy and natural, as he traces in the maniots many of the characters of the grakles united with those of the *Pastor* starlings. In the *Sturninæ* the bill is much more straight, and the under mandible considerably thickened at the base, where the commissure forms an abrupt angle. Mr. Swainson notices the great strength of the legs in these birds, indicating their walking propensities exerted in following the tracks of cattle in order to search after such insects as are disturbed by their grazing. He adverts to the association of crows and starlings in the same field, nearly in the same flock, and almost adopting the same habits, each bird representing the other in its own particular family; in both, he remarks, the lengthened and conic form of the bill is well adapted for searching after insects in the ground; both walk in the same stately manner, and both seem so attached to cattle and sheep as to rest upon their backs. The common starling may sometimes walk stately, but when we have observed it hunting assiduously for its insect food, the gait is more like a hurried run than a stately walk. But to return to Mr. Swainson; he remarks that the genus Pastor has the bill compressed, but in the European Starlings (*Sturnus*) that organ is more acute and depressed; the notch also, he adds, is so faint as to be nearly obsolete. In concluding his observations on this subfamily, he adverts to some of the foreign Pastors leading to *Gracula*, Cuv., as being furnished with naked wattles, and as appearing to be providentially created to destroy the devastating flights of locusts which so often appear on the plains of Southern Africa.

The same author makes the *Agelainæ*, or Maize-birds, succeed to the true starlings; and he thinks that the two subfamilies are so completely united by the *Sturnella collaris* (collared starling of South America), that but for the discovery of the genus *Oxystomus*, it would be difficult to say in which group *Sturnella* should be placed. Mr. Swainson observes that we now enter upon a group which he considers so truly natural, that his surprise is excited in no small degree by the confused notions of certain writers regarding their distinctions. To ignorance of the natural habits of these birds, or a disregard of that peculiarity of structure which would in some respects point out their habits, he attributes their being considered as part of the hang-nests (*Icteridæ*) by most writers, and their being actually united to them and the *Quiscalinæ* in the same genus by Wagler. The fact however, in Mr. Swainson's opinion, seems to be that nature has distinctly separated the American orioles of Linnæus into three great groups, yet that she unites them so completely by insensible gradations, that unless the whole are analysed, their true distinctions will never be detected. As in the case of the boat-tails and hang-nests, the *Agelainæ* are, Mr. Swainson tells us, confined to America, and he is consequently enabled to say something of them from personal observation. 'Whenever,' says Mr. Swainson, 'during our travels through the wilds of Brazil, we reached the *corals*, or cattle enclosures, we were sure to meet with these birds; of which many species (in genera very obscurely known) are found in all parts of that empire. The primary character therefore of the maize-birds is, that they are *terrestrial*, while those of the next family are *arboreal;* and both these peculiarities are rendered sufficiently apparent by external structure. In the maize-birds the feet, like those of the starlings, are strong and lengthened; and the elevation of the tarsi at once proclaims their habits. This structure is carried to its maximum in the Mexican *Agelaius longipes*, Sw., and in the North American *Agelaius icterocephalus*, Bonp. (Bonap. ?). There is still another characteristic of these birds: to enable them to retain a firm hold on the smooth stems of the maize and other grain upon which they feed, their claws are slender and acute, while the tail (always bent downward when the bird is in such an attitude) is frequently worn at its extremity. In the scansorial genus *Dolichonyx*, Sw., this habit is actually accompanied by the scansorial structure of the tail, the feathers of which are rigid and pointed. The most interesting genus of this group is the *Molothrus pecoris*, or cow-bunting of Wilson, the only bird, except the cuckoo, which deposits its eggs in the nests of other birds.' [MOLOTHRUS, where it is stated by mistake that Mr. Swainson has placed the form in the subfamily *Icterinæ*.]

The fifth and last division of the *Sturnidæ* consists, according to the arrangement of Mr. Swainson, of the *Icterinæ*, or *Hang-nests*, and he remarks that they are so intimately connected with it, that naturalists had not hitherto been aware of their true distinction. The group is strictly South American, gregarious, wary, and ingenious; building long purse-shaped nests, suspended from the slender branches of lofty trees: yet, says Mr. Swainson in continuation, unlike all the preceding genera, these birds are never seen upon the ground, and though the legs are robust, they are short, with broad, strong, and fully curved claws. He finds the subordinate types well distinguished by slight but perfectly characteristic differences in the form of the bill, wings, and tail; the full perfection of the group being seen in *Icterus*, not, as it has been thought, in *Cassicus*, which, according to Mr. Swainson's views, is the rasorial type. *Buphaga* is excluded by the same author from the *Sturnidæ*, and placed among the *Certhiadæ;* and he passes from *Agelainæ* to *Fringillidæ*, and from *Fregilinæ* among the *Corvidæ* to *Buceridæ*, the circles touching each other at *Scaphidurinæ* and *Glaucopinæ*, as they appear in Mr. Swainson's *Synopsis*.

Sturnidæ. *Starlings.*

Family Character.—Size smaller than that of the *Corvidæ*. Stature less robust. Bill angulated at the base; the upper mandible entire. Lateral toes equal. (Sw.)

Subfam. *Sturninæ.*

Subfamily Character.—Bill in the form of a lengthened cone; longer than the head; the commissure with an acute angle at the base.

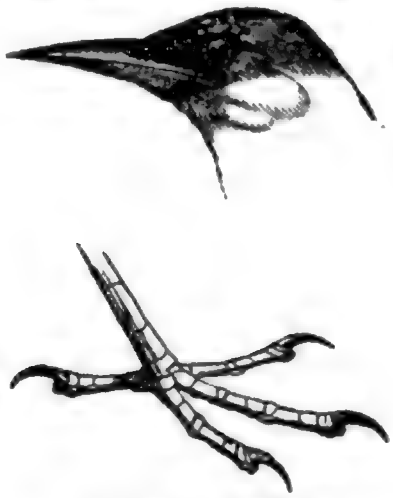
Genera.

Sturnus, Linn.—Bill depressed from the base as far as the tip, which is slightly inflexed, and obsoletely notched. Culmen convex and rounded. Wings lengthened, pointed; the first quill minute and spurious; the second and third longest. Tail short, divaricated. Feet moderate, terrestrial. The lateral toes equal; the middle toe as long as the tarsus; hinder toe shorter. The conirostral type. (Sw.)

Example, *Sturnus vulgaris, the common Starling.*

Pastor, Temm.—Bill depressed only at the base, compressed beyond; culmen slightly bent. Tip of the upper mandible deeply notched. Commissure distinctly angulated at the base. Nostrils large, feathered. Wings moderate in length, ample in breadth; first quill very minute;

the second nearly equal to the third. Tail short, broad, rounded. Feet very large and strong. Middle toe as long as the tarsus; hinder shorter; lateral toes equal. Claws somewhat slender, acute, but not much curved.



Head and foot of Starling.

Locality.—Warm latitudes of the Old World. The dentirostral type. (Sw.)

Example, *Pastor roseus*, the Rose-coloured Ouzel. Not unfrequently seen in Britain.

Gracula, Auct. [ROLLERS, vol. xx., p. 68.]

Acridotheres, Vieill.—General structure of *Pastor*; but the whole of the head entirely naked, and furnished with fleshy crests and wattles. Nostrils large, naked. Feet moderate. Tail even. Bill very wide at the base. The tenuirostral type. (Sw.) Example, *Acridotheres carunculatus.*

Oxystomus, Sw.—Bill much lengthened, longer than the head; the sides are compressed. Culmen flattened, nearly straight, and angulated on each side; the base advancing very far upon the head, and dividing the frontal feathers. Nostrils placed in a large depression towards the base of the bill. Wings very short and considerably rounded. Tail moderate, rounded; all the feathers, and the secondary quills, ending in setaceous points. Legs long and robust. Tarsus much longer than the middle toe; lateral toes unequal, the inner shortest. Pacific Islands. The scansorial type. (Sw.) Example, *Oxystomus caruncculatus.*

Subfam. *Lamprotorninæ. Grakles.*

Subfamily Character.—Bill thrush-like, compressed; the culmen curved from the base. Lateral toes unequal.

Genera.

Ptilonorhynchus.—Size large. Bill short, very thick, convex above: both mandibles distinctly notched. Nostrils placed half-way between the gape and the tip, partly concealed by the short thick-set feathers of the front, which lie on the basal half of the bill. Wings rather short, rounded; the first and second quills graduated; the third shorter than the fourth and fifth, which are the longest. Tail moderate; the feathers broad, their tips truncated. Feet ambulating, large, and very strong. Middle toe and tarsus of equal length, hinder toe very strong, but much shorter; lateral toes unequal, the outer longest, and united to the middle as far as the first joint. Australia. (Sw.)

Example, *Ptilonorhynchus holosericeus.*

Lamprotornis, Temm. *Grakle.*—Bill thrush-like, compressed its whole length. Culmen curved from the base to the tip. Upper mandible notched. Commissure slightly curved. Nostrils midway between the tip and the gape, naked, but with the frontal feathers reaching to their base. Wings long, ample; the first quill spurious; the third, fourth, and fifth of equal length, and longest. Tail short, even, rounded, or (as in the rasorial type) considerably lengthened and cuneated. Feet very large and strong. Middle toe and tarsus equal; hinder strong, but much shorter; lateral toes unequal. (Sw.)

Example, *Lamprotornis ptilonorhynchus.* 'Birds of West Africa,' i. 140.

Subfam. *Scaphidurinæ. Boat-tails.*

Subfamily Character.—Bill of a very lengthened conic shape, entire, and compressed: the culmen slightly curved. Tail graduated, the sides reflected upwards, or boat-shaped. Feet strong. (Sw.)

Genera.

Astrapia (ante, p. 173).

Scaphidura, Sw.—Bill longer than the head, conic. Both mandibles equally thick. The base of the culmen broad, flattened, and advancing very far on the front of the head. Commissure angulated at the base, and sinuated on the sides. Nostrils basal, placed in a small triangular hollow on the sides; the membrane obsolete. Wings lengthened, pointed; the first quill longest. Tail moderate, graduated, boat-shaped. Feet strong. Middle toe and tarsus of equal length; hinder toe much shorter; inner toe hardly shorter than the outer. South America. (Sw.)

Example, *Scaphidura Barita.*

Quiscalus, Vieill.—Bill longer than the head, compressed. Both mandibles equally thick. Culmen slightly curved, and compressed from the base, where it simply divides the frontal feathers, without being dilated. Commissure considerably sinuated. Nostrils broad, naked; the aperture round. Wings moderate, somewhat pointed; the two first quills slightly shorter than the third and fourth, which are the longest. Tail rather lengthened, much graduated, boat-shaped; tips of the lateral feathers truncated. Feet large, strong. Middle toe and tarsus equal; hinder toe shorter; inner toe scarcely shorter than the outer. America. (Sw.) Example, *Quiscalus versicolor.*

Scolecophagus, Sw.—Bill shorter than the head, straight, slender; the margin inflexed, but not sinuated. Wings moderate, pointed; the first quill rather shorter than the second. Tail divaricated, flat, and slightly rounded. Legs lengthened, slender, formed for walking. Middle toe and tarsus of equal length; hinder toe shorter; lateral toes of equal length. Claws slender, acute, slightly curved. (Sw.)

Example, *Scolecophagus ferrugineus.*

Subfam. *Icterinæ. Hang-nests.*

Subfamily Character.—Bill completely conic, entire, rather shorter than the head, either straight or with both mandibles slightly bent. Feet formed for grasping. The claws thick, broad, and much curved. (Sw.)

Genera.

Cassicus, Daudin. *Cassicans.*—Bill rather longer than the head; the base thick, very convex, and enlarged into a broad oval plate, which advances very far on the front, and divides the frontal feathers. Nostrils oval, naked, basal, pierced in the solid substance of the bill, and close to the margin of the upper mandible. Commissure straight, but angulated at the base. Wings rather long; the first and second quills graduated. Tail graduated. Feet short, very strong. Hind toe and claw nearly as long as the tarsus. Tropical America. (Sw.)

Zanthornis (Xanthornus), Cuv.—Bill not longer than the head, generally shorter, perfectly straight; the culmen not dilated at the base, but simply dividing the frontal feathers. Wings moderate, pointed; the first three or four quills generally or nearly equal. Tail moderate, rounded. Feet moderate, but with the hinder toe manifestly longer than the tarsus; lateral toes unequal. America. (Sw.)

Example, *Xanthornus Baltimorii.*

Icterus, Cuv.—Bill somewhat lengthened, as long as the head, or longer: both mandibles slightly curved, and considerably attenuated. Nostrils basal, rather large, covered above by a membrane; the aperture lateral and oval. Wings moderate; the first and second quills rather shorter than the third. Tail somewhat lengthened, graduated. Feet moderate. Inner toe shorter than the outer; hinder toe shorter than the tarsus. Example, *Icterus castaneus.*

Chrysomus, Sw.—Bill resembling *Zanthornis* (Xanthornus must be meant); but the margin of both mandibles inflexed. Wings moderate; the first quill rather shorter than the second. Tail rounded. Feet formed for walking. Toes large, very long and slender; middle toe longer than the tarsus; lateral toes equal; hinder toe shorter than the tarsus. Claws long, very slender, and but slightly curved. (Sw.) Example, *Chrysomus icterocephalus.*

Subfam. *Aglainæ.* (Agelainæ?) *Maizers.*

Subfamily Character.—Bill short, thick, entire, completely conic, sometimes depressed, and rounded at the tip. Culmen rather broad, and flattened at the base. Legs long, slender, formed for walking.

Genera.

Dolichonyx, Sw.—Bill very short, finch-like, conic, entire, shorter than the head; the commissure sinuated. Wings pointed; the first and second quills longest and nearly equal. Tail slightly graduated, subscansorial; the tips acuminated, and somewhat rigid. Legs long, slender. Middle toe longer than the tarsus; lateral toes unequal, the inner longest; hind toe of equal length with the tarsus. Claws long, very slender, and slightly curved. (Sw.)

Example, *Dolichonyx oryzivorus*. [Bob-o-Link.]

Agelaius, Vieill.—Bill short, very conic, entire; the tips compressed; the culmen flattened towards the base; sides of the mandibles inflexed. Wings lengthened; the two first quills longest. Tail slightly rounded. Legs long, slender. Middle toe nearly as long as the tarsus. Claws long, very slender, and but slightly curved. America. (Sw.)

Example, *Agelaius pustulatus*.

Leistes, Vigors.—Bill lengthened, conic, very straight; the culmen depressed from the base to the tip, which is flattened. Wings moderate; the first quill rather shorter than the three next, which are the longest. Tail rounded. Legs large, strong. Middle toe longer than the tarsus; hinder toe shorter; lateral toes unequal, the outer one smaller than the inner; the hinder claw much stronger and more curved than the middle one. (Sw.) Example, *Leistes erythrocephalus*.

Molothrus, Sw. *Cowpen*. Example, *Molothrus pecoris*. [Molothrus.]

Sturnella, Vieillot.—Bill long, equal to the length of the head, conic, much depressed towards the tip, where it is broader than high; culmen dividing the frontal feathers, where it is depressed and flattened. Wings moderate; first quill rather shorter than the second. Tail short, rounded; the feathers rather narrow. Feet large, but slender. Tarsus longer than the middle toe. Lateral toes unequal, the inner shortest; hind toe not much shorter than the middle. Anterior claw small, and of equal size; hinder claw (typically) twice as long as the others. (Sw.)

Example, *Sturnella collaris*. (*Classification of Birds*.)

The family is immediately succeeded in Mr. Swainson's arrangement by the *Fringillidæ*, to which some of the species placed by him among the *Sturnidæ*, but by others among the Finches (*Dolichonyx*, for example), would seem rather to belong.

The Prince of Canino, in his *Birds of Europe and North America*, places the *Sturninæ* in his family *Corvidæ*, next to *Corvinæ*, and arranges under the *Sturninæ* the genera *Acridotheres*, *Quiscalus*, *Scolecophagus*, *Sturnella*, *Icterus*, *Agelaius*, *Molothrus*, and *Dolichonyx*.

Mr. G. R. Gray (*Genera of Birds*) makes the *Sturnidæ*, which are immediately succeeded by the *Fringillidæ*, as they are in the Prince's method, follow the *Corvidæ*.

Mr. Gray divides the *Sturnidæ* into the following subfamilies:—

1. *Lamprotorninæ*.

Genera:—*Ptilonorhynchus*, Kuhl (*Pyrrhocorax*, Vieill.; *Kitta*, Kuhl); *Chlamydera*, Gould (*Ptilonorhynchus*, Jard.; *Calodera*, Gould); *Lamprotornis*, Temm. (*Turdus*, Lath.; *Lamprotornis*, Temm.); *Juida*, Less. (*Lamprocolius*, Sundev.; *Lamprotornis*, Temm.); *Megalopterus*, Smith; *Spreo*, Less. (*Turdus*, Gm.; *Lamprotornis*, Sw.); *Aplonis*, Gould (*Turdus*, Lath.); *Cochoa*, Hodg.

2. *Buphaginæ*.

Genus, *Buphaga*, L.

3. *Sturninæ*.

Genera:—*Pastor*, Temm. (*Psaroides*, Vieill.; *Boscis*, Brehm.; *Turdus*, L.); *Acridotheres*, Vieill. (*Cossyphus*, Dum.; *Gracula*, Gm.); *Psarolophus*, Jard. and Selby (*Pastor*, Gould; *Oriolus*, Hodgs.); *Cutia*, Hodgs.; *Dilophus*, Vieill. (*Sturnus*, Lath.; *Pastor*, Temm.; *Acridotheres* (Vieill.), Swains.; *Gracula*, Gm., Cuv.); *Creadion*, Vieill. (*Sturnus*, Lath.; *Oxystomus*, Swains.; *Philesturnus*, J. Geoff.; *Philedon*, Cuv.; *Icterus*, Less.); *Sturnus*, L.; *Sturnella*, Vieill. (*Cassicus*, Daud.; *Alauda* et *Sturnus*, L.); *Amblyrhynchus*, Leach (*Oriolus*, Gm.; *Sturnella*, Vieill.; *Leistes*, Sw.).

4. *Quiscalinæ*.

Genera:—*Astrapia*, Vieill. (*Paradisea*, L.; *Lamprotornis*, Temm.); *Scolecophagus*, Sw. (*Gracula*, Wils.; *Quiscalus*, Bonap.; *Chalcophanes*, Wagl.); *Quiscalus*, Vieill. (*Icterus*, Temm.; *Quiscala*, Licht.; *Chalcophanes*, Wagl.; *Scaphidura*, Sw.); *Cassidix*, Less. (*Oriolus*, Gm.); *Scaphidura*, Sw. (*Gracula*, Gm.; *Quiscula*, Licht.; *Icterus*, Temm.; *Chalcophanes*, Wagl.).

5. *Icterinæ*.

Genera:—*Cassicus*, Briss. (*Icterus*, Temm.; *Xanthornus*, Pallas; *Psarocolius*, Wagl.; *Oriolus*, L.); *Cassiculus*, Swains. (*Icterus*, Bonap.; *Xanthornus*, Jard. and Selby); *Xanthornus*, Briss. (*Psaracolius*, Wagl.; *Yphantes* et *Pendulinus*, Vieill.; *Oriolus*, L.); *Icterus*, Briss. (*Oriolus*, L.; *Pendulinus*, Vieill.; *Psarocolius*, Wagl.); *Chrysomus*, Sw. (*Pendulinus*, Vieill.; *Oriolus*, L.).

6. *Aglainæ*.

Genera:—*Molothrus*, Swains. (*Emberiza*, Gm.; *Passerina*, Vieill.; *Psurocolius*, Wagl.; *Agelaius*, Swains.); *Leistes*, Vigors (*Agelaius*, Vieill.; *Psarocolius*, Wagl.; *Xanthornus*, Quoy et Gaim.; *Icterus*, Licht.); *Agelaius*, Vieill. (*Oriolus*, L.; *Sturnus*, Wils.; *Icterus*, Briss.; *Psarocolius*, Wagl.); *Dolichonyx*, Swains. (*Emberiza*, L.; *Passerina*, Vieill.; *Icterus* et *Emberizoides*, Bonap.; *Psarocolius*, Wagl.).

We have here given the views of some of the principal ornithologists relative to the family of starlings; and we think no one can peruse it without being struck with the uncertain state in which this department of natural history, in common with too many others, is, and the absolute necessity that exists for a reform of the nomenclature. How that reform is to be brought about is a problem of no small difficulty. A proposed plan for rendering the nomenclature of zoology uniform and permanent, which it is the intention of the proposers to submit at a future period to the consideration of the British Association for the Advancement of Science, has been sent to us, and, after a careful perusal of the scheme, we think that it rests upon sound principles but the proposers must be prepared—indeed they seem to be so—for no light labour; nor will the measure ever be anything like complete till they can induce the zoologists of all other civilised parts of the world to go hand in hand with them. If they succeed in carrying out their measure to a full, satisfactory, and permanent conclusion, they will earn the merited praise of every one who is interested in the science. Previous to their submission of their plan to the British Association, the proposers are anxious to mature it as much as possible by obtaining the opinions of eminent zoologists in various countries; and they state that they will feel grateful for any remarks or criticisms with which they may be favoured, addressed to the care of Mr. Richard Taylor, Red Lion Court, Fleet Street, London. Several eminent zoologists have already formed themselves into a committee; and we have reason to believe that it is their intention to submit their plan to the next meeting of the Association at Manchester. They deserve the co-operation of all zoologists, and the encouragement of all men of science.

STURZ, HELFRICH PETER, born February 16th, 1740, at Darmstadt, was, although in a subordinate class of literature, a first-rate writer, and almost the first who distinguished himself by an elegant and graceful prose style in German, and by his playful humour. After filling the post of private secretary, first to Baron von Widmann at Munich, and next to the chancellor Von Eyben at Glückstadt, he went, in 1762, to Copenhagen, where he resided some time in a similar capacity with the minister Bernstorf, who obtained for him appointments of very considerable value. In 1768 he was made Danish 'Legationsrath,' and visited France and England in the suite of Christian VII. From this journey originated his 'Briefe eines Reisenden,' which contain many interesting details, and various anecdotes relative to the eminent literary characters and others to whom he had been introduced. At this period, while enjoying the present, he could look forward to still brighter prospects for the future; but the scene suddenly changed. Implicated in Struensee's fall, he was arrested in January, 1772, just as he was on the eve of being married, and although released within about four months, so great was the shock he experienced, that he never completely recovered from it, for it continued more or less to affect both his mind and his body during the rest of his life. His circumstances too were greatly changed by that event; and although he obtained an appointment which afforded him a sufficiency, it was in a small town in the duchy of Oldenburg, where he was completely removed from that polished and intellectual society which he had enjoyed in the capital. He had pined in this sort of banishment several years, when letters reached him from Copenhagen announcing the most flattering prospects, but such was the effect the unexpected intelligence had upon him, that he survived it only two or three days, being suddenly carried off by fever 12th November, 1779.

Besides the work above mentioned, and his 'Reminiscences of Bernstorf,' he wrote a number of literary papers on miscellaneous subjects, which he had begun to collect and publish just before his death.

STUTTGARD, the capital of the kingdom of Würtemberg, and the residence of the king, is situated almost in the centre of the kingdom, in 48° 45′ N. lat. and 9° 12′ E. long., 759 Paris feet above the level of the sea. It lies at the bottom of a valley, surrounded on three sides by mountains and hills, which are covered with vineyards and gardens. The valley is extremely fertile, and forms what the Germans call an English garden, extending to Kannstadt. The city consists of the old town, the suburb of Esling, the upper (or rich) suburb, and the new streets and suburbs built under the late King Frederick. These however have been all thrown into one, every mark of separation between them being removed. The old part of the city is ill built, the streets being narrow and irregular, and the houses, for the most part, of wood. The more modern parts have straight streets, intersecting each other at right angles, and contain many handsome buildings. The new royal palace, in particular, is a noble edifice, consisting of a centre and two wings; it has an extensive park, and in front of it is the spacious parade. The gardens and grounds of the palace are very fine, and extend to the new royal country-seat of Rosenstein, near Kannstadt. The palace contains a good collection of paintings and statues, and the windows command delightful views over the adjacent country. In the vicinity of the palace there are several public institutions. Among other buildings deserving notice (of which Stuttgard has, in proportion to its size, a great number) are, the Gymnasium Illustre, the building formerly the military academy, which resembles a palace, the old palace, the opera-house (one of the largest in Germany), the hotel of the department of foreign affairs (formerly the palace of the crown-prince), the royal mews, the palace of the estates of the kingdom, the archives, the new hospital, the three principal Protestant churches, the Roman Catholic chapel, the French Protestant church, and the three barracks, which are among the most considerable buildings in the city. There are numerous public and private collections of works of art, and several libraries; the public royal library contains 200,000 volumes, among which is a unique collection of 12,000 bibles, of 4000 different editions, in 68 languages. The king's private library of 30,000 volumes contains valuable old works and manuscripts, and a great variety of splendid modern publications. Stuttgard has a gymnasium, an academy of arts, a school of arts, a botanic garden, a veterinary school, a topographic-statistical society, a savings'-bank, a Bible society, and numerous schools, and other useful establishments for the poor, and charitable institutions of all kinds. The institution called Katharinenstift is a school for girls, founded by the grand-duchess of Oldenburg, sister of the emperor of Russia, who was in England with the emperor Alexander, and afterwards married the king of Würtemberg. She died in 1819. The population of Stuttgard is 35,000, with the garrison and strangers. There are manufactories of linen and woollen cloths, silk, cotton, gloves, carpets, shawls, &c., and the place is noted for its beautiful works in gold, silver, and bronze; excellent mathematical, philosophical, optical, and musical instruments; cabinet furniture, lackered ware, and carriages. The bark-trade is extremely flourishing.

The history of the city does not carry us back into remote antiquity. The name of Stuttgard first occurs in 1229. It appears however that it was a fortified town in 1286, when it was besieged for seven weeks by the emperor Rudolph I. In 1320 the sovereigns (then counts) of Würtemberg fixed their residence here, and since 1482 it has been the capital of all the possessions of the house of Würtemberg. Near Stuttgard is the beautiful royal country-seat 'The Solitude,' situated on a mountain.

(A. Fischer, *Das Königreich Würtemberg*, 1 vol., Stuttgard, 1838; J. D. G. Memminger, *Beschreibung von Würtemberg*; Hassel; Stein; Hörschelmann; Cannabich, &c.)

STYLA'RIA, Lamarck's name for *Nais proboscidea*, one of the Abranchous Setigerous Annelids of Cuvier.

STYLE. (Botany.) [STIGMA.]

STYLE, used for manner of writing, from the Latin *stylus*, the same word with the Greek *στύλος*, a 'pillar' or 'column:' *στύλος* probably contains the same element with *ἵ-στη-μι*, 'to place' or 'make erect,' and with the verb *στύομαι*. The Romans gave that name to an iron bodkin having a sharp point, with which they were accustomed to write by exaration, or scratching, on their wax-covered tablets or note-books; and from the instrument of writing, the term was transferred to the writing itself, and that too considered in reference not to the form of the characters (which would have been the more immediate transition), but to the mode of expression. Among the Romans however the term, in this figurative application of it, retained always considerably more of its antecedent meaning than it does with us. We say not only style of writing and style of speaking, but style of painting, style of architecture, style of dancing, style of dress, style of anything in which form or manner is conceived to be, in however slight a degree, expressive of taste or sentiment—if even this much of distinction still remains between what is called style and mere manner in the widest or loosest sense.

Style, in writing or speaking, may of course mean a bad style as well as a good style. Yet when the word stands alone, we always understand it in the latter sense—just as when we speak of expression in painting or in music we mean just or forcible expression. Thus Swift has said, 'Proper words in proper places make the true definition of a style.' This however is merely to tell us, what is sufficiently obvious, that the art of expressing thought by language consists in two things: first, the selection of words; second, their collocation or arrangement. That to constitute a good style, both this selection and this collocation must be proper, there can be no doubt; the only question is, what constitutes propriety as to such matters. Style has been sometimes considered as nothing more than the image or outward expression of thought, as its produce or creation in the same sense in which it may be said that the impression upon the wax is the creation of the seal; and it has hence been assumed that all that is necessary for the ensuring of a style of any degree of excellence is the possession of a corresponding power of thought. But a little reflection will satisfy us that this is an insufficient explanation. Of two men equal in powers of mind, and equally in possession of a subject, nothing is more common than that the one should be able to expound it much more clearly and effectively than the other. Language is an instrument the use of which must be learned like that of any other instrument. As a man may have a high capacity for music, and may have a perfect idea of a tune in his head, or may even be able to sing it, without being able to play it or any other on the violin, so a man may have the intellectual powers which fit him for excelling in oratory or poetry, without having the knowledge or command of language necessary to give them adequate effect. Style is rather the vehicle than the mere expression of thought; and the thought may be present where the vehicle is wanting. To some extent also it may be said to be the dress of thought, or that which ornaments and sets off thought, not only by the added charms of sound, but by other powers which are inherent in words, and of which unexpressed thought knows nothing. As there are 'thoughts that breathe,' so there are 'words that burn'—that by their associations excite impressions of the grand, the pathetic, or the humorous, whether they are addressed to the ear or merely to the eye. And great effects are also to be achieved by the arrangement of words, not only in the production of melody and cadence, but in a higher kind of gratification or excitement—as by the luminous disposition of all the parts of the sentence, by the presentment of every term at the place best fitted to bring out its whole import, by all the resources of what the grammarians call inversion, ellipsis, and other figures of speech; which indeed, wherever they are properly used, are no deviations from natural syntax at all, but, on the contrary, the most natural forms that can be employed. For, while writing is an art, it is nevertheless most true that, like all the other arts the purpose of which is to give expression to mind, the guiding and controlling principle of its exercise, its life and being, as we may say, must ever be as exact and sympathetic a conformity as possible to the thoughts or emotions of the writer. Whatever more style is than the mere expression of thought, that much it must be at the least. A powerful thinker may not always be a powerful writer, but no man can be a powerful writer who is not a powerful thinker. Even the humblest quality of style, mere perspicuity, cannot be attained without a corresponding degree of clearness of thought. We sometimes meet with a perspicuity which is little more than grammatical, and hardly belongs to style at all; but even that implies distinct conceptions so far as they go—a limpid stream of thought, however little depth or spaciousness of intellect. And as for all higher attributes, it is manifest that they cannot be found in the style, if they do not exist in the mind of the writer. The only fountains from which a man's words can derive the animation of true passion, or poetry, or wit, must be his own head and heart.

The lowest kind of writing that deserves the name of a style at all (unless it is to be called a bad style) ought, as we have observed, to be perfectly perspicuous, that is to say, readily and completely intelligible in so far as the understanding of it depends merely upon a knowledge of the language. The subject may be a difficult one, but that is only a reason for more pains being bestowed to make the style clear and easy, by a lucid arrangement and the avoidance of all ambiguities of expression. But although this rule may be justly insisted upon where nothing beyond such perspicuity is desirable, it will not bear to be so rigidly enforced in regard to the higher kinds of style. Here some sacrifice even of perspicuity is at times to be submitted to, for the sake of appropriate effects which could not be otherwise attained. Æschylus, no doubt, might have made his choruses, Pindar his odes, Tacitus his historic pictures, more easily comprehensible, better fitted for the use of such readers as would always run while they read, by greater diffuseness and dilution of style; but much more certainly would have been lost than gained by the attempt. Facility of being understood is a valuable quality in a style which has no other attractions; but it has been greatly overrated by the rapturous way in which the grammarians have been accustomed to speak of it. What is to be desired in the highest kinds of writing, as in the highest creations of all the fine arts, is not perfect comprehensibility at a glance, but rather that fulness and profundity of meaning which can never be wholly comprehended, but supplies inexhaustibly something new to be seen and felt every time we return to the work.

In every cultivated language however, the progress of style is decidedly towards more and more of first-sight intelligibility, in so far as that depends upon precision of phrase, and the use of words in certain limited meanings. This has been remarkably the history of the English language, at least for the last two hundred or two hundred and fifty years, during which we have been fixing both our grammatical forms and our rules of syntax to an extent that would surprise most persons if the evidences of it were stated in detail. Whether all that has been done in this way has really improved the language,—whether it has been thereby rendered more expressive, more flexible, more fitted for the various ends which a language ought to subserve, may perhaps be questioned. The gain in point of precision may possibly be more than balanced by the loss both in ease and in variety of style. We will instance one of the modern regulations about which the grammarians are wont to make a very great cry, the asserted necessity of always taking care that the reference of the personal or relative pronoun should be to the last-mentioned substantive of the same gender and number. Now, in the first place, this rule never is nor has been observed in the practice of any writer as it is laid down in the grammars: the reference of the pronoun is always not to the most proximate, but to the most prominent, of the antecedent substantives—to the one which the course of the sentence or statement has placed uppermost in the reader's mind; that is the actual, as it is the natural reference, and it would be absurd that the pronoun should be used upon any narrower principle. But in former times even that principle was by no means rigidly adhered to. If we turn, for example, to the 'Fairy Queen,' we find Spenser, certainly one of the greatest masters of language that ever wrote, and who has applied all the resources of his own English at once with the most consummate skill and the most wonderful effect, making his *hes*, and *shes*, and *its*, in every stanza, perform all sorts of services, and refer to almost any preceding substantive he pleases, wherever they may be placed. Nor is this licentiousness attended with any practical inconvenience. It may be a little offensive at first to our unaccustomed eyes or ears, but this soon wears off; the meaning of the passage is usually as obvious as if the modern rule were ever so carefully attended to, while the advantage which the disregard of it gives in point of spirit and freedom to the composition is far from inconsiderable.

In another respect however English prose eloquence has undergone a change of character in an opposite direction, by the greater infusion which it has received of a colloquial tone and phraseology within the last century and a half. Till towards the close of the seventeenth century the language of books, except in the comic drama and other light compositions of a kindred character, generally preserved a formality of gait and manner which distinguished it nearly as much from living conversation as the critics have held that the language of verse should be distinguished from that of prose. Among the most eminent of the writers who first broke through this species of restraint were Cowley, in his Essays; Dryden, in his prefaces and other prose discourses; Sir William Temple, and the third earl of Shaftesbury. The example set by them was followed by Swift, Addison, Steele, and their associates and imitators, till in the earlier part of the last century the colloquial ease and liveliness, which had thus become fashionable, threatened to degenerate into a slovenliness, or shambling fluency, alike without either elegance or precision. It must be admitted, that of all the writers of the second quarter of the eighteenth century, Lord Bolingbroke, whatever opinion may be entertained of his depth of thought or weight of matter, wrote the best style, at once the most flexible and idiomatic, and the purest, most refined, and most musical. But probably the writer who on the whole did most to restore measure and emphasis to our prose style was Johnson: his manner has not been much copied in all his peculiarities or in its entire character, but yet more or less of its influence may be detected in the style of nearly every one of the more remarkable writers who have subsequently appeared among us, including even such diversities as the sonorous inanity of Macpherson's 'Ossian,' the epigrammatic point and terseness of Junius, and the brilliant falsetto of Gibbon. At the same time however examples of altogether a different character were also producing their effects; and the rude vigour of Warburton, the naïveté of Sterne and Goldsmith, and, above all, the rapidity, variety, and imaginative splendour of Burke, have all operated powerfully in forming the greatest of our later writers. Finally, with all these influences have mingled and co-operated two others which have also been impulsive and generative to a considerable, though not both to the same extent:—on the one hand, the revived study of our old Elizabethan literature; on the other, the new life and spirit that has been put into literature, as into all things else, by the political and social convulsions of the last fifty years. These two influences, though thus apparently opposite in origin, have proved rather mutually assistant than contradictory.

Purity of style is more intimately connected with many apparently higher things than is commonly supposed. Remarking on 'the power and value of words, and the duty as well as advantage of using them appropriately,' Coleridge says (in a note to his work 'On the Constitution of the Church and State,' 1830, p. 19), 'Many years ago, in conversing with a friend, I expressed my belief that in no instance had the false use of a word become current without some practical ill consequence, of far greater moment than would, *primo aspectu*, have been thought possible. That friend, very lately referring to this remark, assured me that not a month had passed since then without some instance in proof of its truth having occurred in his own experience; and added, with a smile, that he had more than once amused himself with the thought of a verbarian attorney-general, authorised to bring informations ex-officio against the writer or editor of any work in extensive circulation, who, after due notice issued, should persevere in misusing a word.' When it is considered indeed what the wrong use of a word in most cases springs from and implies, the mischief it is apt to occasion is easily understood. It is produced by a confusion of thought, which is propagated wherever the vicious mode of expression prevails, and which, besides the injury done in the particular case, helps generally to impair the habit and the faculty of clear and correct thinking. Yet words, for obvious reasons, have a strong tendency to shift their signification; if a language were to be merely spoken, and not written, this would be constantly taking place to a very great extent; the only thing that can check it, that can furnish a practically available standard of the language, is the employment of it in writing. Originally indeed the principles upon which it is written must be taken from its spoken form—from the *usus et norma loquendi;* but afterwards commonly the spoken language both will be and ought to be rather regulated and controlled by the written language. If it should continue to be otherwise, the language would not improve, but would degenerate towards barbarism; for there could be no progress in any other direction, in this or in anything else, where the comparative slovenliness and incorrectness of extemporaneous precipitation were allowed to carry it over the best efforts of deliberation and care. There is always danger however of something of this happening wherever extemporaneous oratory is much in demand; and where the practice of public speech-making prevails to a great extent among the imperfectly educated classes, the case is of course so much the worse. There is reason to fear that such an influence is acting, along with other causes [AMERICANISMS], to seduce the more ambitious writers of English America into an inflated, big-worded, loud-sounding style, which is about as offensive to good taste as the noisy exaggerated eloquence of a person half drunk always is to a sober man. The speechifying or preaching style seems to threaten to become the only style even for written composition in the United States, and its standard the violent vociferation and empty rumble of the newspapers.

STYLE, OLD AND NEW. By the Old Style is meant the mode of reckoning time anterior to the Gregorian reformation of the calendar; and by the New Style, that adopted since. The adoption of the reformation at different times by different countries, renders it necessary to remember the difference of their reckonings, as follows.

The reformation took place in 1582; from thence to the end of February, 1700, new style is *ten* days in advance of old style: thus January 1 (O. S.) is January 11 (N. S.), and so on.

From and after March 1, 1700, to the end of February, 1800, new style is eleven days in advance of old style: thus January 1 (O. S.) is January 12 (N. S.).

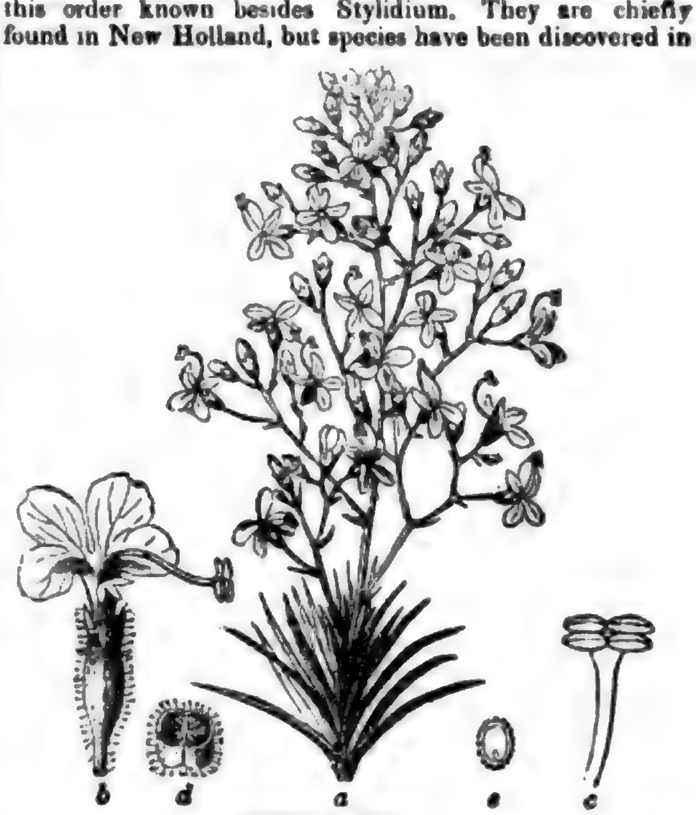
The new style was adopted in England by 24 Geo. II. (1751), which enacted, 1, That the year 1752 should begin on the 1st of January instead of the 25th of March, which was then the *legal* commencement. 2, That the 3rd day of September, 1752, should be called the 14th, or that the days from the 3rd to the 13th inclusive should have no nominal existence. Accordingly, the year 1751 had no January, February, nor March up to the 24th inclusive; and September wanted eleven complete days.

According to Sir Harris Nicolas, the new style was adopted as follows: by Denmark, France, Holland, and most of the Low Countries (some towns excepted), most of Italy, Lorrain, Portugal, and Spain, in 1582; by German and Swiss Catholics in 1584; by Poland in 1586; by Hungary in 1587; by German and Swiss Protestants, and the remaining parts of Holland, &c. in 1700; by Tuscany in 1749 or 1751; and by Sweden in 1753. It is not yet adopted in Russia.

It was at one time sometimes the mode to express the date in both styles. We have an old letter written from France to Holland in 1619, as we should now call it, the date of which is Février $\frac{18}{28}$, $161\frac{8}{9}$. [PERIODS OF REVOLUTION.]

STYLES OF ARCHITECTURE. All the principal styles have been spoken of under the heads of CIVIL ARCHITECTURE—*Egyptian, Gothic, Hindu, Italian, Lombardic, Mexican, Moorish, Norman, Roman;* and to them may here be added some subordinate styles, which are to be considered rather as peculiar and temporary modes, than distinct, independent, and established styles. Such are those known by the appellations of Burgundian, Flamboyant, Cinque-cento, and Elizabethan. Of these the two first mentioned are peculiar to France; and the *Burgundian* may be considered as corresponding with our own Tudor, since it exhibits, with many points of difference, many also of resemblance, and the same general character as to enrichment, and the adoption of very flattened arches, or else horizontal lintels, for the openings of windows. Château Fontaine le Henri and several other examples of this style may be seen in Pugin's 'Antiquities of Normandy.' *Flamboyant* is a term that has recently been applied to that species of French Gothic whose tracery is entirely composed of flowing curves, forming not a perfectly symmetrical pattern. The name has been bestowed from the fancied resemblance to the waving outline of *flames*. The portals of Abbeville, Beauvais, and St. Maclou at Rouen are fine specimens of this style. *Cinque cento*, otherwise sometimes called the *Renaissance* style, is that which arose on the first attempt to revive and apply the classical orders without any regard to their original character. If Roman architecture departs very widely from the principles of that of Greece, the Cinque-cento departs quite as much, and sometimes still more so, from those of the Roman. It is essentially *microstyle* in composition, the orders being treated as diminutive decorative features, not only intermixed with, but almost overwhelmed by others of very grotesque and incongruous design. Still the style possesses historical interest; and although devoid of beauty, is, in many instances, exceedingly rich and eminently picturesque. It was that which prevailed in France in the time of Francis I., and has lately been much affected and brought into vogue again in that country for purposes of interior decoration. Among others, Heidelberg Castle is a noted and splendid example of this style in Germany. What is called *Elizabethan* may be considered the English Cinque-cento or Renaissance—a style in itself full of barbarisms and extravagances, yet frequently rendered imposing by the magnitude of the structures in which it was displayed, and by that profusion of fantastic ornaments which recommends it to the taste of many even at the present day.

STYLIDIA'CEÆ, a natural order of plants belonging to the epigynous group of monopetalous Exogens. They are herbaceous plants, or under-shrubs, with aqueous juices, sometimes having hairs, which are simple, acute, or capitate; the stem and branches are round, or sometimes they have a scape. The leaves are entire, without stipules, mostly scattered, sometimes whorled, the radical ones clustered in the species which possess a scape. The flowers are solitary, or arranged in spikes, racemes, or corymbs, mostly terminal; the pedicels have three bracts. The tube of the calyx is attached to the ovary; the limb is 2-6-parted, bilabiate, or regular and persistent. The corolla is monopetalous, irregular, 5- or 6-cleft, imbricated in æstivation, and late in falling off. There are two stamens, the filaments of which are united with the style, the whole forming a single elongated column; the anthers are 1- or 2-celled; when the latter, they lie over the stigma; the pollen is globose, simple, sometimes angular. The ovary is 2-celled, or sometimes 1-celled from a contraction of the dissepiment, many-seeded, with a single gland in front, or two opposite ones; the style is one with the filaments, and the stigma, which is simple or bifid, is enclosed and hidden by the anthers. The fruit is a capsule, with two valves and two cells; the seeds are indefinite, small, erect, sometimes stalked; the embryo is minute, and enclosed within a fleshy somewhat oily albumen. This curious order of plants is allied to Campanulaceæ and Goodeniaceæ, but the peculiar union of its filaments and style into a single column distinguishes it at once. This column possesses a considerable degree of irritability. [STYLIDIUM.] There are only two genera of this order known besides Stylidium. They are chiefly found in New Holland, but species have been discovered in



Stylidium laricifolium.

a, cutting showing corymbose flowers and leaves; *b*, flower showing irregular corolla, tubular calyx, and capitate hairs; *c*, filaments and style, forming a single column, with anthers covering stigma; *d*, 2-celled ovary; *e*, section of seed with minute embryo.

the Himalaya, Ceylon, and the South Sea Islands. Their properties are unknown.

STYLI'DIUM (a diminution of *stylus*, 'a column'), the name of a genus of plants, the type of the natural order Stylidiaceæ. The essential characters of this genus are: calyx 2-lipped; corolla irregular, 5-parted, form of the segments equal, the fifth smaller, forming a labellum, which is deflected; column consisting of filaments and style, reflexed, with a double curve; anthers with two lobes widely separated; stigma obtuse, undivided; capsule bilocular, with the dissepiment sometimes superiorly incomplete. This is chiefly a New Holland genus of plants, and is remarkable for its gynandrous structure, and for the irritability of the column formed by the union of filaments and style. Irritability is seen in many genera allied to this, as in the indusium of Goodenia. The part which exhibits movement on being excited is the curved column, and the irritability is confined to a small portion only of the column near its base. In the natural state the column projects from beyond the flower, and hangs down over the smaller petal or labellum, and the irritable part of it is in contact with the labellum. The movement of the column consists in raising itself from this deflected position to that of perfect uprightness. In the bud, the column does not possess this power, but as the anthers develop, this property of the column increases, and is at its greatest intensity at the time of the dehiscence of the anthers, and entirely ceases when the impregnation of the ovules has taken place. During this process the anthers also undergo a change; previous to dehiscence, they entirely cover the stigma, but after this process has taken place, the stigma is fully exposed, and remains so. The irritability is then developed with the anther: it is at its greatest height whilst the anther is performing its function, and ceases with the function of that organ. The movement of the column is produced by external stimulants or the application of a solid body. Exposure to heat will erect the column, and its withdrawal will cause it to return to its natural position. After returning to this state, it requires ten or fifteen minutes' rest before it will again exhibit irritability. When elevated, the column cannot be made to return by force to its bent position. When the movement takes place naturally, it is slow and regular, and when under the influence of artificial excitants, it occurs suddenly and by jerks. The final cause of these movements is evidently connected with impregnation, and it seems that the pollen is conveyed to the stigma whilst the column is upright, which could not be the case whilst it was dependent.

The species of this genus described by Mr. Brown, in his 'Prodromus Floræ Novæ Hollandiæ,' are forty-five in number; besides these there are two or three natives of the East Indies.

STY'LIFER, or **STILIFER**, Mr. Broderip's name for a new family of Pectinibranchiata, characterised by him from a shell with the soft parts attached, among other specimens brought home by Mr. Hugh Cuming.

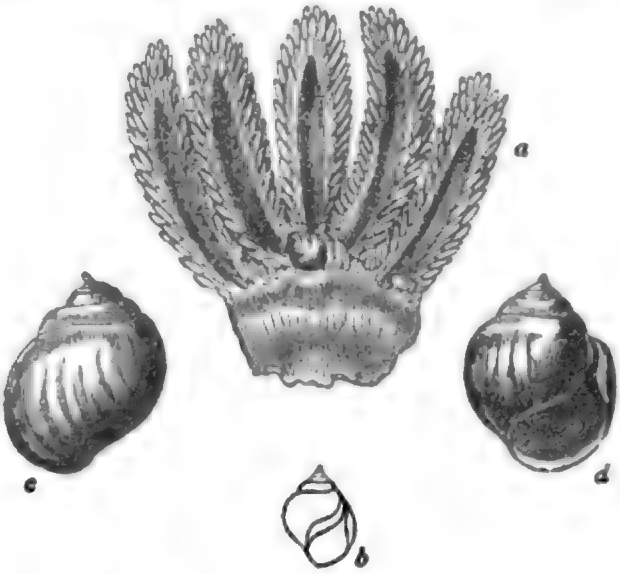
Generic Character.—*Shell* hyaline, turbinated, the apex of the spire mucronate. The aperture subovate, acuminated above. The external lip acute and sinuated.

Animal.—The mantle thick, fleshy, and cup-shaped, covering the last whorls of the shell. The proboscis very long and retractile. The tentacles round, thick, subacuminate, and situate at the base of the proboscis. Eyes very small, sessile at the base of the tentacles. Stem of the branchia solitary. Animal marine, penetrating into the integument of the star-fish.

Example, *Stylifer Astericola*, Brod.

Mr. Broderip states that the arrival of this species with the soft parts had afforded data for a generic character, indicating a distinct family among the *Pectinibranchiata*, the form of whose mantle differs from any other genus of that order. This mantle, which is of a green hue, is thick, fleshy, and cup-shaped, with a small aperture at its base, and a free posterior margin, enveloping the soft parts and the last volutions of the shell, which has thus somewhat the appearance of a small acorn set in its cup. On the ventral aspect of the mantle is the rudiment of a foot, and from the small basal aperture a retractile proboscis (which, when exserted, is as long as the whole animal) is protruded. At the base of the proboscis are two thick, round, somewhat pointed tentacula; and at the base of them are the eyes, or rather, ocular specks without pedicles. The branchia is placed on a single stem. At the base of the proboscis is a spherical muscular stomach, and the intestine ascends into the spire of the shell, where it becomes attached to the liver, which in *S. Astericola* is of an orange colour.

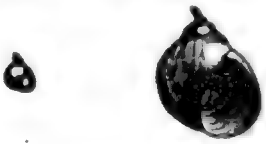
Mr. Cuming found this elegant parasite burrowed in different parts of the rays of the oral disc of *Asterias solaris*. It was almost hidden from sight, so deeply does the animal penetrate into the substance of the star-fish, in which it makes a comfortable cyst for itself, and wherein it most probably turns by the aid of its rudimentary foot. All the specimens infested with these testaceous mollusks appeared to be in the best health, though there is reason to believe that they feed upon the juices of the star-fish. Mr. Broderip observes that Stylifer (with that instinct of self-preservation which is imparted to all parasites whose existence depends upon that of their nidus) appears, like the larvæ of the ichneumon tribes among insects, to avoid the vital parts; for in no instance did Mr. Cuming find it imbedded anywhere save in the rays, though some of the individuals had penetrated at their base, and very near the disc. When extracted, the older shells have the appearance of a milky-clouded glass bubble: the younger shells Mr. Broderip found of an unclouded transparency.



Stylifer Astericola. (Sowerby's *Genera*.)

a, a portion of *Asterias solaris*, showing *S. Astericola* in its cyst: b, a fine specimen of the shell; c, d, views of the upper and under side of the same, magnified.

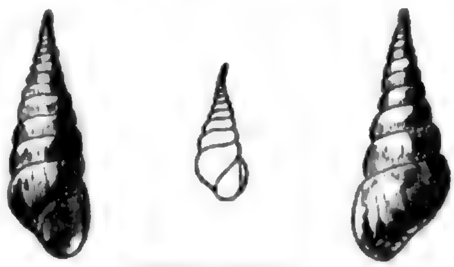
Mr. Broderip remarks that Dr. Turton, in the second volume of the *Zoological Journal*, p. 367, pl. 13, describes and figures a shell under the name of *Phasianella stylifera*, adding that he found a dozen attached to the species of *Echinus esculentus* dredged up in Torbay. Mr. Broderip observes that it is clear that Dr. Turton's shell is not a *Phasianella*, for it is described as having no operculum, and the similarity of the shell leaves no doubt, when joined to the parasitic habits of the animals, that it is one of the congeners of *Stylifer Astericola*. Mr. Broderip therefore names Dr. Turton's specimen *Stylifer Turtoni*.



Stylifer Turtoni.

Natural size and magnified. (*Zool. Journ.*)

Mr. G. B. Sowerby furnished Mr. Broderip with a third species, which, though its habits were unknown to the latter, he considers to be referrible to this genus, and he



Stylifer subulatus.

Natural size and magnified. (Sowerby's *Genera*.)

names it *Stylifer subulatus*; it is so beautifully transparent, that in fine specimens the columella can be as distinctly seen as if there were no intervening medium; and its long apex, which consists of many close-set whorls, is generally out of the perpendicular. (Broderip, in Sowerby's *Genera of Recent and Fossil Shells*, No. xxxviii.)

The characters of the species described by Mr. Broderip will be found in the *Proceedings of the Zoological Society of London* for 1832; and in Th. Müller's *Synopsis Testaceorum*, Berlin, 1836.

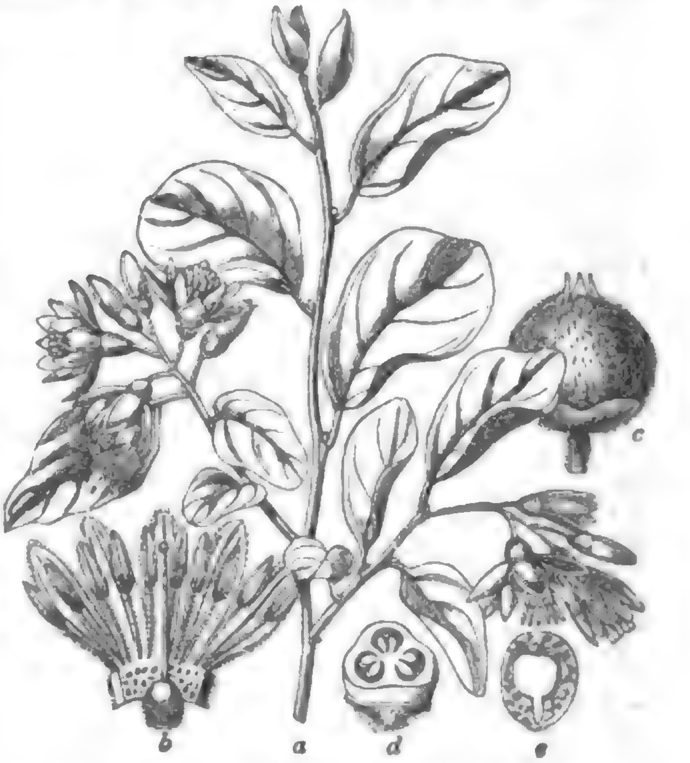
STYLOBATE. In its general meaning this term signifies any sort of basement upon which columns are placed to raise them above the level of the ground or floor; but in its technical meaning it is applied only to a continuous unbroken pedestal, upon which an entire range of columns stand—in contradistinction from *pedestals*, which are merely detached fragments of a stylobate placed beneath each column. So far were the Greeks from considering the stylobate an integral part of an order, that they very rarely employed it, but placed their columns immediately upon the floor of the elevated platform of the gradini, or deep steps, which served as the basement of the temple, and which were generally continued on every side. It was only in particular cases, such as where steps were confined to one end or the front of a building, that, whether columns were continued along its flanks or not, there was of necessity a basement added to those side elevations, equal in height to the ascent of the steps, or the difference of level between the ground and the pavement of the portico; which basement was treated as a distinct pedestal to the whole building. The height of such pedestal therefore varied according to circumstances, and was not strictly regulated by that of the order. Generally indeed it was low in proportion to it, but in the caryatic portico of the Erechtheium at Athens (copied at St. Pancras church, London) we have an example of a very lofty stylobate, its height being nearly equal to that of the figures themselves or the columns of that anthropostyle order. The Romans, on the contrary, broke up their stylobates into distinct blocks or pedestals placed beneath each column; and most followers of that or the Italian school have considered pedestals of that kind to be almost essential to an entire order, and have laid down proportions accordingly, which are in themselves exceedingly faulty, being much too high. At the best, columns upon detached pedestals always look as if placed upon stilts, and where such pedestals are as high as they are sometimes made—one third, or even more, of the column itself—the columns seem to stand very insecurely, and the effect is very much like that of a round column immediately placed upon a dwarf square one. Another evil resulting from such practice is that the order itself, or columns and entablature, loses much of the importance, and the entablature ceases to be in proportion to the united heights of the column and additional shaft or subcolumn beneath it and in continuation of it. Unless absolutely indispensable, or where there must be some balustrading or parapet between columns, for the sake of security, and then they should be no higher than what convenience requires, pedestals should be avoided altogether. A stylobate, on the contrary, may be so employed as to give additional dignity to an edifice, without detracting from or interfering with the order itself, since it gives the whole structure an appearance of solidity in its lower part. The portico of the National Gallery owes much of its effect to the circumstance of its being elevated upon a solid unbroken stylobate, which is however too plain in itself to accord with the order, and even looks poor and unfinished, from the want of a suitable socle and base mouldings.

STYLO'CERUS. [Deer, vol. viii., p. 362.]

STYPTICS (from στυπτικός, 'astringent'), agents which check the flow, generally of blood, from a relaxed or ruptured vessel. They are a kind of astringent, and the principle of their mode of action has been already detailed. [Astringents.] The only point requiring notice here is to enforce the necessity of their prompt employment, as the natural disposition of the blood to coagulate becomes less and less as it continues to flow, till fainting be induced, and a cessation of the current results, after much injury is done to the system. The bleeding may be spontaneous, as is frequently the case with young persons, from whose nose blood frequently flows, even when perfectly quiet, but still more frequently when running or lifting some heavy weight, or it may be the consequence of a wound, such as a leech-bite, or of the extraction of a tooth, or caused by some cutting instrument. Those astringents are alone entitled to be called styptics which can be applied directly to the bleeding orifice; and of these some act chemically, others vitally, and others merely mechanically. Of chemical styptics, a saturated solution of alum, or sulphate of zinc, or creasote, are the best. Strong acetic acid acts both chemically and vitally. When blood continues to ooze from the socket of a tooth, it is a useful plan to plug it with a sponge-tent, which, as it expands, quite fills up the socket, and restrains the hæmorrhage.

STYRA'CEÆ, a small natural order of plants, placed by Lindley in his polycarpous group of monopetalous Exogens. The species are trees or shrubs, with alternate leaves without stipules, usually turning yellow in drying. The flowers are axillary, and are either solitary or clustered with membranaceous bracts. The calyx is persistent, and has five divisions; corolla with divisions, frequently differing from the calyx, and with imbricated æstivation; stamens varying in number, arising from the tube of the corolla, with 2-celled anthers; ovary 3-5-celled, with few ovules, a simple style, and capitate stigma; fruit a drupe; seeds solitary, with the embryo lying in the midst of albumen. This order is nearly allied to Ericaceæ, from which it differs in habit, its definite seeds, and its frequently inferior ovary. It differs from Ebenaceæ in its stamens being perigynous, in the insertion of the ovules, and its simple style. It is however an order on which there are many different opinions, some referring all its genera to Ebenaceæ, whilst others separate from it the genera Symplocos and Halesia as types of distinct orders.

The species are found in the temperate and tropical parts of North and South America, and also in Nepaul and China. This order is chiefly remarkable, in an economical point of view, for furnishing the Storax and Benzoin of commerce, which contain a peculiar acid called the benzoic. Some of the species are used for dyeing yellow, and a species of Alstonia is employed as a substitute for tea. The various species of Halesia are the snow-drop trees of Carolina.



Styrax officinalis.

a, Branch showing leaves and clustered flowers; *b*, corolla opened with perigynous stamens and pistil; *c*, fruit covered with tomentum; *d* transverse section of ovary, showing 3 cells; *e*, section of seed, showing embryo in the midst of albumen.

STYRAX (from στύραξ), the name of a genus of plants forming the type of the natural order Styraceæ. It has a persistent campanulate 5-toothed calyx; monopetalous deeply 3-7-cleft corolla; 10 stamens monadelphous at the base, with linear 2-celled anthers; superior ovary with indefinite ovules, with simple style and 3-lobed stigma; fruit a dry drupe; seed with a double testa, inverted embryo, and fleshy albumen. The species are elegant trees and shrubs, mostly covered with hairs having a stellate form, with entire leaves and white or cream-coloured racemose flowers. They are principally natives of America and Asia; one is found in Europe and one in Africa.

Styrax officinalis, officinal Storax: leaves ovate, downy beneath, shining above; racemes 5-6-flowered, simple, shorter than the leaves. It is a native of Syria, Italy, and most parts of the Levant. It is common all over Greece and the Peloponnesus, where Dr. Sibthorp found it retaining almost the same designation as that given it by Theophrastus and Dioscorides, the modern name being *στουραξ*. It was first cultivated in England by Gerarde, but is still a rare plant in this country. One of the finest specimens is in the Botanic Garden at Chelsea, and is annually covered in May and June with a profusion of rich blossoms. This is the species which yields the Storax which is admitted into the Materia Medica of the London Pharmacopœia. [STYRAX.] There is however another Storax known in commerce, with which this must not be confounded, and which is the produce of the *Liquidambar styraciflua*, a plant belonging to the natural order Balsamaceæ.

S. Benzoin, Benjamin Storax, or Gum-benjamin tree: leaves ovate-oblong, pointed, glabrous above, downy beneath; racemes compound, almost the length of the leaves. It is a native of Sumatra and Java. It is the plant which produces the gum Benzoin or Benjamin of commerce, and which, as well as Storax, is used in medicine. [BENZOIN.] The great consumption however of these resins is not as medicines, but in their use as incense in the worship of the Roman Catholics and Mohammedans. Though older botanists, as Garcias, Grim, and others, were acquainted with the tree that yielded Benzoin, Ray confounded it with the genus Laurus, and Linnæus with the genera Croton and Terminalia. Dryander gave a correct account of the plant in 1787, and referred it to its present position.

S. grandifolius, large-leaved Styrax: leaves broad, obovate, pointed, slightly serrated, green above, downy beneath; lower peduncles 1-flowered, solitary, axillary. A native of North America, in woods and on the banks of rivers from Virginia to Georgia. It is a handsome shrub, bearing white flowers, opening them in June and August.

S. lævigatus and *S. pulverulentus* are North American species, and are natives of the woods of the Carolinas and Virginia.

Several other species are described from South America, mostly from Brazil.

The hardy species of Styrax are well adapted for shrubberies, on account of their foliage and handsome flowers. They may be propagated by seeds sown in pots of light soil, and exposed to warmth, but the best mode is by layers, which should be put down in autumn or spring.

STYRAX OFFICINA'LIS is the source of the officinal storax, though an article is occasionally vended under this name, which is obtained from the Liquidamber styraciflua, and perhaps other species of Liquidamber. Of genuine storax there are several varieties, and of those known to the antients many are now altogether unascertainable, while of those mentioned by even recent writers several are very rare, and only objects of curiosity, not of commercial importance. The tree grows in Greece and Asia Minor, and is cultivated in the south of France, in which last no resin exudes, except occasionally, after very warm summers. Asiatic Turkey supplies whatever is met with in commerce. It is procured by incisions in the bark, or perhaps from the punctures of insects. What flows from these openings is a liquid resinous substance, which concretes into small tears, about the size of peas; these, aggregated into masses, constitute the *styrax albus*, which is of extreme rarity. Another form is that called *amygdaloides*, also of great rarity and extravagant price. It is sometimes termed *calamita vera*. The commercial article is of various degrees of purity and excellence. One kind is called *storax calamita vulgaris*, or *Scobs storacina*. This always contains more or less sawdust, mixed with variable quantities of resin. It is generally in large round cakes, of a brown colour, verging to red or black, with fragrant odour, brittle, and friable, but softens in the mouth, and has a bitter taste. It burns with a light flame. It is considered to be an artificial compound, prepared chiefly in Venice and Trieste. According to the analysis of Reinsch, it contains—volatile oil, a trace only; resin, from 32 to 53 per cent. in different specimens; benzoic acid, from 1 to 2 per cent.; gum, 7 to 14; woody fibre, 20 to 27; ammonia, an inappreciable quantity.

Storax is stimulating in a degree dependent on its purity. For medical purposes it is directed to be purified by solution in alcohol, straining, and afterwards distilling off the spirit. The residuum is then used in a few preparations, such as tinctures and pills. It formerly entered into a multitude of compounds, but it has been greatly discarded, from the extensive adulterations practised with it, and it might be altogether supplanted by benzoin. It is much used to form pastilles, and for fumigations. The bark is called *cortex Thymiamatis*, or *cortex thuris*, from which, by boiling, *liquid storax* is procured, as well as from the liquidamber. There is a storax from Bogota, but its source is unknown.

STYRIA, THE DUCHY OF, in Austria, is situated between 45° 54′ and 47° 50′ N. lat., and between 13° 30′ and 16° 25′ E. long. It is bounded on the north and north-west by the archduchy of Austria, on the west by Illyria, on the south by Illyria and Croatia, and on the east by Croatia and Hungary. The area is about 8500 square miles, or about one-fourth of that of Scotland, and the population amounts to 950,000 souls. The northern and western part of the country is covered with high mountains, which are called by the general name of the Styrian Alps. Properly speaking, they are two great branches of the Julian Alps, which extend to the east; one of these branches separates the valley of the Ens from that of the Mur, runs south-east, as far as the Wild Alps, to the west of Semmering, where it joins the Noric Alps, and then proceeding in a south-easterly direction forms the boundary towards Austria below the Ens, extends into Hungary, and gradually declines to the plain of Oedenburg. The other branch divides the valley of the Mur from that of the Drave, and forms the frontier between Styria and Carinthia. To the south of the Mur the Bacher chain is the continuation of this branch. A third mountain-chain runs from Loibl to the Save, and forms on that side the boundary towards Carinthia. None of the mountains rise to the line of perpetual snow; on the north-western frontier there are some glaciers, but still below the absolute snow-line. The highest mountains that have been measured are the Grössenberg, 8381 feet; the Eisenhut, 7676 feet; the Grimming, 7540 feet; the Stangalpe, 7140; the Hochschwab, 7154; and the Bachstein, 7008 feet, above the level of the sea. The southern and eastern part of the province contains few lofty mountains, but there are many of moderate elevation, and numerous gentle eminences, some of which are separated by extensive valleys. In conformity with the physical character of the country, it is divided into Upper Styria, which comprises the smaller north-western portion, which is entirely mountainous, and Lower Styria, which is the south-eastern, and larger, lower, and level portion. 'Styria,' says Blumenbach, 'is properly a mountainous country, but with the richest diversity; a wild, romantic, beautiful region, which surpasses the magnificence and variety of the finest English park. Throughout the whole country there is an alternation of lofty peaked rocks and perpendicular walls, flowery meadows, lovely valleys, dark impenetrable forests, rushing waterfalls, peaceful lakes, castles, and villages.' The country has numerous rivers, all of which flow into the Danube, and for the most part by an east course. The principal rivers are, 1st, the Mur, which rises in a lake, traverses the centre of the country for about 180 miles, is joined by many smaller rivers, and enters Hungary at Maut; 2nd, the Drave, which enters Styria below Hohenmauthen, and enters Croatia at Fridau; 3rd, the Ens; 4th, the Raab. The Save only touches the southern frontier, towards the government of Laibach, but is joined by the Sän and the Sotla, the latter of which bounds for some extent the south-eastern frontier towards Croatia. The Mur, Drave, Ens, and Save are navigable by boats. There are no large lakes, but many small ones. The largest are, the Grundelsee, above 718 Austrian acres in extent, in many places 60 fathoms deep, and 2031 Paris feet above the level of the sea; the Altenausseersee, 358 acres in extent, and 2280 Paris feet above the level of the sea. The country abounds in cold, warm, and hot mineral-springs, the best known and most celebrated of which are the chalybeate waters of Rohitsch, the sulphureous and alkaline springs of Neuhaus, the alkaline waters of Sekau, and some others.

Like all countries that abound in limestone mountains, Styria has numerous caverns, the most interesting of which is the Mirnitz cavern.

Soil and Climate.—The air in the mountainous part is bleak, though pure; in the valleys of Lower Styria the temperature is much milder, and the vine and maize flourish. The fertility of the soil is various. A great part of Upper Styria consists of bare naked limestone rocks and sterile mountains, but Lower Styria has many very fertile tracts.

Natural Productions.—These are, the common domestic animals, with game, poultry, fish, and bees. The breeding of cattle is very general. The animals are well-shaped, but small, and, as usual in the Alps, are driven in summer to the highest parts of the mountains, and brought back to the plains in autumn. Sheep are not numerous, and the horses are more fit for draught than for the saddle. The vegetable products are very diversified: wheat, rye, barley, and oats, though not abundant in Upper Styria, are of remarkably fine quality. In Lower Styria there are likewise maize, millet, and buckwheat, pulse of various kinds, and culinary vegetables; potatoes, the culture of which was introduced about the middle of last century, are now very extensively cultivated. Of oleaginous plants there are the poppy, sunflower, and rape-seed. Very little hemp is grown; some flax is raised, but not sufficient for home consumption. Of late years hops have been cultivated with success. Wine and fruit are among the chief productions. Timber is a very important article. The principal kinds of timber are the oak and the beech in Lower Styria; the pine, fir, chesnut, walnut-tree, red yew, stone-pine, lime, white poplar, and willow are scattered over the whole country, but for the most part they grow in forests. The great wealth of Styria however consists in its mines, which are confined to the smaller mountainous portion of the country. The most important minerals are—silver, copper, lead, iron (540,000 cwt. a year), alum, cobalt, sulphur, salt, marble, and coals.

Manufactures and Trade.—The manufactures of the country are chiefly of mineral products, the most important of which is iron. The iron-mines in the Erzberg, in the north of Styria, were well known to the Romans. This mountain does not contain the ore in veins or strata, but presents a solid mass of iron-ore, which has been wrought without interruption for eleven centuries.

Styria does not manufacture the whole of the iron produced; the surplus is exported partly to the archduchy of Austria, where the extensive iron-manufactories are chiefly supplied from Styria, and partly, by way of Vienna and Trieste, to France and England. There are a few manufactories of linen, cotton, woollens, and silk, but none of considerable importance. There is a very brisk trade between Upper and Lower Styria; the latter supplies the former with corn, wine, and tobacco, and receives in return iron, timber, and salt. The exports to other countries are chiefly cattle, steel, iron, copper, and lead, to Austria, Hungary, and European Turkey; scythes (a million), sickles (200,000 in a year), steel, and some other iron-wares, to Italy, France, Poland, and Russia. Among the smaller articles of iron, several millions of Jew's-harps are annually exported. The imports are very considerable, consisting chiefly of fine cloths, linens, cottons, silks, and jewellery, from Vienna, and colonial produce from Trieste and Fiume. The transit trade between Italy and Germany, from Vienna to Trieste, is very important. This trade is greatly facilitated by the good roads, especially that between Vienna and Trieste, from which other great roads branch off to the Tyrol, to Linz, to Ofen in Hungary, and Carlstadt in Croatia. The principal commercial towns are Grätz, Pettau, Leoben, Rackersburg, and Marburg. The government is like that of the other Austrian hereditary states; the emperor has the title of duke of Styria. The parliament, or estates, as they are called, consist of four orders—the higher clergy, the nobility, the deputies from the landholders, and the deputies from the towns.

Religion and Education.—The inhabitants consist of two nations; Germans, who are the majority (above two-thirds), and Wends, who are of Slavonian extraction, and speak their own language. The Germans, who inhabit all Upper Styria the circle of Grätz, and a small part of that of Marburg, are a tall, handsome, robust, good-tempered, and industrious race. The Wends are weak, thoughtless, dissolute, and bigoted. The great majority of the people are of the Roman Catholic religion, the Lutherans not being above 3000 in number. The establishments for education are, the University, two theological schools in convents, four gymnasia with sixty-eight professors and about 1800 students, and 627 Roman Catholic and 4 Protestant schools. There are, besides, several other schools for special purposes. The hospitals, infirmaries, and other charitable institutions are very numerous.

History.—Pliny and Strabo are the first authors who give any account of this province. The inhabitants were completely uncivilised, and harassed the adjoining provinces, till the reign of Augustus, when the country was subdued by Tiberius, and the eastern part incorporated with the province of Pannonia, and the western with that of Noricum. The country was even then celebrated for its iron, steel, and cattle; subsequently industry flourished in the towns, especially in Celeja (Cilly), Petovium (Pettau), and other places. Christianity penetrated early into this country, and spread so rapidly, that episcopal sees were established at Pettau and Cilly; but the irruption of the northern hordes put an end to the prosperity of the country, which was successively overrun by the West Goths, the Huns, the East Goths, the Heruli, the Lombards, the Franks, and other barbarians. In the sixth century the Slavonians established themselves in Lower Styria, and afterwards, when they had expelled the Avari, in Upper Styria, till they were overpowered by the Germans. Charlemagne, having conquered Styria, divided it among several counts: under his successors the country suffered from the internal discords of its chiefs, by the incursions of the Bulgarians, and by the invasion of the Magyars, from whose yoke it was delivered by the victory obtained over them by the emperor Otho the Great, in the year 955. The country was divided afterwards into a number of principalities, of which that called the county of Steyer was successively enlarged to its present extent under rulers who bore the title of margraves, and afterwards of dukes, till it was annexed, at the end of the twelfth century, to Austria, with which it has ever since been united.

Various events checked the prosperity of the country, such as the repeated invasions of the Magyars and the Turks, famine, pestilence, the expulsion of the Jews, and the insurrection of the peasantry. The doctrines of the German reformers had been adopted, about the year 1530, by so great a proportion of the inhabitants, that they were openly preached and taught in the churches and the numerous schools which the Protestants had established. At the diet held at Augsburg in 1547, Baron John Ungnad, at the head of the Styrians, applied to the emperor and empire for the free exercise of religion, which the Protestants did not however obtain till the diets held at Bruck, in 1575 and 1578, when the archduke Charles II., being sorely pressed by the Turks, was obliged to grant it, the greater part of the nobility, half of the citizens, and a considerable number of peasants having already embraced the new doctrines.

The rapid spread of the Reformation had been greatly promoted by the school at Grätz, founded in 1568, while the archduke Charles was absent in Spain, which the estates of the duchy converted, in 1573, into a high school for Protestants, and provided it with professors from foreign countries, eminent for their learning. The archduke Charles had already called in the Jesuits to his aid, in 1570, and he assigned them a residence in 1573; on the 12th of November in the same year, he founded the Catholic high school at Grätz, and, at the instigations of his wife Maria of Bavaria, who was full of zeal for the Romish religion, he took measures to restrict the principles of the Reformation, which his son Ferdinand II. prosecuted with so much energy and rigour, that a hundred years after the first appearance of the Protestant preachers in the country, all Styria was re-annexed, by violence, to the Romish faith. Supported by the garrison of the citadel of Grätz, which was considerably increased for the purpose, Ferdinand revoked his father's grant of the free exercise of their religion, and commanded the estates to dismiss the Protestant clergymen and teachers from all the churches and schools within fourteen days. On the 28th September, 1598, the teachers were strictly commanded to leave the city of Grätz on the same day before sunset, and the hereditary estates within a week, on pain of death, and never to return to them. The Protestant high school was closed; a Romish anti-reformation commission was appointed, which boasted of having burned no fewer than 40,000 volumes of Protestant books; and all Protestant citizens were enjoined either to embrace the Romish religion, or to sell their property, and with the proceeds, after the deduction of one-tenth, likewise to leave the country. Many professors of the doctrines of the Reformation abjured their faith, in order to remain in the land of their fathers; 30,000 others, of the richest and most distinguished families, and among them many of the noblest houses, left their native country; and lastly, others concealed their opinions, and cherished them in silence from generation to generation, for two centuries and a half, till the toleration edict of Joseph II. allowed them openly to profess their faith.

(Hassel; Stein; *Die Oesterreichischer National Encyclopädie*, *Conversations Lexicon*; Blumenbach, *Gemälde der Oesterreichischen Monarchie*, &c.)

STYX (Στύξ or Στυγὸς ὕδωρ), a small stream in the north of Arcadia, which is now called Mauronero. According to Herodotus (vi. 74) its source was in the Arcadian town of Nonacris. Vitruvius (viii. 3) states that its water destroyed all brass, iron, and silver vessels which were filled with it.

In the antient mythology the Styx was believed to be the principal river of the lower world, round which it flowed nine times. (Virg., *Æn.*, vi. 439.) It was believed to be an arm of the river Oceanus, which flowed round our earth, and the river Cocytus was thought to be a branch of the Styx. When the gods of the antients took a great oath, they always swore by the water of Styx, and awful punishment awaited him who swore falsely. The divinity of the river Styx was a nymph of the same name, who dwelled at the entrance of the lower world in a spacious grotto supported by silver columns. (Hesiod., *Theog.*, 778.)

SUABIA, one of the ten circles into which Germany was divided previously to 1806, comprehended the south-western part of Germany, one of the most beautiful and fertile tracts of the whole empire, traversed by the Danube from the south-west to the north-east, by the Black Forest on the west, and by the Alps in the interior and on the south. It was situated between France, Bavaria, Switzerland, Franconia, and the circles of the Rhine, and had an area of 13,000 square miles, with 2,200,000 inhabitants. Its chief natural productions are corn, wine, and fruit, and in the mountainous parts minerals, and timber, which is floated down the Neckar and the Rhine to Holland. The country of the Suevi, from whom the name of Suabia is supposed to have been derived, was more extensive than the modern circle. Christianity was introduced at the beginning of the seventh century by the Irish monk Columba. In the year 1080 Henry IV. gave the duchy of Suabia to Count Frederick of Hohenstauffen, the ancestor of the emperors of the house of Suabia. Frederick did not however obtain peaceable possession of the duchy till 1096. Under his distinguished successors, the Suabians were the richest, the most civilised, and the most respected of all the nations of Germany. But when the Italian wars and the contest with the Guelphs had broken the power of the house of Hohenstauffen, and it became extinct on the execution of Conradin in 1268, their vassals, cities, prelates, and counts made themselves independent. Many Suabian cities joined the Rhenish Federation, founded in 1254, and Würtemberg in some measure took the place of the extinct duchy of Suabia. This is not the place to enter into the details of subsequent events, the sufferings of the people from repeated wars, from civil discords and disputes between princes and their subjects, till the final dissolution of the antient constitution of the empire, and the partition of the country among Würtemberg, Bavaria, Baden, the princes of Hohenzollern, the prince of Lichtenstein, Austria, and Hesse-Darmstadt. The largest cities are Augsburg, Stuttgard, and Ulm.

The very name of Suabia has disappeared from the maps and gazetteers of Germany, and was only revived about three years ago by the king of Bavaria, who restored to the circles of the kingdom the antient historical names, and gave that of Suabia to the circle of the Upper Danube.

(*Conversations Lexicon*; Hübner, *Zeitungs Lexicon*; *Weimar Almanach*, &c.)

SUAKIN or **SOUAKIN**, a town or seaport in Nubia, on the west shore of the Red Sea, is in 19° 4′ N. lat. and 37° 30′ E. long., at the extremity of a narrow inlet, about twelve miles in length and two in width. The entrance of the bay is only about sixty fathoms wide, but it opens gradually to two miles. With northerly winds it is very difficult to enter or to leave the bay. But when the winds are from the south, there is a regular land-breeze every morning, which obviates all difficulties. The bay has a sufficient depth of water, generally varying between fifteen and nineteen fathoms. At the bottom of the bay there are several islands, on one of which the town is built. The town is separated from its suburb, called El Geyf, which stands on the mainland, by an arm of the sea about five hundred yards wide. The harbour, which is on the east side of the town, is formed by a projecting part of the continent. The arm of the sea on the west side affords no anchorage for ships of any size. The islands and all the surrounding country are sandy, and produce only a few shrubs or low acacias. The houses of the town have one or two stories, and are constructed of blocks of madrepores. They have a neat appearance, but the greater part of them are falling to decay. The suburb El Geyf is rapidly increasing in size and population, and is now larger than the town itself; but there are few houses of stone, the greater part of the dwellings being formed of mats or rushes, like those of the Nubian Bedouins. Suakin has three mosques, and El Geyf one mosque. The water of the wells, which are about half an hour from El Geyf, is tolerable, but in none of them is it good. Burckhardt estimated the population of Suakin at about 8000, of whom 3000 live upon the island and the rest in El Geyf.

Suakin is the most important trading-place on the west shore of the Red Sea. The inhabitants have no other pursuit than commerce either by sea or with the contiguous countries of Eastern Africa. They export the commodities which they receive from Eastern Africa to all the harbours of Hejaz and Yemen, down to Mocha, but chiefly to Jidda and Hodeyda. Many of the merchants go to Sennaar to buy their goods, and, after returning to Suakin, they perform the journey to the Arabian coast, but others sell their African merchandise to the traders of the town, by whom they are exported to Arabia. They bring from Sennaar, Kartoun, and Shendy, slaves, gold, tobacco, incense, and ostrich feathers; from Beled-el-Taka, a country situated on the east of the river Atbara, great quantities of dhurra; and they collect in the country to the west of the town larger numbers of water-skins, leathern sacks, and tanned hides, all which articles find a ready sale in the ports of Arabia. The hides are tanned by the Bedouins who live in the neighbouring mountains, and are used in Arabia to make sandals. A large quantity of butter in a liquid state, the only form in which it is used in this country, is likewise exported to Arabia, as well as mats made of doum-leaves, which are partly used to cover the floors of the mosques at Mecca and Medina, and partly bought by the pilgrims for the purpose of kneeling upon when they pray. These two articles are also obtained from the Bedouins in the mountains near Suakin. Horses and dromedaries are brought from the countries on the banks of the Nile, and sent to Hodeyda. At Jidda the Suakin merchants purchase all the Indian goods which are wanted for the African markets and the consumption of their own town, as dresses and ornaments for women, household utensils, and several kinds of provision for the table, such as Indian sugar, coffee, onions, and particularly dates, which are not produced in any part of Eastern Nubia. Much iron is also imported for lances and knives, which are manufactured by common smiths, who are the only artisans at Suakin, except masons and carpenters, and furnish these weapons to all the Bedouins in a circuit of fifteen days' journey. The trade by sea is carried on principally in ships belonging to people of Suakin and Jidda; they are almost entirely occupied in sailing between the two coasts. They are often manned by Bedouins, but more commonly by Somaulys from the African coast between Abyssinia and Cape Guardafui, who are the best sailors in the Red Sea. The number of black slaves annually brought through Suakin to the coast of Arabia amounts, according to Burckhardt, to between 2000 and 3000, and about an equal number are sent there from Massowah in Abyssinia, where about 3500 are annually shipped to Mocha. Many pilgrims, mostly negroes from Beléd-el-Sudan, who have been converted to the Mohammedan faith, pass annually through Suakin in going to or returning from the holy cities of Arabia.

The inhabitants of Suakin, like those of all the harbours in the Red Sea, are a motley race, but the majority of them are descendants of natives of Hadramaut, and principally of the town of Shabher, the harbour of that country in the Indian Ocean; they are called Hadherebe. The other inhabitants are called Suakiny, and consist of individuals of the Bedouin tribes of Hodendoa, Amorer, the Bisharein, and others of Arabian and of Turkish origin. The Bisharye language is generally spoken in El Geyf, but the inhabitants of the town speak the Arabic as their native language, and with the Jidda pronunciation. The island contains a public school.

(Lord Valentia's *Voyages and Travels to India, Ceylon, the Red Sea, &c.*; and Burckhardt's *Travels in Nubia*.)

SUA'REZ, FRANCIS, eldest son of Gaspar Suarez of Toledo, and of Antonia Vasquez of Utiel, was born at Granada, where his father practised as an advocate, on the 5th of January, 1548. After receiving a good elementary education, he was sent to Salamanca to study law in 1562. The members of the Society of Jesuits, founded about 20 years before, were at this time labouring to extend the ramifications of their order with the full force of the enthusiasm which gave it birth. John Ramirez, as Suarez asserted in after-life, induced no less than five hundred students of Salamanca to devote themselves to a religious life by the fervour of his preaching on Quadragesima Sunday in 1564. Suarez himself was among the number. He experienced considerable difficulty before he could induce the superiors of the order to admit him to probation; and even after John Suarez, the provincial-general, had resolved to receive him, on account of his possessing qualifications which appeared capable of being turned to account, remonstrances were offered against this determination by more than one member of the Society. During the period of his noviciate Suarez eminently distinguished himself by that obedience and humility, and disregard of self, which it was one of the great objects of the founders of the order to impress upon their disciples; at the same time that something about the young man showed this submission to be the consequence not of a weak or timid disposition, but of a powerful spirit of enthusiasm enforcing self abasement. Before the probationary two years were completed, he was made to begin his philosophical studies. Pursuits so new and so alien to his impassioned temper at first excited in him nothing but sentiments of weariness and disgust; he made little progress, and earnestly begged of his superiors to allow him to desist from studies for which he was convinced he had no capacity. A more favourable opinion of his talents continued notwithstanding to gain ground among the order, and Martin Guttierez, then in high estimation among his brethren, was wont to say, pointing to Suarez, 'God intends, through the instrumentality of that brother, to magnify the church, and do honour to the Society.' Deferring in this, as in everything, to the directions of his superiors, Suarez toiled through the usual course of philosophical study, but apparently with indifferent success; for when advanced to the theological classes, in which he took more pleasure, he found his progress obstructed by his deficiency in the preparatory branches of instruction. With the powerful impassioned will which enabled him to wrest, as it were, by his pertinacity, from the reluctant fraternity admission into their Society, he now laboured to make up his deficiencies. With this view he compiled for himself a system of metaphysics, the same which, published at a later period, with a very few finishing touches, elicited much applause. Having completed this task, he devoted the whole of his private hours to self tuition in the science of casuistry. Having taken his vows at the usual time, Suarez was immediately employed in the educational department. He taught philosophy for a short time at Segovia, and next theology, for several years, at Valladolid. In 1580 he was called to Rome, and lectured on theology there, in the College of the Society, with great applause for eight years. The climate of Rome affecting his health, he obtained leave to return to his native country in 1588, where he was appointed professor of theology in the University of Alcala, a situation which he held till 1596. On quitting Alcala he lectured for a year at Salamanca. The University of Coimbra in Portugal had, in the meantime, by repeated and urgent solicitations, obtained of Philip II. that Suarez should be appointed its principal professor of divinity. On his way thither Suarez received the degree of doctor in theology from the University of Evora. He arrived at Coimbra in 1597, and spent there the remaining twenty years of his life. His lucid arrangement, extraordinary memory, and fervid eloquence, rendered his lectures eminently popular. But the manner in which his contemporaries speak of him is calculated to leave an impression that his striking personal character had quite as great an influence in raising him to fame as his intellectual powers. He shunned rather than sought applause; he was indefatigable in his endeavours to render himself serviceable to others; he was guarded in his language, even when expressing himself under strong excitement; he was abstinent, both in regard to meat and drink; and the same enthusiasm which impelled him 'to take the order by storm,' continued to show itself unabated to the last, in his eager discharge of devotional offices. Of all his works, that which excited most attention in this country was, as might have been expected, the controversial treatise called forth by the defence of the oath of fidelity published by James I., 'Defensio Fidei Catholicæ et Apostolicæ adversus Anglicanæ Sectæ Errores, cum Responsione ad Apologiam pro Juramento Fidelitatis et Præfationem Monitoriam Serenissimi Jacobi, Angliæ Regis.' It appeared at Coimbra in 1613. It is the work of an enthusiastic recluse, who, deeply convinced of the truth of his principles, and accustomed to teach them as abstractions to youth, not to attempt to practise them amid the hindrances of real life, pursues them out to all their consequences with a bold and severe logic. The language is decorous, but the conclusions are stated without reserve or softening, and at the conclusion of each chapter an affectionate exhortation is addressed to King James, begging him to acknowledge their truth, and submit to them in practice. The king replied, not by publishing a rejoinder, but by having the book condemned to be burned in London. By order of the Parliament of Paris, it suffered the same fate in that capital in 1614. It was not such a work as political leaders in the court of Rome would have ventured to put forth; but it was such a one as they rejoiced to see put forth by their abstract thinkers, for whom they could apologise to sovereigns as well-meaning men, but ignorant of the world, and therefore not worth minding, at the same time that they reckoned, and not without cause, upon the good effects to be produced on public opinion by the single minded expression of a sincere enthusiast. The Romish politicians were in this perhaps no more insincere than secular politicians. With Suarez however it was perfect earnestness and conscientious conviction. When informed of the treatment experienced by his book, he expressed the enthusiastic wish that his body had enjoyed the privilege of bearing testimony to his faith by suffering the same fate; and he was in truth the stuff of which martyrs are made. His systematic works were after his death collected and published under the auspices of the Society in twenty-four volumes. The most important are:—four volumes on the chief end of man, in which he treats of the will, good and evil, virtue and vice, and sins; a volume on laws, and God viewed in his capacity of legislator; four volumes on grace, viz. on justification and the necessity of grace, on actual grace and the means of grace, on habitual grace and its effects, on the true meaning of efficaceous means of grace, &c.; two volumes of metaphysics, and one of commentaries on different works of Aristotle. The chief merits of the writings of Suarez are order and precision. His system is a modification of Molinism, with a view to obviate some of the objections urged against it by the strict adherents to the views of St Augustin. The controversy between the Jesuits and the sectaries of that father, like that between the Arminians and Calvinists in the Reformed church, is parallel to the controversy between necessitarians and those who maintain the freedom of human action. The scientific disputants appeal to human reason; the theologians, to revelation: with the one, it is an inquiry into the constitution of man; with another, into the will of the deity; the former must decide by investigating natural phenomena and reasoning upon them; the latter, by critically investigating the language in which the revelation to which they appeal is couched. The qualities of mind elicited in theological controversy are acuteness and logical neatness. These are to be found in Suarez, nor is there anything in his writings to warrant the opinion that he possessed higher intellectual attributes. He was something more than a mere logician and verbal critic; but his greatness consisted in his elevation of sentiment, empassioned temperament, and energetic will. Suarez died at Lisbon, whither he had gone to make arrangements for the publication of his volumes on Grace, on the 25th of September, 1615. He is reported to have said on his death-bed, 'I did not think it was so easy to die.'

(*Life*, prefixed to the edition of Suarez's *Works*, published at Venice in 1740; *Bibliotheca Nova Scriptorum Hispanorum*, *v.* 'Franciscus Suarez.')

SUARROW-NUT. [CARYOCAR.]

SUBAPLYSIA'CEA, M. de Blainville's name for the first family of his MONOPLEUROBRANCHIATA, an order which he defines as having branchial organs of respiration situated at the right side of the body, and more or less completely covered by a part of the operculiform mantle, in which a shell, which is flat, or more or less involved with a very large and constantly entire opening, is often developed; the tentacles null, rudimentary or auriculiform.

The following is M. de Blainville's definition of the family character of the Subaplysiceans:—

Two or four tentacular appendages to the head. Orifices of the organs of generation but little or not at all distant from each other, and without an intermediate external groove.

The genera comprised under this family are **Berthella**, *Pleurobranchus* and *Pleurobranchidium*. [**Semiphyllidians.**]

The other families of this order are—2, *Aplysiacea;* 3, *Patelloidea;* and 4, *Akera.*

The *Aplysiacea* are defined as having a body not divided, or forming a single soft fleshy mass; four tentacular appendages, which are constantly very distinct, flattened, and auriform; mouth in the form of a vertical slit, with two lateral subcorneous labial plates, and a cordiform tongue rough with denticles; eyes sessile, between the two pairs of tentacles; branchiæ covered with a sort of operculum; orifices of the generative apparatus more or less distant, and united together by an external furrow.

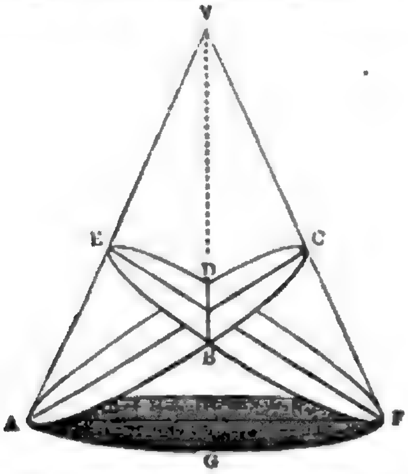
Shell null or incomplete, constantly internal.

The genera in this family are, according to M. de Blainville—*Aplysia, Dolabella, Bursatella, Notarchus,* and *Elysia.*

The third family, *Patelloidea*, consists of the genera *Umbrella, Siphonaria,* and *Tylodina.* The two first of these forms are treated of in the article **Semiphyllidians.**

The fourth family, *Akera*, comprises the genera *Bulla* [**Bulladæ**], **Bellerophon**, *Bullæa, Lobaria, Sormetus, Gasteroptera* [**Bulladæ**], and *Atlas.*

SUBCONTRARY. This word is applied particularly to the sections of a cone, in a manner which, without interfering with that use, would allow of its definition being generalised as follows:—When a figure or solid is symmetrical, so that equal lines or polygons can be drawn on two different sides, those equal lines or polygons may be called *subcontrary.* Thus in Euclid, i. 5, the equal lines, which are obliquely deflected from the two ends of the base of the isosceles triangle, are subcontrary. In a right cone every section has its subcontrary, except only the circle which generates the cone, and its parallels. Let V be the vertex of an oblique circular cone, and ABCD the circle on which it is described. Let the plane VAC be that which passes through the centre of the circle perpendicularly to its plane. Then the cone is exactly the same on one side of the plane VAC as on the other; and if a plane AGF be drawn through A perpendicular to the line which bisects the angle AVF, the section AGF is such that either half would take the place of the other, if it were to make a half revolution about AF. It is then an ellipse, of which AF is one of the principal axes; and the middle point of AF, falling in the line which bisects AVF, is the centre. Consequently every section of this cone has a subcontrary section, except only those which are parallel to AGF. Hence the generating circle ABCD has a subcontrary circle EBFD, made by taking the line EF subcontrary to AC, and drawing through EF a plane perpendicular to the plane AVF. The angles VEF and VCA are equal, as also VAC and VFE.



In the limited use of the word subcontrary, no sections are considered in this light except the two circular sections of an oblique cone. Consequently when subcontrary sections are mentioned, these circular sections are understood. The proofs given of the existence of these subcontrary sections usually conceal the fact of all cones described upon a circle being symmetrical when produced in every direction, and seem to make the existence of a second circular section a sort of accident of the circle, as if no other section had its subcontrary.

Since all parallel sections of a cone are similar, it follows that through every point of the surface two subcontrary circles can be drawn. The surfaces of the second order generally have the same property. [**Surfaces of the Second Order.**]

SUB-DOMINANT, in Music, the fourth of the key, mode, or scale. Thus, in the key of C, F is the Sub-Dominant.

SUBDUPLICATE, SUBTRIPLICATE, &c. [**Ratio**, p. 309.]

SUBERIC ACID, an artificial substance produced by treating rasped cork with diluted nitric acid; the cork is slowly dissolved, and a fatty substance is formed, which floats on the surface of the fluid. The solution is slowly evaporated till it thickens, and the residue is treated with about eight times its weight of water, by which an additional quantity of fatty matter separates. When the solution is filtered, suberic and oxalic acids separate, the former in the state of a white powder; this is to be saturated with ammonia, and the suberate of ammonia formed being decomposed by an acid, the suberic acid precipitates in the state of a white powder, which is to be washed with cold water. Suberic acid may also be obtained by treating margaric, oleic, or stearic acid with nitric acid. The properties of this substance are, that its acid powers are but feeble; it is very soluble in boiling water, and the greater part of it is deposited from the solution on cooling in the form of a white powder; it is soluble also in anhydrous alcohol; fuses at about 300°; and sublimes in acicular crystals.

According to Laurent, it is composed of—

Seven equivalents of hydrogen	7	or	8·05
Eight equivalents of carbon	48	..	55·17
Four equivalents of oxygen	32	..	36·78
Equivalent	87		100·

The suberates are not an important class of salts; we shall therefore mention them briefly. Suberate of ammonia is soluble in water; the suberates of potash and soda are deliquescent, and fusible without decomposition: those of lime, barytes, strontia, magnesia, alumina, and manganese are more or less soluble: protosuberate of iron is a white precipitate; the persuberate is a brown one: the suberates of tin, zinc, mercury, and silver are white insoluble substances: that of cobalt is red, of copper blue-green, and uranium yellow.

SUBERIN is a peculiar substance so named by Chevreul, as obtained from common cork, the epidermis of the *quercus suber.* When ten parts of cork have been treated with water, alcohol, æther, hydrochloric acid, potash, &c., there remain seven parts, which are suberin, possessing the following properties:—it is very inflammable; by distillation it yields water, a colourless oil, and afterwards a yellowish one, all of which are acid; then ammonia and a fatty crystallized substance are produced, and various gases are disengaged, while charcoal equal to one-fourth of the suberin remains in the retort.

SUBJECT, SUBJECTIVE.—These words, with their correlatives Object and Objective, are now again restored to English philosophical language, through the medium of the German writers. The Subject is in philosophy invariably used to express the mind, soul, or personality of the thinker—the Ego. The Object is its correlative, and uniformly expresses anything or everything external to the mind; everything or anything distinct from it—the non-Ego. The universe itself, when considered as a unique existence, is an object to the thinker; and the very subject itself (the mind) can become an object, by being psychologically considered.

The distinction is most important. The exact distinction between the terms subject and object was first made by the schoolmen; for by the Greeks the word *ὑποκείμενον* was equivocally employed to express either the object of knowledge (the *materia circa quam*) or the subject of existence (the *materia in qua*). These correlatives, subject and object, correspond to the first most important distinction in philosophy, viz. the original antithesis of self and not-self. These terms, in their substantive and adjective forms, passed from the schools into the scientific language of Tilesius, Campanella, Gassendi, Descartes, Spinoza, Leibnitz, Wolff, and others.

These terms however gradually lost their primary signification, and this owing to the ambiguous manner in which the terms were used. Besides its primary signification, object became metaphorically *motive, end, final cause*, &c., by a common change in all language, of the metaphor into a real signification. Subject also became synonymous with object, and probably the logical terms 'subject of predication' facilitated this confusion. Be this as it may, the extreme want of precision with which the words are used, may be seen in the very common instance of calling anything 'a subject of investigation.'

SUBLIMATION, a chemical operation effected by the application of heat to certain bodies; it is essentially similar to distillation in principle, but differs from it in the nature of the substances to which it is applied. In distillation liquids are converted into vapour, and condensed into the same form by the cooling agency of water; whereas in sublimation solid bodies are vaporized, and afterwards reassume the solid state, in general merely by the cooling power of the air, without the assistance of cold water.

Sublimation is usually conducted in one vessel, the product being deposited in the upper part of it in a solid state, while the impurity remains in the lower. In small experimental researches a Florence flask answers perfectly well, and a good exemplification of the process is that produced by heating iodine in it: a purple vapour rises, which almost immediately condenses in small brilliant dark-coloured crystals in the upper part of the flask, the impurity remaining in the lower.

Sublimation is extensively employed, and for two different purposes; the simplest case is that of using it for purifying a substance, camphor for example, in which the pure camphor is vaporized, and condenses in the upper part of the vessel, while the impurities remain in the lower part.

In preparing corrosive sublimate and calomel, these substances are formed and sublimed by the same operation: in general large green-glass vessels, called *boltheads*, are used for calomel and corrosive sublimate; while for camphor very thin flint-glass vessels are used, which are called *bomboios*, from the Italian *bombola:* in both cases a vessel is broken after each operation, to obtain the product. Among other substances procured by sublimation is benzoic acid, formerly called *flowers of benjamin*. This acid is sublimed in much larger vessels, and not usually made of glass; while the vapour of sulphur is condensed in a large chamber, or sulphur-house, and adheres to the walls in the form of a fine powder, and known by the name of *sublimed sulphur*, or *flowers of sulphur*.

SUBLIME. (Geometry.) It may be worth while to state in few words, and to prevent a reader of the older mathematicians from imagining that they spoke rhapsodically, that the term *sublime geometry* was technical, meaning the higher parts of geometry, in which the infinitesimal calculus or something equivalent was employed.

SUBLIMITY has two significations: one, that of the quality or circumstance in objects, which raises the emotion named sublimity; the other, that of the emotion itself. In no modern philosophy, except the Scotch, could this distinction in language, for the sake of convenience, have been taken for an equivalent distinction in thought. Yet this distinction has been combated as an error, by almost all the Scotch writers—Kames, Stewart, Brown, Alison, Jeffrey, &c.—when the truth is, no such error was ever entertained by any correct thinker. The generality of people may conceive beauty and sublimity to be qualities of objects without respect to their emotions, as they regard sound, taste, smell, &c. to be qualities of objects without respect to the senses; for the law of the common mind is eminently what the Germans call an objective tendency, that is, a tendency to believe in its own sensations and emotions as *things* distinct from themselves, but no philosophical thinker of the last century has ever fallen into this error, and when Dr. Thomas Brown refutes, with so much pretension, the theory of the one universal sublime as a specific object to which there is a corresponding faculty of perception in the subject, he is combating a chimæra.

But the nature of the sublime, that is, those conditions of objects which invariably excite in us certain emotions, to which we give the common name of sublimity, is a subject of great interest and importance in psychology, and has always been a favourite subject of speculation. We shall briefly notice the more celebrated theories which have professed to embrace and explain all 'those conditions which excite the emotions,' and endeavour to point out their failures.

Longinus, whose work (Περὶ ὕψους) is the most antient, treats only of the sublime in writing. His treatise was meant as a supplement to the work of Cæcilius on the 'Sublime,' in which he says Cæcilius brought a number of instances to show what is the sublime, as if every one did not know that well enough.

Burke's 'Inquiry into the Sublime and Beautiful' was the first attempt to give philosophical precision to our notions of the sublime. His theory is, that the essence of the sublime consists in terror operating either openly or latently; and the delight which is caused by this terror is referred to those principles of human nature which he calls 'passions of self-preservation,' and which turn on pain and danger. These passions 'are simply painful when their causes immediately affect us; they are delightful when we have an idea of pain and danger, without being actually in such circumstances: this delight I have not called pleasure, because it turns on pain, and because it is different enough from any idea of positive pleasure—whatever excites this delight I call sublime.' (*Inquiry*, part i., sect. 18.) 'Whatever therefore is terrible, with regard to sight, is sublime too, whether this cause of terror be endued with greatness of dimensions or not.' (*Ibid.*, part ii., sect. 2.) Nothing can be more explicit than these two passages, nor more accurately exhibit the truth and error of his theory. The error is glaring in the second passage. Terror is often one feeling, exciting, in conjunction with other feelings, the emotion of sublimity, but not always. The stars are sublime, yet there is no terror in the emotion they excite. On the other hand there is a terror in a surgeon about to operate, or in a pedagogue about to flog—but no sublimity. The gallows is very terrible, but not at all sublime. Yet Burke was so chained down by his theory of terror being the ruling principle of the sublime, as to write—'There are many animals who, though far from being large, are yet capable of raising ideas of the sublime, because they are considered as objects of terror—as serpents and poisonous animals of all kinds.' (*Ibid.*, part ii., sect. 2.) Now, when a man asserts that a serpent is sublime, *because* it is terrible, it is evident that he uses the word sublime in a different sense from the rest of the world; otherwise we say a serpent is in no case sublime.

The better to see how independent the sublime is of any danger manifest or implied, let us take a shower of rain and the stars. A shower of rain is certainly not sublime, yet there is danger implied in it, that is, catching your death of cold. The stars are sublime, without a particle of danger either manifested or implied. Terror then is not the ruling principle of the sublime.

That the terrible is often a constituent of the sublime there can be no doubt, and Burke's error consists in seizing this occasional constituent, and declaring it to be the 'ruling principle.' And further, we must observe, that whenever a feeling of terror is found to be a constituent of the sublime, there will also invariably be found another feeling of security, correcting this terror. Thus, when we stand beneath a rock, the terror consists in a natural apprehension of its falling down and crushing us, which apprehension is instantly checked by our feeling of security and confidence of its not falling. If this feeling of security did not momently check the feeling of terror, the effect would be terror only, and not sublimity, and we should escape from it as swiftly as possible. To witness a storm from a place of shelter is sublime, because our terror is checked by the feeling of security; but if the shelter be one which will not probably withstand the violence of the storm, and thus destroys our confidence, or if we be shelterless and fear the storm, then the effect will be that of pure terror, and not that of sublimity. A sleeping lion is sublime, and there is in that emotion a double feeling of security and danger. If the lion awakes, terror alone is the result, and absorbs every other feeling.

So universal is this accompaniment of a feeling of security correcting the feeling of danger in every case of sublimity wherein terror is a constituent, that we are as much justified in asserting that 'a feeling of security, either operating openly or latently, is the ruling principle of the sublime,' as Burke was in his theory of terror. And we might define sublimity as the 'effect of security.' This sounds ridiculous, but it contains a portion of the truth, and just that portion of it which Burke's celebrated theory possesses. If terror had been found to be an invariable element of the sublime, the correct statement of the theory would have been—'The sublime is the effect of the concurrence of the two feelings of danger and security.' But unfortunately there are many cases in which no feeling of danger can be found to exist. Infinity and eternity are sublime; but although, as he says, 'infinity has a tendency to fill the mind with that sort of delightful horror which is the most genuine effect and truest test of the sublime,' yet it does not necessarily fill the mind with horror; it may or may not, but in either case it is sublime. Helvetius says, 'When God said, "Let there be light, and there was light:" this image is sublime. But should such an image inspire fear? Yes; because it is necessarily associated in our minds with the idea of the Creator of such a prodigy; and being then seized in an involuntary manner with a dread of the author of light, we feel the sensation of a commencing terror.' (*On Man*, vol. ii., p. 227.) Now we contend that although fear would arise from such a train of thought, yet this train of thought is by no means a *necessary* sequence to the image—'God said, Let there be light, and there was light.' It may or may not arise in the mind, but the sublimity produced by the image is not at all dependent upon it. Even admitting that it is a necessary sequence, there are still too many cases of the sublime destitute of terror, not to overturn Burke's theory.

Lord Kames has a chapter in his 'Elements of Criticism,' on the sublime. He says, 'A beautiful object *placed high*, appearing more agreeable than formerly, produces in the spectator a new emotion, termed the emotion of sublimity; and every other emotion *resembling* this emotion of elevation is called by the same name.' He has here the mere etymological notion of sublimity as something elevated. (See Dr. Parr's observations on the derivation of sublime from *supra limum*, in the Appendix to Dugald Stewart's *Philos. Essays*.) That there is little to be learnt from such an inquiry is evident.

Mr. Knight, in his 'Analytical Inquiry into the Principles of Taste,' puts forth the theory that the sublime is the effect of the influence of *mental energy* exciting a sympathetic energy in the mind of the spectator or reader. The objections to this are the same as those to Burke's theory, namely, that it embraces a portion of the truth, which it would substitute for the whole truth. We have only to reflect an instant, and numberless instances of the sublime arise in which no mental energy is implied. Solitude, for example, is certainly sublime; so are infinity, eternity, Mont Blanc, &c. Mental energy is perhaps a more comprehensive formula for sublimity than terror, but it is still incomplete; and if one instance of sublimity can be quoted which does not contain the element asserted to be its 'ruling principle,' it is obvious that the theory must be erroneous.

Dugald Stewart's 'Essay on the Sublime' is entirely philological, and as such alone worthy of attention.

Dr. Thomas Brown combats the notion of a universal sublime, but avoids the real question altogether. All that is positive in his lecture on the subject is that the sublime and beautiful are not two distinct classes of emotions, but the same class, differing only in degree. 'It is,' says he, 'as in the thermometric scale, by adding one portion of caloric after another, we arise at last, after no very long progress, from the cold of freezing to the heat at which water boils; though our feelings at these two points are as different as if they had arisen from causes that had no resemblance; certainly as different as our emotions of sublimity and beauty.' (*Lectures on Philos. of Mind*, lvii.) Nothing can well be more erroneous than to take an analogy as a proof. Misled by his analogy, Dr. Brown has falsified the whole nature of the sublime, which according to him is but a larger or intenser form of the beautiful, whereas it differs essentially and antagonistically. He takes the instance of a stream gently gliding through fields rich with all the luxuriance of summer, overshadowed at times by the foliage that hangs over it from bank to bank. This is beautiful. He then traces it on to a majestic river, which flows on and deposits itself in the ocean. Here it becomes sublime. And this sublimity he thinks merely the last in the progressive series of emotions, as the boiling-point is the last in the progressive series of ascending heat. 'If we were to contemplate this continued progress, we should have a series of emotions which might at each moment be similar to the preceding emotion; but which would become at last so different from our earliest feelings, that we should scarcely think of them as feelings of one class.' (*Ibid.*)

The answer to this is, that upon a similar principle of analogical reasoning, you might trace the 'progressive series' of feelings which the man underwent from his earliest childhood; and when this series had conducted him to the gallows, you might say that his feelings at that moment were so different from his earliest feelings, that we should scarcely think of them as feelings of one class. Probably not. Nor should we, in our ethical philosophy, class the crimes which brought him to the gallows, with the innocence which commenced the 'progressive series' of his emotions.

The whole of Dr. Brown's lecture on this subject is trivial or confused; and because he is unable to analyse the feeling itself, he boldly pronounces it not to be analysed. 'It is the vain attempt to define what cannot be defined,' he says, 'that has led to all the errors and supposed mysteries in the theory of sublimity. Sublimity is not one emotion, but various emotions, that have a certain resemblance—the sublime in itself is nothing; or at least it is only a mere name, indicative of our feeling of the resemblance of certain affections of our mind, excited by objects material or mental, that agree perhaps in no other circumstance, but in that analogous undefinable emotion which they excite.' We maintain, on the contrary, that sublimity is *one* emotion, not various similar emotions. It is itself complex, made up of various feelings; but it is one specific feeling, which preserves its characteristic throughout the various shades of difference in the objects which excite it. Dr. Brown thinks, because various objects, differing amongst each other, excite separately feelings of sublimity, that therefore what we call the sublime is but the general classification of those feelings under one name; as A, B, C, D, and the rest, are classed under the word alphabet. Now we contend, and shall shortly endeavour to prove, that the sublime, or that emotion which men have consented to call the feeling of the sublime, is ever one, whatever varieties of feeling may concur with it; that is to say, whether power, terror, magnitude, or mental energy, together or separately, form constituents of each individual emotion of sublimity, nevertheless there is always underneath these, one specific characteristic feeling which renders it not merely an emotion of power, or terror, or magnitude, but of sublimity. Thus A, the sublime, is always A. Whether the word be And, Also, Apt, All—whatever be the sequent letters, A remains A unaltered. This one specific characteristic (A), which of itself constitutes the difference between an emotion of sublimity and one of terror, has been sought for by most of the writers on the subject. Burke thought it was the terrible; Helvetius, that it was a terror just begun, Knight, that it was mental energy; Price agreed with Burke; Kames, that it was a sense of elevation; and Alison, that it was association of ideas. Only Dr. Brown was illogical enough to class the repetition of one feeling as a number of different feelings resembling each other. Finding that A was sometimes followed by *lso*, *pt*, and *ll*, as well as by *nd*, he declared that the A in these words 'and, also, apt, all' was not the same letter, but merely resembled each other. But this is a consequence of his dogma of the similarity of the sublime and beautiful, which he declares to differ only in *degree*, whereas they differ in *kind*; and of his notion of a 'progressive series,' whereby the ocean and streamlet excite the same class of emotions.

Mr. Alison's 'Essays on the Principles of Taste' avoid the real question of sublimity, and the same must be said of his eloquent reviewer Francis Jeffrey, who sums up his theory in these words: 'The emotions which we experience from the contemplation of sublimity or beauty are not produced by any physical or intrinsic quality in the objects which we contemplate; but by the recollection or conception of *other* objects which are associated in our imaginations with those before us, and consequently suggested by their appearance, and which are interesting or affecting, on the common and familiar principle of being the natural objects of love, or of pity, or of fear or veneration, or some other common and lively sensation of the mind.' (*Edin. Rev.*, vol. xviii., p. 2.)

The first part of this passage is either a truism or an absurdity. A truism, if it be meant to state that as a mere sensation (without any respect to all the sentient being had previously undergone, and which that sensation would necessarily excite) an object in itself is not sublime (a truism however which Mr. Alison asserts to be the conclusion on which his speculations rest: chap. v., sec. 6). An absurdity, if it be meant to state that an object has no intrinsic quality capable of exciting that emotion. The size of a rock, for instance, is the condition of its sublimity; so with the cataract—make it a waterfall, and it ceases to be sublime, yet this difference of size is surely an intrinsic quality in the object which excites the emotion?

The fundamental principle of Mr. Alison's theory is 'that all objects are beautiful or sublime which signify or suggest to us some simple emotion of love, pity, terror, or any other social or selfish affection of our nature; and that the beauty or sublimity which we ascribe to them consists entirely in the power they have acquired by association or otherwise of reminding us of the proper objects of these familiar affections.' (*Ibid.*, and Alison's *Essays*, i.)

This theory is in the highest degree vague. It does not discriminate what constitutes the sublime—it does not analyse that complex emotion and draw forth its characteristic, and moreover in its sweeping generality includes much that it cannot apply to. All objects which excite terror are not beautiful nor sublime; neither are all objects which excite pity beautiful, and so of the rest. To discriminate those which are from those which are not, is impossible on this theory. To resolve the emotion of sublimity into association of ideas, is to say that this special emotion is resolvable into the general law of the human mind, but to avoid an analysis or characteristic statement of this special emotion altogether. It is saying that theft is a crime, and referrible to the general law of criminality, without once demarcating what constitutes theft as a crime, distinguished from murder as a crime. Attraction is the law which regulates the descent of an apple, and association of ideas in like manner is the law which regulates the operation of memory and the flights of imagination; yet as memory and imagination are distinct from the general law, as well as from each other, so also is the emotion of sublimity distinct from the emotion of hatred or beauty. Burke, Knight, Kames, and Price endeavoured to ascertain this distinction. Brown overlooked it, and Alison evades it. Had the special law of sublimity been found, and it was then attempted to be classed in its relation to the general law of the mind, the efforts of Mr. Alison and Mr. Jeffrey would have been of great importance; but in the meanwhile it was assumed.

It appears to us that the true method of attaining the knowledge of this special law of emotion, is the method of all psychological inquiries, viz. induction. Before attempting to detect the law which regulates it, we must collect all, or a vast number of instances of the sublime, and analysing the elements of each case, endeavour to discover *one* primal element which is invariably a constituent of the emotion, and without which all the other constituents would not be able to form that special emotion of sublimity.

In noticing the theories of former writers we have found their inductions imperfect; they have selected too few instances, and consequently when we came to select others, these theories were subverted by the mere statement of them. It was sufficient to disprove the theory of terror, to quote one instance wherein the terrible had no place, and the same with the theory of mental energy. But these theories, though incomplete, contain much that is true in their analyses.

In proposing a new theory, founded on a wider range of induction, we may observe that if any one instance of the universally acknowledged sublime can be found in which no such element (as the one we assert to be the ruling principle) be detected, then that single instance is a proof of the incompleteness of our theory, and a more extensive induction will be necessary.

It will be necessary for the sake of clearness to make use of purely mental distinctions in treating this subject, though they are liable to be misinterpreted as real distinctions; accordingly we divide the question of the sublime into three:—1. The material sublime—or the sublime of nature. 2. The moral sublime—or the sublime in human actions and ideas. 3. The emotion of sublimity, which these external things excite in us—or that feeling in the mind which gives to certain phenomena of nature, or deeds of man, the attribute of sublimity. Speaking *objectively*, the exciting cause of sublimity is vastness; speaking *subjectively* the emotion excited is a sense of insignificance.

I. The material sublime. Examine every case of material sublimity, and the most primitive fact will be found to be vastness; whatever feelings may simultaneously concur, this of vastness is invariable. Mere vastness is sublime. Vastness either of form or of power. Hampstead Heath is not sublime, but Mont Blanc is. The Thames is not sublime, but the ocean is. Yet to show how little terror has to do with the emotion, we all know that there is as much danger on the Thames as on the ocean when it is calm. Solitude is sublime—because it is vast, that is, indefinite. But solitude in a room or garden is not sublime. A cataract is sublime, but not a waterfall, yet the one is only larger than the other. Longinus has remarked that the sight of a small fire produces no emotion, but that the boiling furnaces of Ætna, pouring out whole rivers of liquid flame, is sublime. Burke remarks that all general privations are sublime because terrible, such as vacuity, darkness, solitude, and silence. But they are sublime because vast, not because terrible; for they are not necessarily terrible, and they are necessarily vast, indefinite.

These instances are sufficient to illustrate the principle. It will be observed that there are some which seem more naturally to derive their sublimity from terror than from vastness, as Ætna for example. But our object was to show that vastness was always a constituent, even when other emotions came into play; and as we have already seen instances where terror does not form one constituent, and that when it does form one, it is still accompanied by vastness, so we prove thereby that vastness is the more general fact. Vastness is sublime as vastness; but terror is not sublime as terror. The difference between a shower and a storm is purely quantitative, yet the storm alone is sublime.

II. The Moral sublime. It is obvious that the moral sublime must differ from the material sublime in proportion as mind and matter differ. Hence vastness, which in the external world is superficial (*in extenso*), in the moral world becomes intense (*in intenso*). Intensity of will equals vastness of form or power. Mere intensity is sufficient to produce the sublime. Œdipus is sublime. Lear, who appeals to the heavens, 'for they are old' like him, is sublime, from the very intensity of his sufferings and his passions. Lady Macbeth is sublime from the intensity of her will, which crushes every female feeling for the attainment of her object. Scævola with his hand in the burning coals exhibits an intensity of will which is sublime. So the celebrated 'qu'il mourut' of Horace in Corneille's tragedy, where a father's love is conquered by a more intense feeling of the honour of his country. It will be difficult to find terror as an element of these cases of the sublime. Mr. Knight's 'mental energy' has here more truth; but though a satisfactory explanation of the moral sublime, yet it will not apply to the material sublime.

Such appear to us to be the objective qualities of sublimity, but the peculiar emotion they excite has hitherto been thought undefinable: we shall nevertheless attempt it.

III. The emotion of sublimity. As in considering objectively every case of material or moral sublimity, we found as the primary and invariable fact vastness or intensity, so in considering subjectively every case of sublimity as an emotion, we shall find the primary and invariable fact to be a sense of our own insignificance; of our inferiority to the object, or to the will which prompted the deed; and this sense of inferiority has guided mankind in the employment of a word expressing elevation for sublimity. Mere vastness excites this emotion by exciting a corresponding sense of our smallness. Mere intensity excites this emotion by exciting a corresponding sense of our feebleness. Vary the objects—vary the emotions as you may, there will invariably be this one feeling of comparative insignificance. Take as an example the sublime words of Scripture, 'I am the High and the Lofty One, who inhabiteth eternity.' Nothing can exceed the grandeur of that idea, and he who conceives it conceives also, at the same time, the corresponding idea of his own small and finite nature. In the violent dashing of a cataract, in the roar of the ocean, in the violence of the storm, or in the majestic quiet of Mont Blanc preserving its calm amidst all the storms that play around it, or in the concentrated will of a Scævola, Horace, Brutus, or Œdipus, in all these cases we are moved by a vivid feeling of some greater power than our own, or some will more capable of suffering, more vast in its strength than our feeble vacillating will. It is from this reason that an imaginative mind experiences more emotions of sublimity than another. In proportion as we comprehend the majesty of nature, or the amount of self-sacrifice in an heroic action, we comprehend our own inferiority to them.

To take another instance of the sublime—a sleeping lion. The grandeur of the lion arises from his known courage and power. He has an intensity of will, and of strength to execute that will, which we feel immensely to exceed our own. But a caged lion is no longer sublime. And why? Because he is conquered. Man has conquered and caged him. His boasted will and strength have not availed him against the power of man. Our feeling of inferiority has vanished. Had the lion-tamers Van Amburgh, Martin, &c. seen a sleeping lion, they would have probably felt little emotion of sublimity.

When Mr. Knight says that the sublime is the effect of mental energy exciting a sympathetic energy in the mind of the spectator or reader, he mistakes a frequent effect for the cause. Sympathetic energy often follows an emotion of sublimity, but not always. It does not follow the emotion of sublimity produced by infinity, eternity, night, or the emotion excited by the passage, 'God said, Let there be light, and there was light.' So far then from 'filling the reader with a glorying and sense of inward greatness,' as Longinus and Knight assert—it fills him with a sense of weakness and inferiority. We admit that any manifestation is delightful for its own sake, but this sympathetic delight is a principle of human nature which does not come within the question of the sublime. But whether sympathetic energy follow the emotion of the sublime or not, it is never the cause of that emotion.

Dr. Brown, Mr. Alison, and Mr. Jeffrey contend for the identity of the sublime, beautiful, and picturesque, led thereto by their resolving them into association of ideas, instead of distinguishing them as special emotions. We contend that the sublime and the beautiful are two very distinct and dissimilar emotions. The beautiful is founded on emotions of the pleasurable, and its varieties are as infinite as the varieties of objects which excite pleasurable emotions. The sublime is founded on an emotion of our insignificance, and its varieties are as limited as the varieties of objects which excite the feeling of insignificance. The beautiful they rightly assert to be the principle of suggesting some past or possible emotion of some sentient being; but they are wrong in asserting the sublime to be the same principle, for the sublime is not founded on any past and pleasurable emotions which the object may excite (as the ruddy cheek of a girl suggests the pleasurable emotions of health and youth, and therefore is beautiful), but is founded on the double feeling of power and insignificance. This emotion may be pleasurable, as almost all emotions are, but the pleasure derived from the manifestation of power is not the foundation of the emotion. The sublime and the beautiful are identified in the more general law of the association of ideas.

In conclusion we may thus sum up our theory. The invariable condition of sublimity in objects, either material or moral, is vastness or intensity. The invariable condition of the emotion of sublimity—that which distinguishes this emotion from every other emotion—is a comprehension of this vastness with a simultaneous feeling of our own comparative insignificance, together with a concomitant sense of present security from any danger which might result from this superior power. The antithesis to the emotion of sublimity is the emotion of contempt.

SUBMARINE DESCENT. Much ingenuity has been devoted from an early period to the contrivance of apparatus for enabling men to dive, or descend beneath the surface of water, to a greater depth, for a longer space of time, and with less exertion and danger, than is possible by the unassisted powers of the body. The fatal consequences of continued submersion have been described under ASPHYXIA [vol. ii., p. 490], and DROWNING [vol. ix., p. 157]; and from the facts there stated it is evident that about half a minute is the longest period during which most individuals can safely remain under water, without some provision for the supply of air for respiration. Experienced divers may remain under water much longer, though not without great and painful exertion; but the longest period of submersion, with a few extraordinary exceptions, does not exceed two minutes; a space of time too brief to allow the performance of any but the simplest operations beneath the surface of the water. The pearl-fishery affords the most prominent example of the employment of divers unassisted by apparatus for providing a supply of air. The mode of diving adopted, and the effects of protracted submersion upon the divers, are described under PEARL FISHERY [vol. xiii., p. 349]. Professor Beckmann alludes to the employment of divers in antient times to assist in raising anchors, in recovering goods from wrecks, or such as had been thrown overboard in times of danger, and in destroying the works and ships of the enemy in time of war, as well as in fishing for pearls; but some of the statements quoted by him are evidently much exaggerated, as they speak of divers remaining for hours under water. Six minutes is about the longest time of submersion of which any authentic account has appeared in modern times. [PEARL FISHERY.]

Dr. Halley, in a paper printed in No. 349 of the *Philosophical Transactions* (vol. xxix., p. 492), entitled 'The Art of Living under Water,' observes that the divers for sponges in the Archipelago were accustomed to take down in their mouths a piece of sponge soaked in oil, by which they were enabled to dive for a longer period than without it. As the bulk of the sponge must diminish the quantity of air which the diver could contain in his mouth, it does not appear probable that this practice could assist respiration. It has been more recently explained (*Ency. Brit.*, art 'Diving') as a means for assisting the diver to see when under water. In still water light is transmitted freely to a great depth; but when the surface is disturbed by waves, it is much obstructed. To ensure a good light, which may enable the diver to find the objects of his search without delay, it is stated that he ejects a little oil from the sponge; and this oil rising to the surface, and spreading upon it, calms the waves in a most remarkable manner, and occasions a brilliant light at the bottom.

In connection with diving by the unassisted powers of the body, allusion may be made to a curious and important fact related in the *Encyclopædia Britannica*, on the authority of Professor Faraday, to whom it was first noticed by a gentleman connected with the Asiatic Society. The lungs are, in their natural state, charged with a large quantity of impure air; this being a portion of the carbonic acid gas which is formed during respiration, but which, after each expiration, remains lodged in the involved passages of the pulmonary vessels. By breathing hard for a short time, as a person does after violent exercise, this impure air is expelled, and its place is supplied by pure atmospheric air, by which a person will be enabled to hold his breath much longer than without such precaution. The writer states that although he could only hold breath, after breathing in the ordinary way, for about three-quarters of a minute, and that with great difficulty, he felt no inconvenience, after making eight or ten forced respirations to clear the lungs, until the mouth and nostrils had been closed more than a minute and a half; and that he continued to hold breath to the end of the second minute. A knowledge of this fact may in many cases be of great importance, as it may enable a diver to remain under water at least twice as long as he otherwise could do. It is suggested that possibly the exertion of swimming may have the effect of occasioning the lungs to be cleared; so that persons accustomed to diving may unconsciously avail themselves of this preparatory measure.

Another important fact, related in the same work, indicates the advantage of breathing condensed air, and thereby obtaining a larger supply of oxygen in the same bulk than with air of the ordinary pressure. After one of the disastrous occurrences at the works of the Thames Tunnel, Mr. Brunel, the engineer, descended in a diving-bell to examine the breach made by the irruption of the river into the tunnel. The bell descended to the mouth of the opening, a depth of about thirty feet; but the breach was too narrow to allow it to go lower, in order that the shield and other works, which lay eight or ten feet deeper, might be examined from the bell. Brunel therefore took hold of a rope, and dived below the bell for the purpose. After he had remained under water about two minutes, his companion in the bell became alarmed, and gave a signal which occasioned Brunel to rise. On doing so he was surprised to find how much time had elapsed; and, on repeating the experiment, he ascertained that he could with ease remain fully two minutes under water; a circumstance accounted for by the condensation of the air in the bell, from which his lungs were supplied by the pressure of a column of water nearly thirty feet high, which would condense the air into little more than one half of its usual bulk.

Many plans were suggested for enabling persons to remain for a longer period under water than is possible by the natural powers of the body, long before extensive use was made of any of them. Beckmann alludes to a passage of Aristotle (problem xxxii., § 5), which has been supposed to intimate that in his time divers used a kind of kettle to enable them to continue longer under water; but this passage is variously rendered by different translators, and Beckmann appears to place little reliance upon it. He states that the oldest information we have respecting the use of the diving-bell in Europe is that of John Taisnier, quoted by P. Gaspar Schott. It occurs in the 'Technica Curiosa, sive Mirabilia Artis,' &c. of Schott, which was published at Nürnberg, in 1664, lib. vi., cap. ix., p. 393, and is taken from the 'Opusculum de Motu Celerrimo' of Taisnier, who says, 'Were the ignorant vulgar told that one could descend to the bottom of the Rhine, in the midst of the water, without wetting one's clothes or any part of one's body, and even carry a lighted candle to the bottom of the water, they would consider it as altogether ridiculous and impossible. This however I saw done at Toledo in Spain, in the year 1538, before the emperor Charles V. and almost ten thousand spectators. The experiment was made by two Greeks, who, taking a very large kettle suspended by ropes with the mouth downwards, fixed beams and planks in the middle of its concavity, upon which they placed themselves, together with a candle. The kettle was equipoised by means of lead fixed round its mouth, so that when let down towards the water no part of its circumference should touch the water sooner than another, else the water might easily have overcome the air included in it, and have converted it into moist vapour.'* Schott calls the machine described, 'Cacabus aquaticus,' or an 'aquatic kettle;' but he also describes an apparatus called 'Lorica aquatica,' or 'aquatic armour,' which would enable those who were covered with it to walk under water, and which he seems to prefer to the 'cacabus aquaticus' previously described.† This apparatus is represented in plate 31 of Schott's work, which shows a man walking into the water with a covering like a small diving-bell over his head, descending nearly to his feet.

In England, without noticing the supposed contrivance of a diving-machine by Roger Bacon, it is evident that the diving-bell was known at an early period. It is mentioned by Lord Bacon (*Novum Organum*, lib. ii., § 50; and *Phænomena Universi*, p. 702) as a machine used to assist persons labouring under water upon wrecks, by affording a reservoir of air to which they might resort whenever they required to take breath.

Some curious information on submarine operations is given in the postscript to a little volume published at Edinburgh, in 1688, by George Sinclar, 'sometime Professor of Philosophy in the College of Glasgow,' entitled 'The Principles of Astronomy and Navigation.' The postscript contains an account of how 'to buoy up a ship of any burden, from the ground of the sea,' and states that among those who had, in this nation, attempted to recover property from wrecks by diving, was the late Marquis of Argyle, 'who, having obtained a patent from the king, of one of the Spanish Armado, which was sunk in the Isle of Mull, anno 1588, employed James Colquhoun, of Glasgow, a man of singular knowledge and skill in all mechanical arts and sciences.' 'This man,' he proceeds, 'not knowing the diving-bell, went down several times, the air from above being communicated to his lungs by a long pipe of leather. He only viewed and surveyed the ship, but I suppose buoyed nothing up.' Sinclar subsequently states that about 1664 the (then) late Lord Argyle employed an ingenious gentleman, the laird of Melgim, who went down with a diving-bell and got up three guns. A third and more successful trial was made, he says, several years after; and, still later, one Captain Smith was so confident of obtaining the gold supposed to be lost with the ship, that he would not admit a co-partner in the enterprise; which however came to nothing. Sinclar proposed to raise wrecks by the buoyancy of arks or boxes, open at the bottom, which were to be sunk full of water, and then filled with air either by sending down casks of air; by bellows and a long tube; or otherwise. He alludes to the occasional use of casks for the purpose of raising vessels, and explains why, when at a great depth, they are liable to be crushed by the pressure of the water, showing that, by allowing the water to enter by a hole in the lower part of the cask, it would so compress the air as to produce an equilibrium of pressure, and thereby preserve it from fracture.* About the time that the work above quoted was published, William Phips, who subsequently became governor of New England, attempted to raise treasure from the wreck of a Spanish ship sunk on the coast of Hispaniola. What was the precise character of his apparatus, we are not informed. His earliest experiments failed, but he was so confident of success, that he sought for assistance to enable him to prosecute his scheme. He at length obtained the patronage of the Duke of Albemarle, son of the celebrated Monk, and in 1687, after many difficulties, he succeeded in raising a large quantity of treasure, with which he returned to England; where he was honoured with knighthood for his enterprise. Most accounts state that the property he recovered amounted to 200,000*l.*; but in the 'Life of Sir William Phips,' published anonymously in 1697, but attributed to Increase Mather, it is stated as 300,000*l.* It is unnecessary to cite further instances of the use of diving apparatus, or to notice other early authors who have mentioned the diving-bell, excepting to observe that Beckmann alludes to engravings in editions of Vegetius on the art of war, published in 1511 and 1532, representing a diver with a cap, from which rises a long leathern pipe, terminating in an opening which floats upon the surface of the water; and to a figure published in a work on fortification, by Lorini, in 1607, which nearly resembles the modern diving-bell. Beckmann considers the insertion of the former as a proof that the person who drew them was not acquainted with the diving-bell, which he would otherwise have delineated. The machine described by Lorini consists of 'a square box bound round with iron, which is furnished with windows, and has a stool affixed to it for the diver.' Lorini, who was an Italian, does not lay claim to the invention of this apparatus.

Dr. Halley, in the paper before alluded to, in No. 349 of the 'Philosophical Transactions,' describes the defects of the diving-bell, as previously used, and suggests a remedy for them. This paper alone would be sufficient, although it does not enter into the early history of the machine, to contradict the erroneous statement which has been made to the effect that Halley was the inventor of the diving-bell.

In its simplest form the diving-bell is a strong heavy vessel of wood or metal, made perfectly air and water tight at the top and sides, but open at the bottom. If such a vessel be gradually lowered into the water, in a perfectly horizontal position, the air which it contains cannot escape, and therefore the vessel cannot become full of water. This may be readily illustrated by plunging a glass tumbler, in an inverted position, into a vessel of water, and placing a bit of cork, or any other substance which will float on the surface of the water, under the glass. If a bit of burning matter be laid upon the cork-float, it will be seen that it continues burning, although the glass and all that it contains be plunged far beneath the water; thereby proving that the upper part of the cavity of the glass is occupied by air, and not by water. In this experiment however it will be observed that the water does fill a small part of the cavity of the glass, and that it rises more into it when it is plunged to a considerable depth than when the rim is only just immersed beneath the surface. This is occasioned by the condensation of the air contained in the glass, which, being very elastic and compressible, is condensed into a smaller space by the pressure of the superincumbent water, when the glass is plunged to a considerable depth, than it will occupy under the ordinary pressure of the atmosphere. Where the diving-bell is used for descending to a very small depth, as the pressure of the water is small, it will not rise in the bell to a sufficient height to be inconvenient; but at the depth of thirty-three feet the pressure is so great as to compress the air into one-half its original volume, so that the bell will become half full of water; and at a greater depth the air will be still more compressed, and the water will rise proportionately higher in the bell. This condensation of the air does not materially interfere with respiration, provided the descent of the bell be very gradual, as the air then insinuates itself into the cavities of the body and balances the pressure from without. The principal effect of the increased pressure is a pain in the ears, occasioned by the circumstance that the Eustachian tube does not allow the condensed air immediately to find its way into the cavities of the ear, so that the pressure on the outside of the tympanum is, for a time, unbalanced by a corresponding pressure from within, and occasions a sensation like that of having quills forced into the ears. This continues until the pressure of the air in the mouth, which at first has a tendency to keep the aperture of the Eustachian tube closed, forces it open; an action which is accompanied by a noise like a slight explosion. The condensed air then enters the interior cavities of the ear, and, by restoring the equilibrium of pressure on each side of the tympanum, removes the pain; which will return, and be remedied in the same manner, if the bell should descend to a greater depth. But while the mere condensation of the air in the bell does not render it unfit for respiration, it would soon become so if no means were provided for renewing it from time to time, as it becomes vitiated by repeated respiration. The improvements invented by Dr. Halley provided a remedy for this inconvenience, and for that of the contracted space left free from water, when, by being at a great depth, the air is compressed into a small volume, by affording a convenient means of supplying the bell with any required quantity of fresh air, without raising it to the surface.

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* We quote from the translation in the English edition of Beckmann's 'History of Inventions,' by William Johnstone, second edition, 1814, vol. i., p. 164.

† His words are: 'Longe melior est alia illa, quam ex Francisco Késlero proponit *Daniel Schwenterus* in Deliciis Mathematicis,' Part 12, prop. 15.

* Beckmann quotes not from this work, but from one published at Rotterdam, in 1669, entitled 'G. Sinclari Ars nova et magna Gravitatis et Levitatis;' from which, he states, the description of the diving-bell was transcribed into Sturm's 'Collegium Curiosum.'

The bell used by Dr. Halley was of wood, in the form of a truncated cone, five feet in diameter at the bottom, and three feet at the top, and containing about sixty cubic feet. This was coated with lead, and so weighted about the lower part that it would sink while empty, and would always remain in its proper position; that is, with the large open end downwards, with its rim parallel with the horizon. In the top of the bell was a very strong glass window, and a cock, by opening which the foul air might be allowed to escape. About a yard below the mouth of the bell was suspended a stage, so weighted that it might hang steadily. The whole apparatus was suspended from a sprit attached to the mast of a ship, and provided with tackle by which the bell might be raised or lowered, and the sprit might be slung round so as either to carry the bell over the hull of the vessel, or to suspend it clear of her side. The apparatus for conveying air to the diving-bell consisted of two barrels, holding thirty-six gallons each, weighted with lead to make them sink readily. Each of these had an open bung-hole in the lower end, to allow water to enter during their descent, so as to condense the air in the manner described when explaining the principles of the diving-bell itself. There was also a hole in the upper end of each, to which was fitted an air-tight leathern hose, long enough to fall below the bottom of the barrel, and having its loose end so weighted that it would fall naturally into that position. These air-barrels were attached to tackle, by which, with the easy labour of two men, they might be made to rise and fall alternately, like two buckets in a well; and, by lines attached to the lower edge of the bell, they were so guided in their descent that the mouth of the hose always came directly to the hand of a man who stood upon the stage suspended from it. As the apertures of the hose were, during their descent, always below the level of the barrels, no air could escape from them; but when they were turned up by the attendant, so as to be above the level of the water in the barrels, the air rushed out with great force into the bell, the barrels becoming at the same time full of water. By sending down these air-barrels in rapid succession, the air in the barrel was kept in so pure a state that five persons remained in the bell, at a depth of nine or ten fathoms, for more than an hour and a half at a time, without injurious consequences; and Halley states that he could have remained there as long as he pleased, for anything that appeared to the contrary. In addition to this, by the copious supply of air admitted during the descent, the bell was kept constantly full of air, and the water was prevented from entering to any inconvenient extent. Halley observed that it was necessary to be let down gradually at first, and to pause at the depth of about twelve feet, to drive out, by the admission of a supply of air, the water which had entered the bell. When the diving-bell was arrived at the required depth, he let out, by the cock in the top of the bell, a quantity of hot impure air, equal to the quantity of fresh air admitted from the barrels. This foul air rushed up from the valve with such force as to cover the surface of the sea with a white foam. So perfect was the action of this apparatus, that Halley says he could, by removing the hanging stage, lay the bottom of the sea so far dry, within the circuit of the bell, as not to be over shoes thereon. When the sea was clear, and especially when the sun shone, sufficient light was transmitted to allow a person in the bell to write or read; and when the sea was troubled and thick, which occasioned the bell to be as dark as night, a candle was burnt in it. Halley sometimes sent up orders with the empty air-barrels, writing them with an iron pen on plates of lead. Having, by these ingenious contrivances, removed the principal difficulties attending the use of the diving-bell, Halley foresaw its extensive utility. He observes, 'This I take to be an invention applicable to various uses, such as fishing for pearl, diving for coral, sponges, and the like, in far greater depths than has hitherto been thought possible. Also for the fitting and plaining of the foundations of moles, bridges, &c. upon rocky bottoms; and for the cleaning and scrubbing of ships' bottoms when foul, in calm weather at sea.' 'But,' he adds, 'as I have no experience of these matters, I leave them to those that please to try.' To several of these purposes the diving-bell has, since the date of this paper (1717), been applied with great advantage.

In 1732 a communication was made to the 'Philosophical Transactions,' No. 444, vol. xxxix., p. 377, by Martin Triewald, 'Captain of Mechanics, and military architect to his Swedish majesty,' respecting an improvement of the diving-bell. He had the sole privilege of diving upon the coasts of the Baltic belonging to the king of Sweden; and he expresses his opinion, founded on much experience, that no apparatus but that on the principle of the 'campana urinatoria,' or diving-bell, could be safely used at great depths. His letter mentions a man, then sixty-three years old, who had followed the business of diving with the common diving-bell ever since he was twenty. Triewald's diving-bell was of copper, tinned inside, smaller than that of Dr. Halley, and managed by two men. A stage for the diver to stand upon was suspended at such a depth below it, that the man's head would be but little above the level of the water, where the air is cooler and fitter for respiration than in the upper part of the bell; and a spiral tube was attached to the inside of the bell, with a wide aperture at the bottom, and a flexible tube and mouth-piece at the top, so that, when the diver was up in the bell, he might inhale cool air from the lower part, exhaling the foul air by his nostrils. Dr. Halley's air-barrels are applicable to a bell of this construction. In lieu of windows of flat glass, Triewald used convex lenses to admit light to the bell.

In 1775 Mr. Spalding, of Edinburgh (who, according to the 'Annual Register,' vol. xix., p. 202, was a grocer), having some concern in a vessel which had been lost on the Fern Islands, was induced to make some experiments with Dr. Halley's diving-bell, with a view to recovering property from wrecks, and was thereby led to the invention of means for rendering it more safe and manageable. For these inventions he received, in 1776, a reward of twenty guineas from the Society for the Encouragement of Arts, Manufactures, and Commerce, in the first volume of whose 'Transactions' (pp. 220-238) they are fully described. Mr. Spalding's communication contains also a very interesting account of his experiments with Halley's diving-bell. The improved diving-bell contrived by Mr. Spalding was made so light, that, with the divers and the weights attached to the rim, it would not sink; the weight necessary to counteract its buoyancy being added in the form of a large balance-weight, suspended from its centre by a long rope, which was so mounted on pulleys that the divers could either draw the balance-weight up to the mouth of the bell or allow it to fall to a considerable depth below it. Thus, by letting the weight down to the bottom, the divers could, as it were, anchor the bell at any required level; or prevent its further descent if they perceived a rock or part of a wreck beneath it, which might otherwise overturn it. Also, by hauling in the rope while the weight was at the bottom, the persons in the bell might lower themselves at pleasure. Another improvement consisted in the addition of a horizontal partition near the top of the bell, which divided off a chamber that might, by suitable openings and valves, be filled either with water, or with air from the lower part of the bell; so as to alter the specific gravity of the whole machine, and thereby to cause it to ascend or descend at pleasure. The bell was supplied with air by an apparatus resembling that of Dr. Halley; and ropes, stretched across the bell, were used instead of seats and platforms for standing on. By these arrangements the persons in the diving-bell were enabled, in case of accident, to raise themselves to the surface without any assistance from above; and it was rendered so perfectly manageable, that it might be removed to a considerable distance from the point at which it descended; its outward motion, and its return to the vessel for the purpose of being hauled up, being assisted by a long-boat, which carried the signal-lines and the tackle for working the air-barrels.

Though not in chronological order, it may be well here to allude to an improvement upon Spalding's apparatus, contrived by Mr. John Farey, junior, and described by him in the article 'Diving-Bell,' in Brewster's 'Edinburgh Encyclopædia.' He proposes to make the upper chamber of the diving-bell very strong and air-tight, without any openings for the admission of water. In the partition are fixed two forcing-pumps, by which a portion of air should be forced into the upper chamber, whenever, during a pause in the descent, the lower chamber, or the cavity of the bell, is replenished with air. By this means the upper chamber is made a reservoir of condensed air, from which the bell may be replenished with air when it is desired to increase its buoyancy by forcing out the water from the lower part. In like manner, the buoyancy of the bell can be at any time diminished by pumping some of the air from it into the upper chamber, whereby the water will be allowed to enter to a greater height; and, as this is effected without wasting the air, there is no danger of diminishing the buoyancy of the machine to a degree which would prevent it from rising, in case the suspending rope or chain should break. Mr. Farey recommends the form of the frustrum of an elliptic cone, for diving-bells intended for descending to wrecks; the dimensions being, for a bell to hold two persons, six feet by four at the base, three feet six inches by two feet six inches at the top, and six feet six inches high. He also suggests the use of a pressure-gauge in the bell, to show the divers what depth they have descended to; and of a compass to enable them to ascertain and give proper signals respecting the direction in which the bell should be moved. These signals are given by snatching a rope, which may be marked in the same manner as a deep-sea lead-line [SOUNDINGS, vol. xxii., p. 269], so that, after giving a signal to raise or lower the bell, the diver may, by hauling in a certain quantity of the signal-line, intimate the height to which the bell should be moved. Farey recommends that the men be attached by ropes to the bell, so that, in case of falling, they may not sink; and that, in case of being obliged to leave a wreck to which it is intended again to dive, the balance-weight may be left at the bottom, with a buoy attached to the upper end of its rope, so that the right point for descending may be found without difficulty.

The credit of having been the first to apply the diving-bell in aid of civil engineering operations is usually attributed to Smeaton, who used it in 1779 in repairing the foundations of Hexham Bridge. The Report in which he recommended its adoption is a very interesting document, as it affords a familiar explanation of the principle of the diving-bell. It is dated September 16, 1778; and is printed in the collected edition of his 'Reports,' vol. iii., p. 279. The bell used on this occasion was an oblong box of wood, four feet high, two wide, and three and a half long; and it was supplied with air by a pump fixed on the top. The river being shallow, the bell was not covered with water; but in 1788 the diving-bell was used in a much more important work, Ramsgate harbour, by the same engineer. Being here used at a considerable depth, an apparatus was employed for forcing in a supply of air through a flexible pipe, by means of a forcing-pump in a boat. The bell used in this work was of cast-iron, similar in form to that employed at Hexham, but four feet and a half high, four and a half long, and three wide. Its weight was fifty cwt., and the thickness was so adjusted that it would, without the addition of any weights, sink in the proper position. In levelling foundations under water by this machine, the surface of the water at the bottom of the bell formed a convenient and unerring level to work to; and in this, as well as in the subsequent operation of building, every necessary motion was given to the bell by the tackle by which it was suspended; signals being made from below by striking one, two, three, or more blows upon the side of the bell with a hammer.

Since the time of Smeaton the diving-bell has been frequently, and with great advantage, employed in submarine works; sometimes in situations in which it would have been impossible to construct a coffer-dam, or to perform the required operations by any other means. The diving-bells used in such works are usually formed on the model of that made for the works at Ramsgate harbour; but the mode of suspension differs according to circumstances. The bell may be suspended over the side or end of a vessel; through an opening in the centre of a barge; from frame-work resting upon two barges, placed parallel with each other, but at such a distance apart as to allow the bell to descend between them, or from a scaffolding supported by piles. In operations at the harbour of Howth, near Dublin, the late Mr. Rennie used a diving-bell suspended from a kind of railway scaffolding like that described under SCAFFOLDING [vol. xx., p. 497], as used in erecting large stone buildings; two carriages being used upon the scaffold, one to lower the stones, and the other to manage the bell. By the apparatus described as above, aided by ropes attached to the stones, and managed by the men in the bell, the submarine masonry could be executed with great facility. Of the use of this important machine in recovering property from wrecks, the operations upon that of the Royal George afford a familiar example. According to the 'Annual Register,' vol. lix., p. 42, this wreck was first surveyed by the diving-bell on the 24th of May, 1817. Smeaton's method of supplying air to the bell is that most commonly employed; but that of Halley may, in some cases, have the advantage.

In whatever way a diving-bell may be mounted, it is essential that it should descend very gradually, and that its descent should be perfectly under control. In 1838, Mr. Richard Jones, who had been placed in a very perilous situation by the failure of the crab by which a diving-bell in which he was descending was being lowered, was rewarded by the Society of Arts for a contrivance to prevent the occurrence of such an accident. His improved crab has a brake, regulated by the centrifugal motion of two balls, like the governor of a steam-engine; so that, while the crab revolves slowly, and therefore allows the bell to descend gradually, the brake may not be called into action; but if it should, from any cause, be overpowered by the weight of the bell, so as to run down with dangerous velocity, the separation of the balls should disengage the brake, and thereby stop the motion of the crab. The machine is described and represented in detail in vol. lii., p. 72, &c. of the Society's 'Transactions.'

Blasting is often required in submarine operations, and is commonly performed by joining lengths of tin tube together, until they reach from the charge of powder to a little above the surface of the water. These lengths of pipe are joined either by screws or by a cement of white lead, so as to be water-tight, and as the joining is effected, the bell gradually rises, so that the top of the pipe is always under it, until it reaches the surface, to prevent water from getting in. When all arrangements are completed, a person in a boat drops a piece of red-hot iron down the tube, and thus fires the charge. The recently-invented plan of blasting by electro-magnetism is far simpler and more certain than the above.

Many plans have been proposed for enabling a man to walk beneath the surface of water, or to dive in such a manner as to assist in the raising of anchors, or the recovery of property from wrecks, by means of waterproof coverings for the head and upper part of the body, or of strong vessels in which every part but the arms should be encased; a supply of air being either transmitted from above by a flexible pipe, or contained in the cavities of the protecting armour. Such apparatus may be conveniently used at small depths; but at any considerable depth they are both dangerous and inconvenient, because the strength necessary to enable them to bear the pressure of the water is incompatible with the flexibility essential to the free use of the limbs. Dr. Halley alludes, in his paper on the diving-bell, to some contrivances of this kind; and in a subsequent paper (*Phil. Trans.*, No. 368, vol. xxxi., p. 177) he describes an apparatus of his own invention, by which a man might leave the diving-bell, and walk about at the bottom of the sea; his head being covered by a heavy leaden cap like a small diving-bell, supplied with air by a flexible tube extending from the large bell. The diver was to coil this tube round his arm, and unwind it as he left the bell; and to use it as a clue to direct him to the bell in returning. This pipe was formed of leather soaked in oil and hot wax, and was held open by a spiral coil of brass-wire; its internal diameter being about one-sixth of an inch. The pipe was then covered with several thicknesses of gut, and over all with leather. The modern invention of water-proof India-rubber cloth, which has been applied in various ways to diving-apparatus, affords great facilities for the manufacture of water-tight tubes for such a purpose. So long as the helmet was above the level of the water in the bell, it would be kept full of air; and in case of having to stoop below that level, as in getting out of or into the bell, the diver had only to close a valve, by which the air in the helmet was prevented from returning into the bell. The front of the helmet was glazed; and the diver, who was clothed in a thick woollen dress, fitting close to the body, to diminish the effect of the coldness of the water, was enabled to walk by means of a weighted girdle and weighted clogs. Aquatic armour, whether supplied with air from above, or carrying a store in its cavities, sufficient to last for the time the diver intends to remain submerged, has been brought so little into use, that it is needless to devote the space required for a minute description. The apparatus of M. Klingert, which was first described in a pamphlet published at Breslau, in 1798, has been fully explained in Tilloch's 'Philosophical Magazine' (vol. iii., pp. 59 and 171), and in many other English works; and a more recent contrivance of similar character has been exhibited at the Polytechnic Institution, London. In the 'Gentleman's Magazine' for September, 1749 (vol. xix., p. 412), will be found a notice of a curious diving-apparatus, consisting of a case enclosing the person, with the arms protruding in flexible sleeves, which is stated to have been contrived and used for many years by a person named John Lethbridge, who writes from Newton Abbot, near Exon, Devon, and states that he tried experiments as early as 1715. This was supplied with air by flexible pipes. A similar machine was contrived by Mr. Rowe, in 1753, which was to be lowered by tackle like a diving-bell.

One of the diving-machines contrived by Klingert was so arranged that it would rise or fall by the motion of a piston in a cylinder, in the lower part of the apparatus, by which the diver could vary the density of the air, and consequently the specific gravity of the machine, at pleasure. A very simple apparatus for enabling a person diving without a bell, or any of the machines above noticed, to effect the same object, has been recently invented by Mr. W. H. Thornthwaite of Hoxton. It is described in the fifty-second volume (p. 243) of the 'Transactions' of the Society of Arts, by whom Mr. Thornthwaite was rewarded for it in 1839; and it consists of a hollow belt of India-rubber cloth, to which is attached a small but strong copper vessel. Into this vessel air is to be forced by a condensing-syringe, until it has a pressure of thirty or forty atmospheres. The belt is then put on, in a collapsed state, so that it affords no buoyancy, and does not impede the descent of the diver; but when he desires to rise, he opens a valve, by which the condensed air escapes from the copper vessel into the belt. As it expands the belt, it affords sufficient buoyancy to raise the diver immediately to the surface.

An account of schemes for submarine descent would hardly be complete without some allusion to projects for submarine navigation, of which many have been suggested. An early instance is that of Cornelius Drebell, or Drebelle, who is said to have made a vessel to be rowed under water, which was tried in the Thames by order of James I., and carried twelve rowers, besides passengers. This vessel is alluded to by Robert Boyle, in his 'New Experiments Physico-Mechanicall, touching the Spring of the Air, and its effects,' &c., published at Oxford in 1660. Pages 363-5 of this curious work contain an account of Drebell's experiment, and state that he accounted his chief secret to be 'the composition of a liquid that would speedily restore to the troubled air such a proportion of vital parts as would make it again, for a good while, fit for respiration.' The composition of this liquid for enabling the same air to be used again and again, was never made public. Bishop Wilkins, who also favoured some other whimsical projects, devoted a whole chapter of his 'Mathematicall Magick,' which was published in 1648, to a dissertation 'Concerning the possibility of framing an Ark for Submarine Navigation.' In this work (book ii., chap. 5) he recites the difficulties of the scheme, but evidently considers them not insurmountable; and afterwards he enlarges upon its advantages, in privacy, security from pirates, storms, ice, &c., in naval warfare, philosophical experiments, discoveries, &c., and at length states that 'All kind of arts and manufactures may be exercised in this vessel. The observations made by it, may bee both written and (if need were) printed here likewise. Severall Colonies may thus inhabit, having their children born and bred up without the knowledge of land, who could not chuse but be amazed with strange conceits upon the discovery of this upper world.' The bishop adds, 'I am not able to judge what other advantages there may be suggested, or whether experiment would fully answer to these notionall conjectures.' In 1774 a projector named Day lost his life in an experimental descent in Plymouth Sound, with a vessel of about fifty tons burden, which he thought he could have caused to rise after a lapse of several hours; and this experiment, of which an account is given in the seventeenth volume of the 'Annual Register' (p. 245), led to the publication, in the following year, of a 'Philosophical Dissertation on the Diving Vessel projected by Mr. Day, and sunk in Plymouth Sound,' by N. D. Falck, M.D., which contains a representation and minute description of the vessel, an account of the ineffectual attempts to raise her, and much other curious matter. One of the most successful machines contrived for submarine navigation was that of Mr. Bushnell of Connecticut, which was projected in 1771, and completed in 1775. Bushnell's chief object appears to have been the introduction of submarine warfare. His vessel, which was propelled by screws, somewhat resembling those recently tried for steam-vessels, is described in the 'Transactions' of the American Philosophical Society, vol. iv., p. 303, whence the account was copied into 'Nicholson's Journal,' vol. iv., p. 229. The more recent projects of Fulton for the same purpose have been referred to in a previous volume. [FULTON, ROBERT, vol. xi., p. 13.] In the article 'Diving-Bell,' in the *Encyclopædia Metropolitana*, written by Mr. Babbage, a detailed plan is laid down for the construction of a vessel for submarine navigation. Among the suggestions there made are those of using oxygen, condensed in store-vessels, to replenish the air, and of absorbing the carbonic acid produced by respiration, either by cream of lime, or by a strong solution of ammonia.

SUBMARINE FORESTS. Under this term geologists class very numerous accumulations of vegetable matter, involving roots, stems, branches, leaves, and fruits of trees, rarely in the attitude of growth, sometimes in the condition of having fallen, and locally with the appearance of having been drifted from some distance, but all occurring onthe margin of the sea, below the level of high-water, and extending not unfrequently much beyond the low-water line.

Subterranean Forests is another term for similar phenomena, not limited however to any particular level, nor to a close proximity with the sea. The circumstances as to level, and physical condition of the neighbouring regions, when these buried forests either grew on or were drifted to their present repositories, and the changes in these respects which may have since occurred, are extremely worthy of consideration.

If we take, as a mode of classifying these phenomena, the relative levels of the buried forests and the surface of the sea, we find a series of instances, beginning on high ground, and ending below the sea. On parts of the very high ground at the head of Glencoe, we see yet rooted in peaty soil the bases of enormous trunks of trees, while far around, and even in much lower levels, and warmer and more sheltered situations, large trees are altogether wanting. On the moderate elevations between Kirby Lonsdale and Kendal are small dried basins of antient lakes, in which portions of fir-trees abound; on the course of many rivers, in flat parts of valleys, and especially when they approach the sea, as at Ferrybridge on the Aire, and at Stockton on the Tees, vegetable accumulations, peaty plants, and lacustrine shells, hazel-wood, nuts, and large trees abound. In situations where the tides cease to have power, along the sides of rivers, the accumulations of this nature are locally enormous, as over the large area of Hatfield Chase and Thorn Waste in Yorkshire, Sedgemoor in Somersetshire, and the fens of Huntingdon and Cambridge. Finally, on reaching the actual sea-shore, whether along the course of a great river, as the Humber or the Mersey, or on the bare coast, as in Lincolnshire, Yorkshire, Norfolk, and many parts of the coast of Great Britain, we find narrow or extensive deposits of like nature, both above high-water and below low-water mark. Generally in all these situations, the trees, even though not now growing in the neighbourhood, are of sorts that belong to the same latitude and the same region. What might be the circumstances which encouraged their growth in antient times is not easy to be determined. Instead of supposing any elevation of land since the growth of trees in the high valleys about Glencoe, which, by raising the surface to a temperature too low, prevented their continued existence, it appears better to suppose that the duration of forests under some constant conditions is limited. It is only by mutual protection in some cases that trees rise to perfection. Arriving from this cause nearly at once to maturity, and passing by equal stages to decay, it may easily happen, in a limited area, that a whole forest of trees should perish and be followed by no successors. Such an occurrence might be accidentally caused by the alteration of the supply of water, the growth of peat, addition of sediments, and other causes of injury. Violent tempests might prostrate a forest, and affect the drainage of the country, and thus convert the area where the forest grew into a marsh, a peat-bog, a buried forest.

Suppositions of this nature have commonly been suggested by the phænomena observed in various parts of Europe. De Luc adopts such views regarding the buried pine-forest of Bornholm, which is covered by peat and surrounded by sand-hills. The trees lie prostrated from the circumference toward the centre, not by the force of inundations, but by the violence of winds. (*Hist. de la Terre*, v. 222.) A similar opinion has been entertained concerning some part of the extensive levels of Hatfield Chase in Yorkshire, where in places the trees appear as if prostrated in a particular direction. Moreover, in examining the deposits of this nature on the shores of the Frith of Tay, Dr. Fleming found the clay below the peat penetrated by numerous roots, which are either carbonized or pyritized.

But there are other cases in which the accumulations of buried timber and peat may better be supposed to have been drifted. This appears to be the fact in the eastward prolongation of the great levels of Hatfield Chase along the æstuary of the Humber, and much below its level. De Luc supposes the same thing in regard to the peaty deposit of Rotterdam, which rests on silt, as that reposes on sand. He regards the whole as drifted by the river currents, and as accumulated below the river waters.

There are many examples of the occurrence in one deposit of sand, clay, peat, timber, lacustrine shells, and bones of quadrupeds. It is rather characteristic of such combinations that there is only one layer of peat with trees, that it lies upon the clay, and that in this clay are the lacustrine shells and the bones of quadrupeds. This general rule applies to numerous small deposits on the coasts of Yorkshire and Lincolnshire, including bones of deer, and to the larger area of the Irish peat, which yield the bones of the gigantic elk; and is exemplified in the American deposits which contain the mastodon. Beneath the whole of these deposits frequently lie the gravelly clays and sands, with boulders of distant rocks, commonly called 'Diluvium.' The shells are usually of existing species, the trees of existing kinds, but the quadrupeds (beaver and Irish elk for instance) often of races locally or universally extinct.

It has been thought necessary in some cases to appeal to a local change of the relative level of land and sea for an explanation of the submerged forests of the English and European coasts: sometimes this may be avoided by assuming in antient times a different condition of the tides; and sometimes it is unnecessary, because the trees may be supposed to have been transported. It should seldom be granted, because, in the very same district, the 'diluvium' with its marine shells may be thought to be a 'raised beach,' and the submarine forests to mark a real subsidence of the land. This is the case in Holderness.

The antiquity of these buried forests is often beyond the reach of inference, but in many inland districts the condition of the trees is such as to have led observers to believe they were *cut down* or *burned down*. In Hatfield Chace (*Phil. Trans.*, 1701) many of the trees were thus destroyed; some were evidently worked by the woodman's tools of stone or wood. Roman coins were gathered from among the roots; and in one situation the ground below seemed to have been ploughed in ridge and furrow.

Examples of accumulations such as have here been generalised, are abundant round all the shores of Britain, and are common in the interior of the islands.

(De la Beche, *Geological Manual*, 3rd edition, p. 166; Lyell, *Principles of Geology*; Phillips, *Treatise on Geology*, vol. ii.; De Luc, *Histoire de la Terre*; De la Pryme, in the *Philosophical Transactions*, abridged by Hutton; *Transactions of the Cornish Geolog. Society*, &c., may be consulted for details of phenomena and reasoning on the causes and dates of their occurrence.)

SUBMULTIPLE, an ALIQUOT PART.

SUBMYTILA'CEA, M. de Blainville's name for his sixth family of LAMELLIBRANCHIATA.

The following is his definition of the *Submytilacea*:—Mantle nearly as in the *Mytilacea*, that is to say, adherent, and slit throughout its lower part, with a distinct orifice for the anus and a commencement of a tube for respiration by means of a particular disposition of its posterior extremity, which is furnished with tentacular papillæ; a large fleshy abdominal mass for locomotion, without byssus at its base; two distinct muscular impressions.

Shell free, subnacreous, regular, equivalve; dorsal hinge lamellar, ligament external; two muscular impressions with the pallial impression which unites them not excavated backwards.

M. de Blainville remarks that this family are more or less inhabitants of mud, and are locomotive by means of their foot.

He divides them into two sections:—

1. The Limnoconchs (Limnoderma, Poli).

All these have an epidermis, are nacreous, and are inhabitants of fresh waters. [NAIADES.]

2.

Species without any evident epidermis, not nacreous, and more or less pectinated.

These are marine.

Under this section M. de Blainville arranges but one genus, *Cardita*.

Lamarck placed the genus *Cardita* in his family *Cardiacea*, between *Cardium* [CONCHACEA, vol. vii., p. 426] and *Cypricardia*. But M. Deshayes, in the last edition of the *Animaux sans Vetèbres*, well observes that this is not the true position of *Cardita*, as far as its approximation to *Cardium* is concerned, for the *Carditæ* have the lobes of the mantle disunited throughout their extent, whilst the other mollusks of the same family have these lobes united posteriorly and perforated with two apertures; and he observes that it will be right to follow the example of Cuvier and De Blainville, and to approximate the *Carditæ* to the *Unionidæ*, or fresh-water muscles. He remarks that Lamarck seems to believe that certain *Carditæ* have a byssus; but he adds that certain individuals checked in their growth, and so become irregular, have given rise to this opinion, which seems to him to be without foundation.

Generic Character.—*Animal* resembling that of the fresh-water muscles. [NAIADES.]

Shell very thick, solid, equivalve, often very inequilateral; umbones recurved forwards; hinge with two unequal oblique teeth, one short and cardinal, the other long, lamellar, bent, and placed much more backwards; ligament elongated, subexternal, and sunk into the shell; muscular impressions rather large and very distinct; pallial impression narrow.

M. de Blainville divides the genus into the following sections:—

A. Elongated species, a little notched or gaping at the inferior border; umbo nearly cephalic; ligament hidden. (The *Mytilicardia*.)

Examples, *Cardita crassicosta*, Adans., 'Seneg.,' pl. 15, f. 8; and *Cardita calyculata*, 'Malacol.,' pl. 69, fig. 1.

B. Oval species, with the inferior border nearly straight or a little convex, crenulated and completely closed. (The *Cardiocarditæ*.)

Example, *Cardita Ajar*. Adans., 'Seneg.,' pl. 16, f. 2.

C. Species nearly round or suborbicular, with the inferior border rounded, denticulated, and more and more equilateral; the two teeth shorter and more oblique. (Genus *Venericardia*, Lam.)

Example, *Venericardia imbricata*, 'Malacol.,' pl. 68, f. 3.

D. Elongated and very inequilateral species; the umbo nearly cephalic and recurved forwards; two short cardinal diverging teeth besides the lamellar tooth; ligament very long, little or not at all projecting; abdominal impression sometimes a little directed backwards. (Genus *Cypricardia*, Lam.)

M. Deshayes, in the last edition of Lamarck, observes that the *Cypricardiæ* resemble the *Carditæ* in their form; but that, nevertheless, on a careful examination, one may perceive that they have more relationship to the *Cardia*: it is thus, he adds, that some species of the last genus lose the anterior lateral tooth; and others, instead of having the cardinal teeth *en croix*, have them nearly equal and diverging, as in the *Veneres*. If, says M. Deshayes, we unite the two modifications of *Cardia* in a single shell, we have a *Cypricardia*. On the other hand, the position of the muscular impressions, their extent, the pallial impression nearly simple or hardly sinuous posteriorly, and the great space which it leaves between itself and the border, lead M. Deshayes to suppose that the animal of *Cypricardia* has, as in *Cardium*, the lobes of the mantle united posteriorly and pierced in the commissure with two unequal apertures.

With regard to *Venericardia*, M. Deshayes (*loc. cit.*) is of opinion that it will be necessary to change the relationship of that genus, placed by Lamarck among the *Veneres*, and even to suppress it altogether, for the purpose of removing the species assembled under it to the genus *Cardita*. Many cogent reasons conducted M. Deshayes to this result. Poli, he remarks, has, in his great work, given figures of the animals of two species, one belonging to *Cardita*, the other to *Venericardia*. The resemblance of these animals in all essential characters proves satisfactorily that they appertain to the same genus, and this resemblance of the animals will be confirmed by that of the shells. We see, continues M. Deshayes, that Lamarck has comprised among his *Carditæ* elongated, transverse, very inequilateral shells, having at the hinge one or two very oblique teeth in the direction of the upper border. Doubtless if all the *Carditæ* were transverse, and the hinge presented some peculiar characters, it would have been reasonable enough to separate them, supposing the animals to be unknown; but this is not so, and Lamarck himself has arranged among the *Carditæ* rounded shells which have all the characters of *Venericardiæ*. In uniting all the species, living or fossil, of the two genera, and placing them in their most natural positions, a passage between them will be observed so insensible, says M. Deshayes, that it will be impossible to point out where *Venericardia* finishes and *Cardita* commences. When all the characters are examined, the same resemblance is observable as in the external forms. Nearly without exception, the *Venericardiæ* and *Carditæ* have longitudinal ribs, their shell is thick and solid, the lunule is small and much sunk, the hinge is more or less thick according to the species, and offers some modifications of small importance, according as the shell is rounded or transverse; these two teeth are oblique; and this obliquity is observable even in some species which are entirely transverse; but in the greater number of these last the anterior tooth becomes very small and perpendicular to the first: these differences are established by shades in passing from one species to the other. The pallial impression is always simple in its contour, and this important character is found in the *Venericardiæ* as well as in the *Carditæ*. It is necessary, M. Deshayes remarks, to remember here that in the *Conques* the pallial impression is never simple; posteriorly is seen a triangular inflexion, which announces that all the animals of that family are provided with two siphons posteriorly; the *Venericardiæ* and *Carditæ* have it not; the borders of the mantle are free throughout their extent, as in the *Naiades*. Up to this time naturalists have regarded as of great value the presence or absence of siphons, and the union or separation of the lobes of the mantle, and have advantageously employed these characters for the formation of families: if that of the *Conques*, to make it natural, ought not to contain any animals excepting those furnished with siphons posteriorly, and it is certain that such should be the rule, it becomes evident that *Venericardia* should be transported elsewhere; and as we have seen that it becomes fused as it were into *Cardita*, it ought to undergo the change of relationship necessary for that genus.

Habits of Cypricardia.—Cypricardiæ have been found on sands and reefs, but the depths do not appear to have been recorded

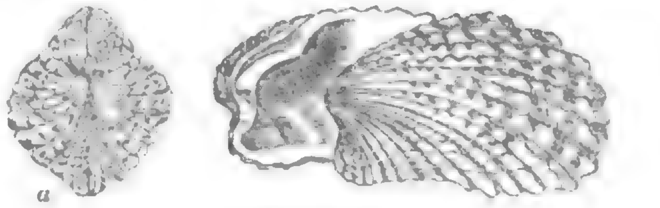
Habits of Venericardia.—Venericardia has been found on mud and sands at depths varying from the surface to fifty fathoms.

Habits of Cardita.—Cardita has been taken on mud and sands, and sometimes attached to stones. Depths varying from the surface to thirteen fathoms.

M. Deshayes, in his Tables, makes the number of living species of *Venericardia* and *Cardita*, which he joins together, twenty-five; and he records *Carditæ Sulcata, Ajar, trapezia, squamosa, crassa*, and *intermedia*, as being found both living and fossil (tertiary). In the last edition of Lamarck, the only living species of *Venericardia* noticed is *Ven. australis*, from the seas of New Holland: of *Carditæ* twenty-one living species are recorded. To these must be added nine living species brought home from the coasts of Central America principally, by Mr. Cuming, and described by Mr. G. B. Sowerby and Mr. Broderip respectively in the 'Proceedings' of the Zoological Society of London, for 1832, and in Müller's 'Synopsis Testaceorum.'

Example, *Cardita calyculata*.

Description.—Shell oblong, white, painted with lunate brown spots; the ribs imbricato-squamous; the scales arched and incumbent.



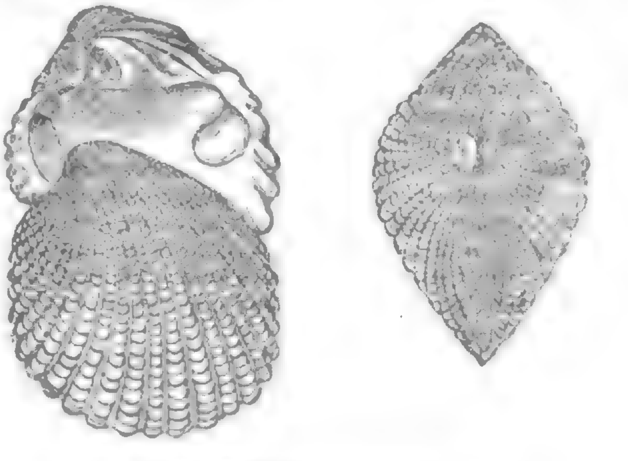
Cardita calyculata.

a, with the umbones turned towards the spectator, showing the lunule,

Fossil Submytilacea.

With regard to the fresh-water division, see the article **Naiades**.

M. Deshayes, in his Tables, makes the number of fossil (tertiary) *Venericardiæ* and *Carditæ* fifty; the species found both living and fossil (tertiary) are noticed above. In the last edition of Lamarck the number of fossil *Venericardiæ* amounts to ten, and of *Carditæ* (fossil only) seven. Mr. Lea describes and figures four new species from the tertiary of Alabama. (*Contributions to Geology.*)



Venericardia (Cardita) imbricata.
Fossil from Grignon. A variety found at Courtagnon.

Dr. Mantell records *Venericardiæ planicosta* and *acuticosta* from the blue clay of Bracklesham, *Ven. Brongniarti* from the arenaceous limestone or sandstone of Bognor, a species from the chalk-marl, and a *Cardita?* from the firestone or upper green-sand. (*Organic Remains of the County of Sussex.*)

Professor Phillips records *Cardita similis* from the coralline and Bath oolite. (*Geology of Yorkshire.*)

Mr. Lonsdale notices a *Cardita* from the inferior oolite. (*Oolitic District of Bath.*)

Professor Sedgwick and Mr. Murchison mention a *Venericardia* from the Gosau deposit and its equivalents in the Alps; and a *Cardita* or *Venericardia* among the fossils of Lower Styria. (*Strurture of the Eastern Alps.*)

Dr. Fitton records *Venericardia tenuicosta* from the gault (Kent, S. Wilts). (*Strata below the Chalk.*)

Mr. Murchison enumerates six species, all named, of *Cypricardia?* from the Silurian rocks—old red-sandstone (middle and lower beds only), upper Ludlow rock, Aymestry limestone, and lower Ludlow rock. (*Silurian System.*)

SUBORNATION OF PERJURY. [Perjury.]

SUBOSTRA'CEA, M. de Blainville's name for his second family of **Lamellibranchiata**.

Family Character.—Mantle open nearly throughout its circumference, retractile at all points, and not adherent; branchiæ not united throughout the median line, so as to expose the abdomen, which is provided with the rudiment of a foot often canaliculated, with the rudiment of a byssus.

Shell of a close texture, subsymmetrical, always more or less auriculated, with a subcomplicated hinge; a single subcentral muscular impression, without any trace of the pallial ligula.

Genera.—*Spondylus, Hinnites, Pecten, Pedum, Lima.* [Pectinidæ; Spondylidæ.]

SUBPŒNA. [Witness.]

SUBPŒNA, WRIT OF. [Pleading in Equity; Richard II.]

SUBSALT. [Salts.]

SUBSIDIARY. A quantity or symbol is so called when it is not essentially a part of a problem, but is introduced to help in the solution. The term is particularly applied to angles, since the trigonometrical tables give a great power over their management, which causes their frequent introduction, even in problems in which there is no question of angular quantity. For example, suppose it required to calculate $ax + b\sqrt{(1-x^2)}$, where $a = \cdot 29164$, $b = 3\cdot 0018$, $x = \cdot 11316$. Assume $x = \cos\theta$, $a = r\cos\phi$, $b = r\sin\phi$, which gives θ from the tables, and ϕ and r from the tables, and from

$$\tan\phi = \frac{b}{a},\ r = \frac{a}{\cos\phi}.$$

The quantity to be calculated is

$$r\cos\phi\cos\theta + r\sin\phi\sin\theta, \text{ or } r\cos(\phi-\theta),$$

$$\text{or} \qquad \frac{a\cos(\phi-\theta)}{\cos\phi}.$$

and the final result is found from the tables in much less time than $ax + b\sqrt{(1-x^2)}$ could be calculated by ordinary means. There is of course no rule for the most convenient introduction of subsidiary angles: every case must be treated according to the circumstances it presents.

SUBSIDY, from *subsidium*, a Latin word signifying aid or assistance. 'Subsidies,' says Lord Coke, 'were antiently called auxilia, aides, granted by act of parliament upon need and necessity; as also for that originally and principally they were granted for the defence of the realm and the safe keeping of the seas,' &c. The word used in its general sense was applied to aids of every description; these were of two kinds, one perpetual, the other temporary. Those which were perpetual were the antient or grand customs, the new or petty customs, and the custom on broadcloth. The temporary included tonnage and poundage; a rate of four shillings in the pound on lands, and two shillings and eight pence on goods; and the fifteenths or tenths, &c. of moveable goods. The limited sense, which is also the more common sense, of the word subsidy, attaches only to the rate on lands and goods.

The grand customs were duties paid on the exportation of wool, sheepskins, and leather, at the rate of, for every sack of wool weighing thirty-six stone, half a mark, or six shillings and eightpence; for every three hundred sheepskins, half a mark; for a last of leather, a mark, or thirteen shillings and fourpence. The petty customs were payable by merchant strangers only, and consisted of an excess of one half over and above the grand customs payable by native merchants. The custom on broadcloth was first given to the king in the 21st year of Edw. III., to indemnify him for the loss he incurred in consequence of the practice, then beginning to prevail, of making up the wool into cloth in this country previous to its exportation. The rate of payment on broadcloths was fixed, in the 27 Edw. III., for every whole piece of cloth not ingrained, at fourpence; ingrained, at fivepence; if dyed scarlet, at sixpence. In addition to this was the alnager's fee, payable also to the crown, for measuring the cloth, at the rate of a halfpenny a cloth. There were also two species of customs payable on wines: one called butlerage, payable by foreigners importing wines, at the rate of two shillings for every tun of wine; the other, called prisage, payable by natives at the rate of, for every vessel importing ten tuns of wine, one tun; for every vessel importing twenty or upwards, two tuns; taken one tun from before, the other from behind the mast. This was compounded for by the payment of 20*s.* for each tun to which the king was entitled.

The origin of these customs seems uncertain; Lord Coke is very anxious to establish that they were in the first instance established by the common consent of the realm in parliament assembled. In support of this he cites Philip de Comines (lib. v., fo. 233): 'Reges Angliæ nihil tale, nis convocatis primis ordinibus, et assentiente populo, suscipiunt. Quæ consuetudo valde mihi laudanda videtur; interveniente enim populi voluntate et assensu crescit robur et potentia regum, et major est ipsorum auctoritas et feliciores progressus' (The kings of England take nothing of this kind unless the nobles are convoked and the people assent: which practice seems to me most laudable, for by the intervention of the free will and assent of the people the strength and power of kings becomes greater and their proceedings more fortunate). Comines however is speaking after various acts had passed restraining the king from taking customs without the assent of parliament. Coke also at great length inquires into the earliest parliamentary records in support of the same opinion. Every one however of those seems to show the existence of something payable as a custom anterior to any parliamentary grant. In the earliest statutes the customs are called custumae antiquae, and custumae ex antiquo.

Before and during Lord Coke's time, as well as immediately after it, the origin and nature of this kind of subsidy were most fully and ably discussed. To understand the subject it is necessary to advert to the sources of revenue possessed by the early Norman kings of England. These kings themselves held a large portion of the lands of the country. Some of these were occupied by villeins, which were taxable by their lord at his pleasure. Others were held by tenants in antient demesne, who originally were bound to perform services of an ignoble kind, such as manuring the lord's land, &c., which services were afterwards commuted for rent. The tenants in burgage, who held lands, &c. in royal cities and boroughs, were also taxable without their consent in parliament, but not, as was said, except upon extraordinary occasions. Lastly there were the tenants holding immediately of the king, who were bound to perform various feudal services. From these last tenants great profits arose to the king by escheats, relief, wardships, marriages, &c. The king also had a right to require contributions from the inhabitants of particular districts towards the expense of repairing bridges and the walls of towns, which contributions were called pontage and murage; and to grant by charter to any city the right to levy tolls upon all vendible things coming into the town. There were also other sources of revenue, the temporalities of vacant bishoprics, the forfeitures arising from felonies, &c. In the earlier periods these seem to have been considered sufficient to maintain the royal state, the courts of justice, &c., and also the ordinary expenses of any wars in which the king might be engaged. In the sixth year of Richard II., the commons petitioned the king that he would live upon his own revenues, and that wards, marriages, releases, escheats, forfeitures, and other profits of the crown might be kept to be spent upon the wars for the defence of the kingdom. In addition however to these duties of defending the kingdom by foreign wars, the king was bound to protect the merchants at sea from pirates, &c., and for this purpose a practice prevailed twice in the year 'to scour the narrow seas.' To defray the expenses of the royal navy, the king collected at the ports of his kingdom certain sums upon all merchandise imported or exported. These sums were called customs, a word which in itself indicates the earliness and uncertainty of their origin. 'To say the truth,' says Mr. Hakewell, in his able argument during the parliamentary discussion relative to Bate's case in the time of James I., 'all these things began, no man can say certainly when or how, but by a tacit consent of king and people and the long approbation of time beyond the memory of any man.' It is to be observed that Hakewell is arguing *against* the existence of a royal prerogative to lay fresh impositions. The right to collect some sum seems however to have existed from the earliest times, and the only limitation in amount seems to have been that the sum should be a reasonable one, regard being had to the purpose for which it was collected. In process of time however, the ordinary sources of the king's revenue being continually diminished by the alienation of crown lands, &c., while the expenses of the crown were increased, the kings imposed of their own authority such sums as varied from the original amount collected, and were complained of as unreasonable by the people. The earlier parliamentary history is full of remonstrances and petitions against grievous and unaccustomed impositions, maltolts (evil tolls), &c. There was an instance also of a petition by the merchants that they might pay no toll, but be allowed to protect their ships themselves. Ultimately the kings were driven by their necessities, the difficulties of the collection of irregular duties, and the circumstances of their position, to have recourse to parliament to fix and authorise the sums to be collected as customs. The first statute on the subject occurs in the third year of the reign of Edward I., when the antient or grand customs were fixed at the sums already stated.

It is observable that in no instance was the right of the king to collect some duties disputed; all that is complained of is the excess and unreasonableness of the sum recently imposed. Many statutes occur on the subject, in which the king often—when the supply is needed, for instance, 23 Ed. I., as a provision against the French, who it is said intended altogether to wipe out (omnino delere) the English language—undertakes that the amount shall be properly applied, and that no aid shall be raised for the future except by consent of parliament. These promises, like the provisions of Magna Charta, which was renewed or confirmed thirty-one times, were generally broken, especially up to the end of the reign of Richard II. However, they were so often repeated, that at last they seem to have acquired some degree of validity, till they were again infringed in a few instances in the reigns of Elizabeth, Mary, and the Stuarts. In these later times however, such infringements were not passed over lightly. In the reign of James I. the question as to the right of the king to increase the customs upon merchandise, without assent of parliament, was raised on the occasion of his imposing five shillings per cwt. on currants. The court of exchequer decided that the king had such right, on the grounds, 1st, that his extraordinary and absolute prerogative was not bound by the statutes restaining him from increasing the customs without assent in parliament; 2nd, because the extra duty 'was not a burden to the commonwealth, but to delicate mouths.' This decision however raised great discussion in parliament, who pronounced it to be illegal. The writs for ship-money in the time of Charles I. created a similar ferment, and notwithstanding the petition of rights, the question cannot be said to have been entirely set at rest till up to the period of the Revolution.

The petty customs were originally founded on a bargain between the foreign merchants and king Edward I., by which they agreed to pay him the amount of them, in consideration of certain privileges granted them, and a release to them of all other prises and takings. Butlerage has the same origin, but is perhaps of an earlier date. Prisage is stated by Lord Coke himself to be due to the king by prescription, and the right of the king to it seems to have stood upon that alone; that right must have been one of inheritance, since by royal charters it was granted to the city of London and to the Cinque Ports for ever.

Tunnage and poundage was a duty varying in amount at different times from one shilling and sixpence to three shillings upon every tun of wine, and from sixpence to a shilling upon every pound of merchandise coming into the kingdom. The object in granting it was said to be, that the king might have money ready in case of a sudden occasion demanding it for the defence of the realm or the guarding of the sea. This kind of subsidy appears to have had a parliamentary origin. The earliest statute mentioned by Lord Coke as having granted it is 47 Ed. III. In the early instances it was granted for limited periods, and express provision was made that it should have intermission, and vary, lest the king should claim it as his duties. It was generally granted upon condition, or for a consideration expressed, as for the keeping and safeguard of the seas, &c., and in some instances the persons assigned to receive it showed particulars to prove that it had been properly expended about the salvation and defence of the kingdom. The duties of tunnage and poundage were granted to Henry V. for his life, with a proviso that it should not be drawn into a precedent for the future. However, notwithstanding the proviso, it was never afterwards granted to any king for a less period. These duties were farmed while Lord Coke was commissioner of the treasury, for 160,000*l.* a year. In the course of the argument in the case of ship-money in 13 Charles I., the king's duties are said to amount to 300,000*l.* This probably was the aggregate of the customs and tunnage and prisage.

Subsidy in its more usual and limited sense consisted of a rate of 4*s.* in the pound on lands, and 2*s.* 8*d.* on goods, and double upon the goods of aliens. The taxes called tenths, fifteenths, were the tenth or fifteenth part of the value of moveable goods. Other portions, such as the fifth, eighth, eleventh part, were sometimes, but rarely, also levied. These taxes seem to have had a parliamentary origin. There are no appearances of the king ever having attempted to collect them as of right. Henry III. received a fifteenth in return for granting Magna Charta and the Charta de Foresta. In the earlier periods never more than one subsidy and two fifteenths were granted. About the time of the expectation of the Armada (31 Eliz.), a double subsidy and four fifteenths were granted. The then chancellor of the exchequer, Sir Walter Mildmay, when moving for it, said, 'his heart did quake to move it, not knowing the inconvenience that should grow upon it.' The inconvenience did grow very fast, for treble and quadruple subsidies and six fifteenths were granted in the same reign. These grants seem to have been at intervals of about four years at that period. Subsidies and fifteenths were originally assessed upon each individual, but subsequently to the 8 Edward III., when a taxation was made upon all the towns, cities, and boroughs, by commissioners, the fifteenth became a sum certain, being the fifteenth part of their then existing value. After the fifteenth was granted by parliament, the inhabitants rated themselves. The subsidy, never having been thus fixed, continued uncertain, and was levied upon each person in respect of his lands and goods. But it appears that a person paid only in the county in which he lived, even though he possessed property in other counties. And, as Hume observes, probably where a man's property increased he paid no more, though where it was diminished he paid less. Certain it is that the subsidy continually decreased in amount. In the eighth year of the reign of Elizabeth it amounted to 120,000*l.*, in the 40th to 78,000*l.* only. Lord Coke estimates a subsidy (probably in the reign of James I. or Charles I.) at 70,000*l.*; the subsidy raised by the clergy, which was distinct from that of the laity, at 20,000*l.*; a fifteenth at about 29,000*l.* Eventually the subsidy was abolished, and a land tax substituted for it.

(2 *Inst.*; 4 *Inst*; 'Bate's Case,' &c., 2 *State Trials*, 371, ed. 1809; 'The Case of Ship Money,' 3 *State Trials*, 826, ed. 1809; Venn's *Abrt.*, tit. 'Prerogative;' Comyn's *Dig.*, tit. 'Parliament,' 'Prerogative.') [CUSTOMS.]

SUBSTANCE. In general usage Substance means a solid. In philosophical speculations it has undergone the fate of most general terms, and has been tortured into all possible shades of meaning. In physical speculations it has usually been taken as an equivalent to matter; but in metaphysical speculations its meaning, as sanctioned by the highest authorities, has remained true to its etymon (*substans*, that which *stands under* phenomena). This meaning will be rendered intelligible by the notion of some Hindu philosophers, who supposed the world to rest on the back of an elephant, and that the elephant stood on the back of a tortoise; what supported the tortoise, they omitted to explain. In adopting their theory, we may add that *that* which the tortoise stood upon was substance.

As we know that all phenomena must depend upon noumena, of which they are only the manifestation; or, to use the language of the schoolmen, as all accidents must be accidents of *something*, and must depend on that something for their existence, so in pushing our analysis to its limit, we must finally arrive at a point to which we can give no antecedent, which we are forced to assume as final, and as standing under or supporting the whole, and this we call Substance. It is the fundamental fact of all existence. We can never know it, for we know only phenomena, which are its appearances. We can never conceive it, for the first attempt to conceive it brings it within the sphere of our ideas, which are only those of phenomena. We can never imagine it, but we are compelled to assume it. It is to us a logical fact, not a noumenal one. Necessary as the basis of all speculation, as the 'point' in mathematics, but, like the point, for ever a mere logical distinction. It is needful for all men to know that this substance is, with respect to the mind, a merely logical distinction from its attributes; and it is needful also to know that as the mind can never transcend the sphere of its action, and consequently never know more than the attributes, all that it can predicate of substance must be false, for substance is to it a mere negation; if it would affirm anything of substance, it must inevitably affirm it by its attributes, which it alone can know positively.

It is from inattention to this latter fact that metaphysicians have blundered and misunderstood each other so constantly. You cannot conceive a point which has neither length nor breadth; you must assume it. You cannot conceive substance shorn of its attributes, because those attributes are the sole staple of your conceptions; but you must assume it. Analyse as you will, you can never get beyond a vague and negative conception of a certain substratum, which, whenever you attempt to realise it, you must invest with attributes. Glass is a substance, at least is called so in common language. Analyse it, and you find that it is no substance—that it is merely the co-existence of flint and alkali. Your substance then has vanished with the analysis. It was found to be flint *and* alkali, nothing more; no distinct element, no *substratum* was discovered. Where then was your glass substance? The glass was a mere mode of existence of two particles of flint and alkali; it was in itself nothing, it had no existence apart from those particles, it had no *substratum*. Analyse the flint in the same way, and you will find the flint to be in itself no substance, but a mode of existence of some other particles. And yet the mind refuses to admit that this analysis could be so continued ad infinitum, thus reducing everything to mere phenomena; it is impelled to stop somewhere, and to ask, 'attributes of what?' and there where it stops it recognises substance. Hence Spinoza's definition of substance being existence itself.

Fichte, the most scientific expositor of idealism, has denied all substance except that of the Ego, and he says, 'Attributes synthetically united give substance, and substance analysed gives but attributes; a continued substratum, a supporter of attributes is an impossible conception.' (*Wissenschaftslehre*, p. 145.) Granted an impossible conception, but not therefore an impossible fact. Fichte assumes that the subjective conception—the idea—is the complete correlation and adequate comprehension of the whole objective fact; and if this point be admitted, his system is irrefutable, for attributes being obviously mental conditions, and as beyond them we are conscious of nothing, so nothing but what they affirm can exist. Interrogate consciousness, and you will get no answer that will apply to a substance. It knows only attributes. Matter is extended, coloured, and of a certain weight. Yet philosophy has long established that weight and colour are purely mental conditions—are effects produced by matter on the sensorium, not qualities of matter in themselves; and Kant has irrefragably shown extension to be the form imprinted on all objects by our minds; and even disputing this, there is no dispute that extension *quâ* extension is not matter, and that colour *quâ* colour is not matter, but that matter is *something* extended and coloured. No, replies Fichte, it is but the synthesis of these attributes, as glass was the synthesis of flint and alkali; and on the Ideal theory, there can be no question of his being correct.

If we dissent from these conclusions, and maintain that there is substance apart from its attributes (though we insist on this distinction being purely logical), it is because the Idealists have not proved the fundamental position on which all such speculation rests, namely, the truth of the correlation between the conception and the object, so that the one should be taken as the entire expression of the other.

In our analysis of substance it is impossible to get beyond attributes; and therefore, subjectively speaking, substance is nothing more than the synthesis of attributes: but does this entitle us to assume that it is equally the case objectively? Not until the subject has been proved to be the complete expression of the object.

But the truth is, attributes themselves are but the conditions excited in us by objects. The Ego acted on by the non-Ego undergoes certain affections: these mental affections are variously extension, colour, weight, hardness, &c., and these are all the effects of the action of the non-Ego upon the Ego, and as a consequence these are all we know, and all we know of the non-Ego. To call substance therefore the synthesis of attributes, is to say that in the synthesis of our mental affections is contained all that *constitutes* the non-Ego, instead of saying that in the synthesis of our mental affections is contained all we can positively *know* of the non-Ego; it is saying that we include all existence, and that beyond our conceptions nothing exists; it is taking the human mind as the measure of the universe.

We maintain therefore, that inasmuch as what we call attributes are not vague abstractions, but positive effects of matter acting on the sensory (and we assume the existence of matter because Idealism has failed in disproving it); so there must be substance or cause to produce those effects; and although we can only know these effects and *by* these effects, yet we are necessitated to assume an inconceivable cause or substance. We do not know this substance: we only know what it excites in us, as a man in the dark receiving a blow from a bludgeon knows only his individual sensation received from that unknown something; it may be a stick, the butt-end of a gun, or a hammer: he knows nothing of what its nature may be; all he knows is what sensations it excites in him.

The stronghold of Idealism is consciousness. In consciousness there is nothing but transformations of itself—no substance, no external world is given; it knows, it feels, it is conscious of nothing but itself. But consciousness is equally the stronghold of Realism; for we are as conscious that what we call substance, or the world, is not ourselves, and does not depend upon us, and is a distinct existence, as we are of our own existence. Hence the universality of the belief of an external world—hence the impossibility of the Idealists' conceiving for an instant the non-existence of substance.

In conclusion we may observe, that substance is the unknown, unknowable substratum on which rests all that we experience of the external world: it is the hidden noumenon whose manifestations as represented in perception we call matter and the phenomena of matter, and of which every positive predicate must necessarily be false, and consequently all inquiry into its nature baseless.

SUBSTITUTION, a very common algebraical process, being, as its name imports, the substituting for any quantity another which is equal to it.

A method of approximation, which is frequently used and of great importance, has obtained the name of *successive substitution*. Let any equation be reduced to the form

$$x = a + e\phi x,$$

where e is less than unity, and ϕx a function of x. If we make $x=a$, the error thereby committed is less than ϕx, being $e\phi x$, in which e is less than unity. Take this value $x=a$, and substitute it on the second side, giving $x=a+e\phi a$: this value is nearer than the last in most cases, for it should be

$$\begin{aligned} x &= a + e\phi\,(a + e\phi x) \\ &= a + e\phi a + e^2\phi' a.\,\phi x \text{ nearly,} \end{aligned}$$

where $\phi' a$ is the differential coefficient of ϕa. The last error was $e\phi x$, and the present error is less, if $e\phi' a$ be less than unity. Generally, if for x we write $a+p$, and if p be erroneous by a quantity of the order e^n, we shall have, by one more substitution,

$$x = a + e\phi\,(a+p).$$

Now the error of $\phi\,(a+p)$ will be of the order e^n, and that of $e\phi\,(a+p)$ of the order e^{n+1}. There is then a continual approximation to the value of x.

Beginning with $x=a+e\phi a$, in which the error is of the order e^2, we have

$$x = a + e\phi\,(a + e\phi a),$$

in which the error is of the third order. Rejecting terms of the third order, we have

$$x = a + e\phi a + e^2\phi a\,\phi' a.$$

Substitute this again, and we have

$$x = a + e\phi\,\{a + e\phi a + e^2\phi a\,\phi' a\},$$

in which the error is of the fourth order. Rejecting terms of the fourth order,

$$x = a + e\phi a + e^2\phi a\,\phi' a + e^3\left\{ (\phi' a)^2\phi a + \frac{\phi'' a}{2}(\phi a)^2 \right\}$$

and so on: the developments being made by TAYLOR'S THEOREM. This would lead in effect to the celebrated theorem of Lagrange: but the actual method of substitution is sometimes preferable.

SUBTANGENT, SUBNORMAL. [TANGENT.]

SUBTENSE, means any line, angle, &c. opposite to or *subtending* a line or angle spoken of. Thus the chord of a circle is the subtense of the arc and of the angle at the centre. The term is now not much used.

SUBTERRANEAN FORESTS. [SUBMARINE FORESTS.]

SUBTRACTION, SUBTRAHEND, MINUEND. The process of subtraction is the removal of a part equal to the less from the greater. The quantity to be diminished (*minuendum*) was called the *minuend*; the quantity to be withdrawn (*subtrahendum*) the *subtrahend*; and the remaining part the *remainder*. The terms subtrahend and minuend are almost out of use, though often very convenient.

The operation of subtraction is often described in a way which might be practised, but is not; and the explanation of the possible mode applied to the actual mode makes confusion. It is obvious enough that if parts of A be subtracted severally from greater parts of B, the remainders put together make up the whole remainder. Thus 24 can easily be taken from 76, for 7 tens exceeds 2 tens by 5 tens, and 6 exceeds 4 by 2, so that 52 is the remainder required. But when we come to take 48 from 93, the preceding mode of partition is useless. To remedy this it is proposed in the explanation to *borrow* one of the nine tens in 94, and to put it on to the 4: then 8 from 13 leaves 5. Now take the four tens of 48, and subtract from the *remaining* 8 tens of 93, and 4 tens are left: the answer then is 45. The process would be as follows:—

93 48 — 45	8 from 3, impossible: borrow a ten from 90; 8 from 13 leaves 5. Take 4 tens from the remaining 8 tens, one of the nine tens having been borrowed, and 4 tens remain.

This process is actually used on the Continent, but with us, as all the world knows, there is a different process, as follows:—

93 48 — 45	8 from 3, impossible: take 8 from 13, and 5 remains. *Carry*[*] one to 4, giving 5, and subtract 5 tens from 9 tens, giving 4 tens.

There is quite a different principle in this process, which is as follows:—If two numbers be equally increased or equally diminished, the difference remains the same. Having arbitrarily increased the three in the upper line by ten, the lower line must be somewhere or other increased by ten, in order to keep the difference (which is all that is wanted) unaltered.

The object in view is attained by increasing the upper line by ten *units*, and the lower line by one *ten*.

We are inclined to think that in the actual performance of subtraction it would be better than the mode usually employed, if we added in thought to the lower to make the higher, instead of passing from the higher to the lower by mental subtraction. Thus the details of the following question are written down, the words in Italics being made emphatic, and the figures written down at the moment they are repeated or thought of:—

$$\begin{array}{r} 4794236 \\ 887349 \\ \hline 3906887 \end{array}$$

Nine *and seven* are sixteen (some persons would here take the trouble to say, carry one, one and four are five: but in this method, if the last-named word be ten or more, it is a direction to increase the next figure by one). Five *and eight* are thirteen: four *and eight* are twelve: eight *and six* are fourteen: nine *and nought*[†] are nine: eight *and nine* are seventeen: one *and three* are four.

This mode would render easy the compendious manner in which the operation of division, extraction of the square root, &c. are performed by some of the continental nations, in which the multiplication and the subtraction by which it is followed are performed at one step: thus—

12439729) 43874924183 (3527
65557371
33587268
87078103
00000000

The first step is to multiply 12439729 by 3, and to take the result from 43874924; the subtraction is performed by passing to the proper unit in the same decad or that next above, and carrying the tens' figure of the decad last employed. The proceeds of the multiplication table are put down without statement, and the computer should learn to remember products without the necessity of repeating '6 times 5 is 30,' '7 times 7 is 49,' &c.

27 *and seven* are 34: 6 and 3 are 9 *and three* are 12: 21 and 1 are 22 *and seven* are 29: 27 and 2 are 29 *and five* are 34: 9 and 3 are 12 *and five* are 17: 12 and 1 are 13 *and five* are 18: 6 and 1 are 7 *and six* are 13: 3 and 1 are 4 *and nought* are 4. The remaining steps are done in the same way. A person not used to this method will hardly believe at first how easily it is acquired, and how much trouble it saves. Those foreigners who are brought up in it find our method perplexing, and liable to lead to error, and greatly prefer their own—we think, with reason.

SUBULICORNES (Latreille), a section of Neuropterous insects containing the dragon-flies (*Libellula*, Linn.) and the Ephemeræ. The larvæ of these insects are carnivorous, and live in the water, respiring by means of appendages situated on the sides or extremity of the body; the pupæ also live in the water, but leave that element to undergo the final transformation. In the perfect insect the wings are always reticulated, and when at rest are in some species horizontal, in others vertical; the compound eyes are very large and prominent; and the ocelli, or simple eyes, are two or three in number; the mandibles and maxillæ are covered by the labrum and labium; the antennæ are short, slender, and subulate.

The dragon-flies (*Libellulidæ*) have the four wings of equal length, the tarsi three-jointed, the antennæ very small and resembling minute bristles, the eyes extremely large, and generally approximated above; the fore part of the head, or what might be termed the face, has an inflated appearance; the legs are rather small, and the abdomen is elongated, sometimes cylindrical, and sometimes depressed, and terminated by membranous appendages. The larvæ and pupæ, both of which are active, nearly resemble the perfect insect in general form, and are remarkable for the great development of the labial apparatus, which is elongated and dilated at the extremity, and covers the fore part of the head like a mask.

The *Libellulæ* are divided into three genera by Fabricius. Those species which have the wings extended horizontally when at rest, the head almost globular, the eyes very large and meeting on the vertex, an elevation in front and close to the eyes, and the abdomen depressed, form the genus *Libellula* as restricted by that author.

The second genus (*Æshna*, Fab.) is chiefly distinguished by the cylindrical form of the abdomen and its greater proportionate length. The wings are as in *Libellula*, and the head is of the same globular form.

In the third genus (*Agrion*, Fab.) the wings when at rest are elevated perpendicularly; the head is transverse, and the eyes are widely separated. Examples of each of these genera are found in this country.

The second division of the *Subulicornes*, or the family *Ephemeridæ*, is distinguished from the *Libellulidæ* by the comparative softness of the parts of the mouth, they being of a membranous character in the insects of the present family, and the parts less defined; the tarsi are five-jointed; the inferior wings are much smaller than the upper, and in some are absent; the abdomen is terminated by two or three long and hair-like appendages. They form the genus *Ephemera*, according to Linnæus, and were so called on account of their short term of life, that is, in the imago or perfect state.

The Ephemeræ, or May-flies, Latreille states, usually appear at sunset, in fine weather in summer and autumn, on the banks of rivers, lakes, &c., and sometimes in such remarkable numbers, that after their death the surface of the ground is completely covered with them, and in certain districts on the Continent they have been collected in cart-loads for manure.

These insects collect together in great numbers in the air, and fly in an undulating manner, constantly ascending and descending, and have a very beautiful appearance. The males are distinguished from the females by the abdomen being furnished with two articulated hooks at the extremity, and apparently the anterior legs and the terminal filaments of the abdomen are larger in this sex; the eyes are also larger. In some there are four compound eyes, two of which are elevated and larger than the others.

The female insect deposits her eggs in the water, and these are collected together in a mass, after which it dies, the duration of life in the perfect state being very short in both sexes. When however we trace them through the transformations, we find their existence is in reality a long one, for in the larva and pupa state some of them exist for two or three years. During this time they are generally hidden, at least in the day-time, in the mud or under stones; sometimes in horizontal holes in the banks of rivers.

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[*] The student may well ask *from where?* The term 'carry' is not the proper one.

[†] Beginners in arithmetic (and older persons too) frequently think this word is *ought*; but *ought* is anything, and *nought* is nothing.

Google

SUCCESSIVE SUBSTITUTION. [SUBSTITUTION.]

SUCCINAMIDE. When dry succinic acid is acted upon by ammonia, water is given off with the evolution of heat, and a fusible crystallizable *amide* is formed, soluble in water and in alcohol.

According to D'Arcet, it consists of nearly—

Eight equivalents of carbon	48
Five equivalents of hydrogen	5
Four equivalents of oxygen	32
One equivalent of azote	14
Equivalent	99

When crystallized, it contains two equivalents of water 18; its equivalent is then 117.

SUCCI'NEA, M. Draparnaud's name for a genus of pulmoniferous gastropods belonging to the *Colimacea* of Lamarck and the *Limacinea* of De Blainville. It is the subgenus *Cochlohydra* of Férussac.

The shell is ovate, rather elongated, with a large, entire, longitudinal aperture, and a short spire; the outer lip is thin and continuous with the delicate sharp-edged columella; the inner lip is spread over a part of the body-whorl. The shell may be distinguished from that of *Limnæa* [LIMNEANS, vol. xiii., p. 501] by its not having a fold or plait on the columella.

Cuvier, who places the genus between *Chondrus* and *Clausilia*, remarks that the animal cannot withdraw itself into the shell entirely, and that it may be regarded almost as a TESTACELLA with a large shell. It has, he remarks, the lower tentacula very small, and lives on the herbage and plants on the brinks of streams, whence it has been considered as amphibious. [HELICIDÆ, vol. xii., p. 106.]

The most familiar species is *Succinea amphibia, Helix putris* of Linnæus, whose specific name has the priority, common in moist places, on the banks of fresh waters.

SUCCINIC ACID is obtained from amber by the application of heat, when the acid sublimes, mixed with much empyreumatic oil and some acetic acid; it is stated that a greater product is obtained when the amber is mixed before sublimation with one twelfth of its weight of sulphuric acid diluted with an equal weight of water. The acid is purified by treating it with dilute nitric acid, by which, unlike most acids similarly constituted, it is not altered or decomposed; by evaporating the solution, crystals of the acid are procured, which possess the following properties:—they are colourless, inodorous, are acid and somewhat acrid in taste, and sublime without decomposition when heated. These crystals are hydrated, and are soluble in two parts of boiling and five parts of cold water, and they dissolve also in alcohol and æther; when heated to 356°, the crystals lose half their water. This acid consists very nearly of—

Two equivalents of carbon	24
Two equivalents of hydrogen	2
Three equivalents of oxygen	24
Equivalent	50

The crystals contain one equivalent of water, making its equivalent number 59. Succinic acid was formerly employed in medicine under the name of salt of amber; it is now chiefly used in combination with ammonia, forming succinate of ammonia in chemical investigations, especially for precipitating iron from solution.

Succinic acid combines readily with the alkalis, earths, and metallic oxides; several of its compounds with the latter are crystallizable, but are not applied to any particular purpose.

SU'CCINUM is a bituminous substance of a peculiar kind, the natural history and chemistry of which have been already detailed. [AMBER, vol. i., 421.] It is not now used in the crude state in medicine, but is employed to yield the oleum succini, or oil of amber. This is procured by the destructive distillation of amber, which is put into a glass, copper, or iron retort, fitted with a glass alembic properly luted. A gentle heat is applied by means of a sand-bath, by which the amber is melted and a little volatile oil passes over; after this the amber swells greatly, and the distillation proceeds rapidly. By this process three very distinct products are obtained, viz. impure succinic acid, which adheres to the neck of the retort; an acid liquid (called spiritus volatilis succini), in which succinic and acetic acids exist mingled with empyreumatic oil; and, lastly, the volatile oil of amber, which is to be separated from the acid liquid by careful pouring off. What remains in the retort is *colophony* of amber, which is used to make varnish. The volatile oil thus obtained is impure, containing various pyrogenous ingredients, and requires repeated distillations to purify it. If in the third or fourth of these the process be interrupted when about two-thirds only of the oil has passed into the receiver, there is obtained a volatile oil of a light yellow colour, a peculiar bituminous odour, and of the specific gravity 0·889. If the distillation be continued too long, an empyreumatic oil is evolved, which gives to the other a coffee-brown hue; and this is the general appearance of rectified oil of amber. By some writers freshly prepared charcoal is directed to be put into the retort when the impure oil is to be distilled, but that is very improper, as by its means the pyrogenous principles, which it is the object of the rectification to separate, are very abundantly generated. The purest oil has a sharp burning taste, an acid re-action, and on exposure to the air becomes brown and inspissated.

Volatile oil of amber probably contains a large portion of creasote, as may be inferred from the analogous action of nitric acid on it and on creasote. One part of rectified oil of amber, and three parts of moderately strong nitric acid, form a magma, which has the odour of musk, and is called *artificial musk*. Rectified oil of amber is stimulating, antispasmodic, and rubefacient. It is now little given internally, except in combination with ammonia, in the celebrated *eau-de-luce*, for which the *tinctura ammoniæ composita* of the present Pharmacopœia is a substitute. This is to be applied to the nostrils in fainting, hysteria, and epilepsy, or a very few drops diluted with water may be taken internally. Oil of amber is beneficially rubbed along the spine in the later stages of hooping-cough. Dr. A. T Thomson says that one ounce of rectified oil of amber, with half an ounce of tincture of opium, forms a good embrocation in tic-douloureux; its disagreeable odour is an obstacle to its employment when the face is the seat of the disease; but it proves a most valuable application when the limbs begin to lose their tone and swell in advanced life.

SUCCORY, commonly called Chicory, or Wild Endive, the Cichorium Intybus of botanists, which belongs to the tribe Cichoraceæ and natural family Compositæ. De Theis derives the name from *chikouryeh*, stated by Forskäl to be the Arabic name. The name Endivia seems to be derived from another Arabic name, *hindibeh*. The genus Cichorium consists of only a few species found in the temperate parts of Asia, the Mediterranean region, and in Europe. It has a double involucre, of which the exterior is 5- and the interior 8-leaved, with the leaflets united at the base; pappus crown-like, formed of many paleæ, shorter than the achenium. Receptacle naked or pitted. Flowers blue. *C. Intybus*, found in uncultivated places, dry pastures, and roadsides in Europe, has two or more heads of flowers, crowded, sessile or stalked, floral leaves lanceolate, subamplexicaul, broader at the base, pappus much shorter than the achenium. *C. Endivia*, or the common ENDIVE, cultivated throughout Europe, is supposed to have been introduced from India, where it is well known by its name of *Kasnee*. This species, like the former, has two or more heads, sessile or stalked, but with the floral leaves broad-ovate, cordate at the base and amplexicaul, pappus four times shorter than the achenium. The cultivation and uses of the ENDIVE have been treated of under that article, and of the present species under CHICORY, under which name it is more commonly known, and especially since it has been so extensively imported from the Continent as a substitute for coffee.

SUCCULA'TÆ, the name of a natural order of plants in the 'Fragments of a Natural System' of Linnæus, adopted by Bartling. It includes those families which are remarkable for the succulent character of their leaves, as Saxifragaceæ, Crassulaceæ, Ficoidaceæ, &c. All plants with thick leaves which abound with cellular tissue containing a watery secretion are called succulent. In these plants the cuticle of the leaves is remarkably destitute of stomates, and thus the transpiration of their juices is prevented. They are mostly inhabitants of arid climates, where they are supplied with only a small quantity of moisture and exposed to great heat.

SUCHONA, River. [DWINA; RUSSIA.]

SUCK, River. [SHANNON.]

SUCKERS. [STEM.]

SUCKLING, SIR JOHN, an English poet, was born at Whitton, in Middlesex, 1608-9. His father was one of the principal secretaries of state and comptroller of the household to James I., and was by descent of a Norfolk family. The son is said to have shown in his boyhood great readiness for the acquisition of languages. We are not clearly informed as to the place and manner of his education. Aubrey thinks that he was at school at Westminster, but this fact does not seem certain. In 1623 he matriculated at Trinity College, Cambridge, and in 1628, about a year after his father's death, travelled abroad. In 1631 he joined the army of Gustavus Adolphus, king of Sweden, and probably remained on the Continent till 1632. On his return to England he led the life of a courtier, and was distinguished among his contemporaries not less by the brilliancy of his wit than by the splendid appearance which he maintained by the most lavish expenditure. Among his companions were Lord Falkland, Carew, Shirley, and Davenant; from the last of whom Aubrey derived most of his anecdotes of Suckling, whom he has thus described (*Lives of eminent Men, Bodleian Letters*, ii., part ii., 545):—'He was famous at court for his ready sparkling wit, which was envied, and Sir William (Davenant) says he was the bull that was bayted; he was incomparably ready at reparteeing, and his wit most sparkling when most set on and provoked.' While pursuing a course of fashionable pleasures, among which gambling seems to have most attracted him, he became engaged in a quarrel with a brother of Sir Kenelm Digby, and received from him a severe beating, which he does not appear in any way to have resented. After this dishonour, his associates looked coldly on him, and the consequent loss of reputation seems to have been accompanied by the decline of his fortunes. About this time we find the first notice of him as an author; in 1637 was published his 'Session of the Poets;' in 1638, his 'Aglaura;' and in 1639, his 'Brennoralt,' under the title of 'The Discontented Colonel,' a satire on the rebels. When the disturbances broke out in Scotland, Suckling equipped a troop of 100 horse in the king's service, and so magnificently, that they cost him, it is said, 12,000*l.* This extravagance was much ridiculed, and the misconduct and defeat of his men in 1639, in the battle between the Scotch and the Royal army, gave occasion for a ballad, more coarse than humorous, said to have been written by Sir John Mennis, a wit of those times, and which is printed in a poetical miscellany entitled 'Musarum Deliciæ, or the Muses' Recreation, containing several pieces of poetique wit,' 2nd edit., 1656. (Percy, *Antient Ballads*, ii., 322.) In 1640, on the meeting of the Long Parliament, Suckling was returned member for Bramber, and took an active share in the party strife that followed; a letter of his is extant, addressed to Henry Jermyn, afterwards earl of St. Albans, in which he discusses at some length the critical situation of the king. In 1641 he joined in a plot to rescue Strafford from the Tower, and was in consequence summoned before parliament, and accused of being an accomplice in a design to bring over the French; upon this he fled to France, and died soon afterwards in that country.

His death is said to have been caused by a fever, or, according to another story, inscribed on his portrait at Knowle in Kent, by a wound in the heel from a rusty nail placed purposely in his boot by his valet, who, after robbing him, wished to ensure safety in flight by disabling his master from pursuit. According to Aubrey, he poisoned himself at Paris. In a pamphlet entitled 'A Letter sent by Sir John Suckling from France, deploring his sad Estate and Flight,' London, 1641, he is said to have stayed some time at Rouen after his arrival in France, and to be then living with his wife at the Hague; but no reliance can be placed upon such a production. His death must have been before 1643, as in that year was printed, at London, 'A Copy of two Remonstrances brought over the river Stix in Caron's Ferryboate, by the Ghost of Sir John Suckling.' His works are:—1, 'Fragmenta Aurea,' London, printed by Humphrey Moseley, 1646, 8vo., with a portrait of the author, containing poems, letters, and an Account of Religion by Reason; in some of his poems he is said to have been assisted by Sir John Mennis. (Wood's *Athen. Oxon.* (Bliss), iii., 926.) 2, 'The Goblins,' London, 1646. 3, 'Fragmenta Aurea,' 1648, no portrait. 4, 'An Account of Religion by Reason,' London, 1658. 5, 'Aglaura, the Goblins, and Brennoralt,' London, 1658. 6, 'Letters to several Persons of Honour,' London, 1659. 7, 'The Sad One,' a tragedy, London, 1659. 8, 'His last Remains,' London, 1659. 9, His Works—Poems, Plays, Letters, Tonson, London, 1709, 8vo., with portrait; again, by Tonson, ibid., 1719, 8vo., with portrait; again, 12mo., 1770, no portrait; incorrectly, according to Chalmers, 'British Poets,' who has printed selections from his poems omitting the more licentious.

A work entitled 'Selections from his Works,' with a Life prefixed by Rev. Alfred Suckling, London, 1836, has furnished nearly all the few facts contained in this scanty biography. The reader may also consult his Life, by Chalmers, the pamphlets about him already quoted; and a folio sheet printed in 1641, entitled 'The Sucklington Faction.'

In person Suckling was about the middle size, though but slightly made, with a graceful carriage. In the edition of his Works by his namesake is an engraving from a portrait by Vandyke, and two more by that master are there mentioned. His poems relate almost entirely to the passion of love; the fortunes of a lover and the feelings arising from his successes and reverses are described with the accuracy of one personally experienced in such adventures. These compositions, written in the transition period between an age of thought and learning, and an age of careless dissipation, present in singular combination the characteristics of the passing and the coming generation. In the more or less pedantic love of classical allusion, and in the strained intricacy of wit, the style of Suckling somewhat resembles that of his contemporaries; while in the licentiousness of his subjects, the gaiety and ease of expression, and the strange mixture of grossness and refinement of feeling, he still more reminds us of the court-poets of the reign of Charles II. His ballad of 'The Wedding' has been justly celebrated for the truth and naïveté of description, and the happy boldness in the use of homely imagery. The songs, 'When, dearest, I but think of thee,' and 'Tell me, ye juster Deities,' are among the best of his pieces. His letters are written in remarkably pure English, but in a style too studied and elaborate for such compositions.

SUCTORIAL CRUSTACEANS. M. Milne Edwards, in his valuable *Histoire Naturelle des Crustacés* (*Suites à Buffon*), remarks that this great division of the class *Crustacea* is connected intimately with the *Entomostraca*, and especially to the order *Copepods*, and he acknowledges that it would have been perhaps more natural not to separate it so definitely from them as he has done. For the rest, he adds, the group is distinguished from all the animals of the same class by the conformation of the buccal apparatus. In fact, he observes, the mouth, instead of being furnished with foliaceous jaws and mandibles proper for dividing solid aliments, is prolonged into the form of a beak, and cannot give passage to any but liquid substances. These crustaceans therefore are nourished by the juices which they obtain from the bodies of other animals only; and this organic disposition renders them essentially parasitic. But this peculiarity of structure, notwithstanding all its physiological importance, brings with it rather slight anatomical differences; for, in the crustaceans, as in the insects, the same parts are modified in their form, to constitute, according to the demand, an apparatus of mastication, or an organ of suction. This last is essentially composed of a conical tube resulting from the elongation of the labrum and the lower lip. There are almost always to be found two styliform pieces, which are evidently the analogues of the mandibles of the masticating crustaceans (Crustacés broyeurs), but which here fulfil the office of small lancets, or rather, of the instrument employed in surgery in dropsical cases known as the trochar. Lastly, there exist ordinarily on each side of the base of this beak other appendages, the principal of which appear to represent the jaw-feet of the superior crustaceans, and serve the animal as the instruments to hook or attach itself to its prey. The feet are, in general, formed as in *Cyclops* [BRANCHIOPODA, vol. v., p. 340] and the other *Copepods*, that is to say, they are short, and furnished with two natatory oars composed of many joints, and it is worthy of note, that, as in the greater part of the crustaceans, the number of these organs amounts to but four pairs; but, in the group before us, they become deformed by age, and sometimes completely disappear. Another trait of resemblance between the *Suctorial Crustaceans* and the *Copepods*, is furnished by the metamorphoses which they undergo in their youth; and it is a remarkable fact, that whilst in the adult state they offer the most variable forms, they have at their birth the ordinary conformation in all the young *Copepods*, and the greater part of the young *Branchiopods*; in the first period of their existence it is even impossible to distinguish them from the young of *Cyclops*.

M. Milne Edwards remarks that this subclass divides itself naturally into two principal orders, and he has thought it right to add a third provisionally. This last, he observes, is ordinarily arranged by zoologists among the *Arachnids* [Arachnida], but he is of opinion that their more proper place is in the class *Crustacea*. The three orders proposed by M. Milne Edwards are the *Siphonostomes*, the *Lerneans*, and the *Araneiform Crustaceans*.

1. Siphonostomes.

This order was established by Latreille, and comprehends all the *Suctorial Crustaceans* whose thorax, composed of many distinct joints, is furnished with natatory feet.

M. Milne Edwards describes these animals as having the body divided into three parts: the head, the thorax, and the abdomen. The first is large, and carries a pair of antennæ, a sucker furnished with styliform mandibles, and anchor-like or prehensile jaw-feet, generally three pairs in number. This cephalic portion of the body is, in general, more or less clypeiform, and is confounded with one or two of the first thoracic rings. The normal number of the constituent segments of the thorax is five, but in consequence of the soldering of the parts, this middle portion of the body offers mostly only two, three, or four distinct joints. The last thoracic ring is apod, and, in the female, carries two or three oviferous tubes. Finally, the abdomen is, in general, rudimentary, and is only furnished with a single pair of appendages, disposed so as to constitute ordinarily a small caudal fin. The general form of the body varies much, and sometimes departs considerably from that which may be considered as normal in this class of annulose animals.

The *Siphonostomes* undergo considerable metamorphoses in their youth, and do not become parasites till they have changed their skin once or many times: they swim at first with ease, but after having fixed themselves, they become more or less deformed, and do not quit their place except slowly and with difficulty.

M. Milne Edwards divides the *Siphonostomes* into two families—the *Peltocephala* and the *Pachycephala*.

Peltocephala.

This family has less affinity with *Cyclops* than some of the *Pachycephala*, but they offer a more complicated structure, and consequently appear to M. Milne Edwards to deserve precedence.

The *head* is very large, shield-like, and, in general, much larger than the thorax or abdomen; it resembles a disk slightly convex above, delicate on its edges, and truncated behind, where it is confounded with the first rings of the thorax. On its upper surface two small smooth eyes may be almost always distinguished; they are closely approximated to the median line. Forward it is continued with two frontal blades more or less distinct, and directed transversely. The *thorax* is composed of a variable number of joints; sometimes two only are distinguishable, sometimes three or even four may be counted, according as the three first segments are confounded with the head, or this soldering extends to but two of these rings, or even to one only. For the rest, the aspect of this portion of the body varies much, for sometimes the dorsal segment of these rings presents nothing remarkable, and sometimes it gives rise to great laminæ, which resemble the elytra of insects.

The *abdomen* is but little developed, and presents no appendage below, but terminates by two small natatory blades ciliated on the edges, or by a species of trifoliated fin.

The *appendicular system* presents, in all the animals of this division, the same essential characters, and is composed of a pair of antennæ, a buccal apparatus, and four pairs of feet.

The *antennæ*, two in number only, are inserted very far from each other, and are short, flattened, and directed outwards; they are always composed of two or three small lamellar joints, and are never setaceous nor annulated.

The *buccal apparatus* is composed of a sucker, of divers rudimentary appendages, situated on each side of its base, and of three pairs of anchor-like jaw-feet. The *sucker* is large, conical, and directed backwards; two unequal pieces are there to be distinguished, which are soldered by the edges throughout the greatest part of their length, but remain free towards the end, and leave between them, at the summit of this species of beak, a circular or triangular aperture: one of these laminæ is inserted between the mouth and the front, and represents the *labrum* or upper lip; the other, situated backwards, is analogous to the lower lip of the masticating crustaceans. Between the base of these two lips springs, on each side, an appendage, which evidently replaces the *mandibles* of these last animals; but which, instead of being short, stout, and dentiform, is slender, very much elongated, and similar to a stylet with a dentilated point; these styliform jaws penetrate into the beak by means of a slit situated near its base, and advance into its interior, so as to come out by the terminating aperture, and serve as a pair of lancets when the animal wishes to suck its prey. A little outwards is found a second pair of appendages, which is reduced to a nearly rudimentary state, and seems to be the representative of the first pair of jaws of the ordinary *crustacea;* in general there is to be distinguished near the same point a styliform or forked horny piece, which seems to be the vestige of a third pair of buccal appendages, appendages which, in the masticating crustaceans, constitute the second pair of jaws. The *jaw-feet*, three pairs in number, offer considerable dimensions, and are ranged on each side of the siphon: the first pair seem to be reflected (refoulées) forward, for they spring in front of the edge of the upper lip, between the sucker and the antennæ, and by some naturalists they are considered as antennæ; they are stout, short, more or less misshapen, and each terminated by a hooked claw, by the aid of which the animal attaches itself to its prey. The second pair of jaw-feet are slender, and always composed of two principal joints of nearly equal length, the second of which carries, near its middle, a small appendage, and terminates by one or two hooks but little bent. The third pair of jaw-feet, situated more backward, are stout, in general short, and more or less completely subcheliform; the crooked claw which terminates them can be bent back on the penultimate joint, in manner of a claw.

The *feet* are four pairs in number, and are always more or less completely natatory; two pairs, and sometimes all, terminate by two oars, each composed of three joints, offering, generally, a very remarkable disposition of a nature to favour their action as natatory instruments, and which consist in a very considerable development of their basilary joint, and the soldering of that joint with an unequal sternal piece, so as to form, with the whole, a single transversal blade, as for the two feet; it is even to be remarked, that in general this basilary piece, which occupies the whole width of the corresponding ring, is much more developed than the terminal oars of those limbs, and constitutes, by itself, nearly the whole of the fin formed by the pair of feet thus modified. These four pairs of limbs belong to the four first thoracic rings, and spring, some from the cephalic buckler, others from the postcephalic portion of the thorax, varying in number according to that of the thoracic rings, which are confounded with the head. The last ring of the thorax carries none; but, in general, a pair of tubercles or lobules may be distinguished there, which appear to be the vestiges of a fifth pair of limbs reduced to a rudimentary state.

These crustaceans live as parasites upon fishes, but they are not permanently fixed to them, and when they let go their hold, they can change their place either by crawling slowly or swimming. The male is, in general, distinguished from the female by some peculiarities of structure, and by a very inferior size. The female nearly always carries her eggs in cylindrical tubes, which spring near the posterior border of the last thoracic segment on each side of the abdomen, and which often attain a very considerable length. The young, at their birth, resemble the young of *Cyclops*, and must undergo many moults before they finish their metamorphosis; little however is known at present of these changes. It is also to be noted that one often finds in the neighbourhood of the vulvæ small ampullæ, which are fixed there by a very narrow neck, and which may be spermatic reservoirs, analogous to those which M. Siebold made known in *Cyclops*.

M. Milne Edwards divides this natural family into three divisions or tribes—the *Argulians*, the *Caligians*, and the *Pandarians*.

Argulians.

This tribe consists of a single genus, *Argulus*, which infests fresh-water fish and the tadpoles of Batrachians, to which they adhere, but they are also found free, swimming about with vivacity.

Argulus foliaceus is known to most anglers: it is figured in Desmarest (*Crust.*, pl. 50, fig. 1), and there is a pretty wood-cut of it in Yarrell's *British Fishes*, vol. ii. p. 399.

Caligians.

There is nothing abnormal in the conformation of the thorax of this tribe, the thoracic rings being simple, and without dorsal appendages. The cephalic buckler is large, more or less oval, delicate on its edges, and furnished anteriorly with very well developed frontal laminæ, the lateral extremity of which covers the base of the antennæ: the posterior angles of this carapace are prolonged more or less far on each side of the thorax, and the portion of its posterior border, comprised between those two prolongations, is confounded with the first, or even the second or third first thoracic segments. The result is, that the thorax is only composed of two, three, or four distinct joints. The feet are furnished with long plumose bristles; and the abdomen is terminated by two small plates directed backwards, and carrying no lateral appendages.

Genera.

Caligus (see the article and the arrangement of M. Milne Edwards, who divides the genus into several sections, and records no less than fifteen species), *Chalimus*, *Trebius*, and *Nogagus*.

Pandarians.

The small crustaceans collected by M. Milne Edwards under this name, are remarkable for the lamellar prolongations with which the upper part of their thorax is furnished. These appendages, he observes, often resemble the elytra of insects, and their number is sometimes considerable; there may be as many as three pairs counted. In general the head is less enlarged and less clypeiform than in the *Caligians*, and the feet are only rarely furnished with plumose setæ; their terminal oars are often only represented by foliaceous submembranous lobes; and the abdomen frequently presents on each side of its terminal piece a more or less projecting lamellar appendage.

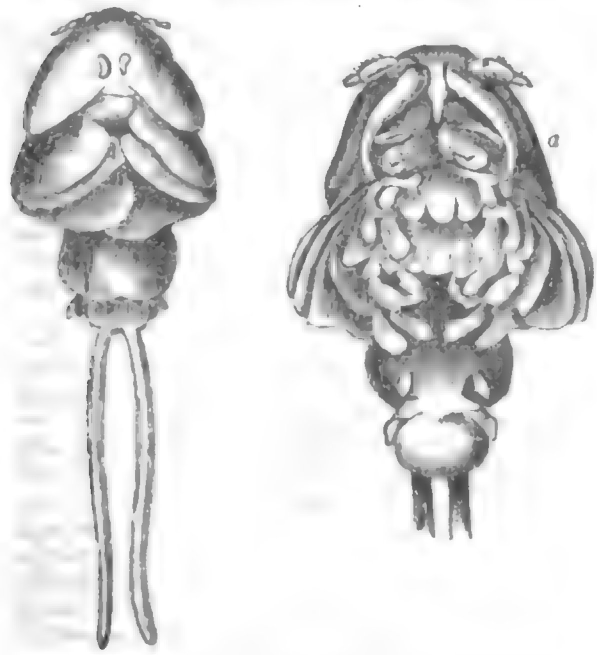
M. Milne Edwards subdivides this tribe into two small groups, principally characterised by the general form of the body, and by the disposition of the oviferous tubes, which in the one are exposed and extended in a straight line behind the body, whilst in the other these tubes are coiled upon themselves and hidden between the superior surface of the abdomen and a clypeiform lamina which springs from the last thoracic ring.

The genera *Euryphorus*, *Dinemoura*, *Pandarus*, and *Phyllophora*, form the first of these groups. *Cecrops* and *Læmargus* belong to the second.

Our limits will only permit us to illustrate this tribe by the genus *Phyllophora*.

The type of this last-named genus is, according to M. Milne Edwards, who established it, very remarkable from the lamellar appendages with which its back is covered. In its aspect it approaches the *Anthosomes*, but in the structure of its feet and in its general organization it is not separable from the *Pandarians*. The only species known is *Phyllophora cornuta*. Length about ten lines.

Locality.—Near Tongataboo.



Phyllophora Cornuta. (M. E.) *a*, seen from below

Pachycephala.

In this division of the order *Siphonostomes*, M. Milne Edwards describes the head as not enlarged, but lamellar and clypeiform as in the preceding family, and the antennæ, instead of being short, flattened, and biarticulate, as slender, cylindrical, elongated, and composed of five or six joints, the size of which diminishes gradually from the base towards the point of the organ. It is also to be noted that the apparatus of suction is, in general, less developed in these crustaceans, than in the *Peltocephala*, and the mode of conformation of these appendages which would appear to represent the jaw-feet is less constant: the feet are not soldered on the median line, and consequently do not constitute unequal fins, as is often the case in the preceding family.

M. Milne Edwards divides the *Pachycephala* into two natural groups. The *Ergasilians* and the *Dichelestians*: the first, he observes, establishes the passage between *Cyclops* and the *Lernæidæ*; the second, between these last and the *Pandarians*.

Ergasilians.

This small group closely approximates to *Cyclops*, and is remarkable for the pyriform conformation of the body, the size of the head, and the development of the abdomen.

Genera.

Ergasilius, *Bomolocus*, and *Nicothoa*. Species of *Ergasilius* are found attached to the gills of the pike and carp (*Erg. Sieboldii*); to those of the eel (*Erg. gibbus*); and to those of a *Silurus* (*Erg. trisetaceus*). The only species of *Bomolocus* known (*Bom. Belones*) is found attached to the branchiæ of the gar-fish (*Esox Belone*). *Nicothoa* includes but one species (*Nic. Astaci*) which is of a rosy colour, about a line in length, and is found upon the branchiæ of the lobster. The young *Nicothoæ*, on leaving the egg, resemble the young of *Cyclops*, and want the thoracic lobes which, when they are adult, give so strange an aspect to these animals.

Dichelestians.

This tribe is easily distinguished from the *Ergasilians* by the elongated form of the body, the smallness of the head, and the frequently rudimentary state of the abdomen. It is also worthy of note that their feet are much less developed than in the *Ergasilians*, and that the organs by the aid of which they fix themselves on their prey, are, on the contrary, more developed, announcing a more essentially parasitic life.

Genera.

Anthosoma, *Dichelestium*, *Nemesis*, *Lamproglena*.

But one species of *Anthosoma* is known (*Anth. Smithii*), about ten lines long, and found upon a *Squalus*. M. Milne Edwards remarks that the *Caligus crassus* of Abildgaard much resembles this species, but seems to be more stout about the head, and to have the cephalic buckler wider forwards.

Dichelestium, too, comprises but one species (*Dich. Sturionis*). It is about one inch in length, and fixes itself on the branchial apparatus of the Sturgeons. The thorax is divided into four portions in the male, and into five in the female, by interannular divisions. The abdomen is very small in the female, about half as large as the last thoracic ring in the male. Neither does *Lamproglena* include more than one species (*Lamp. pulchella*), which is found on the gills of the chub.

LERNEANS. (Lernæidæ, M. E.)

This order is principally distinguished from the *Siphonostomes* by the rudimentary state of the whole appendicular system, which is only represented by vestiges of limbs or simple tegumentary lobes without articulations, and proper only to serve for anchoring the animal on the prey at whose expense it lives. The *Lerneans* are remarkable for the oddity of their shape, which, in general, departs greatly from all the ordinary forms in this class, and seems to be the result of a monstrous development. In youth their conformation is normal and much resembles the young of *Cyclops*; they are then provided with a frontal eye, and natatory oars which permit them to move with agility; but, after having undergone a certain number of moults, they cease to lead an erratic life. The females fix themselves on some other animal, and the males, which are much smaller, hook themselves, in general, under the abdomen of their female and near the vulvar aperture. The organs of locomotion, then rendered useless, waste away or become deformed, so as to be unfit for the office which they were originally intended to execute. The eye nearly always disappears, and the general configuration of the animal changes so as to make it not recognisable. The females especially acquire the most singular forms. They become very large, and solder themselves, so to speak, on their prey by the aid of simple cutaneous appendages or certain members transformed into immovable arms. The males remain extremely small, and depart less from their primitive conformation, but the head becomes larger, and the jaw-feet, transformed into instruments of prehension, and destined to fix the animal on the part which is to be its habitat, acquire a great relative development.

We must here pause for a moment, to mark this provision for the welfare of the animal. If all the young went to one fish, that of the parent for example, as would probably be the case if they were born blind and with organs only fit for attachment, the fish would die, and the whole generation of parasites would be defunct with it. But the young *Lernæa* is hatched in a form that enables it to swim about and feed on minute animals; and, being furnished in this state with eyes, it has not only the means of temporary subsistence whilst leading a wandering life, but also of selecting its proper species on which it is destined to feed. Then the locomotive limbs are gradually changed to organs of attachment, the eyes disappear, nutrition is the object till the organs of generation are fully developed, and, in this, as in some other cases, the perfection of the animal consists not in the enjoyment of locomotion and vision, but in that state which renders it fit for the continuation of the species.

M. Milne Edwards remarks, that zoologists have mistaken the true nature of the Lerneans, and have separated them from the *Crustaceans*, to place them among the worms. Desmarest, he observes, is one of the first authors who have clearly indicated their natural relationship with the ordinary crustaceans; but, he adds, it is only since the knowledge of the transitory forms put on by these parasites in the commencement of their life, that one has been able definitively to assign to them a place in the natural series of the crustaceans, and the acquaintance with these changes is principally due to that skilful observer, M. Nordmann. M. Milne Edwards observes, that there is no branch of the natural history of the crustaceans so little advanced as that relative to the *Lerneans*; nearly all remains to be done, and he expresses a hope that M. Nordmann will not abandon a pursuit which has already conducted him to results so important to science.

M. Milne Edwards divides the *Lerneans* into three families, characterised by the manner in which these parasites attach themselves to their prey. Some fix themselves by means of great brachiform appendages, united together towards the end, and terminated by a horny median *bouton*. Others adhere by their jaw-feet, which are armed with very strong hooks. Others again attach themselves by the whole head, which is furnished for this purpose with horny prolongations of various forms. The first correspond to the *Lerneopods* of M. de Blainville, and may be designated as *Lerneopodians*; the second have the genus *Chondracanthus* for their type, and form M. Milne Edwards's family *Chondracanthians*; and the third he denomintes *Lerneocerians*, because the genus *Lerneocera* belongs to that family, and the name recalls one of their principal characters. With regard to the establishment of generic divisions, and the characters of species, he can only, he observes, refer, in the greater number of instances, to the mode of organization in the females; for the males are nearly entirely unknown to him, and, in his descriptions, the females are designated, unless the contrary is specified.

Cnondracanthians.

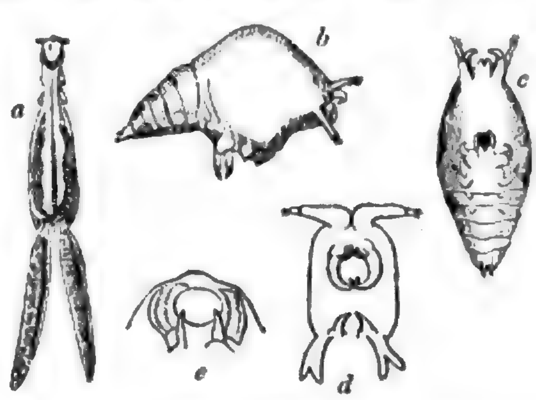
The female *Chondracanthians* fix themselves upon their prey by the aid of small anchor-like jaw-feet, inserted at the anterior extremity of the head, and under the front. The thoracic appendages do not serve for the same use, and have the form of ordinarily two-oared feet of extreme smallness, or fleshy lobes, free at their extremity, and not prehensile. The head is, in general, tolerably distinct from the thorax, and nearly always carries a pair of antennæ, and two pairs of unciform and anchor-like jaw-feet. On the sides of the mouth may be ordinarily perceived a pair of appendages, which represent the second pair of jaw-feet, and which are sometimes anchor-like, similar to the others, but are often rudimentary. The mouth is sometimes situated very far behind the anterior jaw-feet, and is armed with small appendages representing the mandibles. The number and disposition of the appendages corresponding to the thoracic feet vary; sometimes two pairs only are to be counted, sometimes three, and even four. The oviferous tubes spring from the posterior edge of the body, so that the abdomen is rudimentary, and is only represented by one or two small median tubercles. The male is often found attached under the anus of the female: he is extremely small, and does not resemble her in the least, but differs little from the males of the succeeding family. (M. E.)

Genera.

Selius, *Æthon*, *Clavella*, *Cycnus*, *Tucca*, *Peniculus*, *Lernanthropus*, *Chondracanthus*.

Selius consists but of one species (*Sel. bilobus*), found on the branchiæ of the Dotted Polynōe; nor does *Æthon* comprise more, consisting only of *Æthon quadratus*, found on a *Serranus*, and about a line in length. *Clavella* has two species; *Cl. Hippoglossi*, found on the Holibut, and *Cl. Scari*. *Cycnus* has only one species (*Cyc. gracilis*), found on the branchiæ of a cod-fish; and this is the case with *Tucca*, which has only one (*Tuc. impressus*), found on *Diodon Hystrix*. *Peniculus* has but one (*Pen. Fistula*), found on *Zeus Aper*. *Lernanthropus* consists of two species, separated by M. Milne Edwards into two sections; *Lernanthropus Pupa*, found on a Brazilian *Platax*, and *Lern. paradoxus*, found on the mullets. M. Milne Edwards remarks that *Lernanthropus Musca* (De Bl.), found on a *Diodon* from Manilla, belongs to his first section.

Chondracanthus is separated by M. Milne Edwards into two sections, with subdivisions, and contains seven species:—*Ch. cornutus*, found on several flat-fish (*Pleuronectes*); *Ch. crassicornis*, found on a wrasse; *Ch. Soleæ*, found on soles; *Ch. Triglæ*, found on gurnards; *Ch. Merlucci* (from which the *Ch. Xiphiæ* of Cuvier does not appear to M. Milne Edwards to differ, and to which he thinks *Lernæa radiata* of Müller, found in the buccal cavity of *Coryphæna rupestris*, appears to be very close); *Ch. Zei*; and *Ch. Delarochiana*, the last found upon the thunny.



Chondracanthus cornutus.

a, female magnified after Nordmann; b, male seen in profile and more highly magnified; c, the same seen from below; d, head of the female seen from below; e, mouth still more highly magnified.

Lerneopodians.

In the females of this group the head is formed nearly as in the *Chondracanthians*, that is to say, distinct from the thorax, furnished with a pair of antennæ, and armed with two pairs of anchor-like jaw-feet. But the anterior jaw-feet are less proper for serving these small crustaceans for attaching themselves to their prey, and the thorax, which carries neither feet nor fleshy appendages, similar to those which represent the two first pairs of thoracic members in the preceding division, give origin to a pair of very large brachiform prolongations, which unite together sometimes at their base, sometimes towards their extremity only, and terminate by a horny *bouton*, by the aid of which the parasite strongly adheres to the animal on which it has established its dwelling. These organs of adhesion appear to replace the first pair of thoracic limbs.

The male of only a small number of *Lerneopodians* is known, and where known differs extremely from the female. He has the body divided into two very distinct parts; one anterior, the cephalic, which carries the antennæ, a pair of anterior unciform jaw-feet, the sucker, and, farther back, two pairs of well-developed appendages, which represent the posterior jaw-feet and the arms of the female, but which have the form of stout hands carried on a cylindrical peduncle, and terminated by a small ill-formed pincer. The young undergo the ordinary metamorphoses. (M. E.)

There are six genera:—*Tracheliastes*, *Basanistes*, *Achtheres*, *Brachiella*, *Lerneopoda*, and *Anchorella*.

Thacheliastes has three species, divided into two sections: *Tr. polycolpus*, found on the fins of the chub; *Tr. maculatus*, found on the scales of the bream; and *Tr. Stellifer*, found on the branchial arches or within the mouth of *Silurus Glanis*.

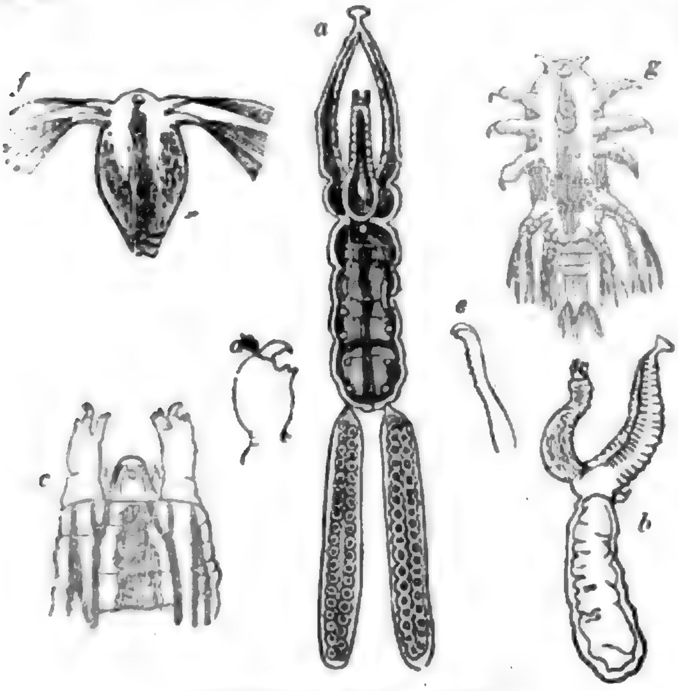
Basanistes comprises two species:—*Bas. Huchonis*, found on the gill-cover of the huchen (*Salmo Hucho*), and *Bas. salmonea*, found on the grayling. M. Milne Edwards states that *Lerneopoda Brongniartii* (De Bl.) belongs to this genus.

Achtheres consists of but one species (*Ach. Percarum*), found on the fins of the river Perch and of the Sandra. Length about two lines.

Brachiella comprises five species, distributed into two sections, with subdivisions:—*Brachiella Thynni* (length about ten lines, of male about half a line), found on the gills of the Thunny; *Br. impudica* (length about four lines, of male about a third of a line), found on the gills of the Haddock (*Gadus Æglefinus*); *Br. bispinosa* (about three lines in length, male unknown), found on the gills of the Sapphirine Gurnard (*Trigla Hirundo*); *Br. rostrata*, closely approaching the preceding, found in the Greenland Seas upon *Pleuronectes pinguis*; and *Br. Lophii*, found on the gills of the Sea-Devil, Toad-fish, or Frog-fish, at Naples.

Lerneopoda consists also of five species, divided into two sections:—*Lerneopoda stellata*, found on the fins of a Sterlet in Norway; *Lern. elongata* (about two inches in length), found fixed to the eye of a Shark in the Polar Seas; *Lern. Carpionis*, nearly approaching the preceding, found on the Salmon in the north of Europe; *Lern. Galei* (length about three lines, male about the same size), found on the fins of a Tope Shark (*Milandre*); and *Lern. obesa* (about two lines in length), found upon *Squalus Acanthias*, the Picked-dog, or Hound-fish.

M. Milne Edwards thinks that *Lern. Dalmanni*, found on *Raia Batis*, the Skate; *Lern. bicandata* (about two lines long), found on the Red Gurnard; and *Lern. salmonea*, belong to this genus. The last species does not seem to M. Milne Edwards to be determinable specifically, and he makes the same remark on the *Lernæa* found by Hermann on the Dace.



Tracheliastes polycolpus. (*M. E.*)

a, female magnified and seen from above; *b*, the same seen on the side and deprived of the oviferous bags; *c*, anterior extremity of the body more highly magnified; *d*, appendage representing the second pair of jaw-feet; *e*, mandible; *f*, larva of the same; *g*, second age of the larva.

Of *Anchorella* five species are recorded, distributed into two sections:—*Anch. emarginata* (about six lines long), found upon the gills of the Wolf-fish (*Anarrhicas Lupus*); *Anch. brevicollis* (about four lines long), found fixed on the anal fin of the Variable Cod-fish (*Gadus callarias*); *Anch. ovalis* (about two lines long), found upon the Red Gurnard; *Anch. rugosa* (about three lines long), found on the Wolf-fish; and *Anch. uncinata*, found on the gills of divers *Gadi*.

M. Milne Edwards is of opinion that *Lerneomyzon pyriformis* and *Lerneomyzon pinnarum* (De Bl.) belong to this genus, as well as *Lernæa adunca* of Strom and *Lernæa anomala* of Abdilgaard.

Lerneocerians.

The female *Lerneocerians*, like the *Chondracanthians*, fix themselves to their prey by the anterior extremity of their body only, and have no brachiform thoracic appendages serving for this purpose, as may be seen in the *Lerneopodians*; but the arming of their mouth is far from having the form which this apparatus offers among the *Chondracanthians*, and the whole head of the parasite is plunged in the tissue of the animal on which it establishes its dwelling, and is there retained by horny prolongations, of varied form, which spring from its posterior or occipital part. In general the head is not very distinct from the thorax, and seems to be completely deprived of antennæ; the mouth is armed with but one pair of jaw-feet, which are simple and unciform. The feet, when they exist, are of extreme smallness, and sometimes no trace of them is to be perceived. The portion of the trunk which is situated behind the point where the oviferous tubes take their origin, and which represents the abdomen, is, in general, much more developed than in the other females of the same order.

The *male* of the *Lerneocerians* is unknown, except in very few species; and, where known, seems as imperfect as that of the *Chondracanthians*; his body is globular, offers no distinct thorax, and does not carry rudiments of feet behind the appendages which represent the jaw-feet. The metamorphoses which the young undergo are analogous to those of the other *Lerneocerians*. (M. E.)

Genera.

Penella, *Lerneonema*, *Lerneocera*, *Lernæa*.

Penella consists of four species, divided into two sections:—*Pen. Sagitta* (about four inches long), found on *Lophius marmoratus*; *Pen filosa*, and *Pen. Blainvillii*, the last found on the Flying-fish, *Exocœtus volitans*; and *Penella Sultana* (about an inch long), found in the mouth of *Carenx Ascensionis*.

Lerneonema, also divided into two sections, comprises three species:—*Lern. Lesuerii* (about two inches long), found in the American Seas upon the Flying-fish; *Lern. monilaris* (about an inch long), found fixed to the sclerotic coats of the eye of the Sprat (*Clupea Sprattus*); and *Lern. abdominalis* (about twenty lines long).

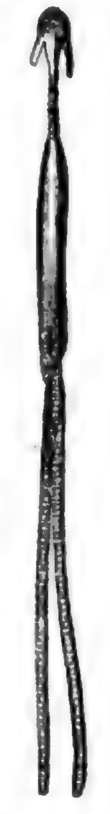
M. Milne Edwards states that *Lerneocera surriraiis* (De Bl.) belongs to this group, and that it much resembles the preceding species, but is distinguished by the brevity of the abdominal portion of the body; and he is of opinion that the genus *Sphyrion* of Cuvier is too imperfectly known to enable him to determine its natural affinities, though it appears probable to M. Milne Edwards that its place is between *Penella* and *Lernæa*.

Lerneocera comprises four species, divided into two sections and subdivisions:—*Lern. cyprinacea* (about eight lines long), found in Sweden on *Cyprinus Carassus*; *Lern. esocina*, *Lern. cruciata*, found in Lake Erie, on *Cichla ænea* (Lesueur); and *Lern. radiata*, found on *Clupea Tyrannus*, United States of America.

M. Milne Edwards thinks that *Lernæa ocularis* of Cuvier belongs to the second section of the genus *Lerneocera*. It is found fixed to the eye of Herrings.

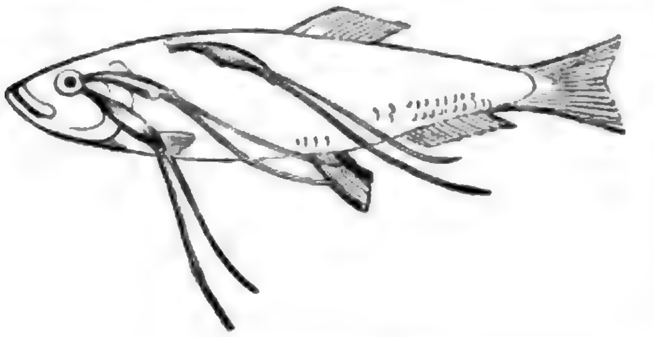
Lernæa consists of two species, each placed in a separate section:—*Lernæa branchialis*, found on the gills of several species of *Gadi*, in the North Sea; and *Lernæa multicornis*.

M. Milne Edwards states that *Lernæa cyclopterina* is distinguished from *Lernæa branchialis* by certain tubercles about the head and neck. He remarks that M. Kroyer has represented it without horns, but he thinks that arose from the mutilation of the animal observed by M. Kroyer. This parasite is found in the Greenland Seas on *Cyclopterus spinosus*.



Lerneonema monilaris, magnified. (M. E.)

The subjoined cut, from Sowerby's 'Miscellany,' shows the external appearance of a sprat infested by these Lerneans. Mr. Sowerby names the parasite *Lernea Sprattæ* (*Lernæa Spratti*). These crustaceans are stated to be luminous at night, and the fishermen say that the shoal is often headed by fish so infested, which they call Lanthorn Sprats.



Lerneans in situ on a Sprat.

Araneiform Crustaceans, or Pychnogonids.

M. Milne Edwards states that it is not without doubt that he has arranged in this place a small group of articulated animals which have been considered by the greater part of zoologists as belonging to the class of *Arachnids*, which seem to him to have more analogy with the *Crustaceans*, for they have no tracheæ nor pulmonary sacs for aerial respiration, and appear to respire oxygen beneath the water only by means of the general surface of the common teguments, as he had already pointed out in many inferior crustaceans.

In the general form of the body these animals approach the **Læmodipoda**, and especially *Cyamus*. Their *head* is elongated, sometimes cylindrical, sometimes conical, and presents at its extremity a trilobated buccal orifice. The *thorax* is constantly divided into four segments, and the *abdomen* is only represented by a small tubular joint fixed to the posterior edge of the last thoracic ring. The head carries no appendages, and the eyes, four in number, are grouped on a small median tubercle, situated on the dorsal surface of the first joint of the thorax. This segment often carries at its extremity a pair of jaw-feet terminated by a well-formed pincer, and sometimes furnished with a palp, which is elongated and composed of many joints. In the male, the number of pairs of feet is equal to that of the joints of the thorax; but in the female there is a pair of pediform supplementary appendages fixed to the first joint of the thorax, bent back under the feet properly so called, much smaller than them, and serving to carry the eggs. The feet are very long, directed outwards, and composed of nine joints, the last of which constitutes a more or less sharp claw.

The digestive tube traverses the body in a straight line, and presents in one of the genera of this family (*Nymphum*) a very remarkable disposition; it gives origin, to the right and left, to a series of prolongations, which are tubular and closed above, which advance very far in the interior of the corresponding feet, and which are the seat of a peristaltic motion. There exists besides a vague circulation. No trace of respiratory organs is perceptible, and the disposition of the organs of generation is not known; it is only to be remarked that in the *Pychnogonons* may be perceived on the second joint of the posterior feet a pore which seems to be the orifice of this last apparatus.

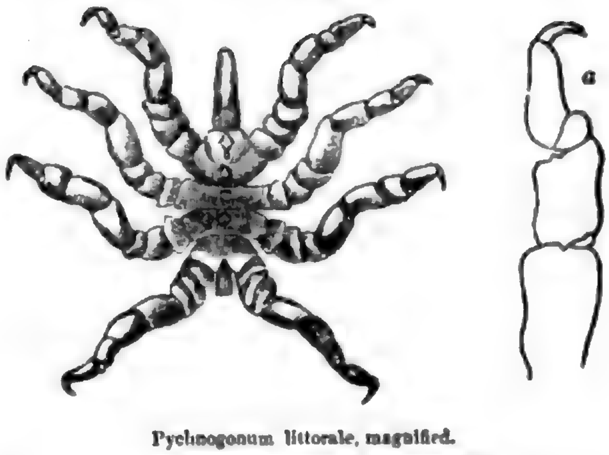
The *Pychnogonids* are all of small proportions, and live in the sea; some are found under stones, others live, it is said, hooked on to fish or other marine animals; but, otherwise, nothing is known relative to their habits.

These animals form a small family, which Dr. Johnston, to whom zoologists are indebted for a good work on this subject, divides into five well-characterised genera. (M.E.)

Genera.

Nymphum, *Pallene*, *Phoxichilidium* (*Orythia*,* Johnston), and *Pychnogonum*.

Our limits will only allow us to illustrate this group, which still requires the close attention of the physiologist and comparative anatomist, by one genus. *Pychnogonum* is distinguished from its congeners by the stoutness of its form, and the size and shortness of its feet, which are strongly contrasted with those of *Nymphum gracile*. Only one species appears to be known, *Pychnogonum littorale*; the accessory feet of the female are very short. Length about four lines. This Araneiform crustacean inhabits our seas and those of France, and is found on Ascidians and various fishes.



Pychnogonum littorale, magnified.
a, foot of the same, more highly magnified.

The reader should refer to the writings of Fabricius, Latreille, Brunnich, Montagu, Lamarck, Leach; and especially of Dr. Johnston, in *Zool. Journ.*, *Miscell. Zool.*, and *Mag of Zool. and Botany*, relative to this highly interesting order of animals.

SUDBURY. [Suffolk.]

SUDERMANIA. [Sweden.]

SUDETES, or SUDETCH MOUNTAINS. [Germany.]

SUDRAS. [Hindustan, p. 231.]

SUET is a variety of the fatty or adipose tissue of animals, accumulated in considerable quantity about the kidneys and the omentum, or caul, of several of the domestic quadrupeds. There are several kinds of it, according to the species of animal from which it is procured, such as that of the hart, the goat, the ox, and the sheep (ovis aries). This last, which is whiter than beef-suet, is officinal. It belongs to the class of saponifiable fats. In the recent state it is white, easily broken, being solid at the ordinary temperature of the air, subdiaphanous, scarcely possessed of odour, or only of a slight peculiar one, due to the hircine, which in the process of saponification evolves a volatile strong-smelling acid (hircinic acid of Chevreul), but possessing a very disagreeable one when putrifying. It readily spoils on exposure to the air, becoming rancid and yellow, but may be restored again to whiteness by chloride of lime or chloride of magnesia. For this purpose, for each hundred parts of suet from two to four parts of chloride of lime are to be dissolved in from four to eight times its weight of water, and to be mixed warm, and as much dilute sulphuric acid is to be added as is necessary to decompose the chloride.

Suet consists of about three-fourths of stearine, with some elaine, and a little hircine, and margarin; the preponderance of stearine renders it the most solid of animal fats. It liquefies with a gentle heat, and the prepared suet of the Pharmacopœia is obtained by melting it over a slow fire, and straining it, to separate the membranous portion. It is used as an ingredient in cerates, plasters, and ointments.

After being melted, it is little prone to spoiling, and by pouring it over various articles, such as potted char, from which it thoroughly excludes the air, it assists greatly in preserving them.

It has been employed also by M. Ludensdorff for preserving the *fleshy fungi*, or mushrooms, by boiling them in it (which thus filled their pores and cells, and penetrated the very substance), and then covering them with a coat of varnish. It does not however always succeed in preserving the colour and form. (See Klotsch, in Hooker's *Botanical Miscellany*, ii., p. 159.)

SUETO'NIUS (Caius Suetonius Tranquillus). The few particulars which are known of the life of Suetonius are derived chiefly from his own writings and from the epistles of his friend the younger Pliny.

The time of his birth is not known, but as he states that he was a young man (adolescens) twenty years after the death of Nero, the time may be fixed approximately. He also says that his father was Suetonius Lenis, a tribune of the thirteenth legion, and of equestrian family (*Oth.*, 10); and that he was in the battle of Bebriacum, in which Otho was defeated by Vitellius. It has been remarked that the name Lenis signifies the same as Tranquillus; but it is said, that instead of 'Lenis,' some manuscripts have 'Laetus.' There are extant several letters from Pliny the

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* Previously used for another crustacean. [Oxystomes

Younge to Suetonius, the son, from one of which (i. 18) it appears that Suetonius was then practising at the bar. In another letter (v. 11) Pliny urges him to publish some works which he had written. At the request of Pliny, Trajan granted Suetonius the Jus trium liberorum, by which he obtained all the privileges of those who actually had children, and was freed from the disabilities imposed by the Lex Julia et Papia Poppaea on those who were married and had no children. He was Magister Epistolarum to Hadrian, but lost his office at the same time that Septitius Clarus, who was Praefectus Praetorii, and many others, were dismissed by Hadrian on the ground, which is very obscurely stated, that they had, without the emperor's permission, conducted themselves towards his wife Sabina with more familiarity than was consistent with the respect due to the Imperial family. (Ael. Spart., *Hadrian*, ii.)

Nothing more is known of Suetonius. His friend Pliny calls him a most upright and learned man, whose character rose in his estimation the better he became acquainted with him. Suetonius was a voluminous writer; a list of his works is given by Suidas (v. Τράγκυλλος) as follows: one book on sports or pastimes among the Greeks; two books on Roman games and shows; one book on the Roman year; one book on the notes or marks used in writing; one book on the 'Respublica' of Cicero; a treatise on proper names, and the forms of garments, shoes, and other articles of dress; a treatise on words of bad omen; two books on Rome and its institutions and manners; a work in eight books on the Cæsars from Julius Cæsar to Domitian, which is still extant; and a Stemma or Genealogy of illustrious Romans. He also wrote a work on kings, in three books; a work entitled 'De Institutione Officiorum;' a work on the Praetors, the eighth book of which is quoted by Priscian; and a work 'De Variis Rebus.'

The only complete work of Suetonius, which is extant, is the 'Lives of the Twelve Cæsars,' now printed in twelve books or parts, but sometimes distributed into eight books, as appears from Suidas, and from several manuscripts. This work comprehends, as already observed, the Cæsars from C. Julius Cæsar, the Dictator, to Domitian, both included. It has been conjectured that the first part of the Life of C. J. Cæsar is wanting, because it begins rather abruptly with the events of his sixteenth year; but the conjecture has nothing else to support it. The biographies of Suetonius are peculiar in their construction. He does not strictly follow the chronological order of events. There is no attempt at rhetorical ornament or effect: the style is characterised by correctness, brevity, precision, perspicuity, and simplicity; there are no idle words. There is an air of impartiality about the whole work, from which a reader derives greater confidence in the truth of the narrative, than from the laboured pictures of Tacitus. Vopiscus calls him a faultless and most impartial writer, and a lover of brevity. The vices of the Cæsars are stated circumstantially and drily, as facts well ascertained. These biographies abound in facts. Indeed their chief merit consists in being a most copious source of materials. Accordingly the style has been appropriately called by La Harpe anecdotical. That Suetonius was a learned Roman, as his friend Pliny states, is apparent from his work. He seems to have had a competent knowledge of the antiquities and the institutions of his country. Like Tacitus, he frequently mentions the legislative enactments (*Senatus Consulta*) which were passed under the Cæsars, but neither is he nor any other Roman historian always a safe guide in such matters. The work of Suetonius does not affect to be historical, yet it comprehends a brief notice of all the public events which happened in the life of each Cæsar. It is a valuable work for the early Imperial times, and if used judiciously with the other authorities, it might form the basis of something like a satisfactory history of this period. He consulted official documents, and availed himself of sources of information which are now entirely lost.

The editions of the 'Lives of the Cæsars' are very numerous. About fifteen editions were printed before 1500. The oldest edition that bears a date is that of Rome, 1470, fol., by G. A. Campani. One of the best editions is that of Isaac Casaubon, fol., Paris, 1610. There is a small useful edition, with a selection of notes, by J. Schild, 8vo., Lugd. Bat., 1647, &c. Among the other editions of Suetonius are those of J. G. Graevius, Oudendorp, and Ernesti. A list of the editions is given in Schweigger's 'Handbuch der Classischen Bibliographie,' Leipzig, 1834. The 'History of the Twelve Cæsars' was translated into English by Philemon Holland, fol., London, 1606. There are four other English translations, the last of which is by A. Thomson, 8vo., London, 1796, 'with annotations and a review of the government and literature of the different periods.' There are French, Dutch, German, Danish, Italian, and Spanish translations. There is also extant a small treatise 'On Distinguished Grammarians' by Suetonius; and another 'On Distinguished Rhetoricians,' consisting at present of only six chapters. Neither of these works is included in the catalogue of Suidas, unless they belonged to the work 'On the Stemma of Illustrious Romans,' which however, if we may judge from its title, would be a different kind of work. It has been conjectured that they formed part of a work 'De Viris Illustribus' (not the work extant under that title, which belongs to Aurelius Victor), on the model of which, Jerome says, in an epistle to Desiderius, that he himself wrote a treatise. There are also extant the following Lives by Suetonius: the Lives of Terence, Juvenal, Persius, Horace, Lucan, and the elder Pliny; the last is only a few lines. These Lives are conjectured to have been part of a larger work 'On Poets.' But the Life of the elder Pliny would not properly belong to such a treatise.

SUETONIUS, PAULLI'NUS. [Atlas; Boadicea; Britannia.]

SUEUR, EUSTACHE LE, one of the most celebrated of the French painters, was born in 1617. His father was an obscure sculptor of Mont Didier. After he had learnt from his father the first rudiments of design, he was placed in the school of Simon Vouet at Paris, then very famous, where he was the fellow-scholar of Le Brun and Mignard. Le Sueur soon surpassed his master, and forsook his manner, and by assiduously studying the antique, and some of Raphael's pictures and the prints after him by Marcantonio, he adopted a style, which for its simplicity and severity contrasted greatly with that of Vouet and the French school of the time, and has at length placed the name of Le Sueur deservedly above that of any of his rivals. He has been termed by his admirers the French Raphael; and although he was far behind that great master in every respect, even in colouring, yet he perhaps approached him more nearly in the style of his heads and draperies, and in the general character of his compositions, than any of his Italian imitators.

The celebrated series of St. Bruno, of twenty-two large pictures, painted on wood, in the cloister of the Carthusians at Paris, was executed by Le Sueur before his thirtieth year; he completed it in three years, and was assisted only by his brother-in-law and scholar Goussé, or Goulai, in the figures, and by Patel in the landscapes. In 1766 these pictures were transferred to canvas, and are now in the Louvre. The character and the composition of several of them are admirable, but in chiaroscuro they are very indifferent, and the colouring is monotonous: they have been engraved by Chauveau and Le Clerc. In his thirty-second year, in 1649, he painted his celebrated picture of St. Paul preaching at Ephesus, and the Gentiles burning their proscribed Books, for the guild of the goldsmiths, to be presented to the cathedral of Notre Dame; it is a grand composition of many figures, the heads and the draperies are much in the style of Raphael; it has been engraved by Stephen Picart and R. U. Massard. Paul Healing the Sick, engraved by Bauzo and the elder Massard, and the Martyrdoms of St. Laurence and of St. Protais, both engraved by Gerard Audran, are also admirable compositions, conspicuous for their simplicity and severity. Le Sueur painted many other celebrated pictures, as, Christ scourged; Christ with Martha and Mary; and the Presentation in the Temple; the histories of St. Martin and St. Benedict; and others—all of which have been engraved by the best French artists. His most extensive works however, by some considered his best, and which occupied him the last nine years of his life, were the mythological paintings of the Hôtel du Châtelet, executed for the President Lambert de Thorigny; they were removed to the Louvre in 1795 The palace was decorated by Le Sueur and Le Brun conjointly; three apartments were painted by Le Sueur, the 'Salon de l'Amour,' the 'Cabinet des Muses,' and 'l'Appartement des Bains.' In these paintings Le Sueur has still adhered to his great model, and has imitated the style of the celebrated series of the story of Cupid and Psyche, painted by Raphael, in the Farnesina at Rome. In the first apartment, he painted several beautiful compositions from the life of

Cupid; in the second, the Muses, and a grand composition of many figures, of Phaeton entreating Apollo to allow him to drive the chariot of the Sun; in the third, Diana surprised by Actæon, Diana detecting the pregnancy of Calisto, and the triumphs of Neptune and of Amphitrite. These works have been universally preferred to those of Le Brun; they have been engraved by Bernard Picart and others, in nineteen plates, and were published in Paris, in 1640, in folio, under the title 'Les Peintures de Charles Le Brun et d'Eustache le Sueur qui sont dans l'Hôtel du Chastelet, cy devant la Maison du Président Lambert, dessinées par Bernard Picart, et gravées tant par lui que par différens Graveurs.'

In 1655 Le Sueur's labours were terminated by his death, in the thirty-eighth year of his age; a constant excitement and an excessive application proved too much for a constitution naturally weak. Though he is reported to have been of a gentle and an amiable disposition, he had many enemies, but the report of his having been poisoned is without foundation; to be disliked by rivals, is the common lot of all men of extraordinary abilities. That Le Sueur's great talents engendered an active jealousy among his rivals, is generally allowed, especially upon the part of Le Brun, who is said to have openly expressed his satisfaction at the death of Le Sueur, saying, that he had been relieved of a great thorn from his foot. It cannot be doubted, that if Le Sueur had lived, the rising influence of Le Brun would have been seriously checked, and the French school of painting have taken ultimately a totally different course from that which it has pursued from the time of Louis XIV. until very late years. Although Le Sueur is now generally acknowledged to have been a great painter, during his lifetime his talents were never duly appreciated, nor was he ever employed on any public work; and though he was greatly superior to his more successful rivals, he would certainly have been a much greater painter had he had equal advantages with them. He never left Paris, he married very young, and being very badly paid for his works, he never had the means of travelling, or improving his taste by visiting Italy and studying the great works of its famous schools, or he would otherwise most probably have ranked with the greatest masters of Florence or of Rome. The defects of his style are, a deficiency in a thorough mastery of the naked figure, a feeble chiaroscuro, and a heavy and monotonous tone of colouring; some of his figures also want life, and appear to want purpose; in composition however, in character, and in the casting of draperies, he has seldom been surpassed; qualities foremost among the properties requisite to constitute a great painter.

When the Royal Academy of the Fine Arts was established in Paris, in 1648, Le Sueur was appointed one of the twelve antients or professors; he had been previously elected a member of the Academy of St. Luke at Rome. His style had no influence upon the arts in Paris; his only scholars were his three brothers, Pierre, Philippe, and Antoine Le Sueur, Le Fevre, and Nicolas Colombel. His own portrait, painted by himself, has been engraved by C. N. Cochin. In Landon's 'Ouvres de Le Sueur' there are 110 prints from his works.

(Felibien, *Entretiens sur les Vies et sur les Ouvrages des plus excellens Peintres*, &c.; D'Argenville, *Abrégé de la Vie des plus fameux Peintres*; Réveil and Duchesne, *Musée de Peinture et de Sculpture*.)

SUEZ, ISTHMUS OF, connects Africa with Asia, and separates the Mediterranean from the Red Sea. Its extent from north to south a little exceeds seventy-two miles. The most northern recess of the harbour of Suez, on the Red Sea, is hardly a mile south of 30° N. lat., and the village of Tyneh, on the Mediterranean, near the arm of the Nile, which in antient times was called the Pelusiac, and which at present is blocked up with sand, is only about two miles north of 31° N. lat. The advantages which would accrue to the commercial intercourse between Europe and the southern and eastern countries of Asia, from a canal navigable for large vessels being made across this isthmus, are obvious, and it has been attempted several times. There certainly once existed a canal on the isthmus, for numerous traces of it still appear in several places; it did not however unite the two seas, but only the Red Sea with the river Nile. This canal was commenced when Egypt was an independent kingdom, under Necho, nearly 2500 years ago, and was completed by Darius. (Herod, ii. 157.) When the French, under Bonaparte, had got possession of the country, they intended to give another direction to the commerce of Europe with India, by making a canal fit for large vessels across the isthmus; and accordingly they examined, with great care, the whole country between the two seas. A few years ago the idea was started of connecting the two seas by a railroad, and a company was formed in England for that purpose, but little or no progress seems to have been made in the execution of this scheme. The country does not present invincible obstacles to such an enterprise, as the following description, which is founded on the labours of the French engineers, clearly shows:—

The whole tract, from Suez to Tyneh, is uninhabited, and, in its present state, is uninhabitable. Drinkable water occurs only in one or two places, but as water has lately been found, by boring at the base of the mountains which lie to the west of the isthmus, and at no great distance from it, this inconvenience could be remedied by a short aqueduct from the wells to the line. It is very improbable that a canal could be made, owing to the want of water. The Red Sea is nearly thirty-three feet higher than the Mediterranean, and a canal would require locks; but the water of the whole isthmus would not be sufficient to feed one lock for a single day. A railway however could certainly be executed, as there is not one eminence along the whole line which deserves the name of a hill. The surface, in general, consists of sandstone, which in many places, by disintegration, has been converted into sand. The surface is not a level plain, but is interrupted by some considerable depressions, and these are covered with salt swamps or salt lakes. A depression of a somewhat different kind extends across the isthmus from Suez to Tyneh, not in a straight line, but diverging first to the west, and afterwards returning to the east, until it again reaches the straight line. In the southern part of this depression the canal of Necho had been made, and the French executed their levellings in the deepest part of it. By this levelling i was discovered that the depression, in nearly its whole extent, is lower than the level of the Red Sea. It is only the most southern extremity, between the arsenal in the harbour of Suez and the caravan-road leading from Cairo to Suez, a distance of 4½ English miles, which is higher than the level of the Red Sea at spring-tides, and in no part more than seven feet, though generally much less. The canal of Necho may easily be traced through this higher ground, and even where the country sinks below the level of the Red Sea such traces may be discovered as far as 30° 10′ N. lat., where they are lost in the deeper depression, which is filled by lakes, called the Bitter Lakes, from the taste of their waters. Up to these lakes the direction of the depression is due north, or nearly so, but the lakes themselves turn to the north-west, and extend to 30° 30′ N. lat. without interruption. The surface of the southern parts of the lakes is about 35 English feet below the level of the Red Sea, but in the northern parts a point was found which was 64 English feet below it. Not far from the northern extremity of the Bitter Lakes are the ruins of a temple of Serapis. The site of those ruins is less than two French feet below the Red Sea. At a short distance to the north of these ruins is another depression, containing a small lake called Temsah, which is dry during the greater part of the year, but filled with water when the inundations of the Nile have attained their greatest height. The water of the river reaches the lake by a depression in the stony ground, which bears the name of El Wadi. It is very narrow near the lake, but widens in proceeding westward to nearly a quarter of a mile, until, in approaching the small lake called Berket-el-Serigeh, it reaches the inhabited parts of the delta, and is nearly half a mile wide. Throughout this depression, which in some parts is nearly twenty French feet below the level of the Red Sea, the canal of Necho had been led, as appears from the numerous traces which still exist. In proceeding northward of Lake Temsah, and at no great distance from them, are some salt-marshes called Karâsh, which occupy a space of a few miles in length from north to south. West of these marshes the stony ground in some places was above the level of the Red Sea, and in others sinks some feet below it. Between the salt-marshes and the lake of Bellah is a similar stony country, of about the same elevation. The last-mentioned lake may be considered as the most southern branch of Lake Menzaleh, being united to it by low ground and marshes, which during the inundations of the Nile are covered with water. East of these two lakes is a stony uneven tract, the surface of which never attains the elevation of the Red Sea, and this tract extends to 31° N. lat., where it joins the plain of Pelusium, which is nearly thirty feet below the spring-tides of the Red Sea, and about three feet above the level of the Mediterranean. The plain is a dead flat, with a sandy arid soil, almost entirely destitute of vegetation, and in many parts covered with a thin layer of salt. When the water attains its greatest height in the Nile, it is almost entirely inundated. At the eastern extremity of the plain is the small village of Tyneh, and about a mile to the south-west of it are a few ruins, which are supposed to be those of the antient town of Pelusium. But no traces of the bed of that arm of the Nile, the Pelusiac, the name of which was derived from that town, can be discovered in any part of the plain. The country which extends to the west of the line described is covered with horizontal strata of sandstone, and presents few inequalities, except towards the south, where, at the distance of about four miles from it, and south of 30° 20′, are the extremities of the ridges which lie between Cairo and Suez, and bear the names of Jebel Amed Taber, Jebel Ueybe, and Jebel Autad: an elevated hill, probably connected with Jebel Ueybe, occurs at a short distance from the western margin of the Bitter Lakes, and is the highest point of the isthmus. The country which lies to the east of the line is stony as far south as the south end of the Lake of Bellah on the north, and as far north as the caravan-road from Cairo to Suez on the south, but that part of the country which intervenes between these two points is entirely covered with sand.

SUEZ, a town situated at the head of the westernmost of the two arms or 'gulfs' in which the Red Sea terminates, is in 29° 57′ 30″ N. lat., 32° 31° 33″ E. long., and 62½ geographical miles east from Cairo. Suez is situated on an angle of land between the broad head of the gulf, the shore of which here runs nearly from east to west, and the narrow arm which runs up northward from the eastern corner of the gulf. It is poorly walled on three sides, being open to the sea on the north-east, where is the harbour and a good quay. Within the walls are many open places, and several khans built around large courts. The houses are in general poorly built. There is a bazaar, or street of shops, tolerably furnished with goods from Cairo. The inhabitants are about 1200 Moslems and 150 Christians of the Greek church. The importance of Suez however arises from its position rather than its population, which can never be great. The transit of the productions and merchandise of the east from the Red Sea to the Nile has always made this an important station, and caused the existence of a city in the vicinity, though Suez itself as a town cannot be traced to an earlier origin than the early part of the sixteenth century. The concourse of pilgrims who annually embark here for Mecca has also rendered necessary a town at this station. The present arrangements for making it the point of communication between Europe and India, by means of steam-navigation on the Red Sea, may probably give an impulse to its prosperity and enlarge its population; but from the want of fresh water, and of every kind of verdure and cultivation, it can never become more than a place of passage, which both the traveller and the inhabitant will hasten to leave as soon as possible.

(Robinson's *Biblical Researches in Palestine;* Niebuhr's *Reisebeschreibung;* Burckhardt's *Travels in Syria, &c.*)

SUFFERANCE. [Tenant.]

SUFFICIENT REASON. (Mathematics and Physics.) The principle which is connected with these words might be, and frequently is, called the *want* of sufficient reason; and even this term may appear inaccurate, for it should be the want of *any possible amount* of reason. Since however all that takes place must have a sufficient reason (whether we know it or not) for its happening, and everything which is asserted must be capable, if true, of being shown to have a sufficient reason, there is no objection to our using the words 'want of sufficient reason' in the sense of absolute want of reason, in all matters connected with the exact sciences. If A be equal to B, there must not only be reason, but reason enough for it; anything short of reason enough is no reason at all, and anything short of proof enough is no proof at all.

The use of the word reason in the statement of this principle may itself be fairly objected to. We are in the habit of speaking of mathematical consequences in the same manner as of those to which the notion of cause and effect applies. When one proposition is made to subserve the proof of another, we call the first one of the reasons of the second, just as we should say that the reason of a flood was the preceding heavy rain. But this mode of speaking must be objectionable if the word reason be used in the same sense in both places. For, first, we are at liberty to deny the effect on denying that cause: if the rain had not fallen, the flood would not have taken place. But when we say that one mathematical proposition is the reason of another, in which position do we stand if we make an hypothetical denial of the first? Simply in that of persons who assert a contradiction of terms, and try to make rational consequences. Thus, the equality of the angles at the base of an isosceles triangle is one of the reasons (so called) why the tangent of a circle is at right angles to the radius; rationally, the first is one of the simpler propositions, the necessity of which, when seen, helps us to see the necessity of the second and more complicated one. But the necessity of the first is not previous to that of the second, except in the order of our perceptions, when we follow Euclid. Suppose we were to ask, if the angles at the base of the isosceles triangle had not been equal, what effect would that circumstance have had upon the position of the tangent of a circle? We might as well inquire, what would our geometry have been if two straight lines had been capable of inclosing a space? We remember a book of arithmetic in which it was gravely asked, by way of exercise for the student, 'If 6 had been the third part of 12, what would the quarter of 18 have been?' a question which can only be paralleled by 'If a thing were both to exist and not to exist at one and the same moment, how many other non-existences would therefore become existences?'

Secondly, the term reason, in the sense of previous cause, is wrong as applied to mathematical propositions, because when any one is made to prove the second, it generally happens that the second, when granted, may be made to prove the first. Thus [Right Angle] of the two propositions, 'all right angles are equal,' and 'two lines which coincide between two points, coincide beyond them,' one must be assumed, and the other will then follow: but either may be the one assumed; the other will follow. Now it is absurd to say that of two things each is the previous cause of the other. The whole of this confusion may be remedied by any one who will remember that one proposition is not the cause of another, but it is our perception of the one which is made the instrument of bringing about our perception of the other. The constitution of our faculties is the previous cause of the necessity of mathematical propositions, but not of one before another, though in arriving at the perception of this necessity our cognizance of the necessity of one is made the previous cause of that of the necessity of another. To say that B is the consequence of A, is only to say that our knowledge of the truth of B is the consequence of our knowledge of that of A.

Taking care to use the word reason in the sense just alluded to, we assume that whatever is necessary has a possibility of being shown to be necessary, and that whatever is true has a possibility of being shown to be true. If this be a legitimate assumption, it then follows that whatever it is impossible to show to be true, must be false. But can there be such a thing as a proposition of which there shall be seen not its falsehood, but the impossibility of demonstrating its truth? Can there arise a case in which we shall be so completely cognizant of all that may possibly be said for or against an assertion, as to affirm a necessary incapability of demonstration of one side or the other? Such cases are universally admitted by mathematicians to exist; and the final assertion which is made on the known impossibility of proving a contradiction, is said to be made on the principle of the *want of sufficient reason*. But this very dangerous weapon is never put into the hands of a beginner, in mathematics at least. And when we call it a dangerous weapon, we do not deny its utility, but we only state what is well known to every mathematical teacher, that a student who is allowed to proceed one step by this principle will soon ask permission to make it the universal solvent of difficulties, and will be quite ready to urge that a proposition *cannot be shown to be false*, in preference to seeking for or following the demonstration that it *is true*. A beginner can easily admit a sound use of this principle, but can hardly distinguish it from the thousand inaccurate applications which his ignorance will make, if it be left in his own hands.

But we can imagine we hear it said that this principle, though sometimes employed in pure physics, is never introduced into mathematical reasoning except *after direct demonstration*, in order to confirm the mind of the learner by making him see how difficult it would have been to imagine the possibility of any contradiction being successfully maintained against the proposition *just proved*. We believe indeed that this principle is seldom employed, and always without necessity, so that we could wish its use were entirely abandoned. But we can show that a tacit appeal to it is sometimes made; and this is the worst possible mode of employing it. If the principle be dangerous, and liable to be unsoundly used, it should be most carefully stated when it is used. Whenever we see a proposition assumed, not as an express postulate, but in a definition for instance, or as a self-evident truth, we may trace the operation of this principle on our minds. For instance, take the proposition which is, if there be such a thing in any one proposition, a digest of all the methods of mathematics, namely, that if the same operations be performed on equal magnitudes, the resulting magnitudes are equal. Try to imagine this not true, and want of sufficient reason interferes to prevent success. *What can make a difference?* In this question the principle claims to be applied.

Now, first, in examining the definitions of Euclid, we find an assertion of theorems which we can hardly suppose that Euclid overlooked, though it is very possible that the impossibility of imagining otherwise may have been his guide. For instance, the assertion of the equality of the two parts into which a diameter divides a circle, following immediately upon the definition of a circle; and the definition of equal solids as those which are contained by the same number of plane figures equal each to each. These and such little matters have been, or may be, corrected; but we will now point out a use of the principle which exists in our elementary works of the present day in an unacknowledged form.

In proving the celebrated proposition of Albert Girard relative to the dependence of the area of a spherical triangle upon the sum of its angles, it is assumed that two spherical triangles which have their sides and angles equal, each to each, are equal in area. Now it is easily shown [SYMMETRY] that there may be two such triangles of which it is impossible to make one coincide with the other, nor is any process ever given for dividing each into parts, so that the parts of one may be capable of coinciding with those of the other. Let the angular points of one be placed upon the angular points of the other (which is always possible), and the triangles will not coincide: in common language, they will *bulge* in different directions. When the triangles are so placed, and the common chords drawn, there is no difficulty in seeing that if ever a want of sufficient reason can be granted upon perception, it is for there being any inequality of the areas of the two triangles. And the equality of these areas is accordingly assumed: for instance, in the proposition above alluded to, a pair of unsymmetrically equal triangles always occurs, except when the given triangle is isosceles. Here again the appeal to this principle may be avoided; for it is easy to make the given triangles into the sum or difference of isosceles triangles, in which each of one set is capable of being actually applied to one of the other.

Leaving the subject of pure mathematics, let us now consider the application of this principle in physics. We have observed [STATICS] that the line of separation between pure mathematics and the more exact parts of mathematical physics is very slight indeed: this means as to the clearness and fewness of the first principles, and the rigour of the demonstrations. If we cut the link which ties the sciences of statics and dynamics to the properties of the matter which actually exists around us, we may go farther, and say that we have not only pure sciences, but pure sciences in which the principle of the want of sufficient reason is strictly applicable, because it is our own selves who have, by express hypothesis, excluded sufficient reason. In propositions of pure mathematics, we have seen that we cannot invent or deny for any hypothetical purpose; *is* and *must be*, *is not* and *cannot be*, are synonymes, in all the truths which these sciences teach. But the properties of matter which are not also those of space, are not, in our conceptions, necessary: we can imagine them other than they are, without any contradiction of ideas. We shall now proceed to consider the point mentioned in STATICS, namely, the character of the axioms of that science. Are they 'self-evidently true,' and 'not to be learnt from without, but from within?' We will not here inquire whether the first must be the second, not being sufficiently clear as to what is meant by knowledge 'from without' and knowledge 'from within' to enter upon any such investigation. It will do for our purpose to take knowledge 'from within' to be a phrase descriptive of such truths as that two straight lines cannot inclose a space, and knowledge 'from without' another phrase indicating such truths as are found, say in the facts of political history or geography. Let us separate from the rest one axiom of statics, say 'equal weights at the ends of equal arms of a horizontal straight lever balance one another.' First, 'equal weights' is a synonyme for equal and parallel pressures. We have no objection to placing the idea of pressure on the same footing as that of a straight line, for be the name we give the former conception what it may, it is probable that those powers of communication with the external world which are certainly necessary to the development, at least, of the former, are not less necessary to that of the latter. Nor are equal pressures difficult of definition; let them be those which are interchangeable, so that either may be put in the place of the other. The rest of the terms of the axiom are geometrical, and to balance each other is to produce no motion,—motion, independently of producing causes, being, we think, as much an idea of geometry as any other. Let A and B be the two ends of the lever (a rigid bar without weight), and C its middle point, which is the pivot; that is to say, the middle point cannot move, the only possible motion of the lever being revolution, in the plane of the pressures, about that middle point. On these hypotheses, we may certainly say that the axiom is self-evident, for want of sufficient reason, that is, of a possibility of sufficient reason for anything in contradiction of it. We have, before the pressures are applied, no cause of motion, by hypothesis: we are to conceive a lever which, if it move at all, does so by reason of the pressures. We have made these pressures equal, and applied them symmetrically: there is then, and can be, no reason why one should predominate, which does not hold as much of the other. In the very notion of equality of pressures there is interchangeability; that is, each may be substituted for the other without alteration of effect. Suppose then the left-hand pressure to predominate: it will do so if the pressures be interchanged. But after the interchange, the same reasons which made the left hand predominate will make the right hand predominate: or both ends will move in the direction of the pressures, which is impossible.

We believe the preceding to be as legitimate a use as can be made of the sufficient-reason principle: but before statics can be established on axioms, there is another of them required, which we have never been able to satisfy ourselves comes 'from within.' It must be assumed that the pressure on the pivot is equal to the sum of the pressures on the ends, whatever the length of the arms may be: this we believe *we learn* from existing matter in quite a different sense from that in which we speak when we say that we learn the conception of pressure or of a straight line from our communication with the external world by our senses: to us it more resembles the assertion that the sea is salt, or that a horse has four legs. It certainly does not arise from the sufficient-reason principle; for there is a reason why difference of pressures on the pivots may arise in levers which only differ in the arms, namely, that very difference of the arms. In fact, there is a presumption against the truth of the proposition *à priori*, derived from a principle the frequent and usual truth of which may as well be called knowledge 'from within' as the conception of pressure or of a straight line: this principle is, 'differences generally make differences, but not necessarily.' The beginner in geometry has this in his mind when he feels that he has learnt something in finding out that the sum of the angles of a triangle is always the same, whatever the triangle may be: he would have expected it to be otherwise. Triangles of different sides have generally different areas, different perpendiculars, different inscribed and circumscribed circles, and different angles: why not different sums of angles? In truth it is a constant and latent assumption throughout the exact sciences that 'differences are to be supposed to make differences, except where the contrary is proved.' And the assumption that the pressure on the pivot of a lever is independent of the arms, is either in defiance of this general principle, or a result of experience.

Thinking then that the sciences of pure mechanics can be founded upon few and incontrovertible postulates, in such a manner as to entitle them to the name of pure sciences, or some other which shall mark the real distinction between them and the other sciences of matter, we cannot yet be of opinion that their postulates are all derived from their own evidence, or obtainable from the sufficient-reason principle. There are however many points connected with this part of them which are difficult of exposition for want of acknowledged terms.

SUFFIX, a term lately employed in mathematical language to denote the indices which are written under letters, as in a_0, a_1, a_2, a_3, &c. Though these signs have been so long used, we never saw a distinctive name given to them before the publication of Professor Hall's Differential Calculus.

SUFFOLK, a maritime county of England, on the east coast. It is bounded on the north by the county of Norfolk, from which it is in almost every part separated by the rivers Little Ouse, Waveney, and Yare; on the east by the German Ocean; on the south by the county of Essex, from which it is in almost every part separated by the river Stour; and on the west by Cambridgeshire, from which it is, for a short distance, separated by the river Lark, a feeder of the Great Ouse. The general form of the county approximates to that of a crescent, of which the whole of the concave side is conterminous with the county of Norfolk. The approximation to the crescent shape would be greater but for the elongation of the south-western part about Haverhill, where the boundary forms an acute angle, and for a second projecting portion near Newmarket. The greatest length is from north-east to south-west, from Southtown, a suburb of Great Yarmouth, to the neighbourhood of Haverhill, 68 miles; the greatest breadth, nearly at right angles to the length, is from the bank of the Little Ouse, in the north-west corner of the county, to Landguard Fort, opposite Harwich, 52 miles. The area of the county is estimated at 1515 square miles, or, taking the aggregate of the parochial surveys, 918,760 acres; the population, at the different enumerations, from 1801 to 1841, was as follows:—1801, 210,431; 1811, 234,211, increase 11 per cent.; 1821, 270,542, increase 15 per cent.; 1831, 296,317, increase 9 per cent.; 1841, 315,129, increase 6·3 per cent. The census of 1831 (which we retain to facilitate comparison with other counties, in which we have employed it) gave 196 inhabitants to a square mile. This county is in size the twelfth of English counties, being smaller than Cumberland, but larger than Sussex; in amount of population (1831) it was the seventeenth, its place being below Cornwall, but above Sussex; and in density of population the twenty-third, falling short of Monmouthshire, but exceeding Hampshire in this respect. There are two county-towns. Ipswich is 63 miles in a direct line north-east of the General Post-office, London, or 70 miles by the mail-road through Romford, Chelmsford, Witham, and Colchester; Bury St. Edmunds is 62 miles in a direct line, north-east by north, from the same point, or 76 by the mail-road through Bishop's Stortford and Newmarket. The county is included between 51° 55′ and 52° 38′ N. lat., and 22′ and 1° 46′ E. long.

Surface; Coast-Line; Geology.—The surface of this county is gently undulating, except just along the north-western and some parts of the north-eastern border, where the land subsides into a marshy flat, secured from overflow only by embanking the course of the rivers. There are also some marshes bordering the rivers in the south-eastern part, but none of these are of any extent. There is not an eminence in the county worthy of notice. The highest ground, as determined by the course of the waters, forms a ridge of crescent-like shape, corresponding with that of the county, through the centre of which it extends. It may be indicated by a line drawn from the neighbourhood of Lowestoffe in the north-east, between Bungay and Halesworth, to the neighbourhood of Debenham; and from thence to the western border of the county, passing between Stowmarket and Ixworth, between Bury and Lavenham, and between Newmarket and Clare. The waters which flow northward from this line fall into the Waveney or the Ouse; while those which flow southward join the Stour, the Orwell, the Deben, or other streams flowing into the German Ocean.

The coast has a tolerably regular outline, convex to the sea. The bays are shallow, and the headlands have little prominence. The maps notice three bays: Hollesley Bay, between the point at Bowdsey, near the mouth of the Deben and Orford Ness; Aldeburgh or Aldborough Bay, between Orford Ness and the headland near the village of Thorpe; and Southwold or Sole Bay, between Thorpe Point and Easton Ness, north of Southwold. This last has some historical interest as the scene of a severe but indecisive conflict between the Dutch and English fleets (A.D 1672). The headlands are the point on which Landguard Fort is placed, at the entrance of the æstuary of the Orwell and the Stour, opposite Harwich; the point at Bowdsey; Orford Ness, near Orford; the point near Thorpe; Easton Ness; and Lowestoffe Ness, the most easterly point in Great Britain. The harbours are the æstuaries of the rivers Stour and Orwell, Deben, Butley or Alde, Blyth and Yare, and the artificial cut through lake Lothing into the Waveney. The æstuary of the Stour and the Orwell is for the most part lined with marshes, which however do not in any part extend more than a quarter of a mile inland from the banks of those rivers, except just above Landguard Fort.

The sea-shore from Landguard Fort is lined for about two miles with sand-hills, and from thence for two miles, nearly to the æstuary of the Deben, by low cliffs of crag upon blue clay. Beyond the æstuary of the Deben (which is skirted by a narrow line of marsh-land) cliffs of similar formation to those just mentioned recommence, and extend nearly three miles to the point at Bowdsey. The shore of Hollesley Bay, from the point at Bowdsey to Orford Ness, eight miles, is low, lined as far as the æstuary of the Butley or Alde with marshes, and north of that æstuary by beach or shingle, which continues to line Aldeburgh Bay, as far as the town of Aldeburgh, four miles, and separates from the sea the marshes formed by the Alde, which has the lower part of its course parallel to the coast-line, and very near it. From Aldeburgh the coast continues to be low for seven miles, and then rises into cliffs, near Dunwich, of rounded shingle and sand. These cliffs extend about two miles to Dunwich, where the low shore recommences, and extends four miles to Southwold. From Southwold, with two or three short intervals, in which the shore is low, a line of cliffs, consisting for the most part of sand or chalk rubble covering gravel and red loam, extends eighteen or nineteen miles to the mouth of the Yare, where the coast of the county terminates. The whole length of the coast may be estimated at above fifty miles.

The greater part of the county is covered by diluvial beds. The exceptions are the crag and London clay district of the south-east, and the chalk district of the north-west. The crag and London clay district may be considered as bounded by a line drawn from Orford by Woodbridge and Ipswich to the banks of the Stour, between Sudbury and Nayland. The chalk is all found to the north-west of a line drawn from Euston, near Thetford, to Bury St. Edmunds, and from thence west by south to the border of the county. The chalk does not wholly occupy this district, but rises from beneath the diluvial beds, or from beneath the fens which occupy the north-western extremity of the county. These diluvial beds vary in their character. In the centre of the county, between a line drawn through Sudbury, Lavenham, Stow-Market, and Diss (in Norfolk), on the west, and another line drawn through Ipswich, Debenham, and Harleston (in Norfolk), on the east, they consist of beds of clay, with fragments of chalk. Eastward of this, beds of loam, with fragments of chalk, extend nearly to the shore, along which they are, in many parts, covered with sand, or gravel, or shingle, or chalk rubble. A similar loam is found bordering the clay on the west side for some distance, and extending south-west of Bury St. Edmunds to the very border of the county. Beyond this, on the north-west, are found beds of sand, with or without flint gravel.

The crag formation consists chiefly of thin layers of quartzose sand and comminuted shells, resting sometimes on chalk, sometimes on the London clay. Crag is a local name for gravel. Close examination has led to the subdivision of this deposit into the red crag and the coralline crag, the former being uppermost when the two are found together. The red crag is at once distinguishable from the coralline by the deep red ferruginous or ochreous colour of its sands and fossils. The fossil testacea found in the crag, amounting to upwards of 400 species, are some of them common to both divisions; others are peculiar to one division, and characteristic of it. These fossils bear a general analogy to testaceous animals now existing in the northern seas, between lat. 50° and 60°; but whether any are identical with those now found in the adjacent (German) ocean is matter of dispute. Lyell refers the crag formations to the Older Pliocene period. The thickness of the crag is no known: it has been penetrated 50 feet near Orford without reaching the bottom.

It is probable that the London clay occupies the whole district which we have assigned to it and the crag; and that the latter covers it in that part of the district which lies north-east of the Orwell. That part of the district which lies between the Orwell and the Stour is for the most part occupied by the London clay alone.

The chalk of the north-western side of the county does not rise into high hills; the formation appears to extend under the diluvial beds which occupy the centre of the county. (Conybeare and Phillips's *Outlines of the Geology of England and Wales;* Lyell's *Elements of Geology.*)

Suffolk produces scarcely any minerals of value. Clay and shell-marl from the crag formation have been dug for manures.

Hydrograpny and Communications.—The Waveney and the Little Ouse, border rivers, which separate this county from Norfolk, and receive the drainage of the northern part, are described elsewhere [NORFOLK, vol. xvi., p. 258-9]: where also the navigable cut from the sea, through lake Lothing, is described, though it belongs to Suffolk. The tributaries of the Waveney are all small. The longest, which rises about two miles east of the village of Mendlesham, and flows by the borough of Eye into the Waveney at Hoxne, is only 10 or 12 miles long. In that part of the county which is adjacent to the lower part of the course of the Waveney are several small sheets of water, as Oulton Broad and lake Lothing, through which the navigable cut passes, and which, together, are above two miles long from east to west; Breydon Water, above three miles long, just below the junction of the Waveney and the Yare, on the border of the county; Fritton decoy, a winding sheet above two miles long; and Flixton decoy, which is much smaller. None of these pieces of water have much breadth, except Breydon, and that, in its widest part, is not a mile across.

The Little Ouse receives only one stream which requires notice. It rises near Bradfield St. Clare, about five miles south-east of Bury St. Edmunds, and flows by Ixworth and Euston park into the Little Ouse above Thetford. Its length may be estimated at 16 or 18 miles. The river Lark, a tributary of the Greater Ouse, rises at Lawshall, five or six miles south of Bury St. Edmunds, flows northward to that town, where it receives a little stream called the Linnet, and then flows north-west, by Mildenhall, to the border of the county, which it skirts for a few miles, and then enters Cambridgeshire, where it joins the Greater Ouse. Its whole length may be estimated at about 30 miles. It is navigable from Bury, and serves to convey produce from that town and neighbourhood to the river Ouse and the port of Lynn.

Of the streams which drain the southern part of the county, the Stour is the most important. It divides Suffolk from Essex, and is described elsewhere. [ESSEX, vol. x., p. 17.] The Stour receives many tributaries: a stream 10 miles long from the neighbourhood of the village of Wickham Brook, and another rather longer from the village of Reed, join it near Long Melford, a little above Sudbury; and the Bret, 23 miles long, from Thorpe Green, near the village of Thorpe Morieux, flows first south-east and then south by Lavenham and Hadleigh into the Stour near Stratford, on the road between Colchester and Ipswich. None of these tributaries are navigable.

The Orwell, or Gipping, as it is called in the upper part of its course, is formed by the junction of several streams, which unite just by Stow-Market, and flows south-east by Needham-Market to Ipswich. Below that town it expands into an æstuary of considerable width, which unites at Harwich with the æstuary of the Stour. It is the æstuary alone which bears the name of Orwell. The course of this river to Ipswich is above 20 miles, for more than half of which (viz. from Stow-Market) it is navigable: the æstuary is 10 or 12 miles long, and for the greater part of that distance more than half a mile wide at high-water. Sea-borne vessels of considerable burden get up to Ipswich. Ipswich, antiently written Gypeswic, Gippeswic, Gipeswich, and Ypeswich, obviously includes in its name the same element as the name Gipping.

The Deben rises near Debenham, and flows about 20 miles in a winding course to Woodbridge, below which it becomes an æstuary 9 or 10 miles long, and from a quarter to half a mile wide, navigable for sea-borne vessels of considerable burden.

The Alde rises near the village of Brundish, and runs 11 miles south-east to its junction with the Ore, which rises near Framlingham, and has an eastward course of about 12 miles. From the junction the united stream, which is sometimes called Ore, sometimes Alde, flows about 15 miles into the sea. The course of this part of the river (which is, for the greater part of its length, an æstuary) is remarkable: about eight miles below the junction of the Alde and the Ore, near the town of Aldeburgh, it approaches within 200 yards of the sea; and then turning suddenly, has the rest of its course nearly parallel to the shore, from which it is separated by a long, narrow, marshy peninsula. The principal feeder of the Alde is the Butley, a small river, the lower part of which becomes a tolerably wide æstuary, opening into the æstuary of the Alde just before it joins the sea. The Alde is navigable to Snape Bridge, near the head of the tideway. The part below the junction of the Butley is sometimes called Butley.

The Blyth rises near Laxfield, and flows eastward 16 miles by the neighbourhood of Halesworth, from which town it receives a small feeder, into the sea near Southwold: it is navigable up to Halesworth, eight or nine miles.

There are no canals, but some of the smaller rivers have been made navigable.

The Norwich and Ipswich mail-road enters the county at Stratford Bridge over the Stour, between Colchester and Ipswich, and runs to Ipswich, and from thence northward by Stoke and Scole Bridge over the Waveney into the county of Norfolk. It is remarkable that this road does not pass through a single market-town between Ipswich and Norwich, a distance of 43 miles, though passing through a fertile and cultivated country. The Yarmouth mail-road branches from the Norwich road at Ipswich, and runs through Woodbridge, Saxmundham, and Lowestoffe. A second Yarmouth road branching from this at Blythburg, between Saxmundham and Lowestoffe, passes through Beccles, and rejoins the mail-road just before entering Yarmouth. The Norwich and Newmarket mail-road enters the county at Newmarket, runs eastward to Bury St. Edmunds, and then northward to Thetford in Norfolk. The distance to Norwich is lessened by following the road which leads from Newmarket to Thetford through Barton Mills. Another road to Norwich enters the county at Sudbury, and runs by Long Melford to Bury, and from thence by Ixworth and Botesdale to the Norwich and Ipswich mail-road at Scole. A road from Bury leads by Stow-Market and Needham-Market to Ipswich. The roads in all parts of the county are excellent.

The Eastern Counties Railway will cross the county in nearly the same direction as the Norwich and Ipswich mail-road, and not far from it. It runs for the most part on the east or right side of the road, at a distance varying from a quarter of a mile to four miles.

Agriculture.—The county of Suffolk is peculiarly interesting in an agricultural point of view; and, with the adjoining counties of Norfolk and Essex, it forms one of the best cultivated districts in the southern part of Great Britain.

The climate is much drier than that of the more western counties of England; but also colder in spring, when the north-easterly winds prevail. The only inconvenience arising from this is the occasional freezing of the turnips, when left on the ground; but the beneficial effects of a sharp dry air on the land, which has been ploughed up before winter, fully compensate for the occasional loss of turnips and the slow progress of early feed. The soil, although varying extremely, may be divided into three or four distinct kinds. A very rich loam, chiefly alluvial, is found in a small portion of the southern part of the county, between the Orwell and the Stour, both of which rivers form æstuaries at their junction with the sea at Harwich. This loam is not so compact as clay, nor so loose as sand, but contains a great proportion of organic matter, or whatever else constitutes a very fertile soil. Of this kind of soil it is supposed, in the Report made to the Board of Agriculture, that there may be about 46,000 acres. The next class consists of heavier loams, varying in every degree, but in general resting on an impervious soil of marl or clay, and in most situations requiring the assistance of drains to carry off superfluous water. This soil is found in the whole of the centre of the county, from the Stour to the borders of Norfolk, and is computed at 450,000 acres, being nearly half the surface of the whole county. Between the strong loam and the sea is a strip running from the north bank of the river Orwell to Yarmouth, diminishing in breadth as it stretches northward, and consisting chiefly of sand of various qualities, incumbent on a subsoil of crag, which is a loose rocky substance, composed of sand, gravel, and broken shells, partly consolidated into a kind of stone. Some of this sand is poor, and scarcely worth cultivating; but a great part of it is enriched by organic matter intimately mixed with it: this is excellent for roots, especially carrots, and bears very fine barley. In the portions which lie low, and which have at some time or other been covered with water, a very rich mud has been deposited, and has produced as rich a soil as may be desired. These rich portions however are few in comparison to the whole tract, which altogether contains about 150,000 acres. There is another tract of sand of a much inferior quality on the western extremity of the county, extending from Bury St. Edmunds to Thetford, with some better lands interspersed. This lies chiefly on a chalk bottom, and is scarcely thought worth cultivating. Where it has been improved, so as to become productive, it has been done at a very considerable expense in draining, trenching, and marling. There may be in this district about 100,000 acres of this poor sand, with 10,000 of a better quality. The last class consists of the fen-lands, which, when properly drained, become valuable; but in their natural state, soaked in water, they are of little value. The extent of fen is estimated at 30,000 acres.

The system of tillage is very uniform throughout the county. The greater part of the land is under the plough. There is now scarcely such a thing to be seen as a common field: a complete bar was formerly opposed to any improved mode of cultivation by the absurd rules and restrictions as to cropping which were established in consequence of the joint and several rights over the land, which no longer exist since the common fields have been divided and enclosed. The practice of ploughing the stubble immediately after harvest, and giving it the full benefit of the alternations of rain and frost which mark the variable climate of Great Britain and Ireland, is adopted on all kinds of soils. Wherever turnips can be profitably raised, and safely fed off with sheep, they form the basis of all rotations. Where the land is too strong and adhesive for turnips, and where sheep would do harm by their treading, and where the carts and horses would do equal damage in taking them off, a fallow is substituted: this however is not the old fallow preparatory to a crop of wheat, but it is the *long fallow*, in which the land is exposed to the influence of two winters. Barley and clover are sown in the spring of the second year, to be succeeded by wheat and beans. This long fallow has been mentioned before. [ESSEX, *Agriculture*.] We shall only observe that it was suggested by the failure of the turnips when it was attempted to sow them on very strong soils. To prevent the land being overrun with weeds, the natural concomitant of a failing crop, it was ploughed in summer and again in autumn; and as the sowing of wheat without any manure, and out of course, was not approved of, it was left to come in for barley with the lighter lands which had borne turnips. Much to the surprise of those who first adopted this plan, almost from necessity, they found that their barley was more abundant and of a better quality after the long fallow, *without manure*, than upon those fields which had borne turnips, and on which sheep had been folded. Nothing was lost therefore but the value of the turnips when fed off, which in many years is trifling. The clover ley being manured in the succeeding autumn, a good crop of wheat might be depended upon. Thus three valuable crops were reaped in four years, barley, clover, and wheat; and, where the land was in good heart, a crop of beans could be obtained, without risk, either after the clover or after the wheat, usually the latter, before another fallow, giving four crops in five years. We are not aware that this mode of cropping stiff clay-lands is adopted in any part of England, except the three counties of Essex, Suffolk, and Norfolk, and perhaps in a part of Cambridgeshire adjoining these counties; but all the practical farmers who have adopted it have found their advantage in continuing the long fallow on stubborn clays.

On turnip land the four-course shift, as it is called, is universal, with some deviation as to the recurrence of clover every fourth year, a portion of the land being laid down with grass-seeds or Italian rye-grass, or planted with beans or peas, according to the nature of the soil. The simple Norfolk rotation is however on the whole the most profitable, and by means of deep ploughing, which is but partially introduced, clover is found to succeed for a considerable period every fourth year. When any deficiency appears, recourse must be had to some substitute, so as to defer it to every sixth or eighth year. The subsoil plough is of great assistance in securing a crop of clover.

There is no part of England where the implements of husbandry are more perfect than in Suffolk, or where new implements are tried with more readiness and with less prejudice. This is owing in a great measure to the very excellent manufacturers of agricultural implements who live in the county. The competition among these men, many of whom possess great capital, tends to the detection of every defect, and ingenuity is stretched to make improvements both on the form and the durability of implements.

The ploughs almost universally used, whether with or without wheels, are of cast-iron, except the beam and the stilts; each part admits of separate renewal at a moderate expense, being cast on one pattern and attached with nuts and screws. The wheel-ploughs are preferred by the ploughmen, because they require less attention and are easier to hold; for a boy can hold a wheel-plough who would make but sorry work with the best swing-plough. The question of comparative draft, which is at this moment in dispute between the Royal Agricultural Society and the Highland Society of Scotland, it would be presumptuous to decide; but perhaps it will be found that in some cases wheels are convenient and save labour both to man and horse, while in others a good swing-plough in the hand of a skilful ploughman will plough a greater variety of land in a more complete manner, without any distress to the horses.

It would be superfluous to enumerate all the different improved instruments which are in use in a large Suffolk farm: it would comprise a complete catalogue of scufflers, scarifiers, rollers, and harrows, which assist the plough in preparing the land; of drilling-machines to deposit the seed; of threshing machines, winnowers, hummellers, &c. to prepare the grain for the market; of machines for cutting roots or straw, or bruising oil-cake for cattle, or bones for manuring the land. Nowhere is so great a variety of farm-machines used for saving labour.

Many of the farm-buildings which have been erected of late years are not only commodious, but splendid. On the older farms there may be some deficiency, but the habitations of the farmers in general are such as many squires of the last century would not have disdained to live in; many in fact are old mansions. The barns are not so large or so numerous as they used to be before the mode of stacking corn out of doors was so generally adopted. Where a threshing-machine is erected, a single floor is sufficient for a large farm; and if the bays will hold one stack at a time, there is stowage enough for corn. The yards, on the other hand, are much increased and better arranged; where there is not sufficient shelter by walls and sheds, this is supplied by what are called *halm-walls*. [HARVEST.] The stubble (*halm*) which has been raked off the land after harvest, is stacked in the farm-yard in such a manner as to enclose a space, leaving an opening only sufficient to admit a loaded waggon. A small square is thus enclosed, and the cattle are sheltered from cold winds. The wall is made ten or twelve feet high, and ten or twelve feet wide at the bottom. This great width is necessary to resist high winds and the rubbing of the cattle. The top is roughly thatched. When, by the rubbing of the cattle and the decay of the stubble, the wall becomes loose and unsteady, it is taken down, and spread over the farm-yard as litter, and a new wall built. These halm-walls last several years. Nowhere are stacks of corn more neatly built than in Suffolk. As many as are intended to be kept for any length of time are built on frames, called *staddles*, supported by stone or iron pillars about eighteen inches from the ground, with flat caps over the pillars to prevent the access of rats and mice. The sides of the stacks are cut smooth by a sharp knife, such as is used for cutting trusses of hay, and thus the depredations of birds are prevented, and nothing is lost. When barley is stacked, which is generally on the ground in a dry spot, it is protected by a slight coat of thatch all round down to the ground. This is fixed by means of rods and pins, and protects the outer layer of barley. It is thus not only preserved from birds, but also from the effects of the weather, and the sample has none of those discoloured grains which deteriorate the value, but is equally clear and bright with the interior of the stack, if the barley has not been hurt in the field.

The practice of dibbling corn by hand is adopted, as far as the number of hands permit; but on a large farm it is too slow an operation; the drill is therefore generally used, which will in one day sow ten acres of land. Machines for dibbling have been invented, and no less than four patents have been obtained lately for such inventions [Sowing Machines], but they have not yet been sufficiently tested by experience to be generally adopted.

Suffolk has but one breed of cattle which is peculiar to it. It is a polled breed, of which the cows are in great repute, and justly so. It is supposed that this breed has some relation to the Galloway and Aberdeen polled breeds; but this is mere conjecture. The cows are usually of a light red, sometimes spotted with white, of moderate size, and excellent milkers. The oxen have not been much attended to, as most of the bull-calves are fatted for the butchers or sent towards Essex and London for that purpose. Their aptitude to fatten has seldom been noticed; but the Suffolk cows, when barren, fatten well. A Suffolk cow has been known to give 30 quarts of milk per day, and of a good quality, for a considerable time after calving; but this is, no doubt, an extraordinary instance. Twenty quarts per day for three months is by no means uncommon, and sixteen may be considered as an average. This will give seven pints of butter, twenty ounces to the pint, per week—no bad produce.

The Suffolk farm-horses are noted for their docility, steadiness, and unwearied perseverance against a dead pull. In former days it was not unusual in fairs and markets to hook the traces of a horse to a ring in a post fixed into the ground. If the horse pulled till he went down on his knees, he was staunch; but if he ever refused his utmost exertions, he was despised. No better mode could be invented to spoil a good horse. The truly-bred Suffolk horses are active in their walk, which is their best pace. It is not easy for a man to keep pace with a Suffolk horse walking along the road. They step out well, and some of them can go at the rate of three miles an hour drawing a plough, and to this is owing the quantity of land usually ploughed in one day in the lighter lands of Suffolk and Norfolk. The usual mode is, as in Scotland, in two yokings, resting two or three hours between, in summer. The defect of the Suffolk horses, if it be any for a farm-horse, is to have rather coarse heads and very wide hips. Some of them are exceptions, and show fine proportions; and many a Suffolk mare has been put to a thorough-bred horse, and produced very fine foals for the carriage or the chase. But those who would try this cross should be very careful to select mares with fine heads, good shoulders, and not a falling croup. In spite of all precautions, the old points will come out, and occasionally spoil a very promising foal, even at the third or fourth generation.

Suffolk pigs are perhaps, on the whole, the most profitable breed in England. They are well-shaped, short-legged, mostly white, with short upright ears, and the porkers of this breed are excellent. It may be distinguished from the Essex breed by being better covered with hair, and from the Norfolk by having smaller ears set more nearly together. It is difficult to trace the crosses of so prolific an animal as a pig; but while the Essex have evidently much Neapolitan blood, the Suffolk seem to have more Chinese. Both crosses being excellent, it is useless to dispute the pre-eminence. The Suffolk pig is not so delicate in constitution as the Essex, and is therefore decidedly the best poor man's pig.

Suffolk has no indigenous breed of sheep; the Southdown and a cross of this breed with the Leicester and Cotswold are very common. The cross between the Southdown and Norfolk is increasing in reputation. The horns of the Norfolk sheep and his rambling propensities have been changed, and a quiet polled breed is the result. They are well shaped; and the mutton, if old enough, is excellent. They are getting more and more into favour.

The principal fairs in Suffolk are as follows:—Aldborough, Mar. 1, May 3; Beccles, Mond. in Whits. week; Bildestone, Ash Wed., Ascension-day; Botesdale, Holy Thursd., three weeks after Michaelmas-day; Boxford, Easter Mond., Dec. 21; Brandon, Feb. 14, June 11, Nov. 11; Bungay, May 14, Sept. 25; Bures, Holy Thurs.; Bury St. Edmunds, Tues. in Easter week and two following days, Oct. 2, Dec. 1; Clare, Tuesd. in Easter week, July 26; Debenham, June 24, Aug. 8; Eye, May 30; Framlingham, Whit Mond., Oct. 10; Hadleigh, Tuesd. in Whits. week, Oct. 10; Halesworth, Oct. 29; Haverhill, May 12, Aug. 26; Ipswich, May 4, Aug. 26, Sept. 25; Ixworth, May 13; Lavenham, Oct. 10, for four days; Shrove Tuesd.; Long-Melford, Tuesd. in Whits. week; Lowestoffe, May 12, Oct. 10; Mendlesham, Oct. 2; Mildenhall, Oct. 11; Nayland, Wed. after Oct. 2; Needham-Market, Oct. 28 and two following days; Orford, Mids.-day, Shrove Tuesd.; Saxmundham, Tuesd. in Whits. week, 1st Thurs. in Oct.; Southwold, Trin. Mond.; Stowmarket, July 10, Aug. 12, Oct. 1; Sudbury, Mar. 12, July 10, Sept. 4; Woodbridge, April 6.

Divisions, Towns, &c.—The county is divided into twenty-one hundreds, as follows, besides the liberty of the borough of Ipswich:—

Hundred.	Situation.	Area. Acres.	Population 1831.
Babergh	SW.	69,630	28,355
Blackbourn	N.	67,370	14,267
Blything	E.	83,850	24,177
Bosmere & Claydon	Central	50,640	12,956
Carlford	do.	22,550	6,348
Colneis	SE.	17,460	4,369
Cosford	Central	30,640	10,489
Hartismere	N.	55,240	17,871
Hoxne	N.	53,070	16,399
Ipswich (liberty)	SE.	7,020	20,201
Lackford	NW.	79,800	13,109
Loes	Central	33,290	13,544
Mutford and Lothingland	NE.	32,960	15,255
Plomesgate	E.	41,390	11,285
Risbridge	W.	59,160	16,215
Samford	S.	44,620	11,242
Stow	Central	22,010	8,308
Thedwestry	do.	39,620	10,103
Thingoe	do.	34,890	17,458
Thredling	do.	7,630	3,328
Wangford	N.	35,540	13,605
Wilford	SE.	30,180	7,433
Total . .		918,760	296,317

The boroughs of Bury St. Edmunds and Sudbury are included respectively in Thingoe and Babergh hundreds.

Suffolk contains the two county and borough towns of Ipswich and Bury St. Edmunds, the parliamentary boroughs of Sudbury and Eye, the ex-parliamentary boroughs of Aldborough or Aldeburgh, Dunwich, and Orford; and the market-towns of Beccles, Bungay, Clare, Debenham, Framlingham, Hadleigh, Halesworth, Lavenham, Lowestoffe, Mildenhall, Newmarket, Saxmundham, Southwold, Stowmarket, and Woodbridge; with the ex-market towns of Bildesdon, Blythburgh, Botesdale, Brandon, Haverhill, Ixworth, Mendlesham, Needham-Market, Neyland, and Woolpit. Some of these are noticed elsewhere. [Aldborough; Beccles; Bungay; Bury St. Edmunds; Ipswich; Newmarket.] Of the rest we subjoin an account.

Sudbury, in the Saxon chronicle Suth-beri, is in the hundred of Babergh, on the road from London to Bury, between 15 and 16 miles south of the latter town. It was antiently a place of consequence, and appears to have obtained its name to distinguish it from Bury St. Edmunds. It was one of the seats of the woollen manufacture established in England by the Flemings, in the reign of Edward III. Simon of Sudbury, archbishop of Canterbury, who was beheaded by Wat Tyler's mob, A.D. 1381, founded here a college of priests, whose yearly revenues at the dissolution were 122*l.* 18*s.* 3*d.* There were also a house of Dominican or Black Friars, a Benedictine cell to Westminster Abbey, and an hospital. The head and body of archbishop Simon of Sudbury were buried in the church of St. Gregory in the town; and the head, dried by art, was shown as late as the middle of the last century. The borough comprehends three parishes, All Saints, St. Gregory, and St. Peter; these have an area of 1250 acres; the population in 1831, was 4677. By the Boundary Act, the township of Ballingdon-cum-Brunden (in Hinckford hundred, in Essex, area 730 acres, population in 1831, 823), and some small extra-parochial districts, were added to the borough for parliamentary purposes, and the limits thus extended have been adopted for municipal purposes also. The town consists of several streets, irregularly laid out; it is a neat, clean, well-built place; the streets are paved, with flagged footpaths, and lighted. Many new houses have been built, and the town has been altogether much improved of late years. Ballingdon has one street, forming a suburb of Sudbury, with which it is united by a bridge over the Stour. The three churches are mostly of perpendicular character: they have all been fine churches but some of the tracery and other parts have been much mutilated. The Independents have a meeting-house. The town-hall is a modern building, and there is a neat theatre. The principal manufacture is of silk. By means of the Stour, which is navigable nearly up to the town for barges, trade is carried on in coals, which are imported, and in agricultural produce, which is exported. The navigation however is very bad. The market is on Saturday, and there is beside a corn-market on Thursday; there are two yearly fairs.

According to the census of 1831, 269 men in the borough and 5 men in Ballingdon, together 274 men, were employed in manufactures, besides women and children. The living of All Saints is a vicarage, of the clear yearly value of 119*l.*, with a glebe-house; the perpetual curacies of St. Gregory and St. Peter are united; their joint yearly value is 160*l.*, with a glebe-house. They are in the rural deanery and archdeaconry of Sudbury and diocese of Ely. There were in the borough, in 1833, eight day-schools, of all kinds, with 365 children, viz. 232 boys, 117 girls, and 16 children of sex not stated; and two Sunday-schools, with 233 children, viz. 120 boys and 113 girls. Two of the day-schools were national schools, and were attended on Sunday by 382 children, viz. 180 boys and 202 girls. Sudbury was incorporated by charter of Queen Mary, A.D. 1554. By the Municipal Reform Act it has 4 aldermen and 12 councillors, with a commission of the peace. It returns two members to parliament; the number of voters on the register in 1835-6 was 578; in 1839-40, 594.

Archbishop Simon of Sudbury, Gainsborough the painter, and Dr. Enfield, a dissenting minister of considerable note, were born at Sudbury.

Eye is in the hundred of Hartismere, about 20 miles north of Ipswich. It is on a feeder of the Waveney, now a mere rivulet, but probably navigable at a former though very remote period. Small rudders and other tackle belonging to boats are said by Leland (*Collectanea*, vol. iv., edit. 1770, p. 26) to have been dug up from time to time by the monks of Eye, in clearing out the ditches. The town was incorporated by King John, and sent two members to parliament from the time of Elizabeth to the passing of the Reform Act, when it was reduced to one member. There are some slight remains of the castle, belonging to the Malet family, one of whom founded at Eye a small Benedictine priory, whose yearly revenues at the dissolution were 184*l.* 9*s.* 7½*d.* gross, or 161*l.* 2*s.* 3½*d.* clear. There are some remains of the monastic buildings, now used as stables, on the east side of the town. The streets of Eye are irregularly laid out and narrow, and the houses are mean. The church is handsome and spacious, with a fine tower of perpendicular character: there are Baptist and Wesleyan meeting-houses. The area of the borough and parish is 2370 acres; the population, in 1831, was 2313. There is little trade, and no manufacture, except a trifling one of lace. The general market is on Saturday, the corn-market on Tuesday, and there are two yearly fairs. The municipal boundaries are coincident with those of the parish of Eye. Before the passing of the Municipal Reform Act, the municipal authorities had no exclusive jurisdiction; no sessions were held, and the court of record had long gone into disuse; under the Municipal Reform Act the borough has 4 aldermen and 12 councillors, but is not to have a commission of the peace except on petition and grant. By the Boundary Act the adjacent the parishes of Hoxne, Denham, Redlingfield, Occold, Thorndon Braisworth, Yaxley, Thrandiston, Broome, and Oakley were, for parliamentary purposes, added to the borough, which thus includes an extensive rural district, about 20,000 acres, with a population, in 1831, of 7015. The number of voters on the register, in 1835-6, was 278; in 1839-40, 332. The living of Eye is a vicarage, of the clear yearly value of 331*l.*, with a glebe-house, in the rural deanery of Hartismere, archdeaconry of Suffolk, and diocese of Norfolk. There were in the borough and parish, in 1833, two dame-schools, with about 60 children; four other day-schools, with 99 children, 47 boys and 52 girls; and three Sunday-schools, with about 280 children of both sexes. One of the day-schools is partly supported by an endowment and a grant from the corporation.

Dunwich is on the coast, in the hundred of Blything, 28 miles from Ipswich, through Woodbridge and Rendlesham. While East Anglia subsisted as a separate kingdom, Dunwich was a place of importance, and the seat of the first East-Anglian bishopric, which may be considered as the predecessor of that which is now fixed at Norwich. It is called in the Saxon Chronicle Domuce or Domuc, and is variously written in other antient authorities Domoc, Dommoc, and Dommoc-ceaster. Various notices in antient authors show it to have been still a place of importance in the time of the Plantagenets, though it appears to have declined under the rising importance of Southwold and Yarmouth. It was the seat of a considerable herring fishery. It was threatened by the insurgents, who in the rebellion of the younger Henry against his father Henry II. overran the county. In the civil war of John, the townsmen adhered to the king, who had befriended the town, and granted it a charter of incorporation. They lost several vessels, and many men, which they had contributed to the king's naval service in the French wars of Edward I. and III. In the war of the roses, they embraced the Yorkist party; and this, by inducing Henry VII. to incorporate the rival town of Southwold, contributed to the decay of the place. But this decay was mainly owing to the encroachment of the sea, which not only ruined the port, but washed away the greater part of the town. Of seven parish churches which it once contained, one only (All Saints) remains, and that is a mere ruin, in the place of which a new church (St. James's) was built a few years since by subscription. Besides All Saints church there are the remains of a Grey Friars' house, and of the chapel of St. James's hospital: they all contain some portions of good architecture, partly Norman. Dunwich is at present a mere village. The market has been discontinued. There is a yearly fair, and some sprats and herrings are caught and cured. The area of the borough and parish (for these are co-extensive) is 3240 acres. The population in 1831 was 232. The corporation has been maintained chiefly for parliamentary purposes, and, as the borough was disfranchised by the Reform Act, will probably go to decay. It has a revenue of about 150*l.* a-year, and is untouched by the Municipal Reform Act. Sessions are held once a year by the borough magistrates, and an Admiralty Court occasionally. The living of Dunwich is a perpetual curacy, of the clear yearly value of 40*l.*, in the rural deanery of Dunwich, in the archdeaconry of Suffolk, and diocese of Norwich. The only school in the parish in 1833 was a Sunday-school, containing from 30 to 40 children, about half of each sex.

Orford is in Plomesgate hundred, 21 miles from Ipswich through Woodbridge. There was a royal castle here in the time of Henry III., who granted a charter to the town, which was previously a borough by prescription. It is now, like Dunwich, a mere village; the market has been given up; and as the borough was disfranchised by the Reform Act, the corporation, which was kept up for parliamentary purposes, will probably become obsolete. It is untouched by the Municipal Reform Act. It has an income of less than 100*l.*, and its jurisdiction is growing into disuse. The area of the borough and chapelry of Orford, including the adjacent hamlet of Gedgrave, is 2740 acres: the population in 1831 was 1302. The village consists of ill-built houses, irregularly laid out, on the north-east bank of the river Alde or Ore, which is navigable. The chapel, when entire, was a large building: the nave alone is now used, and is separated by a wall at the east end of it from the chancel, which is more antient, and has been allowed to fall to ruin. There are some curious portions in the nave. The ruins of the chancel are of Norman architecture: the piers are much varied, and some of them of singular shape. There is a curious font. Only the keep of the castle remains: it is a polygon of eighteen sides, with walls 90 feet high, and has three square towers in its circuit, which overtop the rest of the building. The architecture is Norman. Not far from the town, on the sea-shore near Orford Ness, are two lighthouses. The chapelry of Orford is in the parish of Sudbourne, and the benefice is united with the rectory of that parish; they are in the rural deanery of Orford, archdeaconry of Suffolk, and diocese of Norwich: their joint clear yearly value is 577*l.*, with a glebe-house. There were in the borough in 1833 ten day-schools of all sorts (chiefly dame-schools) with 252 children; and two Sunday-schools, with 316 children, viz. 146 boys and 170 girls. There is a lending library for the use of the borough and the parish of Sudbourne. Orford gives the title of earl to the Walpole family.

Clare is in Risbridge hundred, 18 miles south-south-west from Bury. The area of the parish is 3410 acres. The population of the parish in 1831 was 1619, from one-third to one-half agricultural. The town is on the north bank of the river Stour. The streets are wide, but not paved or lighted, and the houses generally are of mean appearance. The church, which is in the centre of the town, is a fine large building; it has a handsome octagonal font of perpendicular character, and a brass eagle on a pedestal, with the wings expanded, forming the reading-desk. There are places of worship for Baptists and Independents. On the south side of the town are the vestiges of an old castle; the site may be traced, and it appears to have comprehended an area of about twenty acres. The mound on which the keep stood, and some fragments of the walls of the keep, yet remain. Near the ruins of the castle are the remains of a priory of regular canons of St. Augustin; part of the buildings are occupied as a dwelling, and the chapel is converted into a barn. The lordship of Clare gave name to an illustrious family, and the titles of earl of Clare and duke of Clarence were derived from it. There is a weekly market, and there are two small yearly fairs. The living is a vicarage in the rural deanery of Clare, in the archdeaconry of Sudbury, and diocese of Ely, of the clear yearly value of 195*l.*, with a glebe-house. There were in the parish, in 1833, twelve day-schools of all kinds, with 265 children, viz. 116 boys and 149 girls; and three Sunday-schools, with 310 children, viz. 143 boys and 167 girls.

Debenham is in the hundred of Thredling, 13 miles north of Ipswich, on the river Deben, here a mere brook. The area of the parish is 1920 acres. The population in 1831 was 1629, about half agricultural. From its situation on a declivity, the town is clean, but the houses are generally poor. The church is a handsome edifice, and the market-house is a tolerably good building. There is a place of worship for Independents. The market, which is on Friday, is small. There is one yearly fair. The living is a vicarage, in the rural deanery of Cleydon, the archdeaconry of Suffolk, and the diocese of Norwich, of the clear yearly value of 154*l.*, with a glebe-house. There were in the parish, in 1833, three day-schools, with 133 children, viz. 84 boys and 40 girls; and two Sunday-schools, with 279 children, viz. 80 boys, 67 girls, and 132 children of sex not stated. One of the day-schools has an endowment.

Framlingham is in the hundred of Loes, 18 miles north-north-east of Ipswich. It was probably a place of consequence in the Anglo-Saxon period, and St. Edmund, king of the East Angles, is said to have been besieged here by the Danes, A.D. 870. In the middle ages it was important from its strong castle, granted by Henry I. to Hugh Bigod, and at different times held by the Bigods, the Mowbrays, the Howards, and other illustrious families. Sir Robert Hitcham, having purchased the castle and manor of the Howard family, bequeathed them for pious uses to the master and fellows of Pembroke Hall, Cambridge, by which society they are still possessed. The parish of Framlingham has an area of 4470 acres; the population in 1831 was 2445, about two-fifths agricultural. The town stands near the head of the river Ore, which just to the north of the town expands into a spacious pond or mere. The streets are irregularly laid out, but there is a spacious market-place of triangular form, and the houses are many of them well built and respectable. The streets are lighted with oil. The church is in the middle of the town; it is large and handsome, built of black flint, with a tower 96 feet high, in which is a peal of eight bells. The roof of the nave is of curiously carved oak; and in the church are several monuments of the Howards (among them those of Thomas, second duke of Norfolk, and his son the accomplished earl of Surrey, beheaded by Henry VIII.), and the monuments of the duke of Richmond, natural son of Henry VIII., and of Sir Robert Hitcham. On the north side of the town, adjacent to the mere, are the ruins of the castle. The outer wall is yet standing: its form is irregular, approaching to a circle, and it is strengthened at intervals by square towers, thirteen in number. The wall is 44 feet high and 8 feet thick; the towers rise to the height of 58 feet. The principal gateway is on the south side, opposite the town, and is adorned with the arms of the principal families which have possessed the castle, carved in stone. There are some remains of the outworks. The area comprehended by the walls of the castle is above an acre and a quarter; but the demolition of the interior is so complete, that very little idea can be formed of its arrangement. In the vacant area are, or were lately, an almshouse and a workhouse, built of the materials of the castle. The castle was defended, except where it was protected by the mere, by a double ditch, which still remains. There are in the town an almshouse and a free school founded by Sir Robert Hitcham, a second almshouse founded by Thomas Mills, and places of worship for Unitarians, Independents, and Wesleyans. Some malting is carried on in the town. There is a market on Saturday for corn, and occasionally for cattle; and there are two yearly fairs. The living is a rectory, united with the chapelry of Saxtead, which is in the parish, of the clear yearly value of 1201*l.*, in the gift of Pembroke Hall, Cambridge. It is in the rural deanery of Loose (or Loes), in the archdeaconry of Suffolk, and diocese of Norwich. There were, in 1833, twelve day-schools of all kinds, with 294 scholars, namely, 98 boys, 93 girls, and 103 children of sex not stated; and four Sunday-schools, with 378 scholars, namely, 61 boys, 33 girls, and 284 children of sex not stated. Two of the day-schools have endowments, one bequeathed by Sir Robert Hitcham, the other by Thomas Mills.

Hadleigh is in Cosford hundred, 9 miles west of Ipswich. It is said to have been the burial-place of Guthrum the Dane, to whom Alfred ceded East Anglia; and has some interest as the place of martyrdom of Dr. Rowland Taylor, burned in the persecution under Queen Mary, on what is commonly but improperly called Aldham Common, near the town. (Fox's *Acts and Monuments of the Church*, edit. of 1576, pp. 1445-1456.) A stone with this inscription—

> 'Anno 1555,
> Dr. Taylor, for defending what was god,
> In this place shed his blod '

marks the spot. The parish of Hadleigh has an area of 3440 acres: the population, in 1831, was 3425, less than one-third agricultural. The town consists of one principal street, running from south-south-east to north-north-west, and other smaller ones branching from it; but none of the streets are paved or lighted. The church is large and handsome, with a tower and spire and two south porches. The aisles and clerestory extend along the chancel as well as the nave. The architecture is chiefly of perpendicular date, but some portions are earlier. The monument shown in this church as the monument of the Anglo-Danish king Guthrum is of later date than the ninth century, in which he died. The rectory-house, adjacent to the churchyard, is antient, and in front of it is a brick gateway with two hexangular towers of the same date (about A.D. 1490) as the house. There are meeting-houses for Independents, Baptists, and Wesleyans; and a range of twelve almshouses with a chapel, built by William Pykeham, rector of this parish, who built the rectory-house and gateway. Some weaving is carried on in the town. There is a good corn and general market on Monday, and there are two yearly fairs: the corn-exchange or market-house is a good modern building. Hadleigh was formerly a corporate town, but the charter was surrendered in the time of James II., and never restored. The living is a rectory, in the peculiar jurisdiction of the archbishop of Canterbury, of the clear yearly value of 929*l.*, with a glebe-house. There were in the parish, in 1833, six day-schools, with 132 scholars, viz. 70 boys, 32 girls, and 30 children of sex not stated; four boarding-schools, for which no return was made; two day and Sunday national schools, with 213 children (90 boys and 123 girls) in the week, and 262 children (121 boys and 141 girls) on Sundays; and one Sunday-school, with 210 children, viz. 90 boys and 120 girls. One of the day-schools had three small endowments.

Halesworth is in Blything hundred, 31 miles north-north-east of Ipswich through Woodbridge and Saxmundham. The area of the parish is 1070 acres; the population, in 1831, was 2473, one-fifth agricultural. The town is irregularly laid out: a small stream runs through it, and joins the river Blyth half a mile south-east of the town. The streets are wide, but not paved; and some of the houses are well built. The town is lighted with oil. The church is a handsome Gothic building; and there are places of worship for Baptists and Independents. On the south side of the town is a small theatre. There are some large malthouses, and a considerable trade in malting is carried on. The river Blyth and its branch are made navigable up to the town, and afford facility for the export of agricultural produce, and the import of coal, lime, and general merchandise. There is a corn and general market on Thursday, and there is also a yearly fair. The living is a rectory united with the vicarage of Chediston, in the rural deanery of Dunwich, the archdeaconry of Suffolk, and the diocese of Norfolk, of the joint clear yearly value of 450*l.*, with a glebe-house. There were in the parish, in 1833, an infant-school, with 40 children, chiefly girls supported by voluntary contributions; eleven day-schools, with from 267 to 287 children, viz. 117 boys, 120 girls, and from 30 to 50 children of sex not stated; one day and Sunday national school, with 200 children, an equal number of each sex; and one Sunday-school, with 110 children, viz. 50 boys and 60 girls. There were also an evening-school and a lending library.

Lavenham (colloquially shortened into Lanham) is in the hundred of Babergh, 10 miles south-south-east of Bury. The area of the parish is 2800 acres, and it had a population in 1831 of 2107, about one-third agricultural. It is in a healthy situation on the declivity of a hill, at the foot of which flows the little river Bret. It is irregularly laid out, the houses are mean, and the streets are neither paved nor lighted. The market-place is spacious, and there is a stone cross in the centre. There is a bridewell in the town. Lavenham was formerly the seat of a considerable manufacture of blue woollen cloth, and for the regulation of this trade three guilds or companies were established. The wool-hall of the town was much frequented. This manufacture has long passed away, as well as the manufacture of shalloons and serges which succeeded it, and of hempen cloth, a branch of industry of still later date. A little wool-combing and spinning and a little silk-weaving are still carried on. There is a market, almost disused, on Tuesday, and there are two yearly fairs. Formerly the town was governed by six capital burgesses chosen for life; but the authority of these officers, if not the office itself, has come into disuse. The church is large and handsome; it is 156 feet long, 68 feet wide, and has a steeple 141 feet high. The character of the architecture is perpendicular, the clerestory is lofty, and the tower fine, with bold buttresses. The battlements and some other portions are much enriched. The roof is curiously carved; the windows are numerous, and some of them are still embellished with painted glass; and there are one or two remarkable monuments. There are meeting-houses for Independents and Wesleyans, and there are several almshouses belonging to the town. The living is a rectory, in the rural deanery and archdeaconry of Sudbury, and the diocese of Ely, of the clear yearly value of 658*l.*, with a glebe-house. There were in the parish, in 1833, six day-schools, with 125 children, viz. 72 boys and 53 girls; two day and Sunday national schools, with 150 children (75 boys and 75 girls) in the week, and 140 children (70 boys and 70 girls) on Sunday; and two Sunday-schools, with 148 children, namely, 57 boys and 91 girls. One of the day-schools is an endowed grammar-school; and two other day-schools are partly supported by endowment.

Lowestoffe or Lowestoft, colloquially Laystoff, as it was formerly written by some persons, is in the hundred of Lothingland, 45 miles north-east of Ipswich, on the sea. The parish has an area of 1950 acres; the population in 1831 was 4238, scarcely any part of it agricultural. The town stands on the top of a cliff facing the sea, from which it is separated by a beach, in some parts nearly half a mile wide. It consists of one principal well-paved street, nearly a mile long, running north and south, lined with good modern brick houses, and of some smaller streets opening into this on the west side. The houses on the east side of the High-street have gardens at the back sloping down the face of the cliff towards the sea. Buildings have accumulated at the bottom of the cliff on the beach, where the curing-houses for herrings and a rope-walk are situated. The parish church is a large and handsome church of perpendicular architecture, situated nearly half a mile west of the town. The length of the whole building is 182 feet, the breadth 57 feet, the height 43 feet; it has a tower and spire 120 feet high, 50 feet of which belong to the spire. The windows are large and fine, and the east end of the church has some chequer-work of flint and stone. There are in the church an antient font and a number of monuments, including those of Thomas Scroope, bishop of Dromore, who died here, A.D. 1491, of admirals Sir John Ashby and James Mighells, of Potter, the translator of Æschylus and Sophocles, and of several others. There is a chapel-of-ease in the town; and there are places of worship for Baptists, Independents, and Methodists. There are a town-hall or chamber over the market or 'corn-cross,' a theatre, and near the south end of the town a bathing-house. On the cliff is the upper lighthouse, and on the beach are a battery at the south end of the town, and the lower lighthouse. Off the shore are the North and South roads, sheltered to sea-ward by the Corton and Newcome sands. The upper lighthouse is of brick and stone, with a cylindrical revolving lantern furnished with powerful reflectors; the lower lighthouse is of timber. South of the town is the cut communicating between lake Lothing and the sea, forming part of the line of the Norwich and Lowestoffe navigation. The tide-lock will admit vessels 84 feet long and 21 feet in beam. The principal branch of industry at Lowestoffe is the fishery, which occupies about 200 men. Great quantities of mackerel and soles are caught, and sent to the London and Norwich markets; and a great quantity of herrings are taken and cured. There are rope and twine manufactories. The market is on Wednesday, and there are two yearly fairs. Lowestoffe is also frequented as a bathing-place. The living is a vicarage, in the rural deanery of Lothingland, in the archdeaconry of Suffolk, and the diocese of Norwich, of the clear yearly value of 323*l.*, with a glebe-house. There were in the parish, in 1833, an infant-school, with 100 children of both sexes; fourteen day-schools of all kinds (two of them endowed, and one partly supported by subscription), with 425 children, namely, 186 boys, 123 girls, and 116 young children of sex not stated; and two Sunday-schools, with 205 children, namely, 120 boys and 85 girls. There is a lending library in the parish.

Mildenhall is in the hundred of Lackford, 12 or 13 miles north-west of Bury. The parish is extensive, comprehending a considerable district of fenland, and including, beside the town, several detached hamlets, locally termed 'rows, as Holywell Row, north of the town; Beck Row, north-west; and West Row, west-north-west. The area of the parish is 13,710 acres. The population in 1831 was 3267, about half agricultural. The town stands just on the border of the fen country, which stretches northward into Norfolk, and westward into Cambridgeshire, and is a little to the left of the road from London to Norwich by Newmarket, Barton-Mills, and Thetford. It is irregularly laid out, and the streets are neither paved nor lighted, but the houses are for the most part well-built. The church is large and handsome, with a tower 120 feet high. It has a handsomely carved wooden roof and several monuments. There are meeting-houses for Baptists and for Calvinistic and Wesleyan Methodists. The market, which is on Friday, is well supplied with provisions, especially fish and wild-fowl; and there is a considerable yearly fair. The river Larke, which passes close to the south side of the town, is navigable, and facilitates the export of corn and agricultural produce, in which considerable business is done. The living is a vicarage in the rural deanery of Fordham, in the archdeaconry of Sudbury, in the diocese of Ely, of the clear yearly value of 369*l.* There were in the parish, in 1833, fifteen day-schools, with 330 children, namely, 159 boys and 171 girls; and four Sunday-schools, with 395 children, namely, 196 and 199 girls. One of the day-schools was a national school, with 60 girls, and was partly supported by endowment. The handsome seat of Sir H. E. Bunbury is in the town.

Saxmundham is in the hundred of Plomesgate, 20 miles north-east of Ipswich, on the road to Yarmouth. The area of the parish is 1460 acres; the population in 1831 was 1048, about one-fourth agricultural. The town consists chiefly of one long, narrow, unpaved street, running north and south along the high road, lined with neat, respectable-looking houses. It is in a valley, through which, at the back of the houses, on the east side of the street, runs a small brook, a feeder of the Alde, which it joins about four or five miles south of the town. The church is a neat building just out of the town; and there is a place of worship for Independents. Some business is done in malting and in shipping corn for London from the wharfs on the river Alde. The market is on Thursday, and there are two yearly fairs. The living is a rectory in the rural deanery of Orford, in the archdeaconry of Suffolk, in the diocese of Norwich, of the clear yearly value of 275*l.*, with a glebe-house. There were in the parish, in 1833, six day-schools of all sorts, with 132 children, namely, 51 boys and 81 girls; and three Sunday-schools, with 147 children, namely, 80 boys and 67 girls.

Southwold is in the hundred of Blything, on the coast, 36 miles north-east of Ipswich by Woodbridge and Saxmundham. It was in the middle ages a place of some importance, and the townsmen were engaged in frequent disputes with those of Dunwich, occasioned probably by the commercial rivalry of the two places. In the reign of Henry VII. Southwold was incorporated by act of parliament, and the corporate rights of the townsmen were confirmed by subsequent charters of Henry VII. and his successors. In

1659 the town was nearly consumed by a fire, which destroyed the town-hall, the market-house, the prison; besides granaries, shops, warehouses, above two hundred and thirty houses; beside fishhouses, malthouses, brewhouses, and other outbuildings; and a great quantity of corn, merchandise, fishing-nets, and other tackle. The damage was estimated at more than 40,000*l.*, and above three hundred families were ruined. It is probable that the town has never reached the prosperity which it enjoyed before this calamity. The area of the borough and parish (which are coincident) is 680 acres: the population, in 1831, was 1875, scarcely any part agricultural. The town is on a hill, forming a cliff toward the sea, and sinking on the other side into the marshes through which the river Blyth, and an arm of it called 'the Buss Creek,' flow. By these waters the hill on which the town stands is almost insulated. The only entrance to the town is on the north-west side, by a bridge over the Buss Creek; and the main street is on the road from this bridge to the face of the cliff: it has flagged footpaths, and is lined near the sea with respectable houses; but in other parts the houses are of inferior character. The top and sides of the hill round the town are unenclosed land, chiefly or wholly common; and there are two windmills and a lime-kiln. The church is near the entrance of the town, on the north-west side, and is a large and handsome building of perpendicular architecture, mostly of flint and stone: it is 143½ feet long, and above 56 feet wide. The western tower is about 100 feet high; and there are two low hexagonal towers at each angle of the eastern end of the chancel. There is a highly ornamented porch, of somewhat later date than the church. The interior of the church has been richly ornamented, but has been much defaced: the painted ceiling of the chancel still remains, and the magistrates' pews are adorned with gilding and painting. There are meeting-houses for Baptists, Methodists, and Independents. The town-hall is a modern building, and there is a small gaol. The principal branch of industry is the fishery, which, in 1831, employed one hundred men: there are some salt-works. Red herrings, red sprats, salt, corn, and malt are exported; and coal is imported. The town is frequented in the bathing season by visitors from the adjacent counties. The quay is on the Blyth, above half a mile south-west of the town.

The Municipal Reform Act assigns to the borough four aldermen and twelve councillors: it is not to have a commission of the peace except on petition and grant. The corporation revenue, derived chiefly from common, marsh, and other lands, is about 800*l.* or 900*l.* a year. The living is a perpetual curacy, in the rural deanery of Dunwich, the archdeaconry of Suffolk, and the diocese of Norwich, of the clear yearly value of 60*l.*, with a glebe-house. There were in the parish, in 1833, nine day-schools of all sorts, with from 193 to 213 children, namely, 83 boys, 80 girls, and from 30 to 50 children of sex not stated; and three Sunday-schools, with 316 children, namely, 177 boys and 139 girls. One of the day-schools had an evening class of 10 adults.

Stow-Market is in the hundred of Stow, 12 miles north-west of Ipswich, on the road to Bury, from which it is distant 14 miles east-south-east. The parish has an area of 1240 acres: the population, in 1831, was 2672, about one-sixth agricultural. The town consists of one main street along the Bury and Ipswich road, and of some smaller ones; the streets are for the most part paved, and lined with tolerably good houses; indeed several of the houses are very good, and the town is lighted with gas. The church is spacious and handsome, built of flint and stone: the architecture is partly decorated, partly perpendicular. The tower, which contains a peal of eight bells, is surmounted with a light and elegant wooden spire, the whole being 120 feet high. There are places of worship for Baptists and Independents. There is a small manufacture of rope, twine, and sacking; an iron-foundry; and a great number of malt-houses. Near the town are hop-plantations, brick-yards, and a water-mill. The Gipping has been made navigable up to the town, and a considerable quantity of corn and malt are sent in river-craft down to Ipswich to be shipped there: timber and deals, coals and slate, are brought up from Ipswich for the supply of the neighbourhood. The bank of the river forms an agreeable walk. There is a well-supplied corn, cattle, and general market on Thursday; and there are three yearly fairs. The living is a vicarage united with the adjacent vicarage of Stow-Upland, in the rural deanery of Stow, the archdeaconry of Suffolk, and the diocese of Norwich: their joint clear yearly value is 281*l.*, with a glebe-house. There were in the parish, in 1833, seventeen day-schools, with 199 boys and 188 girls, together 387 children; one day and Sunday national school, with 64 boys and 42 girls, together 106 children; and two Sunday-schools, with 141 boys and 139 girls, together 280 children.

Woodbridge is in the hundred of Loes, on the river Deben, 7 miles east-north-east of Ipswich on the road to Yarmouth. The area of the parish is 1650 acres: the population, in 1831, was 4769, scarcely any part of it agricultural. The town stands on the north-west bank of the river, which, at high-water, is a quarter of a mile wide: it consists of two principal streets (one of them near a mile long), which contain many good houses and are well paved; and of several smaller streets and lanes. The market-place is spacious, and surrounded with well-built houses: in the centre of it is an antient shire or sessions hall, in which quarter-sessions for the division are held: the lower part of the hall is the corn-market. The church is large and handsome, built chiefly of black flint: it has a large square tower, built of flint and stone, 180 feet high: toward the top the flint and stone are so intermingled as to form various devices. In the church are several monuments. There are places of worship for Quakers, Independents, Baptists, and Methodists. There are a custom-house, a small theatre and barracks, and near the town is a bridewell. Woodbridge is a place of considerable trade: it is a port, and the river Deben is navigable for small coasting vessels: the tide flows above the town. Corn, malt, and flour are exported; and coal, timber, and general merchandise imported. There are two good quays on the bank, and formerly small vessels were built in the Limekiln Docks. The market is on Wednesday for corn, cattle, and provisions; and there are two yearly fairs. The living is a perpetual curacy, in the rural deanery of Carlesford, in the archdeaconry of Suffolk, and diocese of Norwich, of the clear yearly value of 500*l.* There were in the parish, in 1833, six dame-schools, with 44 boys and 56 girls, together 100 children; seventeen other day-schools, with 360 boys and 311 girls, together 671 children; one day and Sunday national school, with 218 boys and 104 girls, together 322 children; and four Sunday-schools, with 157 boys and 256 girls, together 413 children. There are a range of almshouses in the town, for the support of which, and for other charitable purposes, Thomas Seckford, master of requests in the reign of Queen Elizabeth, left an estate in Clerkenwell, one of the suburbs of London, the increased value of which estate has rendered the charity very wealthy. Woodbridge had before the Reformation a small priory for canons of St. Augustin adjacent to the church. The yearly revenue at the dissolution was 50*l.* 3*s.* 5¼*d.*

Bildeston, or Bilston, is in Cosford hundred, on a small stream which flows into the Bret, about 14 miles west-north-west from Ipswich. It had formerly a considerable manufacture of blue cloth and blankets; but this branch of trade has long been given up. Some yarn is spun. The market, which was on Wednesday, is disused; but there are two yearly fairs. The area of the parish is 1420 acres: the population, in 1831, was 836, about one-third agricultural. The church is a good building, on a hill west of the village; and there is a Baptist meeting-house.

Blythburgh is in Blything hundred, on the south bank of the Blyth, 30 miles north-east of Ipswich. The area of the parish is 3590 acres: the population in 1831 was 579, almost entirely agricultural. It is a place of great antiquity; and Anna, king of the East Angles, who fell in battle against Penda of Mercia, in the time of the Heptarchy, is said to have been buried here. It was in the middle ages an important fishing and trading town. Sessions for the division were held here, and there was a gaol, of which some portions remained to the middle of the last century. The church has been a very fine building, highly ornamented both within and without: the architecture is of perpendicular character; but the tracery and other parts have been much defaced. The length of it is 127 feet, the width above 54 feet. There are some remains of painted glass in the windows, and there are some monuments, one of which is pointed out, but erroneously, as that of Anna, the East Anglian king, and another as that of his son, who fell in the same battle. There are some remains of a priory for the canons of St. Augustin; this priory was a dependency of the abbey of St. Osyth in Essex; its yearly revenues at the dissolution were 48*l.* 8*s.* 10*d.* There are some remains of another religious house. The suppression of the religious houses, and a great fire in 1676, are supposed to have led to the decay of the town.

Botesdale is in the hundred of Hartismere, 15 miles north-east from Bury, on the road to Norwich by Scole. With the village of Rickingall Inferior, which is in Blackburn hundred, it forms a street of more than a mile long, lined with indifferently built houses. The area of the two parishes is 2050 acres; their joint population in 1831, 1120, nearly half agricultural. The market, formerly held at Botesdale on Thursday, has been discontinued, but there is a yearly fair. The chapel at Botesdale (the parish is only a parochial chapelry) has some good portions of perpendicular architecture. It is dedicated to St. Botolph; and the name of the village is a corruption of St. Botolph's dale. Near the church is the grammar-school, which had, in 1833, above 30 scholars. Near Botesdale is Redgrave Hall, the handsome seat of Admiral Wilson; and in Redgrave church, which is about 2 miles from Botesdale, is a handsome monument to chief-justice Sir John Holt.

Brandon is in the hundred of Lackford, about 17 miles north-north-west of Bury, through Thetford. The area of the parish is 5570 acres; the population in 1831 was 2065, barely one-tenth agricultural. The village consists of three streets along the Mildenhall, Brandon, and Thetford roads, which converge and form one main street leading by a neat stone bridge over the Little Ouse into Norfolk. The houses are for the most part well built. The church is a little out of the village on the south-west, and is a good structure. The market has been discontinued for many years; but there are three yearly fairs. There are extensive rabbit-warrens in the neighbourhood, of which one alone is said to have furnished to the London market 40,000 rabbits yearly. Continuous strata of the finest flint occur in the chalk near the town, and are dug and manufactured into gun-flints, a branch of industry that in 1831 gave employment to 60 men. Considerable trade is carried on in corn, malt, coal, timber, and other goods, favoured by the navigation of the little Ouse or Brandon river, which passes on the north side of the village. The duke of Hamilton and Brandon takes his latter title from this village. There is an endowed free-school.

Haverhill is in Risbridge hundred, about 16 miles south-east of Bury: both village and parish extend into the adjacent hundred of Hinckford, in the county of Essex. The area of the parish is 3320 acres; the population in 1831 was 2025, probably a fourth agricultural. The village consists of one principal street, wide, but lined with poor houses, running from south-east to north-west along the road from Colchester to Cambridge. The church is a large antient building, and there are two dissenting places of worship. There was antiently another church, and half a mile north-west of the town was a castle, of which there are no remains. The market has been for some years discontinued, but there are two yearly fairs. In the year 1831, 173 men were employed in the manufacture of drabbets and Tuscan plat.

Ixworth is in Blackbourn hundred, 7 miles north-east of Bury. The area of the parish is 2320 acres; the population in 1831 was 1061, more than half agricultural. There was antiently a priory for the regular canons of St. Augustin, founded about A.D. 1100; the yearly revenues of which at the dissolution were 280*l.* 9*s.* 5*d.* (or, according to some authorities, 204*l.* 9*s.* 5½*d.*) gross, or 168*l.* 19*s.* 7¾*d.* clear. The village consists of one main street along the road from Bury to Norwich by Scole, and of one or two smaller streets. There are some remains of the priory, near which is the parish church, as mall but antient building. Some Roman remains have been discovered near the village. The market was given up some years since.

Mendlesham is in Hartismere hundred, about 15 miles north-north-west of Ipswich. The parish has an area of 4420 acres: the population in 1831 was 1233, more than two-thirds agricultural. The village consists of mean houses, and the market has long been given up. The church is a handsome building, and there is a Methodist meeting-house. An antient silver crown of sixty ounces weight was found here near the close of the seventeenth century: it was supposed to have belonged to one of the East Anglian kings.

Needham-Market is in Bosmere and Claydon hundred, 8 miles north-west of Ipswich, on the road to Bury. The area of the parish of Barking, in which the place stands, is 8010 acres the population in 1831 was 1884, of which 1466 persons belonged to the hamlet or chapelry of Needham-Market. The village consists of one principal street and of some smaller ones: the houses are neat, and some of them even handsome. The chapel is a mean building, with a wooden belfry; and there are one or two dissenting places of worship. The woollen manufacture, formerly carried on here, has been long extinct; and of late years the market has been given up: a little paper and glue are made. The Gipping, which passes the town, is navigable. There is an endowed grammar-school.

Neyland or Nayland is in the hundred of Babergh, 13 or 14 miles west-south-west of Ipswich. The area of the parish is 1470 acres: the population in 1831 was 1047, about one-third agricultural. The village is in a low situation, on the north bank of the river Stour, over which there is a brick bridge, and is occasionally subject to inundation. There are some good dwelling-houses in the place, and some large flour-mills: a considerable quantity of corn and flour is sent down the Stour to be conveyed to London. There is a yearly fair. The church is a handsome building, and there is a meeting-house for Independents. There is a national school. The market has been given up for some years, and the woollen manufacture, once flourishing, is quite extinct.

Woolpit is in the hundred of Thedwestry, 8 miles east by south of Bury, on the road to Stow-Market and Ipswich. The area of the parish is 2010 acres; the population in 1831 was 880, less than half agricultural. The church is built partly of flint and chalk; it is a handsome building, partly of decorated, partly of perpendicular character. There is a large south porch, much enriched, but the spire is mean. The market has long been given up; but there is a yearly cattle fair, one of the largest in the county, if not in England. A very white brick, of remarkably neat and beautiful appearance, is made near the village.

The following villages may just be noticed. Long Melford is in Babergh hundred, about 2 miles north of Sudbury. It consists of one street, nearly a mile in length, extending along the road from Sudbury to Bury. The church is large, and of perpendicular character, with an extensive building, in chequer-work, of flint and stone at the east end. Melford has some old mansion-houses and an alms-house or hospital. The population in 1831 was 2514, about one-third agricultural. Yoxford, in Blything hundred, is on the Yarmouth road, about 4 miles beyond Saxmundham. It is pleasantly situated, and has a well-built street of modern houses. The population in 1831 was 1149. Hoxne (antiently Eglesdune or Hagilsdun) has some historical interest as the place where St. Edmund was taken and killed by the Danes. It is in the hundred of Hoxne, on the bank of the Waveney, not far from Eye. The population in 1831 was 1243. Fressingfield, in the same hundred, was the birthplace of Archbishop Sancroft, and the place to which he retired after his deprivation. The population in 1831 was 1352. Stradbrook (population in 1831, 1527), in the same hundred, was the birthplace of Robert Grosseteste, bishop of Lincoln. East Bergholt and Stratford St. Mary are both in Samford hundred, near the bank of the Stour, between Colchester and Ipswich. East Bergholt has, from the number of good houses in it, an appearance superior to that of most villages. The church is of perpendicular architecture, and has some curious portions. Stratford is pleasantly situated, and has a handsome church. At Freston, on the bank of the Orwell, in the same hundred, is a quadrangular stone tower, about ten feet by twelve in area, and six stories high, with a polygonal turret at each angle. Its date and purpose are not ascertained. The population of East Bergholt in 1831 was 1360, of Stratford 630, and of Freston 183. Wickham-Market (population in 1831, 1202), in Wilford hundred, between Woodbridge and Saxmundham, is on a hill commanding an extensive prospect. South-Town and Gorleston, in Lothingland hundred, are suburbs of Yarmouth, and are included in its parliamentary boundaries. [YARMOUTH.]

Divisions for Ecclesiastical and Legal Purposes.—Suffolk is partly in the diocese of Norwich: it was formerly wholly included in it; but by the late alterations in the territorial arrangements of the church, the greater part of the archdeaconry of Sudbury, and part of the archdeaconry of Suffolk, have been transferred to the diocese of Ely. The eastern part is in the former diocese, the western part in the latter. The present ecclesiastical division of the county is as follows:—

1. Diocese of Norwich.

Archdeaconry of Suffolk.

Rural Deaneries.	Rect.	Vic.	Perp. Cur.	Chapelries, &c.	Total Cures.
Bosmere	19	4	4	3	30
Carlesford	9	2	6	.	17
Claydon	7	5	.	.	12
Colneys	9	3	.	2	14
Dunwich	20	13	15	1	49
Hartismere (formerly belonging to the archdeaconry of Sudbury)	27	4	2	2	35
Hoxne	11	9	3	3	26
Ipswich	5	.	7	1	13
Loes	11	4	3	1	19
Lothingland	18	6	2	1	27
Orford	10	6	5	.	21
Samford	19	6	2	.	27
Southelmham	6	2	.	.	8
Stow (formerly belonging to the archdeaconry of Sudbury) .	6	5	1	1	13
Waynford, or Wangford .	13	5	3	.	21
Wilford	8	6	2	.	16
	198	80	55	15	348

2. Diocese of Ely.

Archdeaconry of Sudbury.

Rural Deaneries.	Rect.	Vic.	Perp. Cur.	Chapelries, &c.	Total Cures.
Blackburne (formerly included in the archdeaconry of Suffolk)	27	.	7	2	36
Clare	17	.	7	5	29
Fordham*	11	5	.	2	18
Sudbury	35	9	5	2	51
Thedwaster	18	4	.	.	22
Thingo	18	.	.	.	18
	126	18	19	11	174
Total of the county .	324	98	74	26	522

By the union of cures the number of benefices is considerably reduced. Peculiars are not enumerated above. Chapels-of-ease are included in the fourth column. The above enumeration is from Cox's 'Clergy List' for 1842.

The peculiars are, Hadleigh and Monks-Eleigh rectories, and Moulton rectory and vicarage, belonging to Canterbury, and Freckenham rectory and vicarage, belonging to Rochester.

The county is included in the Norfolk circuit. The assizes are held in the spring at Bury St. Edmunds, and in the summer at Ipswich. The judges proceed to these places from Cambridge. Quarter-sessions for their respective divisions are held at Bury, Ipswich, Beccles, and Woodbridge. There are county gaols and houses of correction at Bury and Ipswich: county houses of correction at Woodbridge and Beccles; and borough prisons at Ipswich, Bury, Eye, Sudbury, Aldeburgh, Southwold, and Orford. The county gaol and house of correction at Ipswich was built A.D. 1790, on what was then considered the best plan; but there are several defects in the arrangement, and some additions which have been made are ill adapted to the original plan. The county gaol and house of correction at Bury are in an airy situation, just out of the town, well drained and well ventilated. The house of correction for females is a short distance from the gaol. The general management both of the county gaol and house of correction, and of the house of correction for females, is satisfactory. The houses of correction at Woodbridge and Beccles are ill arranged, and inadequate to that purpose. Of the borough prisons, some are inadequate and inconvenient: those at Orford and Aldeburgh are seldom used; and for the borough of Bury, prisoners are commonly sent to the county prison.

Suffolk is divided into the 'Geldable' portion, in which issues and forfeitures are paid to the king, and the 'Franchises,' in which they go to the lords of the liberties. The Geldable part comprehends the hundreds of Blything, Bosmere and Claydon, Hartismere, Hoxne, Lothingland and Mutford (two half hundreds), Samford, Stow and Wangford. The sessions held at Ipswich and Beccles are for this portion. The franchises or liberties are those of—1. St. Ethelred, including the hundreds of Carlford, Colneis, Loes, Plomesgate, Thredling, and Wilford; 2. St. Edmund, including the hundreds of Babergh, Blackbourn, Cosford, Lackford (including the half-hundred of Exning or Ixning, which is the part of the county nearly surrounded by Cambridgeshire), Risbridge, Thedwestry, and Thingoe; and 3. the Duke of Norfolk, including certain of his manors, for which he returns all writs, and receives all fines and amercements: he has also the right of appointing a coroner. The sessions for the two liberties of St. Ethelred and St. Edmund are held at Woodbridge and Bury respectively. The liberty of St. Edmund returns a grand jury at the assizes distinct from that returned by the rest of the county.

The counties of Norfolk and Suffolk were under one sheriff until the year 1576.

Before the Reform Act Suffolk returned sixteen members to Parliament: two for the county; and two each for the boroughs of Ipswich, Bury, Sudbury, Eye, Orford, Aldeburgh, and Dunwich. Ipswich and Sudbury were open boroughs, but very corrupt; Eye had about 200 voters; none of the others had more than 40 voters. By the Reform Act, the county was formed into two divisions, the Eastern and Western, each returning two members; Dunwich, Orford, and Aldeburgh were entirely disfranchised, and Eye was reduced to one member. Eleven members are therefore now returned from Suffolk, being five less than before the Reform Act.

The Eastern division of the county comprehends the hundreds of Blything, Bosmere and Claydon, Carlford, Colneis, Hoxne, Loes, Lothingland, Mutford, Plomesgate, Samford, Thredling, Wangford, and Wilford. The court of election is held at Ipswich; and the polling-places are Ipswich, Woodbridge, Needham-market, Framlingham, Saxmundham, Beccles, and Halesworth. The Western division comprehends the hundreds of Babergh, Blackbourn, Cosford, Hartismere, Lackford, Risbridge, Stow, Thedwestry, and Thingoe. The court of election is held at Bury; and the polling-stations are Bury, Wickham Brook, Lavenham, Stow-market, Botesdale, Mildenhall, and Hadleigh. A slight addition was made to Sudbury, and a considerable one to Eye.

The constituency is as follows:—

	Voters on the Register. 1835-6.	Voters on the Register. 1839-40.
East Suffolk	6147	6404
West Suffolk.	4952	5091
Ipswich	1418	1619
Bury	654	704
Sudbury	578	594
Eye	278	332

History and Antiquities.—Suffolk appears to have been comprehended with Norfolk in the territories of the Simeni (Σιμενοι) of Ptolemy, called by others the Iceni; or, if we follow Richard of Cirencester, it was in the territory of the Cenomanni, one of the divisions of the great Icenian nation. It was included in the Roman province of Flavia Cæsariensis. There were several British or Roman towns in this county, as the Sitomagus, Cambretonium, and Ad Ansam of Antoninus, and probably the Villa Faustini and Iciani of the same writer; and the Gariannonum of the Notitia Imperii. The river Waveney and its valley appear, in the British and Roman periods, to have been one of the branches of that great æstuary which penetrated so deeply inland on this side of the island, as described elsewhere. [Norfolk, vol. xvi., p. 259.] It is there noticed that the æstuary penetrated at least as far as Bungay: it probably extended higher up, for we have seen that traces of antient navigation have been noticed as far up as Eye, which must have stood either upon a branch of this æstuary, or on some navigable river running into it.

The exact locality of the above-mentioned towns has been the subject of much difference of opinion. It will be well first to notice the direction in which Roman or other antient roads have been traced. A road from Londinium (London) and Camalodunum (Colchester) entered the county at Stratford, between Colchester and Ipswich, and leaving Ipswich on the right, ran in a northward direction to the Ipswich and Norwich road near Needham-market, and then coincided with the present line of that road till it quits the county to enter Norfolk at Scole inn.

Another line, 'the Peddar-way,' or 'Ieddar-way,' entering the county from Norfolk, across the Little Ouse near Rushford, runs southward to the neighbourhood of Ixworth, where Roman remains have been discovered. We believe this road has not been traced beyond Ixworth, or indeed scarcely so far; but the direction of existing lanes and roads, and the names of places, lead us to conjecture that it ran by Norton-Street, Woolpit, Fen-Street, and Low-Street to the neighbourhood of Bildeston, and possibly joined the road already described at the passage of the Stour at Stratford. 'The Ikenield-way,' or 'Ickneild-Street,' crossed the county in a south-west direction from the Little Ouse to the neighbourhood of Newmarket. Another line, nearly parallel to this, appears to have run from the source of the Waveney and

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* The rural deanery of Fordham is partly in Cambridgeshire, but the statement given above includes only that part which is in Suffolk.

Little Ouse (perhaps then the narrowest part of the æstuary, which, according to some traditions, insulated Norfolk) by Ixworth to the neighbourhood of Bury. Both these roads must have crossed the line of the Peddar-way, the latter near Ixworth, the former a few miles north of it. Besides these, there was in the eastern part of the county a road which entered the county across the æstuary of the Waveney at Bungay, and ran by Halesworth to Dunwich: it is known as Stone-Street; and a road crossed the south-western corner of the county by Haverhill, part of a line from Camalodunum (Colchester) to Camboritum (Cambridge). These are, we believe, all the known roads; but the remarkable peculiarities in the direction of existing roads and lanes convince us that a Roman road entered the county across the æstuary, now the valley of the Waveney, near Harleston in Norfolk, and ran to Peasenhall, in a direction which if continued would meet the coast at Aldeburgh. We think it probable too that a line of road branching from this at Peasenhall, or perhaps crossing it, in which case it may have come from near Southwold and Blythburgh, or else from Dunwich, ran into the line of road first described by Stone-Street, in the neighbourhood of Needham-Market.

Ad Ansam may be fixed at Stratford. The distance from Colchester (Camalodunum) coincides with that given by Antoninus, and the name Strat-ford, indicative of its position on the line of a Roman road or 'street,' convinces us that this position is correctly fixed. The distance given by Antoninus of the positions between Ad Ansam and Venta Icenorum (Caister, near Norwich) prevent our following the direct line of road; and the stations Cambretonium and Sitomagus, which occur in the interval, must be considered as doubtful. The proposal to fix them respectively at Grundisburgh, or rather Burgh, near Ipswich, where there is an antient encampment, and at Dunwich, is perhaps the best supported by a general though not exact accordance with the Antonine distances, and with the recognised pre-eminence of Dunwich in early Saxon times. It may be added that king Alfred calls Dunwich 'Domnoc-ceaster,' furnishing thus another indication of its Roman origin. The proposal to fix Sitomagus at Stowmarket, or Woolpit, we hold to be inadmissible. Blythburgh, though it has a better claim than either of these places, is not, we think, so well suited as Dunwich. Camden's opinion that Cambretonium was at Brettenham, is not objectionable in itself, but it renders it difficult to fix the position of Sitomagus. As for Iciani and Villa Faustini, we can only conjecture that the first was at Ixworth, where are some Roman remains, and the second on the Roman road at Yaxley, near Eye. Burgh castle, one of the most remarkable Roman remains in England, is described elsewhere. [BURGH CASTLE, vol. vi., p. 26.] It is generally supposed to have been the Gariannonum of the Notitia, but this may be doubted. [NORFOLK, vol. xvi., p. 268.]

Roman antiquities have been found at Blythburgh, on Bungay common, at Bury, at Dunwich, at Eye, at Haughley, near Stowmarket, where a Norman castle was erected on the site of a Roman camp, at Icklingham, near Mildenhall, at Ickworth, near Bury, at Ixning or Exning, near Newmarket, at Ixworth, at Pakenham near Ixworth, where a tessellated pavement was dug up, at Stow Langtoft in the same neighbourhood, where are the remains of a camp, at Felixtow near the mouth of the Deben, and at Wenham near Stratford.

In the Anglo-Saxon period Suffolk passed through similar changes to Norfolk. [NORFOLK.] It was probably settled by a body of Angles independent of those who occupied Norfolk. The names of South Folk and North Folk describe the relative position of these two bodies. Suffolk was probably, from its proximity to the other Anglo-Saxon states, the more important division of the two, and the scene of several events. The battle in which Annas or Anna, king of East Anglia, and his son Firminius, fell fighting against Penda, king of Mercia (A.D. 654), is supposed to have occurred at Bull camp or Bulchamp, near Blythburgh. Annas is said to have been buried at Blythburgh. St. Edmund, king of East Anglia, contemporary of Ethelred I., brother and predecessor of Alfred the Great, was taken by the Danes (A.D. 870), and cruelly murdered at Hagilsdun, now Hoxne (on the bank of the Waveney, near Scole), and was first buried there; but his body was afterwards removed to Bury, which has obtained from him its distinctive title of Bury St. Edmunds. In the Danish wars in the reign of Ethelred II., Ipswich was twice plundered by the Danes, once in A.D. 991, and again two years afterwards, A.D. 993. Again, in A.D. 1010, they occupied the town, extended their ravages inland, and gained a victory over the East Anglians, who, under their general Ulfcytel or Ulfkyttle, made head against them. The scene of this battle is not stated. In the closing period of the Anglo-Saxon dynasty, Suffolk was a separate earldom, under Gurth, the brother of Harold II. Gurth, as well as Harold, fell at Hastings.

In the civil war of Stephen and Henry of Anjou, afterwards Henry II., Ipswich, which was held by Hugh Bigod for Henry, was taken by Stephen (A.D. 1153). In the war of Henry the younger and his brothers against their father, Henry II., a body of Flemings under the Earl of Leicester, a partisan of the young prince, landed in Suffolk, at Walton, south-east of Ipswich, and were joined by Hugh Bigod, one of the most powerful noblemen of these parts. After vainly besieging Walton Castle, they advanced inland, and at Fornham St. Genoveve, on the bank of the Lark, between Bury and Mildenhall, were met and routed, with the loss of above ten thousand Flemings, by the king's army under Richard de Lacy and Humphrey de Bohun, constable of England. The Earl of Leicester and his wife were taken prisoners (A.D. 1173). Bigod, who had still a considerable force, made his peace with the government. In the civil war of John, the county was reduced to subjection (A.D. 1216) by William Fitzpiers, Robert Fitzwalter, and William de Huntingfield, dispatched for the purpose by Prince Louis of France, whom the barons had invited over to oppose John. In the insurrection of the populace in the time of Richard II. (A.D. 1382), those of Suffolk took arms, and murdered, at Bury, Sir John Cavendish, chief justice of England, and some of the monks of the abbey. The Essex insurgents appear to have been driven into this county after their first defeat at Billericay, and suffered a second defeat at Sudbury. In the rebellion of Lambert Simnel, Henry VII. raised an army, which he placed under the command of the Earl of Oxford to oppose a descent which he was apprehensive might be made in this county by a force from Flanders. In the disturbances caused by the attempt of Henry VIII. and his minister Wolsey to raise money by a royal decree (A.D. 1525), the people of Suffolk rose in rebellion, but the dukes of Norfolk and Suffolk prevailed on them to disperse. A part of the inhabitants of Suffolk took part in Kett's rebellion (A.D. 1549). On the death of Edward VI. and the proclamation of Lady Jane Gray as his successor, the Princess Mary, Edward's sister, who was at Kenninghall in Norfolk, removed to Framlingham Castle, where her partisans flocked to her. The Duke of Northumberland, Jane's father-in-law and general, advanced to Newmarket and from thence to Bury to oppose Mary, but retired next day to Cambridge; and the general feeling of the kingdom being in favour of Mary, she advanced from Framlingham to London, dismissing her Suffolk forces by the way.

In the middle ages Suffolk appears to have abounded with religious establishments. Tanner (*Notitia Monastica*) enumerates fifty abbeys, priories, hospitals, or colleges. Only three however of the greater monasteries, viz. those with 200*l.* clear yearly revenue, were in the county, viz. the abbeys of St. Edmunds Bury, Sibton, and Butley. The yearly revenue of Bury abbey (Benedictine) at the dissolution was 2336*l.* 16*s.* gross, or 1659*l.* 13*s.* 11½*d.* clear; that of Butley Abbey (for canons of St. Augustin) was 318*l.* 17*s.* 2½*d.*; and that of Sibton Abbey (Cistercian) was 250*l.* 15*s.* 7½*d.* The interesting remains of Bury Abbey are noticed elsewhere and the monastic ruins of Bungay. [BURY; BUNGAY.] Of Butley Abbey, between Woodbridge and Orford, the gate-house is the principal remain: it is incorporated in a modern mansion: there are some other remains of the abbey, but of less moment. Of Sibton Abbey, which is near Yoxford, on the road from Ipswich to Yarmouth, there are extensive remains. The monastic ruins of Eye, Dunwich, and Clare have been noticed in the former part of this article. There are some remains of Herringfleet Priory for canons of St. Augustin near Lowestoffe; of Leiston Premonstratensian abbey, near the coast, between Dunwich and Aldeburgh; and of Mendham Cluniac priory, on the Waveney, the latter partly converted into a farm-house. Of castellated remains the most remarkable are Framlingham, Orford, and Clare, already noticed; Bungay, noticed elsewhere [BUNGAY]; and Mettingham and Wingfield. Mettingham Castle is near Bungay; a considerable portion of the gate-tower and fragments of the walls are standing. Wingfield is near Eye, the south or entrance front is still entire; the west side has been made into a farm-house. Of old mansion-houses, with which the county abounds, Flixton hall near Bungay; Giffard's hall, at Stoke by Neyland, on the Stour; Helmingham hall, near Debenham; Hengrave hall, north-west of Bury; Kentwell hall and Melford hall, near Sudbury; and Parham hall near Framlingham, may be mentioned.

Few events connected with the great civil war of Charles I. occurred in this county. In the Dutch war of Charles II. two fierce engagements were fought on the coast. The first was fought 3rd June, 1665, off Lowestoffe. The English fleet consisted of one hundred and fourteen ships of war and a number of fireships and ketches, under the duke of York (afterwards James II.), having under him Prince Rupert, the earl of Sandwich, Penn, Lawson, Ayscue (or Ayscough), and other admirals; and the Dutch fleet, of above one hundred ships of war, besides small vessels, under admirals Opdam, Evertzen, Cortenaer, Cornelius van Tromp, and others. After a severe battle the Dutch were beaten with the loss of eighteen men of war taken and fourteen sunk or burned. The English lost one ship. The second battle was fought in Southwold Bay or Sole Bay, in 1672. A combined fleet, consisting, according to the lowest statement, of sixty-five English and thirty-five French men-of-war, under the duke of York as commander-in-chief, having under him the earl of Sandwich, Sir Joseph Jordan, Count d'Etrees, the French admiral, and others, was lying in the bay in careless security, in spite of the warning of Lord Sandwich, who had pointed out the danger of their being surprised, when a Dutch fleet of seventy-five, or, according to some accounts, of ninety-one men-of-war and a great number of smaller vessels, under De Ruyter, as commander-in-chief, with Evertzen, Van Ghent, Bankert, and others, came unexpectedly on them, on the 28th of May. A severe but indecisive action ensued. The English lost six ships of war, two burned, three sunk, and one taken. The earl of Sandwich was killed, and a number of officers and 2000 men killed and wounded. The French are charged with having hung back in consequence of secret instructions from their own government; however they lost two ships, and their rear-admiral was killed. The Dutch lost only three ships of war, but a great number of smaller vessels; their loss of men was probably great, as the States-General forbade the publication of it.

(*Ordnance Survey of England*; Conybeare and Phillips's *Outlines of the Geology of England and Wales*; Rickman's *Gothic Architecture*; *Beauties of England and Wales*; Gardner's *History of Dunwich*; Southey's *Naval History*, in Lardner's *Cabinet Cyclopædia*; Carte's *History of England*; *Parliamentary Papers*.)

STATISTICS.

Population and Occupations.—In 1831 Suffolk ranked the ninth among the agricultural counties, and 31,491 families out of 61,533 were 'chiefly employed in agriculture.' In manufacturing and non-agricultural occupations it stood the thirty-sixth in the list of English counties. In the manufacture of mixed silk and worsted stuffs 269 men were employed at Sudbury; 173 men were employed in drabbets and Tuscan plait at Haverhill, and 11 at Heddington: 42 in silk at Glimsford; a few at Lavenham; and 13 weavers at Hadleigh. At Brandon 60 men were employed in making gun-flints. At the same period, of males aged 20 and upwards, there were 1256 occupiers of land employing labourers; 1121 occupiers not employing labourers; and 33,040 were agricultural labourers, the latter being 46 per cent. of the total male population of the above age. The remainder of the male population aged 20 and upwards was thus distributed:—employed in manufactures, 676; in retail trades and handicrafts, 18,167; capitalists, bankers, and members of the professions, 2228; non-agricultural labourers, 5336; domestic servants, 1342; other males aged 20 and upwards, 4940. The number of male servants under 20 was 690; and there were 11,483 female servants.

The population of the county at the following periods was as under:—

	Males.	Females.	Total.	Increase per Cent.
1801	101,091	109,340	210,431	
1811	111,988	122,223	234,211	11·3
1821	132,410	138,132	270,542	15·5
1831	145,769	150,548	296,317	9·5
1841	154,107	161,022	315,129	6·3

The population increased 104,698 from 1801 to 1841, being 49 per cent.; the increase for England during the same period being 79·9 per cent. The details of the census of 1841 are not yet fully published, but the number of inhabited houses was 64,081; uninhabited 2317; and 577 were building.

The population, &c. of each hundred and borough, according to the census of 1831, was as follows:—

HUNDREDS, BOROUGHS, &c.	HOUSES.				OCCUPATIONS.			PERSONS.			
	Inhabited.	Families.	Building.	Uninhabited.	Families chiefly employed in agriculture.	Families chiefly employed in trade, manufactures, and handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of persons.	Males twenty years of age.
Babergh	4,489	5,179	15	103	2,996	1390	793	11,872	11,806	23,678	5,609
Blackbourn	1,929	2,855	4	32	1,979	590	286	7,246	7,021	14,267	3,553
Blything	3,917	4,998	13	88	2,799	1,251	948	11,950	12,227	24,177	5,967
Bosmere and Claydon	2,361	2,591	6	21	1,808	555	228	6,478	6,478	12,956	3,193
Carlford	1,014	1,325	5	13	915	244	136	3,227	3,121	6,348	1,576
Colneis	647	883	2	9	592	188	103	2,173	2,196	4,369	1,085
Cosford	1,917	2,157	2	51	1,146	600	411	5,229	5,260	10,489	2,564
Hartismere	2,412	3,559	19	25	2,212	940	407	8,726	9,145	17,871	4,171
Hoxne	2,162	3,282	5	34	2,227	734	321	8,261	8,138	16,399	4,033
Lackford	2,401	2,713	20	53	1,123	821	769	6,539	6,570	13,109	3,133
Loes	2,502	2,768	31	48	1,148	867	753	6,550	6,994	13,544	3,121
Mitford and Lothingland	2,965	3,302	22	101	1,180	870	1,252	7,425	7,830	15,255	3,746
Plomesgate	1,730	2,383	6	26	1,230	639	514	5,506	5,779	11,285	2,722
Risbridge	2,850	3,349	17	58	2,187	870	292	8,070	8,145	16,215	3,980
Samford	1,652	2,187	7	24	1,494	416	277	5,679	5,563	11,242	2,886
Stow	1,390	1,716	19	25	907	498	311	4,133	4,175	8,308	2,039
Thedwestry	1,523	2,139	11	29	1,561	365	213	5,068	5,035	10,103	2,488
Thingoe	963	1,224	5	12	891	203	130	3,046	2,976	6,022	1,556
Thredling	435	668	1	1	463	169	36	1,703	1,625	3,328	754
Wangford	2,454	2,810	9	64	1,179	1,071	560	6,583	7,022	13,605	3,204
Wilford	1,108	1,490	3	23	955	326	269	3,679	3,754	7,433	1,793
Bury St. Edmunds (Borough)	2,231	2,429	10	51	141	1,299	989	5,246	6,190	11,436	2,559
Ipswich . . do.	4,116	4,450	25	214	274	2,490	1,686	9,169	11,032	20,201	4,509
Sudbury . . do.	971	1,076	2	36	54	720	302	2,211	2,466	4,677	1,142
Totals	50,139	64,533	259	1,141	31,491	18,116	11,926	145,769	150,548	296,317	71,375

County Expenses, Crime, &c.—Sums expended for the relief of the poor:—1748-49-50 (annual average), 28,063*l.*; 1776, 56,804*l.*; 1783-84-85 (average), 69,407*l.* The sum expended in

		£		*s.*	*d.*	
1801	was	119,963,	being	11	4	for each inhabitant.
1811	..	225,714	„	19	3	„
1821	..	240,384	„	17	9	„
1831	..	270,651	„	18	3	„

In each of the following years ending 25th March, the expenditure was as under:—

1835.	1836.	1837.	1838.	1839.	1840.
£224,904	£187,896	£136,870	£130,683	£145,871	£141,536

The expenditure in the last of the above years would average about 11*s.* 3½*d.* for each inhabitant. The total expenditure for the year ending 25th March, 1834, was 246,609*l.* The saving effected between that year and 1840 amounted to 123,175*l.*, or 45 per cent.; namely, under the head of relief and maintenance, 103,973*l.*, or 42 per cent.; in suits of law, &c., 6590*l.*, or 85 per cent.; and in miscellaneous expenses, 12,612*l.*, or 64 per cent. The number of poor-law unions is 16, comprising 507 parishes and a population of 281,320 according to the census of 1831: there are 2 parishes with a population of 11,436, which are not in any union. The number of paupers relieved during the quarter ending Lady-day, 1840, was 32,180 (4306 in-door, and 27,874 out-door), being 11 per cent. of the population, the proportion for England being 8·6 per cent. The illegitimate births in 1830 were 408, or 1 in 21; in England 1 in 20. The numbers affiliated in 1834-5 were 311; and in 1835-6, 209. Bastard children chargeable on the poors'-rate in 1835-6, 1558, or 1 in 190 of the whole population;—in England 1 in 215. Lunatics and idiots chargeable on the same fund in 1836, 345, or 1 in 859;—in England 1 in 1033. Proportion per cent. of persons married under 21 years of age in 1840, 12·9;—in England and Wales, 9·6 for the two sexes.

The annual value of real property assessed to the property-tax in 1815, was 1,127,404*l.* The sum raised for poor-rate, county-rate, and other local purposes, for the year ending 25th March, 1833, was 300,016*l.*, levied

On land . . .	£247,543
Dwelling-houses . .	45,522
Mills, factories, &c. . .	5,868
Manorial profits, navigation, &c.	1,082
Total	£300,016

The amount expended was—

For the relief of the poor . .	£259,098
In suits of law, removal of paupers, &c. .	7,059
For other purposes . . .	33,900
Total money expended	£300,058

The county expenditure in 1834, exclusive of that for the relief of the poor, was 15,878*l.* disbursed as follows:—

Bridges, building, repairs, &c. .	£746
Gaols, houses of correction, and maintaining prisoners . . .	5782
Shire-hall and courts of justice, building, repairs, &c. . . .	294
Lunatic asylums . .	903
Prosecutions	2,509
Clerk of the peace	854
Conveyance of prisoners before trial	1,225
Conveyance of transports . .	319
Vagrants, apprehending and conveying	23
Constables, high and special . .	666
Coroner	273
Payment of principal and interest of debt	1,000
Miscellaneous . . .	1,280
Total	£15,878

The county-rate levied at different periods, and the principal disbursements, are shown in the following table:—

	1805.	1811.	1821.	1831.	1838.
	£	£	£	£	£
Income .	25,557	12,923	17,138	12,457	17,765
Expenditure —					
Bridges .	1,507	364	1,143	676	1,128
Gaols .	4,738	1,369	7,410	2,973	346
Prisoners' maintenance	779	980	1,185	4,634	3,959
Prosecutions	396	649	1,301	2,130	3,567
Constables and vagrants .	344	437	1,030	587	1,081

In 1839 the length of streets and highways, and the expenditure thereon, were as under:—

		Miles.
Streets and roads repaired under local acts		252
Turnpike roads		221
All other highways		2,859
		3,333
Amount of rates levied . . .		£25,480
Expended in repairs of highways	£25,371	
Law and other expenses .	466	
Total expenditure		25,838

The number of turnpike trusts in 1839 was 14; income from tolls, 9,940*l.*; from parish compositions, in lieu of statute duty, 57*l.*; and the total income was 10,337*l.*, the total expenditure for the same year being 10,583*l.* The assets, including arrears of income, amounted to 2,117*l.*; the debts to 34,288*l.* In 1836 the debt was equal to 2·8 years of the annual income;—the proportion for England being 4½ years; the proportion of unpaid interest to the total debt was 16 per cent., the average for England being 12 per cent.

In 1839 the church-rates amounted to 11,988*l.*; and 3,194*l.* applicable to the same objects was derived from other sources. In 1832 the sum derived from 'other sources' included 3,979*l.* from estates and rent charges. The sum expended for the purposes of the Establishment amounted to 14,443*l.* in 1839, out of which 7,164*l.* were expended on repairs of churches.

Crime.—Number of persons charged with criminal offences in the septennial periods ending 1819, 1826, 1833, and 1840:—

	1813-19.	1820-26.	1827-33.	1834-40.
Total . .	1,300	1,943	2,631	3,470
Annual average .	185	277	375	495

The numbers committed, convicted, and acquitted in each year from 1834 to 1839 were as under:—

	1834.	1835.	1836.	1837.	1838.	1839.	1840.
Committed	484	450	528	493	505	527	484
Acquitted	138	134	157	159	163	152	135
Convicted	346	316	371	334	342	375	349

In 1834 the proportion of persons committed, to the total population of the county, was 1 in 612; and in 1840, allowing for the increase of population, 1 in about 619.

Of 484 criminal offenders tried at the assizes and sessions in 1840, there were 24 charged with offences against the person; 40 with offences against property committed with violence; 401 (including 327 cases of simple larceny) with offences against property committed without violence; 3 with malicious offences against property; 3 for forgery and uttering base coin; and 13 for various misdemeanors. About eighty-two per cent. of the offences were those against property committed without violence; and about sixty-seven per cent. were cases of petty larceny. Sentence of death was recorded in 1 case, which was commuted into transportation for life. Of 349 offenders convicted, including the one above-mentioned, 5 were transported for life; 1 for above 15 years; 19 for periods varying from 10 to 15 years; 21 from 7 to 10 years; 36 for 7 years—making in all 83 offenders transported; 1 was imprisoned for above 2 years; 18 for a term exceeding 12 months; 51 for above 6 months; and 193 for 6 months and under; and 3 were whipped, fined, or discharged on sureties. The acquittals were 135 in number; in 15 cases there was no prosecution; in 38 no bill was found; and 82 persons were found not guilty on trial. Of the total number committed, 400 were males and 84 females: 177 males and 24 females could neither read nor write; 173 males and 53 females could read, or read and write imperfectly; 37 males and 4 females could read and write well; and the state of instruction of 13 males and 3 females was not ascertained. On an average of several years the proportion of uninstructed criminals in this county was 86·6 per cent.; those instructed 13·4 per cent.;—the average of the former for England and Wales being 89·3 per cent.

Savings Banks.—There are 13 of these institutions; and the number of depositors and amount of deposits on the

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20th of November in each of the following years was as under:—

	1833.	1836.	1837.	1838.	1839.	1840.
No. of depositors	5,754	6,675	7,208	7,880	8,503	9,332
Am. of deposits	£178,591	£203,794	£217,915	£236,730	£255,789	£290,913

The distribution of the sums invested in 1830, 1834, and 1839, on the 20th of November in each year, was as under:—

	1830.		1834.		1839.	
	Depositors.	Deposits.	Depositors.	Deposits.	Depositors.	Deposits.
Not exceeding £20	2,763	£20,795	3,115	£23,321	4,616	£33,427
„ 50	1,489	46,098	1,694	51,815	2,345	72,574
„ 100	726	48,871	789	53,868	953	65,466
„ 150	233	27,392	256	30,841	366	44,649
„ 200	109	17,920	121	20,412	192	32,268
Above . . 200	51	12,439	29	7,354	31	7,405
	5,371	173,641	6,004	187,611	8,503	255,789

The deposits of 200 friendly societies, not reckoned above, amounted, in 1840, to 22,158*l.*; and 8670*l.* were invested by 200 charitable institutions.

The state of the elective franchise in 1839-40 is shown in the following table:—

	E. div.	W. div.	Total.
Freeholders of every class . .	3,708	3,056	6,764
Copyholders and customary tenants	742	570	1,312
Leaseholders for life or for a term	40	22	62
50*l.* tenants at will . . .	1,683	1,283	2,966
Trustees and mortgagees .	14	13	27
Qualified by offices . . .	134	131	265
Joint and duplicate qualifications	83	96	179
	6,404	5,091	11,495

Education.—Summary of the Returns made to Parliament in 1833:—

	Schools.	Scholars.	Total.
Infant schools . . .	117		
Number of children at such schools; ages from 2 to 7 years:—			
Males . .		595	
Females . .		639	
Sex not specified .		879	
			2,113
Daily schools . . .	961		
Number of children at such schools; ages from 4 to 14 years:—			
Males . .		11,733	
Females . .		10,317	
Sex not specified .		4,479	
			26,529
Schools . .	1,078		
Total of children under daily instruction			28,642
Sunday schools	488		
Number of children at such schools; ages from 4 to 15 years:—			
Males . .		12,477	
Females . .		13,015	
Sex not specified .		4,738	
			30,234

The number of children in Suffolk, in 1833, between the ages of 2 and 15, may be computed at about 77,000, and between 4 and 14, at about 66,000. Eighty Sunday-schools, attended by 3130 children, were returned from places where no other schools existed; but in all other places in the county the children had also the opportunity, and many of them were in the habit, of attending daily schools as well; but to what extent duplicate returns were caused by this circumstance cannot be ascertained. Fifty-seven schools, attended by 3910 children, were both Sunday and daily schools, and thus far only can duplicate returns be discovered. Taking the numbers returned under daily instruction (28,642), and those attending Sunday-schools (30,230), the total number of children is 58,872, which falls short by some thousands of the total number of children between the ages of 2 and 15. The number of boarding-schools was 58.

Maintenance of Schools.

Description of Schools.	By endowment.		By subscription.		By payments from scholars.		Subscrip. and payment from scholars.	
	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.
Infant Schools	..	..	2	58	106	1,555	9	500
Daily Schools	92	2591	106	4,278	681	15,852	82	3808
Sunday Schools	23	1377	439	26,892	..	..	26	1961
Total...	115	3968	547	31,228	789	17,407	117	6269

According to the Reports of the Charity Commissioners, there are annual funds amounting to 3991*l.* applicable to the purposes of education; the income of endowed schools is 2972*l.*, and a sum of 1018*l.* is for educational purposes in schools not endowed.

The Schools established by Dissenters, included in the above table, are—

		Scholars.
Daily-schools . . .	15, containing	390
Sunday-schools . . .	105, .	9 499

The schools established since 1818 are—

Infant and other daily schools .	508, containing	13,763
Sunday-schools . .	231, .	16,281

Lending libraries were attached to 41 schools in 1833.

SUFFRAGAN. [Bishop.]

SUGAR (French, *Sucre*; German, *Zucker*; Italian, *Zucchero*; Russian, *Sachar*; Spanish, *Azucar*; Arabic, *Sukhir*; Malay, *Soola*; Sanscrit, *Sarkara**). The sugar of commerce is a sweet crystallized substance, most commonly prepared from the expressed juice of the sugar-cane, of which there are several species [Saccharum, vol. xx., p. 299]; but sometimes from beet-root [Beet, vol. iv., p. 160], from the sap of one or more species of maple [Acer, vol. i., p. 79], and from other vegetable productions. Saccharine matter is indeed one of the most common of vegetable secretions [Secretions, Vegetable, vol. xxi., p. 178]; but it is only from the above-mentioned substances that sugar has been extracted to any great extent as an article of commerce, and of these the sugar-cane is by far the most extensively used.

The chemical properties of various kinds of sugar are detailed in the succeeding articles (pp. 234, 235), which also notice most of the sources whence saccharine matter may be obtained. The latter part of the subject is more fully treated of in two papers read before the Society of Arts, in February, 1830, by their late secretary, Arthur Aikin, Esq., and published in the fifty-first volume of their 'Transactions.' A brief enumeration of the principal saccharine substances known to chemists, chiefly condensed from these papers, may assist the reader in taking a connected view of the subject.

Mr. Aikin commences his account of the substances which communicate the sensation of sweetness to the organs of taste, by alluding to the singular fact that the sensation may, under particular circumstances, be produced not merely by the contact of a sweet substance with the nervous papillæ of the tongue and palate, but also by the contact of a perfectly neutral or insipid substance, after the nerves have been over-excited by that sensation which is opposite to sweet. This opposite, he observes, is *bitter*; or, more properly speaking, *acerb*. This circumstance, which is analogous to a well-known optical phenomenon (alluded to in the account of ocular spectra, in the article Sight (vol. xxi., p. 506), is supposed to account for the reported sweetness of the waters of the Nile and some other rivers in the East; since natural pure water, which we should merely designate *fresh*, is, 'not metaphorically, but actually and literally, sweet and delicious as milk,' to the palates of travellers who have been compelled to drink of the bitter springs found in the sandy deserts of Syria and Arabia, and in those which insulate the valley of the Nile. The sensation of sweetness is produced not only by many vegetable and animal substances, but also by some of purely chemical character. Of the latter Aikin mentions the soluble salts of lead (one of which, the acetate, was formerly called *sugar of lead*); the hydrosulphates of silver and copper; and an earth which exists in the emerald, and which has been called glucine from its property of forming sweet salts with acids. [Glucinium, vol. xi., p. 277.]

Of animal substances Aikin observes that the muscular parts of all quadrupeds, birds, and fishes, if boiled or roasted soon after death, have a decided though slight degree of sweetness; which sweetness disappears on the commencement of the spontaneous change which ends in putrefactive decomposition. That the sweet principle does not reside in the muscular fibre is presumed from the circumstance that it may be extracted from flesh by boiling water, in which muscular fibre is insoluble; but as Aikin was not aware of any attempts to obtain the sweet matter in a separate state, he could not tell whether it agrees in essential character with any of the other sweets obtainable from the products of animal and vegetable organization. Glycerin is a sweet substance obtainable from most of the fats or expressed oils, whether animal or vegetable, by the process of saponification. [SOAP, vol. xxii., p. 169.] In its purest state, glycerin is in the form of a sweet syrup, which is not capable of crystallising or undergoing the vinous fermentation. The sweet taste of new milk is occasioned by a saccharine substance called sugar of milk, the proportion of which, in the milk of various animals, is shown in vol. xv., p. 218 [MILK], while its chemical composition is given in p. 235 of this volume. This substance has been, and we presume still is, made in considerable quantities in some parts of Switzerland, for medicinal purposes. It is, according to Aikin, made from the whey left after making cheese. The whey is first heated to separate the butter from it, and is then boiled down to the consistence of syrup, which is poured into earthen pots, and exposed to the sun until it is nearly solid. The mass is then put into water, and heated till the sugar is dissolved, and the insoluble impurities are separated by pouring the hot liquor through a linen filter. It is then clarified with white of egg, and is again evaporated. It deposits, on cooling, a whitish crystalline mass, which differs little from vegetable sugar, but is less soluble in water, and will not undergo the vinous fermentation, although it be mixed with yest. Beckmann, who notices the history of the invention of this substance in his 'History of Inventions' (vol. iv., p. 599, English edit. of 1814), describes the mode of preparing it from new milk; but he observes that the sugar so made is fatter, and more liable to spoil, than that given by milk from which the butyraceous and caseous parts have been carefully separated. The only other sugar of animal origin, mentioned by Mr. Aikin, is that found in the urine of persons suffering under the disease called *diabetes mellitus*. [DIABETES, vol. viii., p. 470.]

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* The above list of synonymes is taken from M'Culloch's 'Dictionary of Commerce.' Dr. Benjamin Moseley (*Treatise on Sugar*, second edition, p. 4) gives a rather longer list, varying from this in a few minor points of orthography, and containing the following terms under which sugar is referred to by Greek and Roman writers:—*Μέλι καλάμινον*, Theophrastus; *Σάκχαρον*, Dioscorides; *Saccaron*, Pliny; *Σάκχαρι*, and *Μέλι καλάμινον*, Arrian; *Σάκχαρ*, Galen; and *Ἅλς Ἰνδικός*, P. Ægineta, from Archigenes.

Honey-dew, or aphis-sugar, and the honey of the bee, are intermediate between animal and vegetable sugars; because, though derived from vegetable juices, they are modified by digestion in the stomachs of insects. Honey-sugar is described in p. 235 of this volume; and in the article on the properties of sugar, in the same page, is a notice of the formation of sugar from the starch contained in many vegetable productions. Among vegetables which contain sugar ready formed (though not in a crystallized or separate state), there are several trees from the sap of which it may be obtained in sufficient quantity for human use. Two of these—the sycamore and the birch—are natives of Britain; but the sugar which they yield is not sufficient to repay the expense of manufacture. The sugar-maple, which abounds in some parts of North America, yields sugar in such abundance as to be of considerable importance. Many trees of the palm family afford a sweet sap, which may be boiled down to a tolerably solid viscid sugar. [BORASSUS, vol. v., p. 173.] Palm-sugar is called *dibs*; and Mr. Aikin thinks that perhaps it is alluded to by Pliny under the name *dablan* (xiii. 7). For notices of manna-sugar, see MANNA, vol. xiv., p. 386, and pp. 235 and 236 of this volume.

Saccharine matter exists in many ripe fruits in great abundance, as is evident not only from their sweet taste, but also from the circumstance that it exudes from some, as the fig and the grape, in the process of drying. From the former of these, as well as from the date and the plantain, it appears that sugar has never been made, perhaps owing to the difficulty of extracting granulated sugar from a fruit containing so much mucilage. Attempts have been made to extract solid sugar from grapes, but without much success. M. Proust, a chemist in the service of the king of Spain, tried to accomplish this object, with the hope of preventing the annual waste of many thousand tons of grapes; but while he obtained a solid sugar of coarse quality, it was at too great an expense to bear competition with common sugar. Political troubles put an end to this experiment; but the manufacture of sugar from grapes was again tried in consequence of the loss of the French sugar colonies, under the encouragement of the French government. Great difficulty was experienced from the strong tendency of the juice, when expressed from the grapes, to ferment; from its liability to contract an empyreumatic flavour while boiling down; and from the difficulty of separating the tartar which all grape-juice contains. The two former difficulties were much lessened by the judicious application of sulphurous acid, but the last was not overcome; and at length the attempt to separate the sugar in a crystallized form was abandoned; and the juice, reduced to a thick syrup, was brought into extensive use as a substitute for sugar, until the return of peace rendered its use no longer necessary. Aikin states that white grapes were preferred for the purpose. The first process in the manufacture was the addition of sulphurous acid to the juice, either by stirring into the cold liquor sulphite of lime, in the proportion of 1 to 400 or 500 of the liquor; or by filling a tub with sulphurous acid gas, and then pouring the juice into it through a colander, so that it might be divided into a great number of streams, to facilitate the absorption of the gas. The liquor then remained quiet for a day or two, in which time much insoluble matter was deposited. The clear liquor, being drawn off, was then boiled; alone, if it had been mixed with sulphite of lime; or with the addition of some chalk, if sulphurous acid gas had been employed. After a partial evaporation, the syrup was clarified, either with blood, with white of egg, or with animal charcoal and white of egg, the latter being considered the best. The liquor, while boiling hot, was run through a filter, and subsequently boiled down to a thick syrup. When the sugar was required in a solid state, the syrup was boiled rather more than in the former case, and was kept in a cool place for a fortnight after boiling. At the end of this time it had the consistency of candied honey; and by subjecting it to pressure about one-third of its weight was obtained of soft sugar, of an agreeable flavour, but mealy, and apt to become moist in damp weather. It was also liable to curdle milk, and consequently unfit for many culinary purposes. The chemical composition of grape-sugar is given in pp. 234, 5. Aikin states that the *rob* of grapes, that is, the juice boiled down to the consistence of honey, has been long known in Syria and Egypt; and that Dr. Shaw, who, when in those countries, ascertained that two thousand quintals of it were annually exported to Egypt from the neighbourhood of Hebron alone, is inclined to attribute a very high antiquity to this preparation. He says further that Dr. Russell, in his 'History of Aleppo,' mentions it under the name of *dibbs* (being the same that is applied to date-sugar), and represents it as a common article of food at that place.

Several roots, particularly of the tuberous or fleshy kind, contain sufficient saccharine matter to be important, either for separating it in a pure state, or in the form of an extract of all the soluble ingredients of the root. Of all the latter class liquorice is one of the most important. See GLYCYRRHIZA GLABRA (vol. xi., p. 278), and *Liquorice Sugar*, in p. 235 of this volume. For the former purpose, attempts have been made upon several fleshy roots employed as food. Marggraf, a Prussian chemist, called public attention to the subject by a memoir printed in the 'Transactions' of the Academy of Berlin, for 1747. The roots he tried were the skirret (a variety of parsnep), the white beet, and the red beet. His experiments were resumed some years afterwards by M. Achard, at the desire of the Prussian government. Probably these and some other early experiments led, in some degree, to the subsequent introduction of the manufacture of beet-root sugar in France under M. Chaptal. [BEET, vol iv., p. 160.]

The above details show how many sources there are from which sugar might be obtained. None of them however, as far as experiment has shown hitherto, will bear comparison with the sugar-cane in point of cheapness; so that it is doubtful whether even beet-root sugar could enter into competition with that from the cane, unless aided by fiscal regulations.

Notices of Sugar and the Sugar-cane by antient writers.—It has been conjectured, although the opinion is not generally adopted, that the Hebrew word used in several places in the Old Testament, and rendered by our translators *calamus* in some places, and in others *sweet cane*, refers to the sugar-cane. Whatever the sweet cane alluded to may have been, it was apparently an article of merchandise in early times; and, as it is mentioned as coming from a far country, it was probably not a production of either Egypt or Judæa. (See *Exod.*, xxx. 23; *Sol. Song*, iv. 14; *Is.*, xliii. 24; *Jer.*, vi. 20; *Ezek.*, xxvii. 19.) Dr. Moseley (*Treatise on Sugar*, second edit., pp. 127-136) has combated this conjecture at considerable length. He also opposes the idea of there being any connection between the term *shecar* or *shuker*, which is commonly rendered in the

English version 'strong drink,' and the produce of the sugar-cane. This supposition is noticed elsewhere [SACCHARUM, vol. xx., p. 299]; and also the allusion of Herodotus to 'honey made by the hands of men.' The frequent application of the name honey to sugar by later writers among the antients renders it highly probable that sugar is here meant; and if so, unless we suppose the sacred writers to have alluded to it, Herodotus is probably the earliest author who mentioned sugar. Nearchus, Alexander's admiral, relates that 'the reed (in India) yields honey without bees;' but his statement, while it carries back the account of the sugar-cane to more than three centuries before the Christian æra, has come down to us through Strabo (694, Casaub.), who lived much later. Theophrastus, whose account is very nearly as old as that of Nearchus, describes three kinds of honey—from flowers, from the air (apparently honey-dew), and from canes or reeds; and in another place (*De Causis Plant.*, lib. vi., c. 16, ed Heinsii), quoted by Dr. Moseley, he describes a reed or cane that grew in moist places in Egypt, which was sweet even to the roots. Moseley quotes this passage, although it appears doubtful whether such a reed really existed, 'because,' he observes, 'other writers have mentioned this reed with sweet roots, probably from him; and many have supposed the sugar-cane was the reed alluded to, though erroneously described.' Thus Erastosthenes (about B.C. 223) as quoted by Strabo (693, Casaub.), speaks of the sweetness of the roots of Indian plants, especially of reeds. Varro also, about B.C. 68, has a passage which Moseley translates as follows:—'The Indian reed does not grow to a large tree; from its viscid roots a liquor is pressed, to which honey cannot be compared for sweetness.' Even so late as A.D. 218,[*] Solinus (*Polyhistor.*, cap. lii.) repeated the same blunder in a passage of which part was taken from Pliny; but Moseley says that neither Pliny nor Herodotus (who also mentions the very large reeds described by Solinus) says anything about the sweetness of their roots. From some passages in early writers it would seem that the juice of the cane was used as a drink. Pliny's account of the Fortunate (now called the Canary) Islands (vi. 32) alludes to 'trees resembling the *Ferula*, from which water may be expressed; the water from the black sort is bitter, but that from the white grateful to drink.' Moseley quotes also a passage from the 'Periegesis' of Dionysius Afer (a work of little value for geographical information), to the effect that the Indians drank the juice of the Indian cane. The like is stated in the 'Periplus of the Erythræan Sea,' supposed to have been written by Arrian early in the second century, of a nation bordering on the Red Sea, who drank 'honey of the reed, called sugar.' The term 'honey of canes,' which appears to indicate a fluid or semi-fluid consistency, was also used by Avicenna, as late as the tenth century; although he also distinctly mentions sugar under another name, as will be seen below.

Dioscorides, about the period of the reign of Nero, is said to be the first writer who uses the word *Saccharum* (σακχαρον), or sugar; but while he gives an accurate description of it, he was evidently unacquainted with the process by which it was prepared. He says, 'There is a sort of concreted honey, which is called sugar, found upon canes in India and Arabia Felix: it is in consistence like salt, and it is brittle between the teeth like salt.' Seneca, in his eighty-fourth Epistle, speaks of sugar as honey found on the leaves of canes, which is produced by the dew, or the sweet juice of the cane itself, concreting; thereby showing the like ignorance of its real character. Pliny (*Hist. Nat.*, xii. 8) speaks of sugar as brought from Arabia, and better from India. 'It is,' he says, 'honey collected from canes, like a gum, white, and brittle between the teeth; the largest is of the size of a hazle-nut. It is used in medicine only.' Galen, in the second century, gives a description of sugar almost identical with that of Dioscorides, excepting that he says nothing of its brittleness and resemblance to salt. These qualities are however again mentioned by Paulus Ægineta, in the seventh century, who, following Archigenes, an earlier writer, describes sugar as 'the Indian salt, in colour and form like common salt, but in taste and sweetness like honey' (ii. 54). He recommends that a piece be kept in the mouth, to moisten it, during fevers; from which it may be supposed that the sugar then known was in the form of candy. The same recommendation, with a similar description of sugar, was copied by Avicenna. Macpherson (*Annals of Commerce*, vol. i., p. 162, note) refers to an Indian stone described by Megasthenes (Strabo, 703, Casaub.), as sweeter than figs or honey, thinking that it must have been sugar-candy; but Megasthenes speaks of this stone 'being dug out of the ground,' and it is difficult to conjecture what he can mean.

Such notices might be extended much further, but enough has been stated to show that sugar was known, and was an article of commerce, at least as early as the commencement of the Christian æra; and also to prove that its origin was very imperfectly understood by antient Greek and Roman writers. Dr. W. Falconer, in a 'Sketch of the History of Sugar in Early Times, and through the Middle Ages,' published in the fourth volume of the 'Memoirs of the Literary and Philosophical Society of Manchester,' in 1796, has given quotations from several early authors not mentioned above; and Dr. Moseley's 'Treatise on Sugar' also goes very minutely into its early history, and gives the opinions of early medical writers respecting its use, which, in the period above alluded to, appears to have been chiefly medicinal. Although more than one writer speaks of sugar as coming from Arabia as well as India, he conceives that, at any rate when in the form of candy, it could not have been made in the former country. Indeed the early Arabian writers themselves speak of sugar as coming from India. It appears probable that the white sugar-candy of China, which has been very long celebrated for its excellence, was the Indian salt of the Roman authors.

Introduction of Sugar into Europe, America, and the West Indies.—Dr. Falconer, after giving passages from Greek, Roman, and Arabian writers down to the end of the tenth century, presents extracts from the historians of the crusades, who describe the sugar-cane as met with by the Crusaders in Syria. One of these, Albertus Agnensis, about the year 1108, says that 'sweet honied reeds,' which were called *Zucra*, were found in great quantity in the meadows about Tripoli. These reeds were sucked by the crusaders' army, who were much pleased with their sweet taste; and our author gives the following account of their use by the inhabitants of the country:—'This plant,' he says, 'is cultivated with great labour of the husbandmen every year. At the time of harvest they bruise it, when ripe, in mortars, and set by the strained juice in vessels till it is concreted in the form of snow or of white salt. This, when scraped, they mix with bread, or rub it with water and take it as pottage; and it is to them more wholesome and pleasing than the honey of bees.' This is, as far as we are aware, the oldest description extant of the process of extracting sugar from the cane. It appears to have been practised at that time to a considerable extent; for the same author, in his account of the reign of Baldwin, in 1110, mentions the capture by the crusaders of eleven camels laden with sugar. Another of these historians, Jacobus de Vitriaco, in 1124, says that in Syria reeds grow that are full of honey; by which he understands a sweet juice which, by the pressure of a screw-engine, and concreted by fire, becomes sugar. This was the first account known to Dr. Falconer of the use of heat or fire in preparing sugar. About the same time William of Tyre speaks of sugar as made in the neighbourhood of Tyre, and sent from thence to the farthest parts of the world. As early as the time of the emperor Frederick Barbarossa (the date 1170 is given by Falconer), Hugo Falcandus speaks of sugar as produced in great quantity in Sicily, and used in two states; either boiled down to the consistence of honey, or boiled further, so as to form a solid body of sugar. About 1306, according to Marinus Sanutus, sugar was made in the countries subject to the Sultan, and also in Cyprus, Rhodes, Amorea, Marta,[*] Sicily, and other places belonging to the Christians.

It is very difficult to trace the progress made in introducing the sugar-cane, and the process of extracting sugar from it, into the islands of the Mediterranean, into Italy, and into Spain; but most authorities agree that these benefits were derived from the Arabs, and were in some degree connected with the increased communication with the East occasioned by the Crusades. M'Culloch, while he admits that the Crusades tended to spread a taste for sugar through the Western world, considers that there can be no doubt of its having been cultivated in modern Europe antecedently to the æra of those expeditions, as well as imported by the Venetians, the inhabitants of Amalfi, and others, who carried on a commercial intercourse with Alexandria and other cities in the Levant. Dr. Moseley states, on the authority of a French 'Essai de l'Histoire du Commerce de Venise,' that sugar was certainly imported into Venice as early as 991. We do not know precisely when sugar was first made in Sicily; but, according to the account given by Lafitau, a Jesuit, it must have been before 1166: for he states that in that year William II., king of Sicily, gave a mill for grinding sugar-canes, with all its rights, members, and appurtenances, to the monastery of St. Bennet. It is also stated by Venetian historians that in the twelfth century Venice could import sugar cheaper from Sicily than from Egypt. The manufacture of sugar was probably introduced into Spain by the Moors, some say from Africa. The cane is supposed to have been first planted in Valencia, and afterwards in Granada and Murcia. A very interesting account of the sugar manufacture, as practised in Valencia in 1664, is given by Mr. Francis Willughby, an English traveller who visited Spain in that year. (Ray's *Travels*, second edit., 1738, vol. i., p. 409, &c.) About 1420 the Portuguese took the sugar-cane from Sicily to Madeira, and, probably during the fifteenth century, it was carried from Spain to the Canaries. Anderson relates, under the year 1503, on the authority of Morisot, 'that, the Canary Isles beginning to be frequented, there arrived two Zealand ships at Campveer, laden with Canary sugars.' 'From these origins,' adds Dr. Moseley, the cultivation of the sugar-cane, and the art of making sugar, were extended by different nations of Europe to the West Indian islands and the Brazils.'

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[*] This date is given by Dr. Moseley (*Treatise on Sugar*, second edit., p. 15), but his æra is uncertain. [SOLINUS, vol. xxii., p. 200.]

[*] Macpherson, in quoting this passage (*Annals of Commerce*, vol. i., p. 491), observes, in a note to the names Amorea and Marta, 'These are apparently the Morea and Malta; but I cannot at present determine the exact time when the name of Morea superseded that of Peloponnesus.' Instead of understanding, from the account of Sanutus, that sugar was cultivated in Sicily and other Christian countries, he reads, that it would grow there if there were a demand for it; and adds, in a note, that Sanutus did not know that it had been cultivated in Sicily long before.

It would be tedious to enter into an examination of the confused accounts which we possess of the gradual extension of the culture and manufacture of sugar on the continent and islands of the western hemisphere, or to repeat the equally confused and often contradictory statements of those writers who have examined the question as to whether the sugar-cane was or was not indigenous to the New World. Much may be found on this subject in the treatises of Moseley and Porter. Aikin conceives that many of these accounts may be reconciled by supposing the sugar-cane to have been cultivated in some cases as an esculent garden vegetable, the stem being eaten, or rather sucked or chewed, in a raw state, after being simply peeled, before it was cultivated for the purpose of manufacturing sugar. Wherever the sugar-cane may have been indigenous, there is no reason to question the fact that the manufacture of sugar, derived originally from China and India, was introduced into the western world by the Spanish and Portuguese. A few isolated facts respecting the production of sugar in the sixteenth and seventeenth centuries will indicate the changes which the trade in this important article has undergone.

In Hispaniola, or St. Domingo, there were, as early as 1518, twenty-eight sugar-works, established by the Spaniards. Peter Martyr, who gives this information, remarks on the extraordinary growth of the cane in that island; which, for a long period, afforded the principal supply of sugar to Europe. Hawkins brought sugar from Hispaniola to England in 1563.

Anderson, in an account compiled from Guicciardini, of the commerce of Antwerp about the year 1560, states that Antwerp received sugar at that time from Spain,—which had it from the Canaries; and also from Portugal, the latter country deriving it from S. Thomé, or St. Thomas, and other islands on the African coast, and from Madeira. Sugar was also an article of import from Barbary.

In the island of St. Thomas, just alluded to, sugar was made, according to Moseley, much earlier than in the West Indies. He states, on the authority of Dapper, that the Portuguese had sixty-one sugar-works in the island, before the Dutch destroyed them in 1610. A few years later, Heylin, in his 'Cosmographie,' stated that forty ships were annually loaded with sugar from this island; for the production of which there were seventy 'ingenios,' or sugar-houses, employing from 200 to 300 slaves in each.

Whatever may have been the precise period of the commencement of the English sugar-manufacture in Barbadoes, Anderson states that in 1627, and for several years later, the Portuguese supplied most parts of Europe with Brazil sugars. About 1650 the British planters in Barbadoes appear to have been realising property very rapidly by the raising of sugar; they having obtained, a few years before, valuable information from Brazil respecting the culture and process of extracting sugar from the cane. In 1670 Sir Josiah Child (quoted by Anderson) alluded to the decline of the Portuguese sugar trade, saying, 'As we have already beat their Muscovado and Paneal sugars quite out of England, and their whites we have brought down in all these parts of Europe, in price, from seven and eight pounds per hundred-weight, to fifty shillings and three pounds. And we have also much lessened their quantities; for whereas formerly their Brazil fleets brought one hundred to one hundred and twenty thousand chests of sugar, they are now reduced to about thirty thousand chests, since the great increase of Barbadoes.' M'Culloch states that in 1676 the sugar trade of Barbadoes is said to have attained its maximum, being then capable of employing 400 vessels, averaging 150 tons burden. [SUGAR TRADE, p. 237.]

Cultivation of the Sugar-Cane.—The botanical characteristics of the sugar-cane are given under SACCHARUM (vol. xx., p. 299), where also the principal species are mentioned. As to the modes of culture, much information is contained in Edwards's 'History of the West Indies,' and in Porter's treatise on 'The Nature and Properties of the Sugar-Cane.'

The height attained by the canes, their colour, the length of their joints, and many other particulars, vary with different species, with the character of the soil, and with the modes of culture adopted. The stems vary in height from eight feet up even to twenty feet, and are divided by prominent annular joints into short lengths. Long narrow leaves sprout from each joint; but as the canes approach maturity, all those from the lower joints fall off. The outer part of the cane is hard and brittle, but the inner consists of a soft pith, which contains the sweet juice; this juice being elaborated separately in each joint, independently of those above and below it. The canes are usually propagated by slips or cuttings, consisting of the top of the cane, with two or three of the upper joints, the leaves being stripped off. These are planted either in holes dug by hand, or in trenches formed by a plough, about eight to twelve inches deep; the earth being banked up upon the margin, and well manured. When the plough is used, it is returned along the furrow, so that the earth may be thrown up on each side of the trench. The distance between the holes or trenches must be such as to afford free access of air to the plants, and convenient space for the labourers employed in tending them and clearing the ground from weeds. Three feet between the rows, and two feet between the holes in the rows, is about the minimum; but when the horse-hoe is used to keep the ground clear from weeds, the above distances must be increased to five feet and two and a half feet respectively. In this matter however there is much difference on different plantations. Two or more slips are laid longitudinally at the bottom of each hole, and covered with earth from the banks, to the depth of one or two inches. In about a fortnight the sprouts appear a little above the earth, and then a little more earth from the bank is put into the hole; and as the plants continue to grow the earth is occasionally filled in, by a little at a time, until, after four or five months, the holes are entirely filled up. The time required for bringing the canes to perfection varies much under different circumstances; and many planters disregard system as to the time of planting, performing that operation rather at the most convenient than at the most seasonable time. From August to November is however generally considered the best time for planting in the British West Indies; and about March and April is perhaps the most generally approved time for cutting the canes, although that operation is sometimes performed through a great part of the year. The maturity of the cane is indicated by the skin becoming dry, smooth, and brittle; by the cane becoming heavy; the pith grey, approaching to brown; and the juice sweet and glutinous. The canes which grow immediately from the planted slips are called *plant-canes*; but it is usual, in the West Indies, to raise several crops in successive years from the same roots; the canes which sprout up from the old roots, or *stoles*, being called *rattoons*. The rattoons are not so vigorous as the original plant-canes; but they afford better sugar, and that with less trouble in clarifying and concentrating the juice. The old practice of the West Indian colonists was to plant one-third of the cane-grounds every year, so as to obtain one crop from plant-canes and two from rattoons; but latterly more dependence has been placed upon rattoons. Some planters have, under favourable

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circumstances, raised rattoon crops for more than twenty years successively, from the same stoles. The canes should be cut as near the ground as possible, because the richest juice is found in the lower joints; and, after cutting them, it is considered well to cut the stumps down a few inches below the surface of the ground, and to cover them up with mould. One or two of the top joints of the cane are cut off, and the remainder is divided into pieces about a yard long, tied up in bundles, and carried immediately to the mill. The upper branches of the cane are used as food for cattle. and the remainder of the waste forms a valuable manure, for which purpose the *trash* or waste from the mill is admirably suited, though much of it is usually consumed as fuel.

The sugar-cane is liable to the attacks of many destructive insects; of which a minute account was communicated to the Society of Arts, in 1827 and 1829, by the Rev. Lansdown Guilding, of Kingstown, St. Vincent, in the West Indies, which, with plates of some of the insects, was published in the forty-sixth and forty-seventh volumes of the Society's 'Transactions.'

Preparation of Raw or Muscovado Sugar.—The operation of cutting the canes is so adjusted as to keep pace with the action of the mill by which the juice is to be pressed out; so that the canes may be crushed or ground while quite fresh. In the East Indies mills of very rude and imperfect construction are used; some of them resembling mortars, formed of the lower part of the trunks of trees, in which the canes are crushed by the rolling motion of a pestle, which rests in an inclined position against the side of the mortar, and is moved by oxen yoked to an horizontal bar connected with it. The expressed juice runs off by a hole bored obliquely from the lower part of the mortar-like cavity, and is conducted by a spout to a vessel placed to receive it. In order to make such a mill effective, it is necessary to cut the cane into very small pieces. Dr. Ure gives engravings of two of these machines; in one of which the driver of the oxen, and in the other the man who feeds the mill also, rides upon the horizontal bar attached to the pestle. These mills are not portable, it being necessary that the stump of which the mortar is formed should be firmly fixed in the ground. Others are capable of being moved from place to place, so that they may accompany the movements of the cane-cutters. One of these consists of two vertical rollers of hard wood, having, near their upper ends, endless screws, or spiral ridges, so fitting into each other that both rollers may revolve when rotatory motion is applied to either. These are mounted in a strong frame, which may be fixed in any place by driving piles into the ground, and wedges are used to regulate the position of the bearings or axes of the rollers, so as to adjust them to a greater or less distance apart. The axis of one of the rollers is prolonged vertically above the framing, and carries a beam to which oxen are yoked to turn the mill. This appears to be the prototype of the vertical mill long used in the West India colonies; and another, still simpler, consisting of two grooved rollers placed horizontally in contact with each other, and turned by the power of men applied to levers at their ends, appears, in like manner, to be the rude original of the improved horizontal mills introduced of late years.

The common vertical cane-mills of the West Indies consist of three rollers, mostly of wood, with narrow strips of iron attached to their faces, so as to form, by the spaces left between them, straight grooves extending from end to end of the rollers. These are usually from twenty to twenty-five inches in diameter, and about forty inches long; and they are placed side by side in a strong frame, with contrivances for varying, in a slight degree, their distances from each other. The moving-power is applied to the middle roller, and communicated from it to the others by cogged wheels. Any sufficiently powerful prime-mover may be used to work the mill; but wind is the least advantageous, on account of its uncertainty, since it is highly important that all the operations should go on without interruption. Therefore, when wind is used as a moving-power, it is well to have also apparatus for working the mill by mules or oxen, should the former fail. Of late steam-engines have been adopted with good effect in some of the sugar-works in the West Indies. In using the mill, a negro applies the canes in a regular layer or sheet to the interval between the first and second rollers, which seize and compress them violently as they pass between them. The ends of the canes are then turned, either by another negro on the opposite side to the feeder, or by a framework of wood called a *dumb returner*, so that they may pass back again between the second and third rollers. As these are placed nearer together than the first and second, they compress the canes still more, so that on leaving them they are reduced to the form of dry splinters, which are called *cane-trash*, and are used as fuel in heating the vessels for evaporating the juice. Channels are added to receive the liquor expressed from the canes, and to conduct it to the vessels in which it is to undergo the succeeding operations.

The construction of this mill is very defective, since it is impossible to supply the canes to the rollers in so uniform a layer as to prevent them crossing each other. They become therefore unnecessarily crushed and broken, so that the liquor is rendered foul, and the rollers are exposed to irregular and destructive wear. These evils are obviated by the improvement of placing the rollers in a horizontal position, and feeding the mill by sliding the canes gradually from an inclined board. The rollers are made very accurately of cast-iron, hollow, and fluted or grooved on the surface. Such improved sugar-mills have been described and represented by Professor Barlow, in the treatise on Machinery and Manufactures, forming part of the 'Encyclopædia Metropolitana,' by Porter, in his work on the Sugar-Cane, and by Dr. Ure, in his 'Dictionary of Arts,' &c.; from the latter of which works the following description is condensed. The three rollers are not placed in the same plane, but are arranged in a triangular form, the periphery of the upper roller being very nearly in contact with the two lower rollers, which are also very near together. They are mounted in an iron framing, resting upon a massive foundation of masonry, and having the necessary provisions for adjusting the relative positions of the rollers. The two lower rollers, which are called respectively the feeding and delivering rollers, have small flanges at their ends, between which the top roller is placed, so that the pressed canes, or *begass*, may not be able to escape from the rollers and clog the machinery. The rollers are made from two inches and a quarter to two inches and a half thick, and are generally fluted, sometimes in a diagonal direction, to enable them the better to seize the canes from the feed-board. It is however, observes Dr Ure, on the whole considered better to flute the feeding-roller only, leaving the top and delivering rollers plain. When the top roller is fluted, it should be very slightly, for after the work of a few weeks, its surface becomes sufficiently rough to bite the canes effectively. The practical disadvantage of fluting the delivering roller is in the grooves carrying round a portion of the liquor, which is speedily absorbed by the spongy begass, as well as in breaking the begass itself. and thus causing great waste. The feed-board is an inclined plane, commonly of cast-iron, the edge of which is nearly in contact with the feeding roller. The space between the feeding roller and the top roller is usually about half an inch; but the space between the latter and the delivering roller is much less. The delivering board, which receives and conducts away the *trash* of the cane, is also of cast-iron, sloping downwards from the delivering roller, with which its edge is in close contact, so that it may detach any portions of trash or begass that may adhere to the delivering roller, and which, if not detached, would become mixed with the expressed liquor. The rollers are set in motion by toothed gear, and suitable channels and receptacles are provided for receiving and conducting away the cane-juice. In some cases the liquor is raised from the gutter of the mill-bed by pumps connected with and worked by the machinery of the mill; but it is essential that such pumps should be worked very slowly, lest the agitation of the liquor should favour fermentation. Where circumstances render such an arrangement practicable, labour may be saved by placing the crushing-mill on a high level, so that the liquor may run from it to the vessels in which it is to be purified, by inclined gutters. The dimensions given by Dr. Ure as those of the most approved horizontal mills, worked by steam-engines of from eight to twelve horse-power, are, length of rollers, four feet to four feet eight inches, and diameter from twenty-five to twenty-eight inches. The surface speed of the rollers is 3·4 or 3·6 feet per minute. The rate at which juice may be expressed varies according to circumstances; but it is stated that in Demerara a well-constructed engine and mill will produce about a hundred gallons of liquor per hour for each horse-power.

Cane-juice, as expressed by the mill, is an opaque, slightly viscid fluid, of a dull grey, olive, or olive-green colour, of a sweet balmy taste, and of a specific gravity varying from 1·033 to 1·106. It holds in suspension particles of solid matter from the cane, a considerable portion of which is separable by filtration or repose. This solid matter consists of fragments of the cellular parenchyma of the cane, its fibres, and bark, mixed with a very abundant greenish substance, like that called *chlorophyle* by chemists, which forms the colouring-matter of leaves. The juice is so exceedingly fermentable, that in the climate of the West Indies it would often run into the acetous fermentation in twenty minutes after leaving the mill, if the process of clarifying were not immediately commenced. As this would be extremely injurious, it is very important so to proportion the size of the clarifying apparatus to the power of the mill, that the juice may be conducted immediately to it, as fast as it is expressed from the canes.

The processes followed in the East Indies for separating the sugar from the cane-juice are very tedious and imperfect, and may be dismissed with a very brief notice. The liquor, after being strained so as to separate the coarser feculencies, is boiled down in a range of open boilers heated by a long flue, into a thick inspissated juice, the scum which rises during the operation being removed. When it is sufficiently evaporated, it is removed into earthen pots to cool, and in these it becomes a dark-coloured, soft, viscid mass, called *goor*, or *jaggery*. Sometimes a little quicklime is added to the juice before boiling, which, by partly clarifying it, renders it capable of being formed into cakes or lumps. In general however, if intended for subsequent clarification, the juice is merely boiled down, and sold in pots, in a granular honey-like state, to the boilers or refiners. These separate much of the molasses or uncrystallizable part of the juice, by putting the goor into a coarse cloth and subjecting it to pressure. The sugar, which in this state is called *shucker* or *khand*, is further purified by boiling it with water, with the addition of an alkaline solution and a quantity of milk. When this has been continued until scum no longer rises upon the liquor, it is evaporated, and sometimes strained, and afterwards transferred to earthen pots or jars, wide at the top, but coming to a point at the bottom, which is perforated with a small hole, that, at the commencement of the operation, is stopped with the stem of a plantain-leaf. After it has been left for a few days to granulate, the holes in the pots are unstopped, and the molasses drains off into vessels placed to receive it. The sugar is rendered still purer and whiter by covering it with the moist leaves of some succulent aquatic plant, the moisture from which drains slowly through the sugar, and carries with it the dark-coloured molasses. After several days, the leaves are removed, and the upper part of the sugar, which has been most purified, is taken away and dried in the sun. Fresh leaves are then added, by which another layer of sugar is whitened in like manner; and the operation is repeated until the whole mass is refined. The sugar thus prepared is called *chenee*, and is that which is commonly brought to England.

A similar process to the above is said to be practised in Cochin China, by making a pile of brown sugar and of slices of the cellular part of the plaintain stem, in alternate layers. The colouring-matter of the sugar is thus absorbed by the plaintain, leaving the sugar very pure and white. From sugar so prepared the fine white sugar-candy of that country is made.

The separation of the sugar from the cane-juice is effected in a much simpler manner in the West India colonies. The juice is conducted by gutters from the mill to one or more large flat-bottomed coppers or open pans, called *clarifiers*, which usually contain from three hundred to four hundred gallons each, but sometimes as much as a thousand gallons. Each of these clarifiers is placed over a fire, which may be regulated or extinguished by a damper; and each is supplied with a stop-cock or siphon for drawing off the liquor. When the clarifier is filled with juice, a little slaked lime is added to it; the lime, which is called *temper*, being, in most cases, previously mixed with a little cane-juice to the consistence of cream. The quantity of lime varies with different juices, and should be very carefully adjusted, as too much is very injurious to the sugar. Dr. Ure remarks, respecting this process, 'If an albuminous emulsion be used to promote the clarifying, very little lime will be required; for recent cane liquor contains no appreciable portion of acid to be saturated.' 'In fact,' he proceeds, 'the lime and alkalis in general, when used in small quantity, seem to coagulate the glutinous extractive matter of the juice, and thus tend to brighten it up; but if an excess of temper be used, the gluten is taken up again by the strong affinity which is known to exist between sugar and lime. Excess of lime may always be corrected by a little alum-water. Where canes grow on a calcareous marly soil, in a favourable season the saccharine matter gets so thoroughly elaborated, and the glutinous mucilage so completely condensed, that a clear juice and a fine sugar may be obtained without the use of lime.' As the liquor in the clarifier becomes hot, the solid portions of the cane-juice coagulate, and are thrown up in the form of scum. The heat should be urged nearly to the boiling-point, but the liquor in the clarifier should not actually boil. Porter says it should never exceed a heat of 210° Fahr. The proper heat is indicated by the scum rising in blisters and breaking into white froth, which commonly happens about forty minutes after the fire is lighted. The damper is then closed, and the fire dies out; and after an hour's repose, the liquor is ready for removal to the first of the evaporating pans. It is drawn off either by a cock or a siphon, in such a manner as not to disturb the scum, which subsides unbroken, and is removed from the clarifier before another charge of cane-juice is put into it. The clarified juice is bright, clear, and of a yellow wine colour.

From the clarifier the purified juice is transferred to the largest of a series of evaporating coppers or pans, three or more in number, in which it is reduced in bulk by boiling. The largest of these should be of sufficient size to receive the whole contents of the clarifier; but the others may become gradually smaller, on account of the diminished bulk of the liquor, by evaporation, as it is removed into each of them in succession. These evaporators are placed over a long flue, heated by a fire at one end, over which the smallest of the coppers, called the *teache*, is placed. In the process of boiling, impurities are thrown up in the form of scum, which is carefully removed; and sometimes that from the smaller pans is allowed to return, by a channel provided for the purpose, into the largest pan, or *grand copper*. If, during the evaporation, it be perceived that the liquor is not sufficiently clear, some lime-water is added to it, for the same purpose as the temper was originally applied to the juice in the clarifier. In the least and smallest of the evaporating coppers, called the *teache*, the liquor is boiled down to as thick a consistency as is considered necessary for granulation; this point being most commonly ascertained by observing to what length a thread of the viscid syrup may be drawn between the thumb and finger. For this purpose a drop of the syrup is taken between the thumb and forefinger, and drawn into a thread until it snaps asunder. When it has done so the portion suspended from the finger shrinks up, so as to remain at a greater or less length, according to the degree to which the syrup has been evaporated. The proper state is indicated by a thread of from half an inch to a quarter of an inch long. This trial by the *touch*, whence the teache is supposed to derive its name, is very imperfect; for it sometimes happens that the syrup may have the required tenacity, and yet not be in a good state for crystallizing. The latter point may be better ascertained by observing the incipient granulation of the syrup on the back of a ladle dipped in the teache. More perfect tests have been suggested, but Dr. Ure observes, that tenacity and granular aspect 'will continue to constitute the practical guides to the negro boiler, till a less barbarous mode of concentrating cane-juice be substituted for the present *naked teache*, or *sugar frying-pan*.' He adds the following remarks, illustrative of the evils of this practice:—'That weak sugars are such as contain an inferior proportion of carbon in their composition was first deduced by me from my experiments on the ultimate analysis of vegetable and animal bodies, an account of which was published in the 'Philosophical Transactions' of the Royal Society for 1822. Since then Dr. Prout has arrived at results confirmatory of my views. See 'Philosophical Transactions' for 1827. Thus he found pure sugar-candy, and the best refined sugar, to contain 42·85 parts of carbon per cent.; East India sugar-candy, 41·9 parts; East India raw sugar in a thoroughly dry state, but of a low quality 40·88; manna sugar, well refined, 28·7; sugar from Narbonne honey, 36·36; sugar from starch, 36·2. Hence, by *caramelising* the syrup in the *teache*, not only is the crystallizable sugar blackened, but its faculty of crystallizing is impaired, and the granular portion is rendered weaker.' The thermometer, though useful, will not, he states, be a sure guide in determining the proper moment for *striking*, or emptying the teache, because a viscous syrup, containing much gluten and sugar, altered by lime, requires a higher temperature to enable it to granulate than a pure saccharine syrup.

The concentrated syrup is laded, or *skipped*, from the teache, either immediately into open wooden boxes called *coolers*, or into a large cylindrical cooler, about six feet wide and two deep, from which it is afterwards transferred to the smaller coolers, or rather crystallizing or granulating vessels. The latter plan seems preferable, because when successive portions or skippings of syrup are poured into the same vessel, the saccharine particles of one portion agglomerate round those of the preceding skipping, so that a larger grain is produced. The smaller wooden coolers, of which there are commonly six, are usually rectangular, about seven feet long, five or six feet wide, and one deep. The large mass of sugar in each cooler is favourable to the production of large crystals, because it occasions the syrup to cool very slowly.

In the last-mentioned vessels the sugar is brought to the state of a soft mass of crystals, imbedded in molasses, or thick, viscid, but uncrystallizable fluid. The separation of this fluid is the next part of the process, and is performed in a building called the *curing-house*. This is a large building, the floor of which is excavated to form the molasses reservoir, which is lined with sheet-lead, boards, or cement. Over this cistern is an open framing of joists, upon which stand a number of empty casks, or sugar hogsheads, called *potting-casks*. Each of these has eight or ten holes bored through the lower end, and in each hole is placed the stalk of a plantain-leaf, which is long enough to descend a few inches below the level of the joists, and to rise above the top of the cask. The soft concrete sugar is removed from the coolers into these casks, in which the molasses gradually drain from the crystalline portion, percolating through the spongy plantain-stalks, which act as so many drains to convey the liquid to the cistern beneath. With sugar of average quality three or four weeks is sufficient for this purpose, but sometimes a longer time is necessary. If the sugar be removed too early from the cooler, which Porter thinks is often the case, a portion of crystallizable syrup is lost, by its running away with the molasses. Most accounts describe the curing-house as an *airy* building; but Dr. Ure says that it should be close and warm, to favour the liquefaction and drainage of the viscid caramel.

When it leaves the curing-house the sugar is packed in hogsheads for shipment as *raw*, *brown*, or *muscovado sugar*; and in this state it is commonly exported from our West Indian colonies. As the molasses is very imperfectly separated from the crystallized sugar, a considerable diminution of weight takes place subsequent to the shipment, by the drainage from the hogsheads. This waste has been estimated to amount to no less than 12 per cent., or more than 27,000 tons annually, upon the sugars of the British colonies. The loss upon French colonial sugars used to be much greater even than this. Dr. Ure states, on the authority of Dutrone, that of 120,000,000 lbs. of raw sugar which were annually shipped by the planters of St. Domingo, only 96,000,000 lbs. were landed in France; the loss by drainage amounting to 20 per cent. Means have been recently adopted in some colonial sugar-works for reducing this loss; but they may be better described after treating of the superior kind of raw sugar called *clayed sugar*.

Clayed sugar, which is also called *Lisbon sugar*, is raw sugar that has been subjected to an operation similar to that which has been described in the notice of East India sugar, as practised in the preparation of *chenee*. The sugar is removed from the coolers into conical earthen moulds called *formes*, each of which has a small hole at the apex. These holes being stopped up, the formes are placed, apex downwards, in other earthen vessels. The syrup, after being stirred round, is left for from fifteen to twenty hours to crystallize. The plugs are then withdrawn, to let out the uncrystallized syrup; and, the base of the crystallized loaf being removed, the forme is filled up with pulverised white sugar. This is well pressed down, and then a quantity of clay, mixed with water is placed upon the sugar, the formes being put into fresh empty pots. The moisture from the clay, filtering through the sugar, carries with it a portion of the colouring-matter, which is more soluble than the crystals themselves. The clay may be repeatedly re-wetted or renewed, until, after about twenty days, the loaves are sufficiently purified to be removed from the formes. They are then dried gradually in a stove, and crushed into a coarse powder for exportation. The syrups that run off during the operation of claying contain much saccharine matter, and are therefore re-boiled, so as to form an inferior sugar. Claying is little practised in British plantations, from an opinion that the increase of labour and diminution of quantity of produce occasioned by it is not compensated by the improved quality of the sugar. It was however very generally practised by the French in St. Domingo, where four hundred plantations adopted the process.

A similar process to the above, so far as regards the result, is that patented by Mr. Hague, in 1816, for England, and in 1828 for the colonies. It consists in submitting the raw sugar, after being cured in the usual way, to the action of a vacuum filter. The apparatus consists of a shallow vessel, beneath which is a cavity or reservoir, connected with an air-pump. The bottom of the vessel is perforated with a number of small holes; and when a quantity of muscovado sugar, mixed with a little water into a pasty mass, is laid in it, upon a piece of haircloth, the air is withdrawn from the cavity beneath the sugar. The pressure of the superincumbent atmosphere upon the surface of the sugar then drives the moisture, and with it much of the colouring-matter, through the holes in the bottom of the vessel. When the sugar is sufficiently whitened, the air-pump is stopped, the sugar and molasses are removed, and a fresh charge of muscovado is applied. Mr. Porter states that this process has been applied with advantage in the colonies, and that it is likely to supersede claying. He considers that it may lead to economy not only by preventing the loss by drainage, but also by bringing the sugar to so dry a state that it might be packed in bags, like East India sugar, instead of casks. It is also important for effecting a saving of time in the preparation of sugar for shipment. Besides its use in the colonies in separating molasses from muscovado sugar, this plan has been applied to raw sugars in England, as the first step in the refining process.

Somewhat similar to the above is the plan patented by Mr. John Taylor for expelling molasses from raw sugar by the application of very powerful pressure; water or lime-water being previously mixed with the sugar in the proportion of one-eighth to one-tenth of its weight. This plan, according to Porter, is not equally efficient with that of Hague.

Another means of avoiding the loss consequent on the drainage from raw sugar during its voyage to this country, and that occasioned by the repeated solution of the sugar, which weakens its grain, is the importation of sugar for the use of the refiner, in the form of concentrated cane-juice, containing nearly half its weight of granular sugar along with more or less molasses, according to the care taken in the boiling operations. Dr. Ure appears very sanguine as to the result of this plan, observing, 'Were this means generally adopted, I am convinced that 30 per cent. would be added to the amount of home-made sugar-loaves corresponding to a given quantity of average cane-juice; while 30 per cent. would be taken from the amount of molasses.' The saving of labour in the colonies, by which the produce of the cane may be exported five or six weeks earlier than is usual, is also important. It had been feared that the syrup would undergo some chemical change during the voyage; but Dr. Ure states that among more than a hundred samples which he had analysed for the Custom-house, he had not perceived any traces of fermentation. He adds, however, that it does not appear that our sugar colonists have availed themselves of the proper chemical method of counteracting that incipient fermentation of the cane-juice which sometimes supervenes, and proves so injurious to its products. A very slight *muting*, or impregnation with sulphurous acid, such as might be given by burning a sulphur match in the cistern immediately before charging it from the mill, would, he says, suffice for the most fermentable cane-juice; and the sulphurous acid might be driven off by heating the cane-juice in the clarifier before adding the temper-lime, so as to prevent the introduction of calcareous sulphite into the sugar. A like process is adopted successfully with grape-must.

Sugar-refining.—Raw or muscovado sugar, as brought from the colonies, forms the common moist or brown sugar of the shops. The saccharine particles are always mixed with other matter, which imparts to the sugar a dark colour, a moist clammy feeling, and an empyreumatic odour. The impure matter is stated by Dr. Ure to consist of gluten, lime, and particularly caramel. The object of the sugar-refiner is to remove these impurities, so as to obtain the sugar in the hard white semi-transparent state known as *loaf-sugar*.

The art of refining sugar, as well as that of extracting it from the cane, is supposed to have been brought to Europe from the East, probably from China; but at what time is uncertain. The Venetians are believed to have been the earliest sugar-refiners in Europe; and it is known that they practised the art before the discovery of America. Macpherson (*Annals of Commerce*, vol. ii., p. 25, note) says that it appears, from the accounts of the chamberlain of Scotland, published from the originals in the Exchequer, by John Davidson, Esq., that in 1329 *loaves of sugar* were sold in Scotland at the price of 1*s.* 9½*d.* (more than an ounce of standard silver) per lb.* Heylyn, in his 'Cosmographie' (in the account of the island of St. Thomas), speaks of the art of refining as 'first found out by a Venetian in the days of our forefathers, who got 100,000 crowns by the invention;' but this often-repeated statement gives little information, and cannot be received as conclusive as to the invention. It appears however that the Venetians originally operated upon the coarse black sugar brought from Egypt, and that they followed the Chinese practice of converting it into sugar-candy before they made loaf-sugar. Stow's 'Survey of London' states that sugar-refining was commenced in England about 1544. There were then two sugar-houses in London, but they yielded little profit, because there were many sugar-bakers in Antwerp who could supply refined sugar to England better and cheaper than it could be made at home. Subsequently, the commerce between England and Antwerp being stopped, these two sugar-houses supplied all England for twenty years, and became so profitable, that many other persons embarked in the business. Moseley says that in 1596 Sir Thomas Mildmay, on the pretext that frauds were practised in refining sugar, petitioned Queen Elizabeth for a licence for an exclusive right to refine sugars for a term of years; for which monopoly be offered to pay an annual sum. His petition was rejected, 'and,' Moseley adds, 'England, which formerly had been supplied with refined sugar from Antwerp, the chief commercial city then in Europe, now not only supplied itself, but exported great quantities to other countries.' Anderson was therefore mistaken in supposing that the first account of sugar-refining in England was that in a pamphlet printed in 1659, which he quotes under that year for a notice of the prosperity of Barbadoes.

Few manufacturing operations have undergone of late years more important changes than that of sugar-refining. As generally practised until recently, the process commenced by mixing the raw sugar in a large open copper with lime-water, and adding to the mixture when warm a quantity of bullock's blood. The heat occasioned the serum of the blood, which consists chiefly of albumen, to coagulate, and in so doing to collect most of the impurities floating in the liquor, and to raise them with it to the surface of the syrup in the form of a thick scum, which was carefully removed. This clarifying process was sometimes repeated with a fresh quantity of blood, or, as it is technically called, *spice*. When the liquor was thus rendered tolerably clear, and was partially evaporated by boiling, it was further cleansed by passing it through a filter of thick woollen cloth, which detained any particles of scum that might have been left after skimming the liquor. It was afterwards concentrated by boiling in a smaller open copper till it was sufficiently thick for graining; after which it was formed into loaves in the manner hereafter described. For loaves of the finest quality a second refining followed this; the loaves produced by the first operation being broken and re-dissolved, either in water or lime-water, and then again clarified with white of egg beaten up with sugar and water: this, being almost pure albumen, acted in a similar way to the serum of the blood, and threw up a greyish scum. A small quantity of indigo, finely powdered and mixed with syrup, was then added; the effect of which was to throw up a slight scum, and by its colour to neutralize the yellow colour of the liquor. The same processes of filtering, concentrating, and pouring the syrup into moulds, follow in this as in the case of single-refined sugar.

In the preceding section allusion has been made to the methods of separating molasses from raw sugar by the vacuum-filter and the hydraulic-press, both of which have been applied to the preparation of sugar for refining. Aikin states that by the latter process sugar is now capable of yielding loaves equal to double-refined by one process.

Many improvements have been effected upon the old methods of clarifying and concentrating the syrup. Several of these improvements are fully detailed by Mr. Porter, to whose work we refer for further information. The reader may also consult No. 582 of the 'Penny Magazine,' which contains an account (illustrated by cuts of some of the apparatus employed) of a visit to the refinery of Messrs. Fairrie, at Whitechapel. In the process there described the raw sugar is transferred from the casks into large circular vessels, called *blow-up cisterns*, in which it is mixed with water, and with a small quantity of lime dissolved in water so as to form a milky fluid. The mass is heated by steam, which is forced by its own pressure through small apertures in copper pipes, which are laid along the bottom and sides of the vessel; and the perfect solution of the sugar is aided by stirring with long poles or oars. The liquor is not in this case skimmed, but is allowed to flow from the blow-up cistern to a range of filtering-vessels in a room beneath. The filters are tall vessels six or eight feet high, of cast-iron or wood, having cisterns at top and bottom, and a number of cloth or canvas tubes, closed at their lower ends, but communicating at their upper ends, by which they are suspended, with the upper cistern. Within each of these tubes is a bag of thick close cotton-cloth, which, being much larger in diameter than the tube in which it is enclosed, is necessarily folded together. At the establishment alluded to, sixty such compound bags or tubes are comprised in each filter; the inner bags being six feet long and two wide, while the outer tubes are only about three inches in diameter. By this device a very extensive filtering surface is obtained in a small compass; and, as the liquor from the upper cistern cannot escape from the bags excepting by percolating through the meshes of the cloth, it becomes, as it drops into the lower cistern, very clear and transparent; most of the solid impurities remaining in the bags. When the bags and tubes are clogged up, they are removed from the filter and washed; but as the solid particles removed from them contain some saccharine matter, they are subjected to a subsequent process for its extraction, and the refuse of this process is sold for manure. On leaving the filter, the syrup, though clear and transparent, is of a reddish colour; and the removal of this tinge is effected by filtering the syrup through a mass of powdered charcoal. The application of the bleaching power of charcoal to the purification of sugar is one of the great improvements effected by modern science. Animal charcoal, or burnt bone, is found very superior to the charcoal of wood, for this purpose; possibly because, from the quantity of earthy matter which exists in bone, the carbonaceous particles are more finely divided than those of vegetable charcoal. Animal charcoal is variously applied in the bleaching of sugar-syrup; but in the case immediately under notice it is used in the form of a coarse powder resembling gunpowder in grain. It is placed in a large square vessel, which has a perforated false bottom covered with a piece of cloth, upon which the charcoal is laid to the thickness of nearly three feet. The syrup is conducted by pipes from the bag-filter to the surface of the charcoal, through which it percolates slowly; it then drops through the cloth, and through the holes in the perforated bottom, into the cavity beneath, where it is found almost colourless. The pulverised charcoal, after becoming foul by use, is first washed by passing water through it until all the soluble matter is removed, and then re-calcined in a retort-house on the premises; whereby all the remaining impurities are driven off, and the valuable properties of the charcoal, or *bone-black*, are restored, so that it may be used again and again.

In some cases, before the sugar is placed in the blowing-up cistern, it is partially purified by mixing it into a pap with hot water or steam, and exposing it to drain in large sugar-moulds, similar to those used in the preparation of clayed sugar. In this case the purification may be rendered more complete by the filtration of moisture from a magma of sugar (a mass of wet sugar in a state resembling mortar), applied in the same way as that of clay in the claying process. Sometimes also a little blood is mixed with the sugar in the blow-up cistern; or, instead of it, a mixture of gelatinous alumina and gypsum, called *finings*, prepared by adding a solution of alum to a body of lime-water, and collecting, washing, and draining the precipitate upon a filter, is used. Other refiners use both the blood and finings. The bone-black, in the state of very fine powder, is also, by some refiners, mixed with the sugar in the blowing-up cistern, in the proportion of from 5 to 20 per cent. of the whole, instead of being used in the manner first described. Dr. Ure, who mentions this order of procedure, states that the liquor which first passes through the bag-filter is generally tinged a little with the bone-black, and must therefore be pumped back into the upper cistern for refiltration. He adds that, in cold weather, the case containing the bag-filters may be kept warm by steam-pipes. Aikin observes that, from experiments on the mode of action of animal charcoal in the manufacture of beet-sugar, it appears not only to attract to itself the colouring-matter, and to destroy the peculiar flavour by which one kind of sugar is distinguished from another; but also to have the property of removing much of the mucilage, and thus facilitating the crystallization of the pure saccharine part. He states also that it has been used with great advantage in clarifying the cane-juice itself, and thus obtaining a raw sugar nearly equal to brown sugar-candy.

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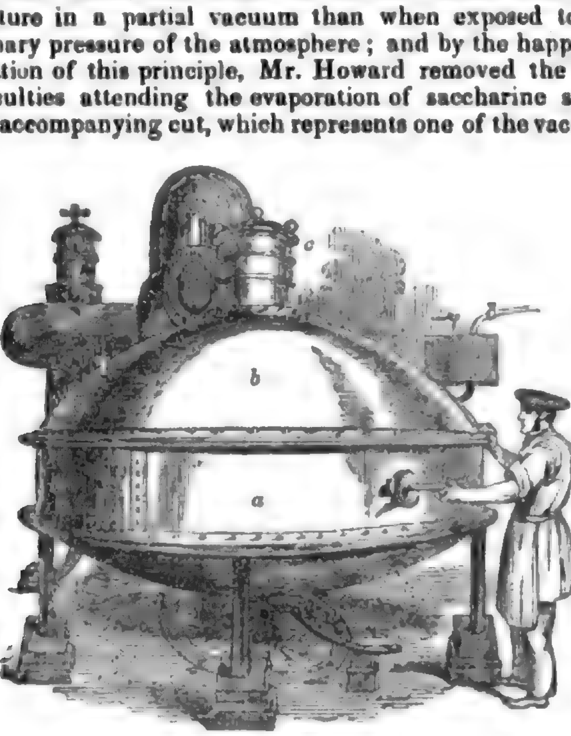
* The value of money in Scotland at the time alluded to may be seen by other items of the same account, which are given in the Appendix, No. iii., to acpherson's fourth volume. From these it appears that the price of a horse ied from 8s. to 13s. 4d.; that an ox cost 10s.; and a sheep from 1s. 2d. to 2s.

In the evaporation or concentration of the clarified syrup, which forms the next part of the refining process, improvements of the greatest importance have been effected. In the old plan of concentrating the syrup in open pans, they were heated by fires to a temperature of from 230° to 250° Fahr. Many plans were contrived for rendering the application of heat more regular and controllable, by the intervention, between the fire and the evaporating pans, of fluids which, under the ordinary atmospheric pressure, cannot be raised above the proper temperature; by heating the pans by means of steam-pipes; or by some similar contrivance. The most valuable invention of all appears to be that patented in 1813 by the Honourable Edward Charles Howard, and now extensively used under the name of Howard's vacuum-pan. It is well known that fluids will boil at a much lower temperature in a partial vacuum than when exposed to the ordinary pressure of the atmosphere; and by the happy application of this principle, Mr. Howard removed the chief difficulties attending the evaporation of saccharine syrup. The accompanying cut, which represents one of the vacuum-pans used at the refinery of Messrs. Fairrie, may assist in the explanation of this admirable contrivance. The apparatus consists of a close copper vessel, *a*, *b*, the several parts of which are united by flanges, with packing between the joints to render them perfectly air-tight. The middle portion of this vessel, *a*, is cylindrical, and from six to seven feet in diameter, and the upper part, *b*, is convex or dome-shaped. The bottom of the pan is also convex, but in a less degree, being part of a larger sphere. The whole is supported upon legs, so that every part may be readily inspected. The bottom of the pan is double, the cavity between the inner and outer bottom forming a receptacle for steam, the admission of which raises the contents of the pan to any required temperature. The best kind of pans have also a spiral coil of copper pipe a little above the inner bottom, about on a level with the lower flange, or bottom of the cylindrical part of the vessel, by which steam may be made to circulate through the body of syrup in the pan, and thereby to greatly assist in its evaporation. The bottom cavity is supplied with steam generated at a low pressure; but the spiral pipe contains steam of high pressure, and consequently of great heat. *c* is a small cavity called the *neck*, rising from the centre of the dome, from which, by means of the bent tube and apparatus seen behind the pan, a communication is formed with an air-pump, by which the pan may be partially exhausted of air. A communication is also formed between the interior of the pan and a vessel containing clarified syrup; and another, by means of a pipe from the bottom of the pan, with a vessel in the room below, which receives the sugar after it has been boiled; each of these communications, as well as that with the air-pump, being supplied with valves, by which they may be opened or closed at pleasure. The pan is supplied with apparatus by which the temperature of the syrup, the rarity of the air, &c., can be readily ascertained; and it has a safety-valve to admit air in case of the air-pump acting too fast; so that the vacuum cannot be accidentally made too perfect, by which the pressure of the external atmosphere might become dangerous. The subsidiary parts of the apparatus may be variously arranged, but do not require further description. In using the pan, a quantity of liquid sugar is admitted, sometimes from a vessel placed above it, and sometimes from one on a lower level: in the latter case, the syrup is forced into the pan by the pressure of the atmosphere, on the same principle that water rises in a common pump—a partial vacuum being formed in the pan by the action of the air-pump. The air-pump continues at work during the boiling or evaporation of the syrup, motion being communicated to it from a steam-engine; and by this means the sugar is enabled to boil at a temperature of only 130° to 150°, or 100° lower than that required in open vessels. To enable the person who superintends the process to ascertain when the syrup is sufficiently evaporated, the pan is supplied with a very ingenious appendage called the *proof-stick*, the handle of which is shown at *d*. This contrivance consists of a tube extending into the body of sugar in the pan, and terminating in a peculiar kind of valve, so formed that, by turning a rod which is inserted in the tube, a sample of sugar may be taken and drawn out with the rod, without admitting air into the vessel. The sample thus obtained is examined and tried by the *touch*, as described in explaining the process of evaporation in the West Indies; and when it appears to be in a satisfactory state, the sugar is allowed to flow, through an opening in the bottom of the pan, into a granulating-vessel in a room below.



The important improvement of boiling sugar in vacuo made way, for a considerable time, but slowly. At length however the superiority of the new process became so apparent, that it was extensively adopted. It is stated in the 'Penny Magazine' that, in some years, the premiums paid by refiners for permission to use the patent process amounted, collectively, to more than forty thousand pounds.

The practice of boiling the syrup at so low a temperature has occasioned a curious difference in the next process, which is that of granulating or crystallizing the concentrated liquor. In the West Indies, the vessels used for this purpose are called *coolers*, because in them the syrup is brought down to a much lower temperature than it has received in the boiling-coppers. The corresponding vessels used in refining sugar upon the old plan were similar to these, and were called by the same name; but when the method of boiling at a low temperature is adopted, the granulators become *heaters* instead of *coolers*; the sugar, when placed in them, being raised to a temperature of 180° or 190°. This is done by the admission of steam into a cavity surrounding the granulating-vessel, which is a shallow open copper or pan, in which the thick pulpy mass is stirred violently to promote the granulation.*

* Aikin observes, respecting this process, 'If the syrup, whether for single or double refined sugar, after being properly boiled, were poured directly into the earthen cones, instead of being previously well beaten while in the cooler, the crystallization, which is purposely disturbed by the beating, would take place regularly, and the result would be a mass of crystals; but sugar, in so crystallizing, does not exclude the whole of the colouring-matter, nor could the process of claying be employed, under such circumstances, with any good effect.'

It should be borne in mind that, owing to the low temperature of the sugar in the vacuum-pan, it is, in a great measure, crystallized before leaving it; so that the principal object of the subsequent reheating in the granulator is to bring it into a favourable state for removal to the moulds. To promote the formation of large crystals in the pan, it has been thought advisable to admit the charge of syrup in several successive portions, that the crystals of the first may form nuclei to those of the subsequently added portions; but Dr. Ure conceives that this hypothesis is more specious than sound, because the subsequent heat applied in the granulator reduces the crystals again to a small size.

From the granulators the sugar is transferred, by means of copper basins or pans, into moulds of a conical form, which were formerly made of coarse pottery, but are now usually of iron. These moulds, like those used in the claying process, have orifices at their points, which are stopped up before they are filled with sugar. They are arranged on the floor in rows, with their open bases uppermost; and immediately after the sugar is poured in it is stirred round, to diffuse the crystals equally through the semifluid mass. They are then left for several hours, that the sugar may become solid: after which they are removed to another room; and, their points being unstopped, and the concreted sugar at the apex being pierced by a steel wire, they are set in earthen jars, that the uncrystallized fluid may drain from them; or the same purpose is effected by placing them in racks, with gutters to receive and conduct to a cistern the syrup that flows from the sugar. This syrup is re-boiled with raw sugar, so as to yield an inferior quality of sugar; and when all the crystallizable matter has been extracted from it, the remainder is sold as treacle. It was formerly usual to 'clay' the loaves in order more thoroughly to remove the molasses; but this process is abandoned by most refiners for the superior method introduced by Mr. Howard of cleansing the loaf by causing a saturated solution of sugar in water to percolate through it. When the loaf of sugar is thoroughly purified by the repetition of this process, and is sufficiently dry, it is turned out of the mould; the base being scraped to an even surface, and the apex applied to a kind of lathe, in which any part that may be slightly discoloured is cut off, leaving the end clean and smooth. The coarser loaves, instead of being turned, merely have their damp ends chopped off, so as to reduce them to the form of truncated cones. The loaves are finally dried in an oven heated by steam-pipes to a temperature of 130° or 140°, and then wrapped up in paper for sale.

It is needless to follow the processes by which the syrups and other refuse of the best sugar are converted into sugars of inferior quality, which are either sold as cheap loaf-sugar, or formed into large coarse loaves called *bastards*, which are crushed into powder for sale; or to detail further the results of the improved processes introduced of late years. It has been asserted that about two-thirds of the molasses found in the moulds under the old system were formed by the intense heat employed in concentrating the syrup; a loss which is now, in a great measure, obviated. The discontinuance of the use of fires to heat the vessels employed is attended with great advantage on the score of safety as well as convenience; heat being conveyed to every part of the building, in any required quantity, by means of steam-pipes. The effect of these improvements in diminishing the price, and consequently increasing the consumption of refined sugar, is also very important; the cost of refined sugar being now only about 20 per cent. greater than that of raw sugar, although formerly the difference of price was as much as 40 per cent.

Sugar-Candy.—This is the only kind of refined sugar made in China and India; and is made of the finest quality by the Chinese, who export it in considerable quantities. M'Culloch states that two sorts are met with at Canton, called, respectively, Chinchew and Canton; the former being the produce of the province of Fokien, and the latter of that of Canton. Of these, the former is by far the best. He adds that Chinese sugar-candy is consumed, to the almost total exclusion of other sugar, by the Europeans at the settlements in the East.

Candy is sugar which, after being more or less perfectly refined, is suffered to crystallize very slowly upon strings or twigs. For making it, the syrup is poured into moulds in a much thinner state than for loaf-sugar, in order that the viscidity of the fluid may not impede the aggregation of the saccharine particles around the threads or twigs inserted for the purpose; and, to maintain the necessary degree of fluidity, the moulds or boxes are placed in a stove, and kept hot for several days. Perfect stillness is important during this operation, as any disturbance reduces the size of the crystals. The syrup is afterwards let off very gradually. The crystals vary much in shape, and become grouped or agglomerated together as they form upon the strings or the sides of the box or mould. Candy is more transparent and harder than loaf-sugar; and its hardness renders it less soluble. Aikin observes that it is, on this account, often represented as less sweet than loaf-sugar, for the same reason that the latter is popularly considered less sweet than muscovado sugar; but that there appears no reason for supposing that sweetness is not the essential character of sugar, and therefore that the purer it is, the more perfectly is its sweetness brought out. Coloured sugar-candy is made by mixing cochineal, indigo, or other colouring-matter with the syrup; and perfumed candy may be impregnated with any desired scent in the same way.

Beet-root Sugar.—The process of manufacturing sugar from beet has been fully detailed in a previous volume [BEET, vol. iv., p. 160]; and is also noticed in pages 234 and 235 of the present volume. Beet-root sugar is now extensively manufactured in many parts of the continent of Europe; but its success is probably owing, in a great measure, if not entirely, to the heavy imposts upon colonial sugar.

The manufacture of beet-root sugar in the United Kingdom is regulated by an act passed in 1837 (1 Vict., c. 57), and it is subject to the same duty as British plantation sugar: none however is made. In Russia the cultivation of beet-root for sugar was for some time carried on very actively; but the profits not being so great as were expected, the manufacture is declining. In 1841 the number of beet-root refineries in Russia was 174, and the total produce was 2009 tons, the importation of colonial sugar being 26,932 tons. In Saxony the manufacture has proved a failure, and there are now only two establishments. In Hanover it is of very little importance; and there are only two manufactories, at Nieuburg and near Osnabrück. The commercial treaty with Holland, under which colonial sugar is admitted at a moderate duty, has had the effect of checking the operation of the beet-root sugar manufactories in Prussia. The quantity manufactured in 1840, in fifty beet-root establishments in the province of Magdeburg, was 1,600,000 cwt., and the capital embarked in buildings and machinery is said to exceed 1,000,000*l.* sterling, some of the establishments having cost 30,000*l.* The manufacturers hope that the duty on colonial sugar will be increased to 30*s.* per cwt. The manufacture of beet-root sugar is more extensive in France than in any part of the Continent. In 1841 the number of acres cultivated with beet-root for sugar was 142,518; and in the same year the quantity of sugar produced was 31,621,923 cwt., of which one-third was manufactured in the north eastern departments. The number of manufactories was 389, some of them provided with very costly machinery made in England. In the session of 1842 the French government proposed to reduce the duty on colonial sugar, but the interests of the beet-root sugar manufacturers were sufficiently powerful to procure an adjournment of the question for a year, and it is probable that they will demand compensation if the proposed alteration be effected.

Maple Sugar.—The earliest notice we have met with of sugar made from the juice of the sugar maple [ACER, vol. i., p. 79] is a paper in No. 364 of the 'Philosophical Transactions,' which was published in 1720, entitled 'An Account of the Method of making Sugar from the Juice of the Maple-Tree in New England,' by Paul Dudley. This proves that Macpherson was in error when he stated (*Annals of Commerce*, vol. iv., p. 209) that the manufacture was first attempted about 1752; although for some time after that date it was carried on in a very limited way. He informs us that the difficulty of procuring supplies of West India sugar during the American revolutionary war contributed to give it more importance; and the convenient circumstance that the principal time for making the sugar, about February and March, is that at which, owing to the frost, there is a scarcity of other employment, induced many of the farmers of Canada and Nova Scotia to prepare maple-sugar, not only for their own use, but also for sale at Quebec, Halifax, and other places. About 1790 this branch of husbandry was much attended to in the middle states of North America, and refined maple-sugar was sold in Philadelphia, which was pronounced equal to any loaf-sugar made from West Indian muscovado sugar. Maple-sugar is still made for domestic use in many parts of the United States.

The sap is obtained by boring holes in the trunk, in a direction inclining upwards, with an auger about three-quarters of an inch in diameter; the depth of the holes being such that they may penetrate about half an inch into the alburnum, or white bark, as the sap is found to flow more freely at that depth than at any other. The south side of the trunk is considered best for boring the holes, of which two or three, at a height of eighteen or twenty inches from the ground, are said to be sufficient for an ordinary tree. Tubes of elder or sumach are inserted in the holes, so as to project a few inches from the trunk; their outer ends being cut so as to form small troughs, along which the sap trickles into receptacles placed beneath them. The season for collecting the sap extends for about six weeks, ranging between the beginning of February and the middle of April. This is done in frosty weather; yet the tendency of the juice to fermentation renders it desirable to boil down the sap at furthest within two or three days from the time of its extraction. This is done in very rude apparatus, which is carried to the encampment formed by the sugar-makers. The syrup is thus brought to about one-third of its original bulk, the scum which rises being removed. White of egg is sometimes used as a clarifier; and occasionally a little butter or fat is thrown in during the last boiling. The molasses are separated, though mostly in a very imperfect manner, by filtration. The concreted sugar is said to be equal in taste to cane-sugar, and to sweeten as well; and when the molasses are well removed, the sugar is not deliquescent, like equally brown sugar from the cane. It is seldom refined, but is capable of being made equal to loaf-sugar from the cane. The composition of maple-sugar is noticed in the next article.

(Moseley's *Treatise on Sugar*, second edit., 1800; Porter on *The Nature and Properties of the Sugar-Cane*, &c., 1830; Edwards's *History of the West Indies;* Anderson's *History of Commerce*, second edit., 1787-9; Macpherson's *Annals of Commerce;* Ure's *Dictionary of Arts*, &c.; M'Culloch's *Dictionary of Commerce; Transactions of the Society of Arts*, vol. li., pp. 143-188; *Memoirs of the Literary and Philosophical Society of Manchester*, vol. iv., p. 291, &c.)

SUGAR. (Chemistry.) The following are the general properties of sugar obtained from different sources:—

Cane Sugar.—The properties of this are, that it is colourless, inodorous, of a purely sweet taste, moderately hard, and brittle. The crystals, when rapidly formed, as in common refined sugar, are small; but when obtained by the slow evaporation of a strong solution, they are of considerable size and prismatic in their form (sugar-candy). The specific gravity of sugar is about 1·065: it undergoes no change by exposure to the air; and, when moderately heated, loses only a little hygrometric moisture: it is soluble in one-third of its weight of cold water, and combines with hot water in all proportions: a solution saturated at 230° forms, on cooling, a mass of small crystals. It is soluble in alcohol, but much less so than in water; for absolute alcohol takes up only 1-80th of its weight, even when boiling, and this separates in small crystals as the solution cools: spirit of wine, of specific gravity 0·830, dissolves nearly one-fourth of its weight. Sugar is phosphorescent when two pieces are rubbed together in the dark. When heated to 365° sugar melts into a viscid colourless liquid, which, when cooled suddenly, becomes a transparent mass (barley-sugar): by keeping, it becomes opaque; at 400° to 420° sugar is converted into caramel by losing an equivalent of water. When exposed to a high temperature, sugar undergoes decomposition, yielding various gaseous products, and leaving a large proportion of charcoal. The acids produce very different effects upon sugar: thus nitric acid decomposes and is decomposed by it, the principal products being nitric oxide, carbonic, oxalic, and saccharic acids: by sulphuric acid, when concentrated, sugar, or even a strong solution of it, is readily decomposed, sulphurous and carbonic acid gases being formed and evolved, and a large quantity of charcoal remains: 1-100th of a grain of sugar, on account of the large proportion of charcoal which it contains, is capable of imparting colour to an ounce of sulphuric acid. When however sugar dissolved in dilute sulphuric acid is kept for a long time at a high temperature, it absorbs oxygen from the air, formic acid is produced, and there is deposited a brown insoluble matter, which has been supposed to be identical with humus or humic acid. Hydrochloric acid dissolves sugar, and forms with it a thick black resinous paste. Although even a solution of sugar undergoes change slowly when exposed to the air, yet by the addition of yest it undergoes fermentation, and is converted by it, as is supposed, first into grape sugar, and then, as is well known, into alcohol.

Sugar in many cases combines with the alkalis, earths, and metallic oxides, and, in some cases, forms definite compounds with them: with ammonia, according to Berzelius sugar combines to form a compound of one equivalent of each; but by exposure to the air the ammonia escapes, and leaves the sugar unaltered: potash and soda appear also to combine with sugar, and they destroy its sweetness; this is restored when the alkalis are saturated with an acid: but if they be left long in contact, the sugar becomes changed into a substance resembling gum.

Lime, barytes, and oxide of lead dissolve in considerable quantity in a solution of sugar: when the first-mentioned of these bodies, in the state of hydrate, is digested at a moderate heat in a solution of sugar, a bitter alkaline solution is obtained, in which the sugar is combined with more than half its weight of lime: Professor Daniell obtained, by the action of these bodies, gum and crystals of carbonate of lime. According to Peligot, the compound of sugar and lime consists of one equivalent each of caramel or anhydrous sugar, lime, and water. The compound of sugar and barytes is similar. When hydrated oxide of lead is digested in a solution of sugar, a yellow alkaline liquid is formed, which yields a tough deliquescent mass by evaporation: but when excess of the oxide is boiled in a solution of sugar, and the liquor is filtered hot, it deposits eventually bulky flakes of a tasteless insoluble compound, composed of, according to Berzelius, one equivalent of sugar and two equivalents of oxide of lead, or 42·35 sugar + 57·65 oxide.

Sugar dissolves carbonate and diacetate of copper, forming green solutions which are not decomposed by the alkalis, and this is also the case with the salts of iron. A crystalline compound of sugar and common salt may be formed by the spontaneous evaporation of a solution of four parts of the former and one part of the latter.

According to the analysis of Berzelius, cane sugar consists of—

Twelve equivalents of carbon . .	72	or	6·4
Eleven equivalents of hydrogen .	11	..	42·1
Eleven equivalents of oxygen . .	88	..	51·5
Equivalent . .	171		100·

When exposed to a high temperature, as already noticed, two equivalents each of oxygen and hydrogen are separated: the equivalent of the remaining caramel or anhydrous sugar is of course = 153.

The uses of cane sugar are too well known to require much notice: on account of its antiseptic power, it is employed to preserve various vegetable products: it is used as a sweetener of many kinds of food, and is in these cases nutritious; but being destitute of azote, like other substances similarly constituted, it is incapable of supporting life for any length of time.

Maple Sugar, when refined, is stated to be equal in appearance and sweetening power to refined cane sugar; and in composition they are very similar. According to Dr. Prout's analysis, maple sugar may be considered as composed of—

Twelve equivalents of carbon . .	72	or	42·1
Eleven equivalents of hydrogen .	10	..	6·4
Eleven equivalents of oxygen . .	88	..	51·5
Equivalent . .	171		100·

Beet-root Sugar, according to the analysis of Dr. Prout, is exactly similar to that of cane and maple sugar.

Grape Sugar.—Water dissolves less of this than of cane sugar, the solution is less viscid, and it is not so sweet; alcohol however dissolves more of it, but it is deposited from it in crystalline grains. With sulphuric acid, instead of being charred, as cane sugar is, it forms a compound acid called *sulphosaccharic acid*, which gives no precipitate with the salts of barytes.

According to Saussure, this sugar is composed of—

Twelve equivalents of carbon . .	72	or	36·36
Fourteen equivalents of hydrogen.	14	..	7·07
Fourteen equivalents of oxygen .	112	..	56·57
Equivalent .	198		100·

Manna Sugar.—Mannite is contained in manna which exudes from the *Fraxinus Ornus* and other species of ash: the best is imported from Sicily and Calabria, under the name of *flake manna:* from this the sugar is procured by boiling it in alcohol, and as the solution cools the mannite crystallizes: by very slow crystallization it may be obtained colourless, in slender four-sided prisms of a silky lustre. It has a slightly sweet taste, is very soluble in water, but the solution is not fermentable. Mannite is also produced during the fermentation of cane and grape sugar. It appears to be composed of—

Six equivalents of carbon . . .	36	or	39·6
Seven equivalents of hydrogen . .	7	..	7·6
Six equivalents of oxygen . . .	48	..	52·8
Equivalent . .	91		100·

It may be observed, that, unlike any of the preceding varieties of sugar, the oxygen and hydrogen do not exist in this kind in the proportions which form water.

Honey Sugar contains two kinds of sugar, one resembles grape sugar, and the other is uncrystallizable: the solid sugar is obtained from granular honey by the action of strong alcohol; this leaves the sugar, but dissolves the other ingredients: by dissolving in water, treatment with animal charcoal, and evaporation, this sugar may be obtained in a white granular state.

Liquorice Sugar, or *Glycyrrhizin*, is obtained from liquorice-root: it is a yellow transparent substance, extremely sweet, very soluble both in water and alcohol, and has a great tendency to combine with acids, bases, and salts: it occasions precipitates in the solutions of most metallic salts.

Mushroom Sugar is obtained from several species of agaricus, &c. It crystallizes in square prisms, is colourless, only slightly sweet, and less soluble in water than cane sugar. It forms a red solution in concentrated sulphuric acid.

The sugar of malted grain, and that formed artificially from starch, have the general characters of grape sugar.

Sugar of Milk, or *Lactine*, is obtained by evaporating the whey of milk to its crystallizing point: it forms colourless four-sided prisms, which are soluble in about six parts of cold water and two and a half parts of hot: the taste of this sugar is not very sweet, it is unalterable in the air, and is insoluble in alcohol and æther.

According to the experiments of Berzelius, when anhydrous it is composed of nearly—

Two equivalents of carbon . . .	30	or	45·45
Four equivalents of hydrogen . .	4	..	6·06
Four equivalents of oxygen . . .	32	..	48·49
Equivalent . .	66		100·

In its crystallized state it contains one equivalent of water = 9.

Sugar of Diabetic Urine has the general characters of grape sugar. [DIABETES.]

SUGAR. PROPERTIES OF. Sugar is a proximate principle, chiefly of vegetables, but also sparingly of animals of the class Mammalia. It presents considerable varieties, according to the source whence it is obtained, and is distinguished into those which are capable of undergoing the vinous fermentation, and into those which are not; also into those which can assume a definite crystalline form, and those which cannot; but sometimes these two kinds co-exist in the same sort, as in the sugar from the sugar cane, which yields both the finest crystals and likewise molasses or treacle. It almost invariably exists in a dilute and liquid state in plants, but it occasionally exhibits a crystalline form in the flower of certain plants, such as the Rhododendron ponticum, the Strelitzia Reginae, and Eucomis punctata. Sugar is the great principle by which rapidly-growing succulent parts of plants and seeds, when they germinate, are nourished. Hence it is produced in large quantities in such seeds as contain starch, when excited to germinate, as may be observed in the process of malting, which up to a certain stage is exactly that of the germination of the seed. Under these circumstances, seeds which are insipid from the bland nature of the starch which they contain become sweet. By this means many seeds which are regarded as little suited for the nourishment of man may be made to contribute to his support, by merely steeping them in water till they sprout, as is practised by the Burmese with the seed of the cotton-plant. Malcolm's *Travels in Burmah.*) A similar transformation of starch into sugar takes place in the ripening of many fruits. Thus the fruit of the banana, or plaintain, which, when gathered green, abounds in starch, if allowed to ripen on the stalk is destitute of starch, and yields much gummy and saccharine matters. The same happens when the palms are about to flower, as all the starch in their lofty stems is rapidly transformed into sugar; and hence the sago-palm (Sagus Rumphii, &c.) and the Mauritia flexuosa (sago-palm of the Orinoco) are cut down just when the flower-buds begin to appear, to obtain the sago they contain. In other palms the flower-buds are allowed to protrude, and a wound being made in the spatha, a large quantity of a sweet fluid distils, which may either be concentrated by boiling, when sugar is deposited, or the liquid may be fermented, and so yield the *toddy* called *palm wine.* If these, or the sugar-cane, maize, or our common esculent roots, parsnep, skirret, carrot, or beet, are allowed to flower, all the gummy and saccharine matters disappear from the roots or stem. The transformation of starch into gum and sugar is effected by a principle called *diastase*, which is so powerful, that 'one part of it is sufficient to render soluble the interior portion of two thousand parts of starch, and convert it into sugar.' Wherever buds are lodged, there the elements of diastase are placed, to come into play, when they begin to sprout, and supply them with food in a state of solution, as is the case with the buds or eyes of potatoes.

Many seeds, before they are ripe, contain a saccharine substance, which is changed into starch when fully ripe, but which again becomes sugar in germinating, such as the garden pea. Many stems of grasses are sweet at an early stage of their growth, but become insipid at a later period. This influences greatly the nutritive powers of these grasses, according to the stage of growth when they are cut down and made into hay. (See Appendix to Davy's *Agricultural Chemistry.*) Those which have been allowed to become too ripe are often restored to a proper state by the fermentation (*heating*) which occurs after the hay is stacked; but this is sometimes so violent as to consume the rick. It is an error committed in the agriculture of Scotland that the grass is generally allowed to become too ripe before it is mown; and hence English horses manifest an aversion to the hay of Scotland when first offered to them.

These facts explain why it is necessary to pluck up the beet-root which is grown in the south of France much earlier than that raised in the north; and also why the quantity and quality of the juice of the sugar-cane varies in different seasons. 'The juice of the sugar-cane varies in its constituent parts according to the nature of the soil, the quantity of rain, the distribution of heat in the different seasons, and the disposition more or less precocious of the plant when in flower.' (Humboldt, *Pers. Narrative*, vii., p. 184.) The soil affects it much, as the canes grown on the sea-coast, if watered with salt-water, yield a juice which is brackish: this is thought however to be better fitted for distillation of spirit than that produced from the canes of the interior. (*Ibid.*, iii., p. 210.) Even the highly manuring of beet-root lessens the quantity of sugar.

The starch lodged in the stem of certain trees in autumn is converted, by the ascending sap in spring, into sugar, with great rapidity. This is the case with the Acer saccharinum, or sugar-maple, and many other species of that genus.

The same is the case with the ascending sap of the birch-tree, but this does not contain sufficient sugar to permit the concentration of it; there is enough however to undergo the vinous fermentation, and thereby furnish the agreeable beverage called *birch wine.*

Next to the sugars from the cane and beet-root, among those which are crystallizable and capable of fermentation, the most important is the *granular* sugar obtained from a great variety of sources. It exists in considerable quantity in the juice of grapes, and hence the name *grape sugar*, which should be limited to this particular variety, is sometimes extended to the whole class of krummel sugars. It forms a constituent of a great many fruits, not merely fleshy, such as pears, cherries, peaches, melons, dates, figs, grapes, on which last two it forms a white incrustation when these are dried, but in chesnuts, when produced in warm regions. It exists in the nectaries of many flowers, and is collected by the bees; hence honey is only one of the kinds of this sugar. Though harmless in probably all instances to the bees, from whatever plant collected, it not unfrequently has a poisonous influence over human beings, when it has been collected from poisonous plants, such as Rhododendrons and their allied genera.[*]

Granular sugar is readily formed by the action of dilute sulphuric acid on starch, or sugar of milk, or the *bastard* sugar which remains after the finest refined sugar has been procured from the cane or beet-root sugar. Lignin, or anything containing or formed from it, such as saw-dust, linen-rags, or paper, may be likewise transformed into granular sugar. It is likewise the kind of sugar formed during the germination of seeds. Lastly, it is that kind of sugar which is formed by a perverted action of the digestive and assimilating organs in the disease termed *diabetes mellitus*. [DIABETES.] All these varieties taste less sweet than the cane-sugar, and also differ among themselves; thus grape and honey sugar are sweeter than that from starch, while starch sugar is sweeter than that obtained from juniper berries. All of them contain less carbon and more water than the cane sugar, and may be regarded as hydrates of sugar.

Sugar, which, though with difficulty crystallized, is referred to this section, exists in many fungi or mushrooms, especially of the genus Agaricus. While it contributes to their nutritive properties, it most likely proves one source of the poisonous qualities they sometimes possess, as it is occasionally transformed into oxalic acid. Masses of crystals have been observed on the cap of a mushroom, some of which were sugar, while others were oxalic acid. Free oxalic acid is found in the Polyporus sulphureus, Bull., which is most likely formed at the expense of the sugar.

The only uncrystallizable sugar which is capable of fermentation is the syrup which remains after the refining of the cane and other sugars. It receives the name of molasses, and is used in medicine under the name of Sacchari faex, which is preferable to that of *theriaca*, as this might lead to confusion with a poisonous compound which bears a similar name. Molasses are largely employed for the distillation of rum.

The kinds of sugar unsusceptible of fermentation are, the sugar of milk and mannite; yet sugar of milk, when by the action of dilute sulphuric acid it is converted into granular sugar, is as susceptible of fermentation as any of the above-described. In other respects it conducts itself like common sugar, except that with nitric acid, besides oxalic acid, it forms saclactic acid. It is procured from whey, either simply by evaporating to dryness (*saccharum lactis inspissatum*), or by crystallizing it. It is frequently separated from the curd by the addition of a great many substances, which can coagulate this, such as alum, vinegar, tamarinds, and mustard, and in certain diseases these medicated wheys are much recommended.

Sugar of milk has little sweetness, but a hot solution of it tastes much sweeter than the dry sugar. Sugar of milk is much used by the followers of homoeopathy as the material of their dynamized globules.

Manna sugar constitutes the greater portion of the manna which flows from the Ornus europaea and other ashes in the south of Europe, the bark of the olive-tree, many species of pines, the root and leaves of celery, the bulb of the common onion, and in the rhizome of the Triticum repens, or couch-grass. The sweet juices of many plants, such as beet, carrots, &c., when long exposed to the air, generate manna sugar by a partial fermentation. To prevent this is one of the great objects of the manufacturer of beet-root sugar; hence the necessity for speedily concentrating and purifying this juice. To this variety of sugar probably belongs Cynodon, which exists in the root of Digitaria (Cynodon) Dactylon. And also the principle called *canellin*, obtained from canella alba.

The principle called glycyrrhizin, obtained from the liquorice-plants, and the analogous principle from the leaves of the abrus precatorius, and the root of the common polypody fern, probably belong here, as well as sarcocollin, which exists both in Penæa mucronata, P. Sarcocolla, and in the Polypody. Picromel, or the sweet principle which exists in the bile of mammals and birds, is probably a variety of sugar, though unsusceptible of fermentation, and ought to be considered in conjunction with it, from the share it may have in augmenting the sugar in diabetes.

In treating of the dietetical properties of sugar, it is necessary to view it in a variety of conditions. In temperate climates sugar is regarded as a luxury, one indeed which is nearly indispensable; but in tropical countries it is a universal article of subsistence, partly as real sugar, and partly, and more generally, as it occurs in the cane, which is either simply chewed or sucked, or softened by previous boiling. It is inconceivable what enormous quantities of the sugar cane are consumed in this way; vast ship-loads arrive daily in the market at Manilla, and in Rio Janeiro; and in the Sandwich Islands every child is seen going about with a portion of sugar-cane in the hand. In this state it is eminently nutritious. It has been called 'the most perfect alimentary substance in nature,' and the results, in the appearance of the negroes, during the cane-harvest, notwithstanding the increased severe toils of that season, seem to confirm the statement. They almost invariably become plump and sleek, and scarcely take any other food while the harvest lasts; even the sickly revive, and often recover their health. The crude plant, or the newly expressed juice, contains water, sugar, gum, green fecula, extractive, gluten, acetic and malic acids, acetates of lime and potash, supermalate and sulphate of lime, and lignin. It is the object of the various processes to which the juice is subjected, both in the countries where it is produced and where it is refined, to separate the sugar from the other ingredients, some of which dispose it to ferment and spoil, and others are obstacles to its crystallizing. (See a valuable paper by Messrs. Guynne and Young, in *British Annals of Medicine*, vol. i., p. 778; and ii., p. 42, where they enumerate tannic acid and oxide of iron among the ingredients of raw sugar.) By the removal of such of these principles as contain azote, especially the gluten and green fecula, the nutritive power of sugar is sensibly diminished. Raspail justly observes, that 'sugar will not ferment by itself; why then expect that it should ferment without albumen in the stomach? Neither sugar nor gluten taken singly are nutritive, but they become alimentary when united.' (*Chêmie Organique*, sec. 886.) This fact in a great measure explains why dogs, when fed by Majendie exclusively on sugar and distilled water, invariably died in a few weeks, being thus deprived of azote. The more therefore we succeed in bringing sugar to a high state of crystallization, by the eliminating the other principles with which it is associated, in proportion do we lessen its alimentary properties. The poor therefore, who are precluded, by its high price, from using refined sugar, obtain a more nutritious article in the brown sugar which they consume. In any form Dr. Prout does not reckon sugar very nutritious, rating it as the lowest of three out of the four great alimentary or staminal principles, taking the quantity of carbon they respectively contain as the gauge of their power to maintain life: 'that is, the saccharine principles contain, on an average, from forty to forty-five per cent. of carbon; the albuminous (including azote) from fifty to seventy-five per cent.; and the oleaginous about eighty per cent. of this principle. Further, these staminal principles are all susceptible of transmutation into new principles, according to certain laws: thus the saccharine principle is readily convertible into oxalic acid; or, under other circumstances, into the modification of the oleaginous principle, alcohol.' (Prout *On the Stomach*, Introduction, p. xv.)

However harmless the use of saccharine vegetables may be to persons in health, there cannot be a doubt but that in some instances they are extremely hurtful. 'The derangement or partial suspension of the converting the saccharine principle in man into the albuminous or oleaginous, not only constitutes a formidable species of dyspepsia, but the unassimilated saccharine matter in passing through the kidneys gives occasion to the disease termed *diabetes*.' The blood of a perfectly healthy individual contains no appreciable quantity of sugar; but in diabetes, sugar has been repeatedly ascertained to exist in the sanguiferous system,—a fact unequivocally demonstrating that the assimilating organs had failed to convert the saccharine aliment into the constituent principles of the blood. Oxalic acid is neither found in the blood nor in the urine in a state of health; but in certain forms of disease probably exists in both fluids. Lactic acid, when in excess, which forms one of the most troublesome kinds of acidity in the stomach, and the frequent concomitant of *bilious attacks*, is likewise the result of such mal-assimilation generally of the saccharine matter, though occasionally of albuminous matters. The prohibition of articles of a decidedly saccharine nature from the diet of diabetic patients becomes absolutely necessary. Not only sugar in its crystallizable states must be prohibited, but those fruits which contain it. A single peach or pear has occasionally brought back the disease in all its severity. Even those starchy or farinaceous matters which we have seen to be convertible into sugar must be avoided, especially potatoes, the starch of which is, of all others, the most easily transmuted into sugar which is of the same nature as the diabetic sugar.

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[*] Poisonous honey is mentioned by Tournefort, in his 'Relation d'un Voyage du Levant,' vol. ii., p. 228, &c. (p. 66, &c. of the third volume in the English edition of 1741); and he also refers to passages of Xenophon, Aristotle, Diodorus Siculus, Pliny, and Dioscorides, in which it is alluded to.

The abuse of sugar is to be avoided by persons disposed to the oxalic acid diathesis; and persons of a bilious habit should use it with great moderation. (See Prout.)

Sugar, though prone to fermentation when in a dilute state, possesses when concentrated great antiseptic properties, and is extensively employed to preserve both animal and vegetable substances from decomposition. Sometimes the sugar existing naturally in many fruits is sufficient to ensure their preservation, as in figs, raisins, and other dried fruits; especially if the season has been bright and warm, when more sugar is elaborated. In other cases sugar is added, as in many preserves and jellies. Sugar added to meat, fish, &c. renders less salt necessary for keeping them, and preserves more of the natural taste and flavour. Many medicinal substances, as well as flavours and colouring principles, are preserved by means of sugar. [SYRUPS.] Sugar, from the readiness with which it reduces to a metallic state those bases which have a weak attraction for oxygen, has been proposed as an antidote in cases of poisoning with copper, corrosive sublimate, &c. It is to be doubted whether syrup is adequate to effect the reduction at the temperature of the stomach. [COPPER.] On the other hand, sugar yields oxygen to those substances which attract it strongly, such as phosphorus; hence nothing so quickly and certainly revives a fire nearly extinct as throwing a little brown sugar on the embers. Sugar burnt at a low temperature constitutes *caramel*; one part of this dissolved in four parts of water constitutes the liquor (improperly called *tinctura*) Sacchari tosti, which is employed as a colouring-matter for many liquids, especially for the dark-coloured sherries and other wines.

Refined sugar is much employed for the administration of volatile oils, constituting oleo-saccharums. Finely powdered white sugar sprinkled upon ulcers with unhealthy granulations acts as an escharotic.

The term sugar has been applied to some substances on account of their sweet taste, which are widely different from real sugar, and possess even poisonous properties, such as acetate of lead, or *sugar of lead*. Oxalic acid, another very poisonous substance, is often called, from being prepared from sugar, *acid of sugar*, and therefore thought to be harmless. Fatal accidents frequently result from this mistake. [OXALIC ACID.]

SUGAR-TRADE. Before the discovery of America, sugar was a costly luxury used only on rare occasions. About 1459, Margaret Paston, writing to her husband, who was a gentleman and landowner of Norfolk, begs that he will 'vouchsafe' to buy her a pound of sugar. (Ramsay's *Paston Letters*, i. 66.) In 1661 a duty amounting to 1*s.* 6*d.* per cwt. was imposed on the importation of British plantation sugar in England; and in 1669 the duty was doubled. From 1703 to 1747 the duty was 3*s.* 4*d.* the cwt.; 4*s.* 10*d.* from 1747 to 1759; 6*s.* 4*d.* from 1759 to 1779; 6*s.* 8*d.* from 1779 to 1781. In 1782 the duty was increased to 12*s.* 3*d.* the cwt.; in 1791 to 15*s.*; 1797 to 17*s.* 6*d.*; 1803 to 24*s.*; and after several intermediate changes in the same direction, it was fixed at 30*s.* At the last peace a reduction took place to 27*s.*; but in 1818 the former duty of 30*s.* was again charged. In 1819 however the duty was fixed at 27*s.*, and was reduced to 24*s.* in 1833, at which it still remains. From 1793 to 1803 the duty on East India sugar was 37 and 38 per cent. ad valorem, and afterwards was 11*s.* and 8*s.* the cwt. higher than the duty on West India; but by an act passed in 1836, the duties were assimilated by the reduction of East India sugar from 32*s.* to 24*s.* the cwt. The duty is 32*s.* on sugar imported from any British possession within the limits of the East India Company's territory in which the importation of foreign sugar is not prohibited. Mauritius sugar, charged at the same rate as East India prior to the 5th July, 1825, has since been admitted at the same rate as British West India. The duty on foreign sugar has been 60*s.* and 63*s.* the cwt. for the last twenty-five years; and since 1825 the latter rate has been charged.

The net revenue arising from the duty on sugar was in

				Average price per Cwt. in London.	
		£		s.	d.
1801	. .	2,782,232	. .	54	0
1811	. .	3,339,218	. .	41	4
1821	. .	3,660,567	. .	30	2¼
1831	. .	4,219,049	. .	23	8
1839	. .	4,183,257	. .	39	4¼

In 1840 and 1841 the gross revenue on sugar consumed in the United Kingdom was 4,465,006*l.* and 5,123,966*l.* respectively, being, for the latter year, nearly one-tenth of the total revenue. Fluctuations in price, and the domestic circumstances of the country, occasion great diversities in the consumption of different years. Thus, with the low price of 1831, the consumption was greater than in 1839, notwithstanding the population of Great Britain had increased nearly 2,000,000. The annual consumption averages above 20 lbs. per head for England and Scotland, and would probably be 50 lbs. if a great reduction were to take place in the price. In France the annual consumption averages 5 lbs. per head; in the States of the German League, above 4 lbs.; and in the whole of continental Europe, about 2½ lbs.

The quantity of sugar produced in different parts of the world from the sugar-cane was estimated as follows in 1839:—

Exported.		Cwt.
British sugar colonies	. .	3,571,378
British India	. . .	519,126
Danish West Indies	. .	450,000
Dutch ditto	. . .	260,060
French sugar colonies	. .	2,160,000
United States of America	.	900,000
Brazil	. . .	2,400,000
Spanish West Indies	. .	4,481,342
Java	. . . . . .	892,475
For internal consumption, exclusive of China, India, Siam, Java, and United States	.	2,446,337
		18,080,658

The consumption of the United Kingdom is between one-fourth and one-fifth of the above quantity, but our demand is restricted to our own possessions, as the following table will show:—

YEARS.	Total quantity imported.	Quantities of Sugar retained for actual consumption in the United Kingdom.				Net revenue from duties on Sugar.
		British Plantation.	East India.	Foreign.	Total quantity retained for home consumption.	
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	£.
1815	4,134,335	2,131,030	43,041	37,228	2,211,299	3,454,333
1816	3,890,149	2,446,458	34,960	49,403	2,529,931	3,612,193
1817	3,911,161	3,267,034	27,332	4,575	3,298,941	4,433,926
1818	4,075,806	1,701,421	25,056	419	1,726 896	2,751,107
1819	4,198,515	2,720,609	100,046	245	2,820,900	3,996,543
1820	4,209,676	2,816,788	84,795	281	2,901,864	3,925,387
1821	4,373,166	2,936,411	120,203	268	3,056,882	4,158,958
1822	3,774,386	2,851,678	137,092	297	2,989,057	4,060,444
1823	4,201,706	3,125,907	102,901	183	3,228,991	4,407,410
1824	4,412,650	3,214,701	152,673	50	3,367,424	4,641,904
		British Plantation and Mauritius.	British East India.			
1825	3,908,135	2,972,623	107,200	25	3,079,848	4,176,655
1826	4,419,095	3,430,652	143,312	26	3,573,990	4,950,991
1827	4,110,019	3,270,885	69,856	186	3,340,927	4,630,192
1828	4,968,020	3,504,164	97,244	11	3,601,419	5,002,297
1829	4,856,393	3,421,409	118,400	12	3,539,821	4,896,242
1830	4,916,004	3,590,041	131,979	24	3,722,044	4,767,342
1831	5,366,262	3,667,396	113,536	79	3,781,011	4,650,590
1832	4,867,749	3,575,329	79,600	605	3,655,534	4,394,338
1833	4,739,292	3,553,450	98,283	71	3,651,804	4,414,302
1834	4,743,414	3,620 522	121,007	50	3,741,579	4,549 392
1835	4,448,267	3,757,851	98,680	31	3,856,562	4,667,900
1836	4,649,161	3,378,144	110,522	33	3,488,399	4,184,165
1837	4,482,578	3,684,712	270,035	43	3,954,810	4,760,565
1838	5,030,374	3,491,225	418,375	65	3,909,665	4,656,892
1839	4,678,219	3,348,298	477,252	49	3,825,599	4,586,036
1840	4,035,845	3,074,198	518,320	2,316	3,594,834	4,449,070
1841	4,734,230	2,992,142	1,066,032	257	4,058,431	. . . .

From one of the above sources, the supply, instead of being augmented with the increase of population in this country, has not been able to maintain even a stationary situation. In the following periods of five years each, the imports of sugar from the British West Indies were as under:—

1820-4 . .	3,764,360 cwt
1825-9 . .	3,869,933
1830-4 . .	3,860,484
1835-9 . .	3,354,833

If the supply had continued to advance with the increasing population of the United Kingdom, it would now have been considerably more than 4,500,000 cwt., whereas it was only 2,202,833 cwt. in 1840; and in 1841 still less, being 2,148,980 cwt. In the former of these years the price of sugar rose higher than it had been at any period since 1817; in November the average was 57*s.* 10½*d.* the cwt.; and at one period there was only a month's consumption of British West India sugar in bond. The equalization of the duty on East India sugar in 1836 had given a stimulus to the cultivation of the sugar-cane in the East Indies, and the import of 1840 exceeded all expectation, being 1,066,032 cwt., or above 53,000 tons. A reference to the table given above will show the great increase which has taken place in the imports from this quarter since 1837. The supply from the Mauritius increased to 705,385 cwt., which was also a larger quantity than had ever been received from that colony. The scarcity of 1840 was so great that 2316 cwt. of foreign sugar were entered for home consumption, paying a duty of 63*s.*, or 39*s.* the cwt. more than sugar from British possessions. Out of 2316 cwt. thus admitted, 1543 cwt. were from Brazil, 419 from Java, 289 from Cuba, and small quantities from Siam, the Philippines, &c. The quantity of foreign sugar in bond was about equal to the deficiency in British plantation sugar, but the greater part was excluded by the high differential duty. Brazilian muscovado was at this time worth from 20*s.* to 22*s.* in bond, of equal quality with British at 54*s.* and 56*s.* also in bond; Brazilian white sugars were 24*s.* to 26*s.*, similar in quality to white sugars from British possessions at 62*s.* and 66*s.* The sugar of Brazil, Cuba, and other foreign countries is chiefly exported to the Continent, where the price is on an average from 10*s.* to 20*s.* the cwt. lower than in this country. In the *pro forma* tariff appended to the Report on the Import Duties, it was proposed to reduce the duty on foreign sugar from 63*s.* to 30*s.*, East and West India sugar being reduced from 24*s.* to 15*s.* A reduction on British West India sugar would be of no public advantage unless it was accompanied by an alteration of the duties on foreign sugar.

In 1841 the administration of Lord Melbourne proposed to alter the sugar duties, but, being unable to retain office, nothing was done, and in the new tariff (April, 1842) sugar is one of the few articles which remains untouched.

The refining of sugar is not allowed in our colonies, but is an important branch of industry which the mother-country retains for her own advantage. Although foreign sugar is excluded from consumption by the high duties, it is allowed to be refined in bond for exportation, a drawback being paid, exceeding, it is said, the quantity of raw sugar actually used, which should be in the proportion of 34 cwt. of raw to 20 cwt. of refined. The quantity of sugar refined in bond is about 200,000 cwt. annually. In the year ending 25th June, 1840, the chief export of British refined sugar was—to Italy, 40,000 cwt.; British North America, 37,000 cwt.; Turkey, 30,000 cwt.; Russia, 20,000 cwt.; Australian settlements, 11,000 cwt.; British West Indies, 10,500 cwt. The sugar-refiner is at liberty to select the raw material from the markets of the world, when the article is intended for export, and so likewise is the exporter of raw sugar. The principal foreign countries from which we imported sugar in 1838 were—Brazil, 197,510 cwt.; Cuba, 165,022 cwt.; Philippine Islands, 144,109 cwt.; Java, 55,105 cwt.; Singapore, 31,954 cwt.; besides small quantities from the Foreign West Indies, China, and Siam. The total import of foreign sugar in 1840 was 805,000 cwt., and in 1841, 806,500 cwt., all of which, with the trifling exceptions shown in the table given above, was either exported or refined.

SUHLA', or SUHL, is a thriving manufacturing town, the capital of the circle of Henneberg, in the Prussian province of Saxony, situated in a romantic valley on the river Aue or Lauter, in the forest of Thüringen, in 50° 35′ N. lat. and 10° 40′ E. long. [THÜRINGERWALD.] It is a well-built open town, entirely surrounded with forests. It consists of about one thousand houses, with four churches, three hospitals and poor-houses, an orphan asylum, several schools, and other public institutions. The population is 7500. The inhabitants are employed in two great branches of manufacture; 1st, that of dimity and ticking, which employs between 500 and 600 looms, and produces 70,000 pieces of dimity in a year, besides ticking; 2nd, that of fire-arms, sword-blades, bayonets, and ramrods, which requires annually 7000 cwt. of iron and steel, which is supplied by nine forges in the neighbourhood of the town. In the fifteenth, sixteenth, and seventeenth centuries this was the only place in Germany where arms were manufactured. The walnut-tree for the musket-stocks is obtained from Bavaria. The inhabitants likewise manufacture fine steel articles, especially surgical instruments and almost every other article of steel or iron. (Hassel, Cannabich; Stein.)

SUHM, PETER FREDERIK, one of the most learned and industrious writers that Denmark has produced, was the son of Admiral Suhm, and was born at Copenhagen, October 18th, 1728. Such was his extraordinary application to study, that he is said to have read not only the chief classic authors, but other works to the amount of about fifteen hundred volumes, in his father's library at Plessen, when he was not more than sixteen—a report no doubt greatly exaggerated. In 1746 he entered the university of Copenhagen, and, in compliance with his father's wishes, studied jurisprudence; but though he received, two years afterwards, an appointment in the supreme court of justice at Copenhagen, and though the most brilliant career both at the bar and in public affairs opened itself to him, he soon renounced it, devoting himself entirely to his literary pursuits, more especially to the study of northern history and antiquities. In order to acquire authentic information and materials relative to these subjects, he not only visited Norway in 1751, but remained there till 1765, when he returned to Copenhagen, where he continued to reside until his death.

Shortly after his return he began to publish the fruits of his laborious researches in a succession of historical works, all relating to Northern and Gothic annals, mythology, and archaeology, and no less remarkable for the vast erudition displayed in them, than for the prodigious literary industry of which they are a monument. One of the most valuable of them is that entitled 'Odin, or the Mythology of Northern Paganism,' 1771. His 'Critical History of Denmark,' 4 vols. 4to., 1774-81, and his 'History of Denmark,' 7 vols., 1782, &c., likewise afford a mass of information relative to the more obscure periods and antiquities of that and the other countries of Scandinavia. His industry with his own pen was equalled only by the munificence with which he patronised similar undertakings. He caused, for instance, the two last volumes of the 'Scriptores Rerum Danicarum' to be printed at his own expense; and bore the cost of publishing the Islandic 'Landnamabok,' &c., and the edition of the 'Annales Abulfedæ,' by Adler, 5 vols., 1789-94.

In addition to his various and vast labours as an historian, Suhm distinguished himself also in several other branches of literature, including poetry. His 'Idyls,' indeed, although not without merit, have little interest at the present day; but his prose 'Tales' founded upon northern legends and traditions are deservedly popular, and entitle him to be considered the originator of that species of historical fiction, which has since been brought to perfection by Scott. These and his other miscellaneous productions form the collection of his 'Samlade Skrifter,' in 16 vols., 1788-99.

Suhm not only formed at great expense a most valuable collection of books, amounting to upwards of one hundred thousand volumes, but freely opened it to the public, librarians and attendants being kept by him for that purpose; and he continued to augment it—appropriating to that purpose the yearly sum of 5000 dollars—until he consented that it should be incorporated with the royal library, in 1796, on conditions which sufficiently attest that noble-minded disinterestedness which, after literary enthusiasm, formed the leading trait of his character. His death, which was occasioned by gout, took place on the 7th September, 1798. (Eichhorn, *Geschichte der Litteratur*.)

SUICER (SCHWEITZER), JOHN GASPAR, or CASPAR, was born at Zürich in 1620, and after studying at Montauban, returned to Switzerland, and became the pastor of a country commune in 1643. In 1660 he became professor of Hebrew and Greek in the University of Zürich, and devoted himself especially to the study of the Greek fathers. He resigned his chair in 1683, and died on the 29th of December, 1684.

His chief work, the reputation of which is still great, was his 'Thesaurus Ecclesiasticus, e Patribus Graecis, ordine alphabetico, exhibens quaecunque Phrases, Ritus, Dogmata, Haereses, et hujusmodi alia huc spectant,' Amst., 1682, 2 vols. fol.; best edition, Amst., 1728, 2 vols. fol., with a supplement by his son. He is said to have been engaged upon this work for twenty years.

Suicer wrote three other works, on the Nicene Creed and other points of Oriental church history, besides a Greek Syntax and a Greek and Latin Lexicon.

SUICER, JOHN HENRY, son of the above, was born at Zürich on the 6th of April, 1644, and received a learned education from his father, to whose profession he also devoted himself. After travelling over part of Switzerland and Germany with a pupil, he was recalled to Zürich, and received an appointment to the gymnasium of that town. In 1683 he succeeded his father in his professorship, and in 1700 he was appointed to the chair of theology in the University of Heidelberg, but fell ill shortly after his arrival in that town, and died there on the 23rd of September, 1705.

Besides the Notes to his father's 'Thesaurus,' he wrote, 1, 'Compendium Physicae Aristotelico-Cartesianae,' Amst., 1685; Bâle, 1691; 12mo.; 2, 'A Commentary on the Epistle of Paul to the Colossians,' Zürich, 1699, 4to., to which are added, in the same volume, three discourses, 'De Fortunis Graeciae Antiquae,' 'De Graecia Christiana,' and 'De internis Ecclesiae reformatae Terroribus;' 3, 'Specimen Commentarii in Epistolam ad Ephesios,' in the 'Miscellanea Duisbergensia.'

J. H. Suicer is sometimes confounded with an ancestor of the same name, who wrote 'Chronologia Helvetica, res gestas Helvetiorum ad nostra usque tempora complectens,' Hanau, 1607, 4to.; reprinted in 1735, in the 'Thesaurus Helveticus' of Fueslin. He places the foundation of Zürich in A.M. 1980, but he is a trustworthy historian of modern times. He also wrote a history of Switzerland down to the year 1532, which is preserved in MS. in various libraries.

(*Life of J. H. Suicer*, by J. R. Wolff, Zürich, 1745; *Biographie Universelle.*)

SUICIDE is the term usually applied both to the act of self-destruction and to him who commits it. Of the many views in which it may be considered, that is at once the most definite and the most important in which it is regarded as a subject of medical investigation. It will therefore be adopted in the present article.

In this view the most important distinctions among cases of suicide are founded on the circumstances which lead to its commission; and of these there are two chief classes: in one, a man is led to disregard his life for the sake of something for which his death is necessary; in the other, he is depressed by an evil more intolerable than the act of dying. But whichever of these be the motive, it may act in two different ways, and the suicide may be, as M. Esquirol has said, either acute and involuntary, or chronic and prepense. Or, again, suicides of all kinds may be divided (and this is probably the most practical method) according to the condition of the mind which has preceded the act, and which in each case constitutes the disposition to self-destruction.

In many cases this disposition is only a part of the general perversion of the judgment in complete insanity: it thus exists in certain maniacs in combination with many other signs of a diseased mind. Some are merely melancholy; some are carried on by illusions which lead them, as if unintentionally, to suicide; some have sensations which they imagine may be cured by such violence as proves fatal; some are driven to the act by commands which they imagine they have received; some destroy themselves at the commencement of insanity, when they are conscious of the malady which threatens them; others, in their convalescence, in horror at the excesses which they have committed, or at the mere thought of having been deranged.

There are also cases of monomania in which almost the only indication of insanity is the desire for self-destruction, excited by an illusion respecting some melancholy event, or by some fancied command. There is a peculiar and very terrible variety of this monomania, in which the desire for destruction leads the patient to take the lives of others, against whom he bears no ill-will, before he attempts his own. Many instances of this homicidal monomania, as it is called, are recorded; and only recently (March, 1842) one of the worst examples of it has occurred in London, a man murdering three of his children and himself, in circumstances which could leave no doubt of his insanity.

There are conditions of the mind which are not called insanity (in the ordinary acceptation of the term), but which do not less strongly predispose to suicide. Such is especially that named *ennui*, or *tædium vitæ*, for which, though it is thought by foreigners to be so common in England, that Sauvages has called it 'melancholia Anglica,' we have in our language no term except the very inexpressive one, *spleen*. Many circumstances give rise to this state of mind. It occurs sometimes in young persons who grow sad, with a passive anxiety for some object, they hardly know what; who complain that they are useless in the world, or not cared for, and slowly pine away or destroy themselves. But more commonly it is the consequence of a want of occupation, or of a sudden transition from a state of active exertion in business or in pleasure, to one of voluntary or compelled repose; or it results from the difficulty which those who have long lived in the excitement of frivolous pursuits find in maintaining it by new objects of desire.

The state of the hypochondriac, though of somewhat the same kind, is less dangerous. He is persuaded indeed that his sufferings are irremediable, and that death would be a great relief to him; he even often talks of committing suicide; but he is as irresolute in the use of the means of death, as he is anxious in the use of those of prolonging life; and if he do at last, after repeated postponements, attempt to destroy himself, the attempt is generally, through want of determination, abortive, and he again sinks into the same despondency and inactivity.

In all these cases the suicide is of the chronic or prepense kind; and in all, the condition of mind which precedes it is connected with a perversion of the judgment so obvious, that no reasonable person could hesitate to regard it as insanity. Whatever ingenuity of plan may have been shown in the preparation for the act, very few persons would deny that, under similar external circumstances, it would not have been committed by a sane man; and this is true of the great majority of prepense suicides in the present day.

In the acute or involuntary suicides, the predisposing condition of the mind is the result of circumstances which act rapidly, and pervert a judgment which, before their occurrence, might be deemed sound. Suicides of this kind are probably less frequent than those of the preceding; but they are usually more shocking, and attract more attention: they are especially common in large towns, or wherever men pursue great objects at great hazards. For instance, a loss of money or of honour, the failure of an ambitious enterprise, jealousy, and many afflicting events, are enough at once to deprive a man of tender sensibility of the power of just reflection, and to make him think that death is not so bad as the misery which he must undergo. On the spur of the moment of anguish he destroys himself. Similar circumstances impel a man of colder temperament or of a braver disposition more slowly to the same end. The one may for a time endure passively his disgrace; the other may have courage at first to bear up against it; but at length the judgment is in both alike perverted, and the same state of mind is produced which urges others to immediate self-destruction.

Lastly, there are examples in which suicide is committed with perfect coolness, being adopted, after due deliberation, as the most judicious course which, in the circumstances of the case, and as far as the knowledge of the individual enabled him to judge, could be followed. Such are many of the cases in which men, finding themselves afflicted with incurable and painful diseases, have shortened that which they believed would be a miserable life; and of the same class are the suicides committed in accordance with national custom, or superstition, or from patriotic motives. The cases of this class are not proper subjects for medical consideration, for in these there is no disorder of the mind. The act is committed either without deliberation, in obedience to custom or authority; or, when deliberation is used, the conclusion is only the necessary result of the error in the premises.

Such are the states of mind which most commonly predispose to suicide and the circumstances which produce them. The character of the act itself usually corresponds closely with that of the mind by which it is urged. By those who commit it after deliberation, the means employed are almost always successful: so they are when men who have endured affliction for some time, at last sink under it. But when suicide is attempted under the sudden impulse of the fear of disgrace, the endeavour is often abortive; the means chosen are insufficient, or they are awkwardly employed; and it deserves notice, that the attempt generally seems to be the acme of the frenzy: for if it be unsuccessful, it is very rarely repeated, and often he who has made it, in the next minute seeks assistance and bitterly repents his folly

There are other circumstances of which the influence in producing the disposition to suicide is less obvious, and is detected only by a statistical comparison of the number and characters of the suicides committed under their influence and beyond it. Such are the varieties of climate, of habits of life, of age, &c., on all of which reports, more or less accurate, have furnished useful information.

The names of the following countries are placed in the order of the respective proportions of suicides to the population:—the United States, England, Prussia, France, Austria, Russia, Italy, Spain.

It is a generally-received opinion that cold foggy climates favour the development of the suicidal disposition; but in Holland, the climate of which is very similar to that of Great Britain, the proportion of suicides is lower than in any of the countries just enumerated; and that many circumstances are capable of counterbalancing whatever influence climate may have, is proved by the number of suicides in the same country having varied considerably in different periods.

In accordance with the same general opinion, it is commonly said that suicides are more frequent in the latter part of the autumn than in any other season; but the kind of weather which is most favourable to the suicidal disposition is that of long-continued heat and drought. Of 1131 suicides committed at Berlin, Hamburg, Westminster, and Paris, there were, in the first quarter of the year, 237; during the second, 299; during the third, 335; and, during the fourth, 260. A similar influence of the spring and summer weather in favouring the disposition to suicide is proved by the statistics of M. Esquirol at the Salpetrière, and by those of M. Prevost, who found that of 133 suicides committed in Geneva in ten years, the number in each month was as follows:—April 19, June 17, August 17, July 15, October 14, May 13, March 10, November 9, September 6, January 5, February 5, December 3. From the returns of coroners' inquests in Westminster (*Journal of the Statistical Society*, vol, i.) it appears that in the first quarters of twenty-five years there were 169 suicides, in the second 182, in the third 159, and in the fourth 146. The greatest numbers occurred in June, July, and March. From all these facts there can be no doubt that spring and summer have a worse influence on the suicidal disposition than either autumn or winter.

The tendency to suicide varies greatly among persons of different stations and occupations. In a recent letter from Mr. Farr to the registrar-general, this tendency is shown to be 'least among persons who carry on occupations out of doors, and greatest among artisans who are weakly from birth, are confined in-doors, have their rest disturbed, or have little muscular exercise.' The proportion of annual suicides among masons, carpenters, and butchers, for example, is 1·33 to 10,000; and among tailors, shoemakers, and bakers, 7·43 to 10,000; and, in general, 'the tendency to suicide is twice as great among artisans as it is among labourers.' It is not proved that education has, as many have asserted, a tendency to increase the number of suicides: its influence in this respect is not at all discernible. Neither does the state of poverty or wealth seem to have any material influence; but what all returns agree in proving is, that among the inhabitants of large cities and their neighbourhoods, suicides are much more frequent than among those who live in the rural districts. M. Guerry has shown (*Statistique Morale de la France*) that the frequency of suicides in France regularly decreases as the distance from Paris increases, and that this rule holds true of all the departments except that in which Marseille is situated, for this town has the same influence in exciting the disposition to suicide which Paris has. Similar results were obtained by Prevost from statistics collected at Geneva, and they are completely confirmed by general observation in England, though, from commerce and pleasure being less centralised in our metropolis than they are in those of most continental kingdoms, the difference is not so easily discernible.

The tendency to suicide is much more frequent among men than among women. By the Westminster Return, already quoted, it is shown that in twenty-five years 478 males and 178 females destroyed themselves: the proportion therefore is as 73 to 27. Nearly the same proportion was observed by M Prevost in the suicides in Geneva; and M. Esquirol, comparing the results of several tables, says the proportion may be stated generally as three males to one female

There is sufficient reason to believe that in the married state the disposition to suicide is less than in single life. Some difference in this respect however is noticed by M. Prevost between the sexes; for he found that though the number of suicides among married men was less than that among single men, the proportion among married and single women was just the reverse.

The following table will show at once the variations in the disposition to suicide at different periods of life. The first column indicates the ages; the five next columns show how many suicides, in every thousand that are committed in each of four different places, are committed by persons of those several ages; and the last column shows the proportion of persons of each of those ages in every thousand of the whole population, exclusive of children under ten years old.

Age.	Berlin.	Paris. By gun-shot.	Paris. By hanging.	Salpêtrière.	Geneva.	Prop. per 1000 of pop. above 10 y.
10 to 20 years	224	61	68	91	53	312
20 to 30 „	251	283	51	262	252	188
30 to 40 „	96	182	94	272		160
40 to 50 „	156	150	188	237	474	136
50 to 60 „	146	161	256	56		100
60 to 70 „	77	126	285	46	221	68
70 to 80 „	41	35	108	16		30
80 and upwards	9	2	0	0		6
	1000	1000	1000	1000	1000	1000

It thus appears that the disposition is greatest between the ages of 20 and 30, both absolutely and relatively to the whole number of persons living at those ages.

Under the head of Paris in the preceding table the suicides are arranged according to the means by which they were perpetrated. Many returns have been made to determine the proportion in which each method of self-destruction is employed in different places; but they are of little value, for it seems to be determined by the opportunities most conveniently afforded in different situations, and by the fashion (if one may so speak) which exists at particular times for one method or another. In the neighbourhood of lakes and rivers or canals, for example, drowning is always the most frequent method of self-destruction; in places more remote from large quantities of water, hanging or shooting.

From the various degrees of force with which the preceding circumstances operate, and from the influence of others which are not separately capable of being appreciated, it results that the proportion of suicides in different countries, and in the same country at different times, varies widely. The following calculations will show pretty accurately the degrees of difference:—in Westminster, the proportion of suicides annually, between 1832 and 1836, was 1 to every 6379 of the population; in London the proportion is in general as 1·33 to 10,000, in those who follow hard labour out of doors; as 7·43 to 10,000 in those who pursue sedentary occupations; and as 4 to 10,000 among paupers. The number of persons who are known to commit suicide in England amounts to about 1000 annually; and besides these there are many who, being found drowned, without any evidence whether their deaths were accidental or intentional, are not returned among the cases of suicide. According to M. Quetelet, the proportion of suicides annually is, in—

Russia . .	1 to 49,182	inhabitants.
Austria . .	1 to 20,900	„
France . .	1 to 18,000	„
State of Pennsylvania	1 to 15,875	„
Prussia . .	1 to 14,404	„
City of Baltimore	1 to 13,656	„
Boston . .	1 to 12,500	„
New York. .	1 to 7,797	„

In and around Paris the suicides between—

	1817 and 1825 were	1 in 2,400	inhabitants.
Berlin .	1813 and 1822 „	1 in 2,941	„
Geneva .	1820 and 1826 „	1 in 3,985	„
London .	. . .	1 in 5,000	„

In Paris the average annual number of suicides was,—

From 1817 to 1821 .	346 or 1 in 1,971	inhabitants.
From 1822 to 1826 .	397 or 1 in 2,612	„
From 1829 to 1833 .	465 or 1 in 1,665	„

In 1835 there were 574 suicides.

In Paris therefore there appears to have been a regular increase in the number of suicides from 1822 to 1834; but in England there is no reason to believe that a similar augmentation has taken place. From the Westminster return already quoted, it appears indeed that the annual average number of suicides there has increased, but their increase has not been in a proportion corresponding to that of the population. Thus, dividing the time into periods of five years, the average annual number of suicides was—

From 1812 to 1816	25·8
„ 1817 to 1821	20·2
„ 1822 to 1826	23·8
„ 1827 to 1831	29·8
„ 1832 to 1836	31·6

But comparing these numbers with those of the population at the census immediately preceding each of three quinquennial periods, it appears that the proportion of the number of suicides to that of the population was—

After 1811	1 in 6232
1821	1 in 7623
1831	1 in 6379

From what has now been said of the variety of causes which may engender or encourage the disposition to suicide, it must be manifest that no general account can be given of the morbid conditions of the body, or of the brain, which accompany the mental disturbance. Many facts relating to this part of the subject have been related; but as yet they are unconnected by any generalization. We may therefore proceed at once from the causes to the treatment of the suicidal disposition.

Here also what has been said of the one may serve for a guide to the knowledge of the other. With respect to the treatment of those among the insane who exhibit a tendency to self-destruction, there can be no other deviation from the ordinary treatment of insanity than that which consists in the careful removal from them of all means by which their intentions may be accomplished. Both for these and for those who show no other sign of insanity than their desire for death, the most successful remedy is the giving full occupation for the time: this is indeed essential to the safety of all who show any disposition to suicide. The occupation moreover should be one which will carry the mind as far as possible from the subjects on which it is morbidly sensitive, or on which it has been accustomed to dwell too intently. Above all, a person suspected of an intention to commit suicide should be kept carefully from the contemplation of histories of self-destruction. Numerous instances have proved that the tendency to imitate the acts of others operates as forcibly in producing suicides as in encouraging the most trivial fashion. Only last winter (1841) there was in London a kind of epidemic mania by which persons, exhibiting no other signs of insanity and urged by no strong motive of despair, felt irresistibly impelled to attempt to drown themselves, especially by jumping off the bridges into the Thames. Scarcely a night passed without one or more such occurrences, till the same remedy was applied which had in many similar instances of epidemic suicidal mania proved successful. All who were brought before the magistrates charged with attempts to drown themselves were punished by a short imprisonment; and within a few days after it became known that this plan was being followed, the epidemic ceased. In other instances it has been found that the horror of being disgraced after death has been sufficient to deter men from imitating others in the commission of suicide. For all cases of imitative suicide therefore there is a plain preventive means which should never be neglected; and the fact which the histories of these epidemics furnish, namely, that the fear of being disgraced after death operates forcibly in deterring men from suicide, is a sufficient proof of the imprudence of the opinion which regards suicide as affording by itself sufficient evidence of the insanity and irresponsibility of those who commit it. If it be desirable to diminish the number of suicides, the practical rule should be to place suicides and homicides on the same level; and not to remit the appropriate punishment for either except on the clearest proof of such insanity as renders a man by common consent irresponsible.

SUICIDE is death caused by the act, voluntary or involuntary, of the party dying.

A rescript of Hadrian expressly directed that those soldiers who, either from impatience of pain, from disgust of life, from disease, from madness, from dread of infamy or disgrace, had wounded themselves or otherwise attempted to put a period to their existence, should only be punished with ignominia (*Dig.*, 49, tit. 16, s. 6, 'De Re Militari'); but the attempt of a soldier at self-destruction on other grounds was a capital offence; and those who, being under prosecution for heinous offences, or being taken in the commission of a great crime, put an end to their existence from fear of punishment, forfeited all their property to the Fiscus. (*Dig.*, 48, tit. 21, s. 3.) Suicide was not uncommon among the Romans in the later republican period; and it became very common under the emperors, as we see from the examples in Tacitus, and in the younger Pliny, who mentions the case of Corellius Rufus (*Ep.*, i. 12), Silius Italicus (iii. 7), Arria (iii. 16), and the woman (vi. 24) who succeeded in persuading her husband, who was labouring under an incurable disease, to throw himself, tied to her, into a lake. [SILIUS ITALICUS.] Except in the cases mentioned in the two titles of the 'Digest' above cited, suicide was not forbidden by the Roman law; nor was it discountenanced by public opinion.

Voluntary suicide, by the law of England, is a crime; and every suicide is presumed to be voluntary until the contrary is made apparent. This crime is called self-murder and felonia de se (self felony), neither of which terms is calculated to convey a correct notion of the legal character of this offence, or of the mode in which it is punished.

A felo de se (self-felon) is a person who, being of years of discretion and in his senses, destroys his own life, either intending to do so, or intending to do some other act of a character both unlawful and malicious; as if, in attempting to kill another, under circumstances which would have rendered such killing either murder or manslaughter, a gun bursts in the assailant's own hand, or he runs upon a knife *casually* in the hand of the person whom he intended to kill. Death occasioned by falling upon a knife held up in his defence by the party assaulted, would not be suicide by the assailant, but justifiable homicide by the party assaulted. [MURDER.] But in no case is self-felony considered to be committed if death do not ensue within a year and a day of the blow or injury; or, in other words, if a whole year intervene between the day on which the blow, &c. is given, and the day on which death takes place.

The legal effect of a self-felony is a forfeiture to the crown of all the personal property which the party had at the time he committed the act by which the death was caused, including debts due to him, but though the crime is called felony, it was never attended with forfeiture of freehold, and never worked any corruption of blood. It appears however that formerly the crown was entitled to the year, day, and waste of the freehold lands of a self-felon; as we find that in 1289 the widow of Aubrey or Albert (Alberici) de Wytelesbury gave 300*l.* to the king (Edw. I.) to have all the goods and chattels of her husband, 'a felon by drowning himself,' saving to the king the year, day, and waste of Aubrey's lands and tenements. (2 Madox, *Exch.*, 347.)

The fact that a self-felony has been committed is ascertained by an inquest or inquisition taken before the coroner or other officer having authority to hold inquests, upon view of the dead body, and examination of witnesses in the presence of a jury, summoned, as in other cases, to inquire into the cause of a sudden or violent death. [CORONER.]

Where a self-felony is found by the inquisition, the jury ought also to inquire and find whether the party had any, and, if any, what goods and chattels at the time when the felony was committed. But an omission in this respect may be supplied by an inquisition taken by the sheriff under a writ De melius inquirendo, or 'further inquiry.' The property in the self-felon's goods, upon being found in either of these modes, is vested in the crown with relation to the time of the felony, so as to make any intermediate dealing with the property void as against the crown.

If any part of the goods happen to be in the possession of a person who refuses to deliver them up, or if any debtor refuse to pay to the crown the amount owing from him to the self felon, a personal information, in the nature of an action of trover, in the one case, and of debt in the other, is exhibited against him, generally in the Exchequer. (Mann., *Exch. Pract., Revenue Branch.*)

The crown takes the property of the self-felon subject to no liability in respect of his debts or engagements. Upon a memorial presented to the treasury by a creditor of the deceased, a warrant under the sign-manual is however generally obtained, authorising the ecclesiastical court to grant letters of administration to such creditor, who, upon such grant being made, acquires the ordinary rights, and becomes subject to the ordinary liabilities of a personal representative.

It was formerly usual for the crown to make grants to its servants and favourites of the property arising from these and other forfeitures. These grants were either of particular forfeitures, or of forfeitures accruing within a particular district. Grants of the latter description were usually made in fee simple, and many such grants are still in force in various parts of England. An act was passed in 1693 (4 & 5 W. and M., c. 22) to relieve such parties from the necessity of litigating their rights with the crown whenever a forfeiture occurred, by directing that, after the inrolment of such grants in the court of King's Bench, no process should be issued on the part of the crown to question the right of the grantees.

The finding of the jury is not conclusive either as to the fact of self-felony or as to the property of the deceased; and all persons interested in controverting any part of the finding may plead to the inquisition, and contest its sufficiency by a demurrer, or deny its truth by a traverse. The issues, of law or of fact, raised upon such pleadings, are disposed of as in other cases. [PLEADING.]

Formerly coroners returned their inquests into the court of King's Bench, in order that process might issue against those who made seizures, set up claims, or withheld property or debts in derogation of the rights of the crown. (*Rex* v. *Sutton*, 1 Saunders, 270.) Since the passing of 4 & 5 W. & M., c. 22, that practice has been discontinued; and the course now is, that any party who considers himself aggrieved by the finding of the coroner's jury obtains a writ of Certiorari from the court of King's Bench, by which the coroner is required to return the inquisition. The return being made, if the court, upon inspection of the inquisition, see clearly that it cannot be supported, in consequence of some legal defect, they will quash it without putting the party to the expense of a demurrer. If however the inquisition be good in substance, the coroner may be ordered to amend defects in form.

Involuntary suicide is where death is occasioned by the act of the party, either without an actual intention of destroying life or of committing any other wilful malicious act, or without the legal capacity of intending to do so. The first class of cases may be established by showing that the act was done with some other intention. The practical difficulty generally arises upon the second class. Neither self-felony nor any other crime can be committed by a child who has not attained years of discretion; nor can it be committed by a person who, by disease or otherwise, has lost, or has been prevented from acquiring, the faculty of discerning right from wrong. A tendency to self-destruction is common in several species of insanity, and the connection between the morbid affection and the act of violence which occasions death may often be very distinctly traced. It not unfrequently happens however that cases arise in which it is nearly impossible to determine whether the act is to be ascribed to a diseased state of the mental faculties, or to passions which are not under the ordinary restraint.

At common law, which in this respect follows the canon law, a person found by inquest to be felo de se is considered as having died in mortal sin; and his remains were formerly interred in the public highway without the rites of Christian burial, and a stake was driven through the body: but by the 4 Geo. IV., c. 52, the coroner or other officer by whom the inquest is held is required to give directions for the private interment of the remains of any person against whom a finding of felo de se shall be had, without any stake being driven through the body, in the churchyard or other burial-ground of the parish in which the remains of such person might by the laws or customs of England be interred, if the verdict of felo de se had not been found; such interment to be made within twenty-four hours from the finding of the inquisition, and to take place within the hours of nine and twelve at night, without performance of any of the rites of Christian burial.

The Code Pénal of France contains no legislation on the subject of suicide. Of the modern codes of Germany, some adopt the silence of the French code, and others vary in their particular provisions. In the Bavarian and Saxon codes suicide is not mentioned. The Prussian code forbids all mutilation of the dead body of a self-murderer under ordinary circumstances; but declares that it shall be buried without any marks of respect otherwise suitable to the rank of the deceased; and it directs that if any sentence has been pronounced, it shall, as far as it is feasible, be executed, due regard being had to decency and propriety, on the dead body. Besides which, the body of a criminal who commits self-murder to escape the execution of a sentence pronounced against him is to be buried at night by the common executioner, at the usual place of execution for criminals. The Austrian code simply provides that the body of a self-murderer shall be buried by the officers of justice, but not in a churchyard or other place of common interment.

SU'IDÆ, Swine; *Sus*, Linn.; a family of PACHYDERMATA of high importance to man for economical purposes.

The swine have on each foot two large principal toes shod with stout hoofs, and two lateral toes which are much shorter and hardly touch the earth. The incisor teeth are variable in number, but the lower incisors are all levelled forwards. The canines are projected from the mouth and recurved upwards. The muzzle is terminated by a truncated snout fitted for turning up the ground, and the stomach is but little divided.

ORGANIZATION.

Skeleton.—Cuvier remarks that the *skull* of a hog is nearly a quadrangular pyramid, the palatine surface of which is almost perpendicular to the base, represented by the occiput. The nasal bones occupy the upper part of the muzzle; their base is slightly widened; the other extremity advances a little pointedly above the nasal aperture. The intermaxillaries ascend rather obliquely to one-third of the length of the nasal bones, and carry at their extremity the peculiar bone which supports the snout. The orbit is round, and well defined (cerné) by an advance of the frontal and the two post-orbital apophyses, the portion formed by the frontal especially is well marked. Between the two it is nearly the sixth of a circle, not closed. The frontals descend in front of the orbit more than a fourth of the length of the muzzle before they encounter the nasal bones. The lachrymal bone occupies a rather large rhomboidal space upon the cheek. The two lachrymal holes are pierced, the upper one on the border itself, the other a little in front of the border of the orbit. In the orbit, the lachrymal descends to the upper border of the vault of the suborbital canal. The jugal bone is articulated to the whole width of the lachrymal bone. It is elevated, and the suture with the temporal bone behind the post-orbital apophysis descends at first, and afterwards becomes horizontal. The zygomatic apophysis of the temporal bone ascends a little, and rises to a point backwards above the auditory meatus. The temple is well marked by a parietal crest, which goes to the occipital without touching its congener; so that the occiput is truncated squarely above, where it widens a little. The palate is prolonged a little behind the origin of the zygomatic arches. The palatine bone advances no farther than just before the last molar tooth. It is prolonged a little on each side, where it terminates in form of a tubercle between the two pterygoid wings. It ascends into the orbit, showing nothing there but a process (languette) by no means large, which pushes forward into the internal walls of the suborbital canal. The internal pterygoid apophyses are distinct from the body of the bone, high and narrow, and terminated in a hook. The external apophyses at least equal them, make one with the body of the bone, and also terminate in a hook. In the temple the posterior sphenoid is nearly reduced to the anterior surface of the external pterygoid apophyses. It articulates itself with the temporal bone, does not touch the frontal except with its point, and does not reach the parietal. The anterior part occupies most space there, and it permits nevertheless the frontal bone to descend in front of it till it reaches the palatine, and even to bend itself back to enter into the vault of the suborbital canal between the maxillary and the palatine bones. The temporal bone raises itself rather high in the temple, where its parietal suture curves downwards. It occupies a part of the occiput on each side, and its suture comes in front of the base of the mastoid apophysis, which is very long, very pointed, and entirely belonging to the occipital bone. The tympanic cavity (caisse) is a very projecting tubercle, not to say pointed, in front of this apophysis. It receives a very long and very narrow auditory meatus, which commences very high behind the posterior base of the arcade. Its cavity is very small, and the whole of its apparent volume consists only of cellular osseous substance. The glenoid facet is projecting and much wider than it is long, between the arcade and the tympanic cavity, which last is early ossified in its convex portion, and seemed to Cuvier to belong to the temporal bone, from which it is not separated even in the fœtus, but the petrous bone (rocher) is long distinguishable: this last does not appear externally. The two frontal bones unite together early, and the two parietals still earlier: there is no interparietal in those subjects which have seen the light. The suborbital hole is rather large, above the fourth molar, nearly in the middle of the maxillary bone. Its canal opens widely in the orbit, at the ordinary place. The lachrymal holes have been already noticed. There is below the orbital surface of the orbital bone a deep hollow without issue, the use of which was unknown to Cuvier. At the upper vault of the orbit is a suborbital hole, which conducts to an aperture pierced on the front. The orbital hole is near the suture with the anterior sphenoid. The analogous holes to the spheno- and pterygo-palatine bones are in the suborbital canal. The last enters the palate opposite the penultimate molar. The optic and spheno-orbital holes, are approximated as ordinarily, and rather large. The oval aperture is separated by the whole external pterygoid apophysis, the direction of which is transversal. It is common to the sphenoid and temporal bones, and is only separated by a small bony ridge from a large carotidian hole, which answers in part to the internal side of the tympanic cavity. Under the junction of the anterior sphenoid to the posterior is a double canal, which goes into the thickness of the vomer. The posterior foramen lacerum, the stylo-mastoidian, and the condylodian are very much approximated near the mastoid apophysis. At the interior one may see that the frontal and sphenoidal sinuses are very much extended, and narrow the cerebral cavity a good deal. The first-named sinuses extend to the occiput. The sella ascends nearly vertically to sustain the optic nerves. The bony tentorium only exists on the sides, it does no more than pass upon the petrous bone. The ethmoidal fosset is very much sunk, of moderate size, divided by a very salient crest, and riddled with numerous holes. The area of the cerebral cavity is only half that of the cranium, as it appears externally, so much is it augmented by the great sinuses which exist even to the occiput.

Different *Suidæ* offer more or less variations in the length of the head.

The Wild Boar (*Sus Scrofa*, Linn.) has the face longer and the skull less elevated; the domestic pig of Europe has the cranium slightly more elevated, and the face still sufficiently long; the Siamese pig has the face shorter, the cranium more convex in the frontal region, and larger in proportion.

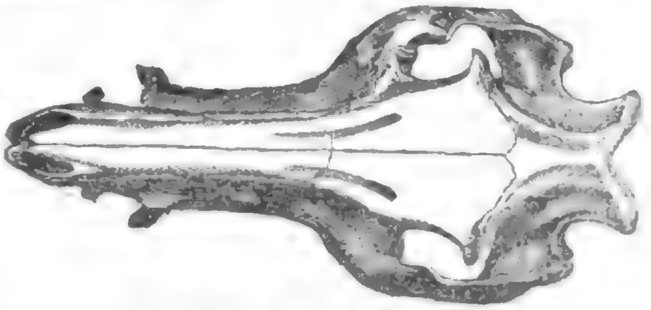
The Masked Boar of Africa differs from the European boar in having its *zygomata* extending more outwards and taking a more horizontal direction, and especially by a great elevated apophysis, above the alveolus of the canine tooth, and ascending obliquely so as to leave a canal between it and the maxillary bone. It terminates by a great rugged tubercle, and the nasal bone opposite to a similar tubercle. It is to these two prominences that the great warts or mamillæ, which give this animal so hideous an aspect, adhere.

The Babiroussa, when compared with a Siamese hog of the same size, has the cranium longer in proportion to the muzzle, the orbit more advanced, the temporal fossæ more approximated on the cranium, the zygomatic arch longer and ascending less suddenly backwards, and the tympanic cavities much longer.

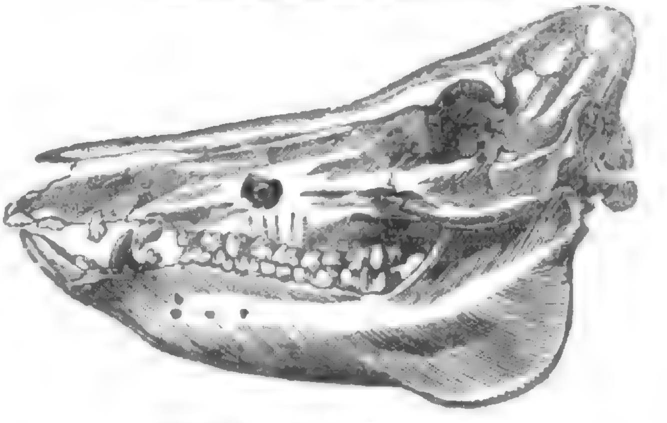
The peculiar character of the Ethiopian boar (*Phacochœrus*) consists in the retreat of the eyes and the relative smallness of the temporal fossæ, the necessary consequence of that retreat; in the enormous development of the base of the zygomatic arches; and in the width of that part, as well as in the interval between the orbits. The alveoli of its enormous canines form a projection on each side of the muzzle, which is terminated by two small peculiar bones that unite the extremities of the nasal to those of the intermaxillary bones, and which correspond to the single bone carried on the extremity of the intermaxillaries in the common hog. The tympanic cavities are small, terminated in a point. The basilary part has between them a hook projecting on each side, and in front are two very deep and very remarkable fossæ prolonging the vault of the back nostrils, and hollowed, principally, in the sphenoid bone.

The Peccary approximates more to the *Babiroussa* than to the Siamese hog, but its muzzle is still shorter; the tympanic cavities are rounded and cellular; its mastoid apophyses are very short and directed backwards; its palate is prolonged, narrowing as it retires, more backward than its molars. Its glenoid facet is very different from that of the hog, and fenced (cernée) in front and behind as in some of the *Carnivora*.

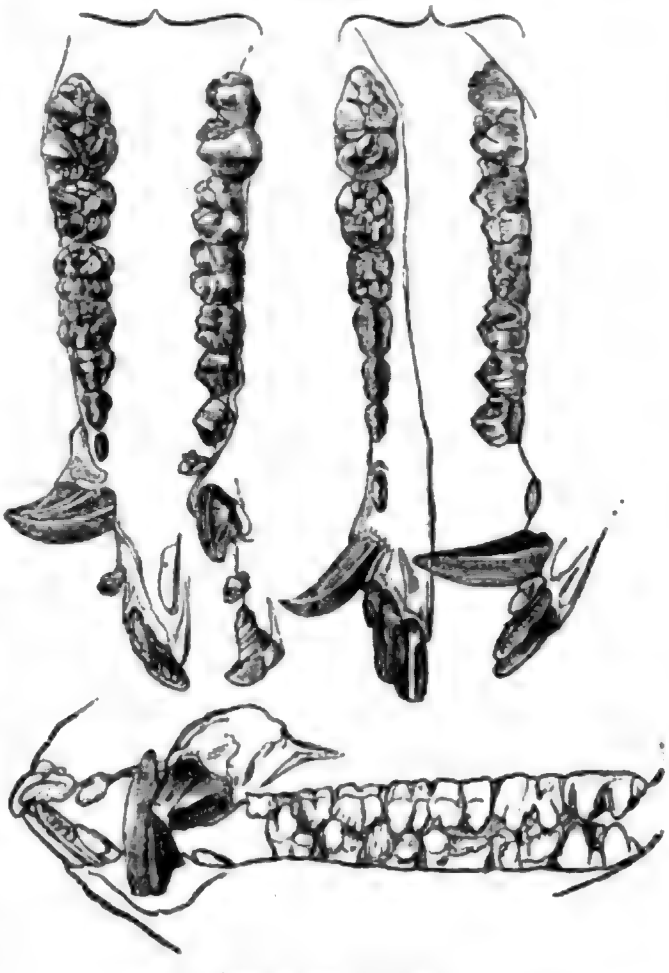
Cuvier remarks that the relationship of the *Suidæ* with the *Carnivora* is very close, indeed that there is no difference in the anterior part of the cranium. Take, says he, the head of an opossum (Sarigue) for example; shorten the cranium; widen the orbits and parietal crests; raise the occiput, shortening at the same time the basilary part and the back nostrils, and you will only require the differences of projection of some parts, the presence of an external pterygoid apophysis, the direction downwards of the curvature of the zygomatic arch, &c., to arrive at the head of a hog. In the pterygoidian and neighbouring parts, the kangaroo approaches it still nearer.



Skull of Hog, seen from above. (Cuv.)

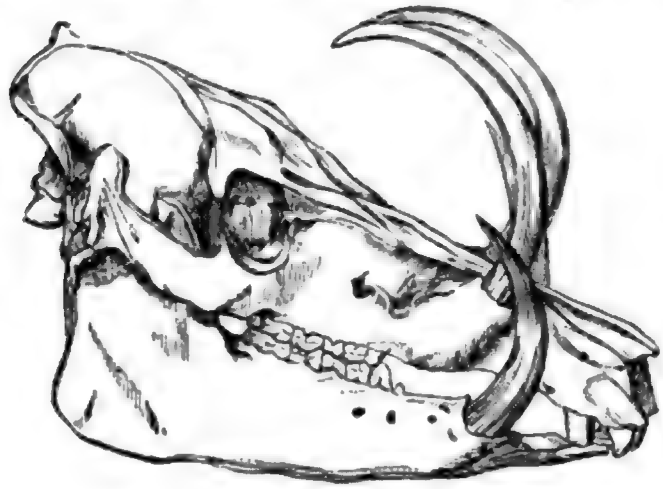


Skull of Hog, seen in profile. (Cuv.)



Teeth of Hog. (F. Cuv.)

The dentition of the hog has its characters and laws, like that of all other animals. The normal number of its teeth is six incisors, two canines, and fourteen molar teeth in each jaw. (*Ossemens Fossiles.*)



Skull of Babiroussa.

The *dentition*, as we shall presently see, varies in the different species, especially in *Phacochœrus*.

The *extremities* of the hog have much relationship to those of the Ruminants, especially of the sheep and the stag.

The spine of the *shoulder-blade*, as in the horse, is nearly at an equal distance from the anterior and posterior border; whilst in the ox and stag it is much nearer to the anterior edge. This spine, as in the horse again, is lowered before, and more projecting at its upper third, where it forms a hook bent backwards. In other respects, it is wider in the upper part than that of the horse, its coracoid tubercle is less projecting, and its articular surface higher than it is wide. The great tuberosity of the *humerus* is very high, as in the Ruminants; but it is notched by a large re-entering arch; the bicipital groove is, on the internal side, narrower and deeper; the whole upper part of the head of the bone is narrower in proportion. The *ulna* is wide and depressed, with a ridge on its anterior surface, forming with the internal edge a long hollow surface, by which in advancing age it is soldered to the radius. In the ruminants it is more compressed and much more slender. In the Peccary it is soldered sooner and more completely than in the hog. The *carpus* much resembles that of ruminants, with this difference that the trapezoidal remains a longer time distinct from the great bone. Nevertheless no bone has a perfect resemblance, and on comparison the difference will be detected, although it cannot be expressed in words.

The differences of the *femora* are also very difficult to be expressed verbally. The head is more elevated and more convex towards the upper part than that of any ruminant. The great trochanter is wider and a little notched; the projecting ridge which goes from one to the other trochanter is more rounded; the internal edge of the rotular pulley ascends less than the other, which is the contrary of the structure in the ruminants; the notch between the condyles is narrower and pointed forward, &c. The tibia is easily recognised, because it is shorter, has its lower head squared and not narrowed from behind forwards, and has no articulation with the *fibula*. The principal difference of the *tarsus* rests on the small wedge-shaped bone, on the vestige of the fifth toe, and in the scaphoid remaining distinct from the cuboid bone. The astragalus tends to that of the ruminants by the form of the pulley of its lower head. The metacarpal bones, metatarsals, and toes cannot be confounded with those of any other animal, and their characters, partially visible externally, are known to all naturalists, or will be easily divined by them. It need only be remarked, that in the Peccary the two middle bones of the metacarpus and metatarsus are soldered into a *cannon*, as in the ruminants, and that the only vestige in this animal of the external toe on the hind foot is a small flattened stylet, applied against the base of the cannon bone.

The cervical vertebræ of the hog are not easily confounded with those of any ruminant of its proportions, by reason of the brevity of their bodies, and the width of their transverse apophyses, especially of those of the penultimate one. The body of the vertebra is not so convex in front as in the ruminants. (*Ossemens Fossiles.*)

In the *Proceedings of the Zoological Society of London* for 1837, is an interesting notice, by T. C. Eyton, Esq., of some osteological peculiarities in different skeletons of the genus *Sus*. The animals observed were, a male pig of the pure Chinese breed, brought over by Lord Northampton; a female pig from Africa, procured from Sir Rowland Hill, bart., M.P.; and an English male of the long-legged sort. Upon examining the first, Mr. Eyton was surprised to find that a great difference existed in the number of the vertebræ from that given in the *Leçons d'Anatomie Comparée* (vol. i., ed. 1835, p. 182), under the head either of *Sanglier* or *Cochon Domestique*. He also found that the other varieties differed, and he gives the following table of those differences:—

	English Male.	African Male.	Chinese Male.	'Leçons d'Anat. Comp.'	
				Sanglier.	Cochon Domestique.
Cerv. . .	7	7	7	7	7
Dors. . .	15	13	15	14	14
Lumb. . .	6	6	4	5	5
Sacr. . .	5	5	4	4	4
Caud. . .	21	13	19	20	23
	—	—	—	—	—
Total .	55	44	49	50	53

But he adds that it is possible that some of the caudal vertebræ may be missing.

Mr. Eyton further remarks, that the Chinese Pig was imported into this country for the purpose of improving our native sorts, with which it breeds freely, and the offspring are again fruitful. He adds, that he had seen a fine litter of pigs by Sir Rowland Hill's African Boar, imported with the female he described, the mother of which was a common pig; and he remarks, that time will show whether they will again be fruitful.

'From what has been stated,' says Mr. Eyton, in conclusion, 'the result appears to me to be, that either the above three *Pigs* must be considered as distinct species, and which, should the offspring of the two latter again produce young, would do away with the theory of Hunter, that the young of two distinct species are not fruitful, or we cannot consider osteological character a criterion of species.

'I have been induced to offer the above, not with any desire of species-making, but of adding something towards the number of recorded facts by which the question, what is a *species?* must be answered.'

Undoubtedly all such records are valuable; and the zoological labours of Mr. Eyton (especially in the department of ornithology) are too well known to require our humble praise. But there seem to us a little more point and haste in the above conclusion than are quite consistent with soundness. John Hunter's theories are not so easily done away with, and osteological character will, we venture to predict, continue to be considered a criterion of species, notwithstanding the differences here set forth. By the term *Pig* we understand the African and Chinese varieties of the Hog. *Phacochœrus* cannot be meant, or it would have been stated. The pure Chinese breed was imported long ago, and for years its stock, bred from its union with our English varieties, has been known in our farm-yards. The varieties bred by man from the Wild Hog are spread all over the world in a domesticated state; and there is no more reason to doubt that the result of the union of an African pig with a Hampshire hog would be fruitful, than that a breed composed of the Berkshire, Chinese, and Neapolitan would produce a good litter. Now if we take little or no note of the differences in the caudal vertebræ, for the reason assigned by Mr. Eyton among others, what remain? Differences not exceeding two in the dorsal vertebræ, two in the lumbar vertebræ, and one in the sacral vertebræ, after a course of domestication, no one knows how long. We know what breeding will do with dogs; take a greyhound and a true shepherd's dog for example—to say nothing of tail-less cats:—we know what it will do among poultry; it will take away the drooping feathers of the cock's tail in those Bantams known to bird-fanciers as hen-cocks (Sir J. Sebright's breed), and remove the tail-feathers altogether (Rumpless fowls); whilst in the topknotted varieties an osteological difference is produced in the cranium. Man has occasionally an additional lumbar vertebra. This accidental excess was first detected in the negro, and was laid hold of by those who would have made him a different species; but, by and by, they found a white man with one more vertebra than he ought to have had, and wisely said no more about it.

There is nothing in the other parts of the internal organization of the *Suidæ* requiring particular notice; except perhaps the Stomach. Nos. 548 to 551 (both inclusive) of the Physiological Series of the Museum of the Royal College of Surgeons in London are preparations of the stomachs of Hogs; and Nos. 551 A to 553 (also both inclusive) are preparations of the stomachs of Peccaries. We would particularly call attention to No. 551 A, which exhibits the stomach of *Dicotyles torquatus*, showing this singular viscus divided into three compartments by the production of the two ridges, which are situated one to the left and the other to the right of the cardiac orifices, analogous to those in the stomach of the Hog. The cardiac, or left division, is greatly extended in the transverse direction, and terminates in two moderately elongated culs-de-sac. This division communicates with the middle compartment by a broad circular aperture. The œsophagus opens into the middle compartment, which is of less extent than the preceding, and communicates by a smaller transverse aperture with the pyloric division. The whole of the middle compartment is lined with cuticle, continued from the œsophagus. The left and right divisions, being laid open, show the extent to which the cuticle is prolonged into them. The greater part of the cardiac cavity, with the two culs-de-sac, being lined by a villous membrane, proves that it has a greater share in the digestive processes than as a mere preparatory receptacle. The villous coat of the pyloric cavity is remarkably thick, and the muscular coat is considerably increased near the pylorus, the valvular structure of which is better seen in No. 551. (Owen in *Cat. Mus. Coll. Reg. Chir.*, vol. i.)

Systematic Arrangement and Natural History.

Linnæus placed the genus *Sus* between Hippopotamus [River-Horse] and Rhinoceros, in his order *Belluæ*, which order stands between those of *Pecora* and *Cete*, in his last edition of the *Systema Naturæ*.

Cuvier arranges the *Cochons* (*Sus*, Linn.) under his ordinary Pachydermata. This genus comprises the subgenera *Sus*, *Phacochœrus*, and *Dicotyles*, and stands between *Hippopotamus* and Anoplotherium, which last is followed by *Rhinoceros*.

Illiger arranges *Sus* as the only genus of his *Setigera*, his last family of his fifth order *Multungula*, which order is immediately preceded by the *Nasuta*, consisting of the genus *Tapirus*. The *Solidungula* immediately follow the *Multungula*.

Mr. Swainson divides the *Ungulata* (Hoofed quadrupeds) into two tribes: 1. *Pachydermes*; 2. *Anoplotheres*. He places *Sus*, *Phacochœrus*, and *Dicotyles* in the second tribe, in company with *Tapirus*, *Palæotherium*, *Lophiodon*, and *Anoplotherium*, with *Xiphodon* and *Dichobunes* (*Dichobune*), as the subgenera of the last. [Anoplotherium; Palæotherium.]

European Suidæ.

All zoologists seem to agree that the domesticated hogs are the descendants of the wild boar, *Sus Scrofa*, Linn.; *Sus Aper*, Briss.; *Le Sanglier* of the French, still an inhabitant of many of the temperate parts of Europe and Asia, but no longer existing in a natural state in the British Islands.

Dental formula:—Incisors $\frac{6}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{7-7}{7-7} = 44$. (See the cut, p. 243.)

The wild boar, which is too well known to need description, and of which living individuals are often to be found in our menageries (where by the way they are styed up on a floor of flagstones, instead of being allowed small paddocks and access to water, where they might turn up the ground, wallow, and live in something approaching to comfort), harbours in the most solitary places in retired forests. His lair is generally in some wild and remote spot, not far from water, and commanding by some devious path access to the open country. The young, or *marcassins*, as they are termed by the French, are striped with longitudinal bands.

Throughout Europe the boar was held in high estimation as a beast of chace. Nobles, princes, and even kings delighted to take the field with the boar-spear, and peril their persons in hunting this fierce animal. In our own country, where it formerly rioted in the dense forests which have now vanished before the inroads of an increasing population, the loss of his eyes* was the punishment inflicted by William the Conqueror on him who was convicted of killing a wild boar. In the vast forest which so late as Henry II.'s time stood on the north side of London, were stags, fallow-deer, wild boars, and bulls. In the *Leges Wallicæ* it appears that Howel-dda gave permission to his grand huntsman to chace the boar from the middle of November to the beginning of December. In Europe the boar-spear has given way to the rifle; but in India, where the field is taken on horseback, the spear is still used, and hog-hunting appears to be one of the most exciting of the wild sports of that land of the sun.

An attempt was made by Charles I. to restore this noble game to England; and he turned out several wild boars in the New Forest: but the civil wars were no friendly times for the experiment, and they were all destroyed. More recently General Howe procured some wild boars and sows from Germany, and turned them into the forests of Walmer and Alice Holt or Ayles Holt, 'to the great terror of the neighbourhood,' as White says, in his 'History of Selborne;' 'and, at one time, a wild bull or buffalo: but the country rose upon them and destroyed them.'

We can see no reason why the boar should not be introduced into some of our royal forests at least. It would not be more dangerous than the stag or the deer; and unharbouring the boar, with all the accompaniments of the spear and the couteau, and the grand boar-hounds, such as we see in the pictures of Snyders, would be sport worthy of a prince.

The different domestic breeds, and the economical part of the subject, are treated of in the article Hog. But, according to Pennant, this animal has been made useful to man even during its life. 'It has been applied,' says that author, 'to an use in this island, which seems peculiar to Minorca and the part of Murray which lies between the Spey and Elgin. It has been there converted into a beast of draught; for I have been assured by a minister of that country, eye-witness to the fact, that he had, on his first coming into his parish, seen a cow, a sow, and two *Trogues* (young horses), yoked together, and drawing a plough in a light sandy soil; and that the sow was the best drawer of the four. In Minorca the ass and the hog are common helpmates, and are yoked together in order to turn up the land.'

The senses of the hog are acute, especially that of smelling. The broad snout ploughs up the herbage; and not a root, an insect, or a worm escapes the olfactory sense. If fairly treated, it is by no means a dirty animal; but it is too often styed up in its own filth. There are few more pleasing scenes in the farm-yard than a well laid-out piggery properly kept. The animal itself is anything but stupid, and is capable of strong attachment where kindness is shown to it. That it is docile the number of learned pigs proves; and still more the famous sporting sow, that went regularly out with the gun, and stood her game as staunch as any pointer. It is said that the hog is trained on the Continent to hunt for truffles.

Asiatic Suidæ.

Genus *Babyrussa*, F. Cuv.—M. F. Cuvier has separated this form from *Sus*, relying upon characters, one of the principal of which is the upward direction of the alveolus of the upper canine tooth, which is enormously developed, ascending upwards, and curving back upon itself; the first upper grinding tooth is a false molar, and the two first below have the same character. The canines of the lower jaw form long, and, as compared with the other tusked *Suidæ*, slender tusks, as the animal advances in age.

Dental formula:—incisors $\frac{4}{4}$; canines $\frac{1-1}{1-1}$; molars $\frac{5-5}{5-5} = 34$.

There is but one species of *Baby-roussa* (literally Hog-deer) or *Babiroussa*, as it is frequently written. This is the *Babyrussa alfurus* of modern authors, *Sus Babyrussa* of Linnæus, *Le Babyroussa* of Buffon, *Le Sanglier des Indes Orientales* of Brisson, and *Le Cochon Cerf* of Lesson and other French authors.

Description.—The Babiroussa stands high upon its rather slender legs. The skin, which is of a greyish tint, inclining to fawn-colour on the belly, is very thinly furnished with hair. The upper tusks come through the skin of the muzzle, and form nearly a circle directed backwards, often touching the skin again on their downward curvature. The females are smaller than the males, and are without these tusks.

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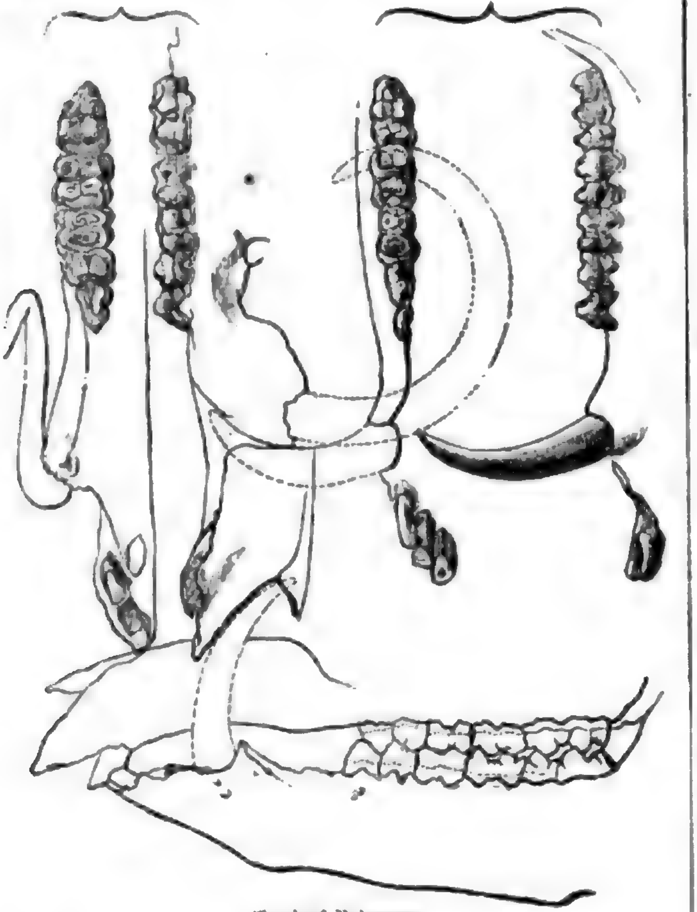
* The same penalty is said to have been inflicted on those who killed the stag or the roebuck.



Teeth of Babyrussa.

Piso, in his edition of the 'Natural and Medical History of East India,' by Bontius, remarks, that sedulous as Bontius was, he had made no mention of this animal. Piso however supplies the deficiency, and gives in the page no very bad figures of the animal and of its skull. In the frontispiece however, where the Babiroussa occupies a conspicuous place in the foreground, the painter has evidently had the hog-*deer* in his mind, and has taken a few liberties with the animal's muzzle, aspect, and bearing, though the tusks are tolerably correct, lengthening its neck not a little. The Indians, Piso tells us, ascribe these animals to a union of the hog and the deer. He says that they are only found in the island of Bouro, thirty miles distant from Amboyna. He adds, that the Babiroussa is swift and fierce, and that its flesh is highly prized (inter delicias expetita) by both natives and foreigners.

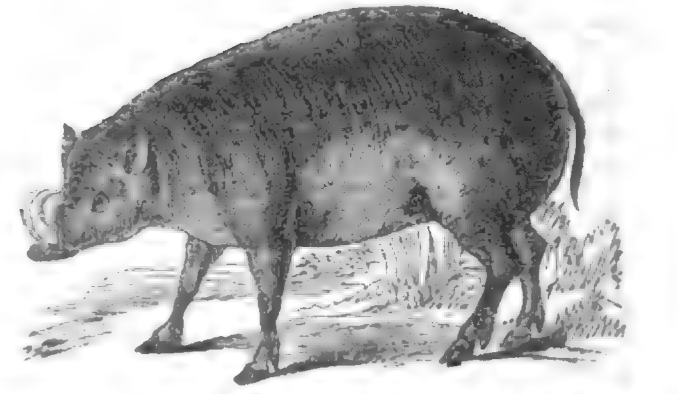
It still inhabits the marshy forests of the island of Bourou, and is said to be abundant in the Moluccas, and a few other islands of the Indian Archipelago.

M. F. Cuvier has given very good figures, and a lively description of two males and females brought to France in the Astrolabe, and kept in the Paris Menagerie. The female was much younger and more active than the male, which was aged and very fat, and spent his short life in eating, drinking, and sleeping. The female bred once after her arrival in Europe. When the male retired to rest she would cover him completely over with litter, and then creep in under the straw to him, so that both were concealed from sight. They died of diseased lungs about three years after their arrival.

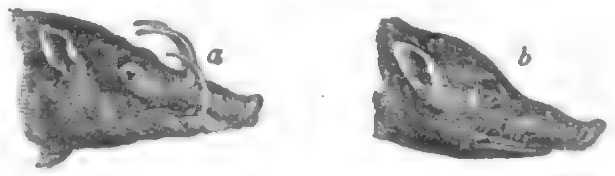
M. Lesson states that in captivity the Babiroussa is restless and fierce, a character which is certainly not deserved by the young male exhibited in the garden of the Zoological Society in the Regent's Park, which appears inclined to be familiar, and likes to be noticed. This individual gets under the straw in the manner described by F. Cuvier. Indian corn seems to be a favourite food in confinement.

The lower tusks must be formidable weapons, though not so destructive as those of some of the other *Suidæ*. In old individuals the upper tusks can hardly inflict a wound: they may perhaps ward off the bushes from the eyes of the animal as it rushes through the thick cover of its retreats.

Here we may notice the species figured and described by MM. Lesson and Garnot, in the *Zoologie de la Coquille*, under the name of *Sus Papuensis*



Babiroussa (male; from the individual in the garden of the Zoological Society of London).



Head of Babiroussa, seen in profile: *a*, male; *b*, female.

This new species, the *Bêne* of the natives of New Guinea, is described as being remarkable for its small stature and its agreeable and slender form. The canines of the upper jaw are very small, and nearly of the same form as the incisors; the bristles are rather thick, short, yellow, and brownish below, white above and annulated with black; the tail is very short. The young (marcassins) are of a brown colour more or less deep, with five rather bright fulvous stripes upon the back.

The length of the Papuan Hog is three feet. It is common in the forests of New Guinea, and the Papuans highly esteem its flesh, which the French found excellent. The natives catch the young in the woods in order to rear them in a kind of domestication.

M. Lesson remarks that the *Sus Papuensis* has many points of analogy with the *Peccaries*, and seems to be intermediate between them and the true Hogs. The individual described by M. Lesson had only thirty-six teeth; perhaps, he observes, four molars were still to be developed, which would raise the number to forty.

AFRICAN SUIDÆ.

Genus *Phacochœrus*, or, as it is written by some, *Phascochœrus*, F. Cuv.

Generic Character.—Feet formed like those of the true Hogs; two triquetrous incisors above, six small ones below; tusks lateral and directed upwards, very large; molars composed of enamelled cylinders enclosing the osseous substance and joined together by a cortical substance; very large fleshy warts or wens on the cheeks; tail short.

Dental Formula:—Incisors $\frac{2 \text{ or } 0}{6 \text{ or } 0}$; canines $\frac{1-1}{1-1}$; molars $\frac{3-3}{3-3}$;=16 or 24.

M. F. Cuvier remarks that we have here arrived at a system of dentition entirely different from that of the true hogs (Sangliers), and which announces animals endowed with a particular nature, and much more herbivorous than omnivorous. Nevertheless, in the locomotive organs the true hogs and the Phacochœres bear the greatest resemblance to each other, and have accordingly been united in the same genus, as far as these organs served for the principal basis of the formation of generic groups. At present, he observes, but two Phacochœres are known,* and one has incisors, whilst the other appears to be deprived of them. We have seen, he remarks, that in the Pachyderms there is but little regularity in the number of the teeth; and he inquires whether this may belong to the nature of these animals, or to lacunæ which it has not been given to us to fill up; a question which he will not decide. Therefore he does not separate these animals.

In the upper jaw the incisor is described by M. F. Cuvier as hooked, and very distant at its root from its congener, but as approaching it at its crown. The canine is a powerful tusk, the alveolus of which is open on the sides of the maxillary bone, and which develops itself, ascending and curving backwards, terminating in a sharp point. The first and second molars are, especially when compared with the third, very small teeth: they are composed of four tubercles, which, by use, present four small, elliptical, or circular figures, surrounded by enamel. The second is larger than the first. The great molar, the last, occupies a space twice as large as that which precedes it, and is composed of three rows of tubercles disposed longitudinally. Those on the edges are placed opposite to each other, and those in the middle are intermediate to the first. When these tubercles begin to be worn, they present so many disks of enamel, and form, as it were, three chains of rings; and when the effects of mastication extend further, these disks and these rings enlarge, and become more or less deformed: those on one side unite to those on the other, whilst those in the middle sometimes subsist; whence result some varieties of figure, in which, nevertheless, are ordinarily found indications of the first; and it is always anteriorly that these teeth are first worn, because there they first begin to rise from the alveolus, pushing before them the first molars, which often are found in great measure destroyed in old individuals, and have even, sometimes, entirely disappeared. These teeth are a very long time without taking root; it is only when they cease to push forward, which does not happen till very late, that they terminate in more or less elongated cones, in enveloping at their base the dentary capsule, which then divides and ceases to form a single organ.

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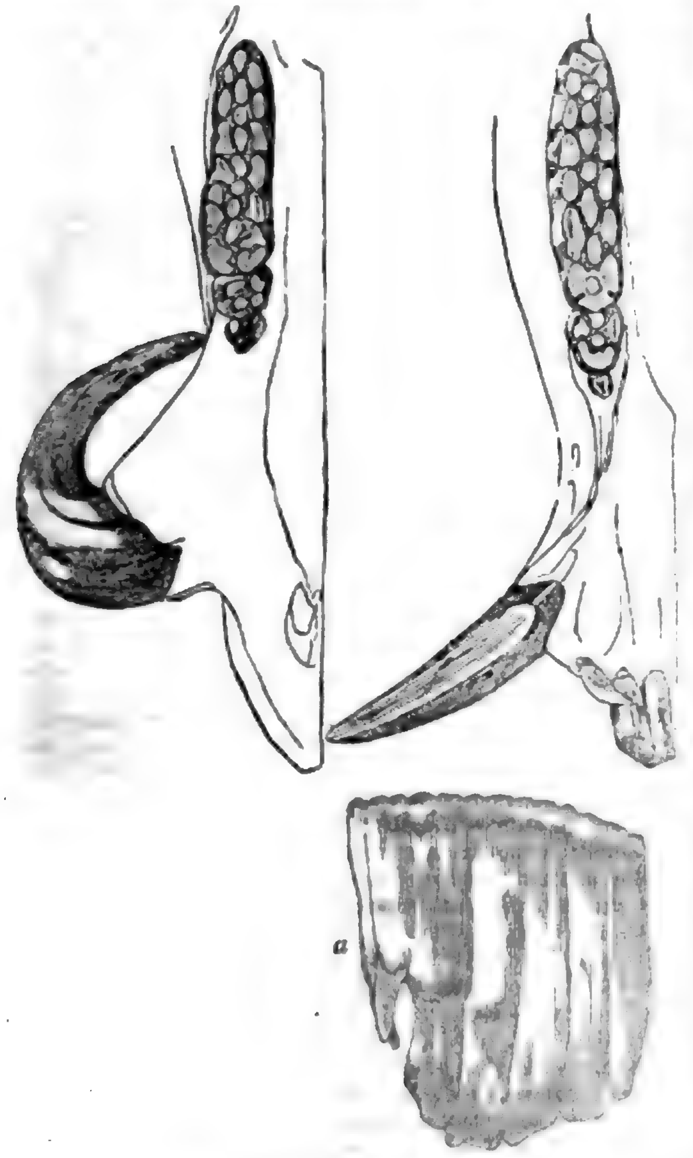
* A third species is now recognised; and, we believe, all three are in the British Museum.

In the lower jaw, we are told by the same excellent zoologist, the two first incisors are of nearly equal size, and strongly levelled forwards; the third, which is very short, leans entirely against the two first. The canine is a strong triangular tusk, which departs much from the axis of the jaws. The molars do not differ essentially from those which we have described; only the first differs much more from the second in size than we have above seen.



Teeth of Phacochœrus.
a, last molar tooth (side view). (F. Cuv.)

In their reciprocal position, adds M. F. Cuvier, the two first lower incisors are in relation with the upper one. The third below is only opposed to the gum. The canine, by its postero-internal surface, is united to the antero-external surface of the upper canine; and these tusks are sharpened by whetting. The molars are opposed crown to crown. (*Dents des Mammifères.*)

M. Cuvier's plate is taken, as far as regards the upper jaw, from a Phacochœre without incisors, and, as relates to the lower jaw, from a Phacochœre furnished with those teeth; and he remarks that the disks of the last molars of the first are smaller and less numerous than those of the last molar of the second: he concludes by inquiring whether this may be a specific character.

Le Vaillant, in his 'Second Voyage dans l'Intérieur de l'Afrique,' states that in one of his huntings he killed a monstrous boar, absolutely different from all known hogs. Instead of the usual snout, it had that part very wide and square. The eyes were very small, separated very little from each other, and high on the forehead. On each side, upon the cheek, a cartilaginous and very thick skin, three inches in length and width, elevated itself horizontally. At the first glance, he observes, one is apt to take these excrescences for the ears of the animal; and the more so, because these last organs, which are applied against the very short neck, are partially hidden in an enormous mane, the rusty, brown, and greyish bristles of which are sixteen inches long upon the shoulders. Directly below these false ears may be remarked on each side a bony protuberance projecting more than an inch, which serves the animal for striking right and left. It has, besides, four tusks, of the nature of ivory, two in each jaw; the upper ones, from seven to eight inches long, are very thick at their origin, and terminate in an obtuse point; they are furrowed, and rise into the air from the lips: those of the lower jaw are much smaller, and so applied against the great ones, when the mouth is shut, that one would take them, then, together as being only one and the same. The head of this boar, says Le Vaillant, is truly hideous; and, at the first view, one finds striking analogies and resemblances to the hippopotamus, which is hardly less frightful. He cautions methodists, who are accustomed to view nature only according to rules which they have established, against seeing a mere hog (Sanglier) in this animal; for, besides its large snout, it wants incisors in both jaws. Notwithstanding its wide-spread muzzle, it turns up the earth to seek for roots, on which it feeds. It is, he adds, very fleet, though very stout and large, and goes so fast that the Hottentots call it 'the runner.' Le Vaillant gives a figure of a young animal of this species, from one in his own cabinet, and states that the figure given in Buffon's Supplement of this boar of the Cape has little exactness, nor can one at all recognise the head of this creature, the whole of whose characters have been neglected by the draftsman.

We illustrate this genus by Rüppell's *Phacochœrus Æliani*, or *Ælian's Wart-Hog*, from the north of Africa.

After stating that the discovery of two species of this genus is due to F. Cuvier, it is remarked that in all the individuals of *Phacochœrus Æliani*, whether old or young, of both sexes, there were in the intermaxillary bone two incisors, with their crowns turned inwards, and their roots directed outwards, wedged into the lower plate of that bone. These upper incisors were of greater size in males than in females, generally larger in animals that had obtained their full growth than in younger ones, and, in general, they rose freely a few lines above the axis of the palate. In the lower jaw were six incisors, which were not wanting even in very old animals, in which last they were invariably larger than in the young ones. The upper canine teeth had on their outer and inner surface a groove, which was continued with the curve; but this groove was wanting in the lower canines, which were one-third smaller in old animals than the upper ones. In all, young and old, of both sexes, there were four back teeth in the upper jaw, and three in the lower jaw. The first and second were small, narrow, somewhat round, with simple crowns, and with two roots wedged into two separate sockets. The third in the upper jaw and the second in the lower were strong, and as broad as the fourth: its enamel-surface consisted of five crown-globules, four in each corner, and one in the middle. It had four roots, wedged into four separate alveoli.

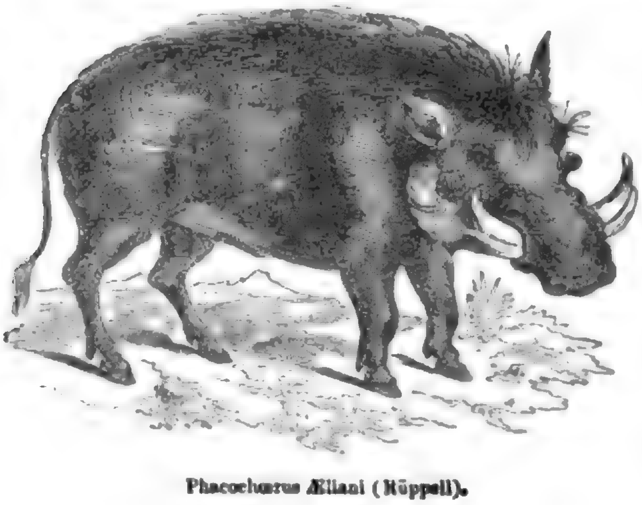
With regard to the three first back teeth, it is remarked that, as age advances, they gradually disappear, and none but the anterior ones remain. In a very old animal all three were almost entirely destroyed. The third was diminished by two-thirds, and nothing remained of it but the crown-surface, which kept its position solely from being wedged in between the fourth large one and the second: the alveoli that had been occupied by its roots had entirely vanished. But even in this animal all the upper and lower incisors still remained, although very much worn. After admitting the soundness of F. Cuvier's views as to the loss of the anterior molars by the pushing forward of the fourth, attention is called to the twofold type in the construction of the molar teeth of the wart-hog, and to the diversity of their growth. The three anterior molars are shaped like other molar teeth, are nourished in the same manner, have enamelled crowns and true roots. These must decay and die when they have attained their utmost growth. The alveoli then fill up with bony substance, loosen, and finally push out the teeth they contained. The three anterior teeth then decay and fall out, like the teeth of all other animals advanced in age; but it is altogether different with respect to the fourth, the largest and hindmost molar. The latter is, as F. Cuvier has observed, a compound tooth, and to be classed with the teeth of the elephant.

The lower jaw contains only three molars. The two anterior formed, like the upper ones, with two and four roots: what has been said with regard to the posterior or fourth tooth of the upper jaw is quite applicable to the third or last of the lower jaw.

Phacochœrus Æliani, then, is at all ages provided with incisors in the upper and lower jaw, and therefore is in the most marked manner distinguished from the wart-hog of the Cape. Another distinction is, that the Cape wart-hog has, according to F. Cuvier, only three molars in the upper and lower jaw; whereas *Phacochœrus Æliani* always presents four in the upper jaw. But there is hesitation in admitting this last mark of distinction to be of much weight, because the anterior molars are disposed to decay.

Further, if a line be drawn from the hind part of the head, as far as the most prominent part of the nasal-bone, there will be found in *Phacochœrus Æliani* a sinus, the depression of which falls in the middle of the line. This very place, in the case of the wart-hog of the Cape, rises to an arched prominence; and there are other differences.

Description of Phacochœrus Æliani.—Skin of an earthy colour, scantily bristled. A mane which extends along the neck and the back arises between the ears: the single hairs of it are frequently ten inches long. All the bristles, those of the mane included, are light brown. They have not each a several root, but three or six bristles form one tuft, and have one common root. The whole body, with the exception of the back, appears rather bare. The head is broad along the brow, which is rather depressed; the eyes are small, and situated very high up; there is a depression below the eyes, and near the cheek is a wart, which, as compared with a smaller one alongside the cheek, may be called the larger wart. These warts are formed of thickened skinny tissue, and they are smaller than in the species from the Cape. A whisker of white hair curling upwards runs along the lower edge of the lower jaw. The eyes are small, eye-lashes blackish, eye-brow bristles long and black, and under the eyes is a tuft of bristles. Ears cut obliquely at the lower part of the external edge, and the whole margin bordered with white bristly hair. Tail nearly bare, thin, and with a tuft of hair. On the fore-feet a piece of thick hard protuberant skin.


Phacochœrus Æliani (Rüppell).

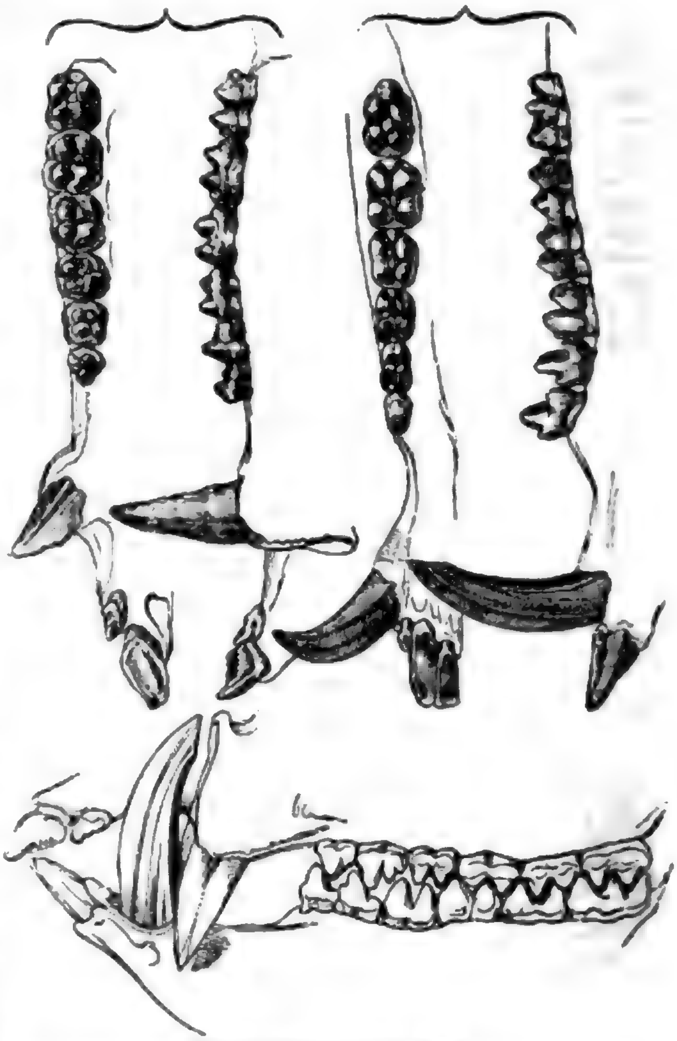
Locality, Habits, &c.—This species was found by M. Rüppell, first in Kordofan, and more frequently afterwards on the eastern slope of Abyssinia. It haunts low bushes and forests. It creeps on its bent fore-feet in quest of food, and in this posture digs up the roots of plants (of which its food is supposed to consist) with its enormous canine teeth. The hind-legs push the body forward as it moves in this posture.

AMERICAN SUIDÆ.

Genus *Dicotyles*, Cuv.

Generic Character.—Intermediate toes larger than in *Sus*, and touching the ground. Canines of the ordinary form, not protruding from the mouth. Incisors and molars resembling those of *Sus*. A glandular opening on the loins, secreting a fetid humour. No tail. The two great bones of the metacarpus and those of the metatarsus united together.

Dental Formula:—Incisors $\frac{4}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{6-6}{6-6}$; $=38$.


Teeth of Dicotyles. (F. Cuv.)

Cuvier remarks, that the Peccaries want the external toe on the hind feet, and the tail. The bones of the metatarsus and metacarpus of their two principal toes are soldered together into a species of *cannon*, as in the ruminants, with which their stomach (*ante*, p. 245), divided into many compartments, gives them a marked relationship. He further observes, that it is singular that their aorta is often found very much *puffed out* (renflée), but without any fixed place for the swelling, as if they were subject to a sort of aneurism. ('Tyson found this to be the case in his specimen, but I have searched for it in vain in the specimens that have died at the Gardens.'—R. O.)

Of this form, now so well known by means of our zoological societies and publications, there are two species, *Dicotyles torquatus* and *Dicotyles labiatus*.

Dicotyles torquatus.—In Hernandez we find a figure and two descriptions of this species, under the names of *Quauhtla Coymatl*, *Quapizotl*, *Aper Mexicanus*, by which 'Jo. Fabri Lyncei descriptio' is headed; and of *Coyametl*.

or *Quauhcoyametl*, 'quoniam est montanus,' by Fernandez. Both notice the gland on the loins; and the latter, who repeats the Mexican names first above stated, remarks that it is fierce and truculent when first taken, but mild when tamed, 'et amicus domesticis, habeturque in deliciis.' The flesh he describes as similar to ordinary pork, but harder and not so sweet, and the food of the animal as consisting of acorns, roots, 'and other mountain fruits,' as well as of worms, earthworms, and other creatures of the same sort that are bred in lacustrine, moist, and marshy places. These Mexican Hogs, he adds, lay waste the cultivated fields, if they are not driven from them, go in droves, and when domesticated are fed on the same esculents as the common hogs.

Piso, whose figure is not so good as that in Hernandez, describes this species, under the name of *Taiaçu*, as a wild pig, but yielding in size and fierceness to the boar, and scarcely acquiring the size of domestic hogs. He speaks well of its flesh: 'Admodum probatæ est carnis, ut facile nostratium domesticorum superet: lardo est tenuiori atque bono;' and also alludes to the gland, combating the notions that it was an umbilicus or a mammary organ. In many regions of America, especially in New Spain, many boars of this nature and conformation are, he tells us, found, and their flesh is equally approved of: that it may keep the better, the gland, he remarks, ought to be removed as soon as the animal is killed, otherwise it soon becomes corrupt. He characterises these Peccaries as irascible and revengeful; for, when they are wounded, they call together an infinite number of their kind, that they may attack their enemies, whether hunters or tigers, against which they exercise a perpetual enmity; so that it not rarely happens that the most sagacious hunters are obliged to save themselves by ascending a tree, when the leader of the herd, raging with his legions, bites and tears the trunk of the tree in lieu of the lost enemy. The hunters, surrounded by these irritated numbers, slay them in safety with hunting-spears or firearms; but it is long before the Peccaries break up, and not before they are tired out with watching and hunger.

These descriptions may apply to the *Collared Peccary*, *Dicotyles torquatus*, Cuv.; but we shall presently see that the other species, *Dicotyles labiatus*, Cuv., show their hostility to their enemies in the same way; and the descriptions probably refer to both.

The *Collared Peccary* has been bred in a state of domestication in South America and in some of the West India Islands; but, notwithstanding the favourable accounts given of its flesh by the author whom we have last quoted, it is out of all comparison inferior to that of the common hog, both in flavour and fatness. The comparative infertility, too, of the *Peccary*, which only produces two young at a birth, is at once a bar to its superseding the domestic pig, which is equally fertile in all climates where it has been introduced. The gland, too, is highly objectionable, making the animal, neat and trim as it generally is, a nuisance in life, and flavouring the flesh, unless removed immediately after death. D'Azara however seems to have revelled in its scent as a perfume; and Tyson and others appear to have considered it agreeable enough. Those which we have seen in captivity have been positively offensive; and the Peccaries seem to have affected the olfactory organs of Buffon, Sonnini, and indeed all other modern authors, in the same disagreeable way. This species is the *Patira* of Sonnini, and the *Taytétou* of D'Azara, according to Mr. Bennett.

Locality, Habits, &c.—Mexico and nearly the whole of South America, where they haunt the thickest and greatest forests, dwelling in hollows of trees or earths made by other animals. Not common in the vicinity of villages, to which they are bad neighbours, devastating the crops of maize, potatoes, sugar-canes, and manihot.

Dicotyles labiatus.—D'Azara appears to be the first who distinguished the two species of Peccaries, which are both confounded by Linnæus under the common name of *Sus Tajacu*. Indeed the old writers above quoted seem to have fallen into the same error; for it is very improbable that the collared peccary only was known when they wrote. Cuvier, who first gave the scientific specific names now used, states that *Dicotyles labiatus* is the *Taytétou*, *Tajassou*, &c., as well as the *Tagnicati* of Azara. It is larger than the *Collared Peccary*, which is seldom more than three feet long, and rarely weighs more than fifty pounds; whereas the *White-lipped Peccary* (*Dic. labiatus*) often measures three feet and a half in length, and sometimes weighs a hundred pounds. The last-named species is thicker and stouter, the legs are shorter, and the snout, which is longer, has its termination more expanded. Its prevailing hue is brown, and the lips are white. 'In its colour,' says Mr. Bennett, who has given very good figures of both species in his 'Gardens and Menagerie of the Zoological Society,' from which work we quote, 'it has little of the greyish tinge which characterises the latter, the black hairs of the back and sides having only a few brownish rings, which are rather more thickly spread on the sides of the head beneath the ears. These organs are less remarkable than in the other species, in consequence partly of the greater length of the mane, which advances forwards between them, and is continued down the back towards the tail, the bristles of which it is composed being very thick and somewhat flattened. The whiskers consist of long, black, scattered bristles; and a few others of a similar description project just above the eyes. The whole of the under lip, together with the sides of the mouth and the upper surface of the nose, are white. The legs and hoofs are black; and the latter are long and narrow, the posterior one of the hinder feet almost touching the ground. The tusks are longer and more visible externally than in the Patira. In the young animal the livery is more varied, being in some degree striped like that of the young wild boar of Europe; but these stripes are lost by degrees as the animal advances in age, and few traces of them remain after the first year.'

The secretion from the gland in this species has been said to be inodorous. This could not be said of the white-lipped Peccaries exhibited in the garden of the Zoological Society of London, though they were perhaps somewhat less offensive than the Collared Peccaries.

Locality, Habits, &c.—Mr. Bennett says (*loc. cit.*), 'unlike the former species, the white-lipped Peccaries congregate in numerous bands, sometimes amounting, it is said, to more than a thousand individuals of all ages. Thus united they frequently traverse extensive districts, the whole troop occupying an extent of a league in length, and directed in their march, if the accounts of the natives are to be credited, by a leader, who takes his station at the head of the foremost rank. Should they be impeded in their progress by a river, the chief stops for a moment, and then plunges boldly into the stream, and is followed by all the rest of the troop. The breadth of the river or the rapidity of the current appear to be but trifling obstacles in their way, and to be overcome with the greatest facility. On reaching the opposite bank, they proceed directly on their course, and continue their march even through the plantations which, unfortunately for the owners, may happen to lie in their way; and which they sometimes completely devastate by rooting in the ground for their favourite food, or devouring such fruit as they find there. If they meet with anything unusual on their way, they make a terrific clattering with their teeth, and stop and examine the object of their alarm. When they have ascertained that there is no danger, they continue their route without further delay; but if a huntsman should venture to attack them when they are thus assembled in large numbers, he is sure to be surrounded by multitudes, and torn to pieces by their tusks, if he is so unwise as to neglect his only chance of escape, which consists in climbing a tree, and thus getting fairly out of their reach. The smaller bands are by no means equally courageous, and always take to flight at the first attack.'

M. Lesson remarks that this species have been nowhere more particularly observed than in Paraguay.

In Guiana, Sonnini was often surrounded by a herd of Peccaries, exasperated at the havoc made among them by the fusils of himself and his companions. Betaking himself to a tree, he beheld at his ease how they encouraged, by their grunts and rubbing snouts together, those which were wounded from the shots above, still maintaining their ground with bristles erect and eyes fiery with rage. They sometimes stood an incessant *fusillade* of two or three hours before they quitted the battle-field and left their dead to the conquerors. After such encounters comes the festival of the travellers. A great gridiron, so to speak, of sticks fixed in the ground and some three feet in height, with numerous small branches laid on it in a transverse direction, is got ready. On this sylvan cooking-apparatus the pieces of Peccary pork are broiled over a slow fire kept up during the night. Sonnini dwells enthusiastically on these forest feasts, to which he looks back with regret.

Fossil Suidæ.

Fossil remains of this family have been found in the second division (Miocene of Lyell) and the third and fourth divisions (Pliocene of Lyell) of the tertiary deposits. In the first of these divisions are to be noticed the three species of *Sus* found in the Epplesheim sand. Bones of swine occur frequently in the bone caverns and bone breccia.

The following porcine remains are noticed by Herrmann von Meyer, in his *Palæologica*:—*Sus Scrofa, fossilis*, Cuv., from the bone caverns (Hutton Cave on Mendip for example) and the bone breccias: *Sus priscus*, Goldf., from the bone cave at Sundwick in Westphalia; *Sus* (*Aper*) *Arvensis*, Croiz. and Job., from the Puy-de-Dôme; *Sus antiquus*, and *Sus palæochærus*, Kaup, from the Epplesheim sand; and remains of *Sus* (Bourdet) from the tertiary. (*Mém. de la Soc. Lin. de Paris*, iv.)

Here we may notice *Chæropotamus* [Pachydermata], a fossil genus closely allied to *Sus*, and in some respects, especially in the dental details, approaching nearest to *Dicotyles*. The following species have been detected:—*Chæropotamus gypsorum*, Desm.; *Chæropotamus Parisiensis*, Von Meyer, from the gypsum at Montmartre (Cuv.); *Ch. Meissneri*, Von Meyer, from the Braunkohle, Switzerland; *Ch. Sömmeringii*, Von Meyer, from the tertiary (Lacusterkalk von Georgengmund); a *Chæropotamus?* detected by Clift from the banks of the Irawadi (*Geol. Trans.*, vol. ii., 2nd series), by Fischer (*Essai sur le Turquoise*), and by M. de Serres (*Ann. des Sci. Nat.*, ix.). See further Professor Owen's paper *On the Fossil Remains of Chæropotamus, Palæotherium, Anoplotherium, and Dichobunes, from the Eocene formation, Isle of Wight*, wherein the *Chæropotamus gypsorum* of Desm., *Ch. Parisiensis* of Von Meyer, is characterised, on more ample data than had hitherto occurred, as *Chæropotamus Cuvieri*. (*Geol. Trans.*, vol. vi., 2nd series.) [Palæotherium, vol. xvii., p. 152.]

Professor Owen has also characterised, in the same volume of *Geol. Trans.*, a new form (*Hyracotherium*), whose skull was probably intermediate in character between that of the hog and the Hyrax, under the name of *Hyracotherium leporinum*, from the London clay at the æstuary of the Thames (Eocene of Lyell).

Dr. Lund remarks, that there are but two genera of *Pachydermata* at present belonging to Brazil, the Tapir and the Peccary. Among the immense quantity of bones referrible to the latter genus, he says he can make out at least four species, very distinct from each other, and equally so from the two recent species, one of the fossil species nearly doubling in size either of the recent.

For *Anthracotherium*, which may be perhaps looked for here, see Pachydermata and Von Meyer's *Palæologica*.

SUIDAS (Σουΐδας), a Greek lexicographer. Strabo (p. 329, Casaub.) speaks of a Suidas who wrote an historical work on Thessaly, which is also cited by the scholiast on Apollonius Rhodius, and by Stephanus of Byzantium; but it seems very unlikely that this Suidas was the author of the Lexicon which goes under the name of Suidas. Eustathius, in his 'Commentary on Homer, occasionally quotes Suidas the lexicographer; and as Eustathius lived about the end of the twelfth century A.D. and the beginning of the thirteenth, we may conclude that the lexicographer Suidas was at least prior to this time. There appears to be no certain indication in the Lexicon of Suidas which will show who he was or what was his country. There are indeed passages in the work from which it appears that he lived during or after the reign of Alexius Comnenus, for he quotes Michael Psellus (v. Γηώρας; v. Δίρτρου; v. Ἡγήτορες); and if these passages were inserted by Suidas, he must have lived not earlier than the close of the eleventh century A.D. (But see Gaisford's edition.) In the article 'Adam,' he gives a chronological epitome, which he closes with the death of the emperor John Zimisces, who died A.D. 974; and in another place (v. Κωνσταντινούπολις) be speaks of Basil II., and his brother Constantine, who succeeded John Zimisces. There are other passages in Suidas, from which some inferences as to his age might be derived, but it is often difficult to know when the lexicographer is quoting others or speaking himself. Whatever may be the age of the compiler of the Lexicon, the work has the appearance of having received additions from a variety of hands.

The work of Suidas is a Dictionary arranged alphabetically, but with some deviations from the strict alphabetical order. It contains both proper names, as names of persons and places, and words which belong to a dictionary of a language in the modern acceptation of that term. Among the names of persons there are names both from profane history and from sacred history, such as Abimelech and Adam. The work is exceedingly imperfect in all the classes of names, and appears to have been formed on no plan. Some of the articles are long and tolerably complete; others are very short and contain no information. Thus, for instance, 'Adam' is a long article, but of 'Aaron' we are told nothing more than that it is a proper name. The work is compiled from numerous writers, some of whom are mentioned in a list prefixed to the Lexicon, comprising twelve names, among which are Eudemus and Cassius Longinus. It may however be doubted if this list was made by the compiler of the Lexicon. A much more copious catalogue is contained in the edition of Küster. Among the old scholiasts, none was used by the compiler more freely than the scholiast on Aristophanes; but the work of Suidas contains some passages which are not in the extant scholia on Aristophanes. The work is not only deficient in plan, but is often defective and inaccurate in the execution. Numerous corrupt and base words have been introduced from bad authorities or bad manuscripts; sometimes under one name of a person we find events belonging to the lives of various persons of the same name, placed without any discrimination (v. Σεβῆρος); and under one name there are frequently events and extracts from writers which belong to other names (v. Μαξιμῖνος; v. Ἀλυάττης; v. Πῶρος). The Lexicon contains a great number of extracts from Greek writers, and frequently without mention of their names, but these extracts have often no reference to the title of the article, and add nothing towards explaining or illustrating it. This is partly owing to many marginal additions having been introduced into the text by ignorant transcribers.

With all these defects the Lexicon of Suidas is a very useful work, and is of great assistance for the literary history of antiquity. It is also useful for illustrating the meanings of many words. It also contains numerous passages of antient writers that are lost. As to the biographical notices, it has been conjectured that they have all been taken from one work, which is further conjectured to be the 'Onomatologon' of Hesychius. The 'Onomatologon' was a list or catalogue of men distinguished for knowledge, and it is stated in the Lexicon (v. Ἡσύχιος) that it is an epitome of the work of Hesychius of Miletus, who lived in the time of the emperor Anastasius; but we may allow this assertion to have its full weight, without admitting that it is the only source from which Suidas derived even his literary notices. (See the notes of Küster, and Naeke.)

There is an unpublished epitome of Suidas by Thomas of Crete: Robert Grostete, bishop of Lincoln, who died in 1253, is said to have made a Latin translation of Suidas (Fabricius, *Bibl. Med. et Inf. Lat.*); but see the note in Fabricius (*Biblioth. Graeca*, vi. 402, ed. Harles).

The first edition of Suidas was by Demetrius Chalcondylas; it was printed at Milan, 1499, fol., without a translation. This edition is defective in some places. The second was the Aldine edition of Venice, 1514, fol., also without a translation: this edition differs in some passages from that of Chalcondylas, whence it seems probable that it was printed from a different manuscript. The edition of Aldus was reprinted by Froben, at Basel, 1544, fol.; also without a translation, but with the correction of some typographical errors. H. Wolf made the first Latin translation of Suidas, which was published at Basel, 1564, fol., without the Greek text, and the revised translation was printed again at Basel, 1584. The first edition of the Greek text with a Latin translation was by Aemilius Portus, Geneva, 1619, 2 vols. fol.: the Latin version was new. In 1705 the edition of Küster appeared at Cambridge, in 3 vols. folio, with the improved version of Portus and numerous notes. The foundation of this edition is the text of Portus, which was corrected with the help of MSS. The preface of Küster contains a dissertation on Suidas, and on the previous editions, and more particularly on that of Portus. The last edition of Suidas is by Gaisford, 3 vols. fol., Oxford, 1834; the first two volumes contain the text, and the third the indexes. Gaisford states in his preface that Küster used pretty nearly the same MSS. as himself, but that he has been very careless in noting the readings, and that his edition, though useful in other respects, is consequently of very little critical value. Gaisford has noted all the various readings of the best MSS., and also the readings of the

Milan edition. He has also generally noted the emendations of Portus, many of which Küster adopted without any remark; indeed Küster is accused, and justly, of taking the notes also of other scholars without any acknowledgment. Gaisford has carefully indicated the sources from which Suidas derived his information; and he has reprinted most of Küster's notes. The third volume of Gaisford contains the 'Index Küsterianus Rerum et Nominum Propriorum quae extra seriem suam in Suidae Lexico occurrunt,' and two new indexes. One of these two new indexes contains all the words in Suidas arranged in alphabetical order, which is useful because the Lexicon does not always follow the usual alphabetical order; and it also contains other words which do not appear in the alphabetical order of the Lexicon. The other of these two indexes is an index of the writers who are cited by Suidas. This edition is a splendid and valuable work.

Various critics have laboured on the text of Suidas, among whom Toup is perhaps the most conspicuous for acuteness and diligence.

(Fabricius, *Biblioth. Graeca*, vi. 389, ed. Harles; Ludolphi Küsteri *Praefatio; Praefatio Editoris Oxoniensis.*)

SUISSET, R., lived about the middle of the fourteenth century, and was educated at the university of Oxford. He is principally known as the author of a work printed at Venice in 1505, and again in 1520: the latter edition, the only one we have met with, is entitled 'Subtilissimi Ricardi Suiseth Anglici Calculationes noviter emendatæ atque revisæ.' A complete analysis of a new philosophic theory developed in this work is given in Bruckeri (*Hist. Phil.*, tom. iii., p. 580-583). Among its contents may be particularly mentioned the chapters 'De intentione et remissione,' 'De loco elementi,' 'De maximo et minimo,' 'De luminosis,' 'De motu locali,' and 'De medio non resistente.' Pits mentions other works by this writer, which do not appear to have been preserved: Tanner altogether omits him. We have placed the initial only of his Christian name at the head of this article, because, although he is called Richard in the title of the work just given, yet the colophon of the very same book writes 'Calculationum Liber Magistri *Raymundi* Suiseth;' and a contemporary manuscript note in one of the two copies of the book in the British Museum corrects the former appellation to Roger; while Vossius (*De Scient. Mat.*, c. 18) calls him John Suiseth.

SUIT is a legal term used in different senses. The word *secta*, which is the Latin form, is from 'sequor,' to follow; and hence the general meaning of the word may be deduced.

1. A suit, in the sense of litigation, is a proceeding by which any legal or equitable right is pursued, or sought to be enforced in a court of justice. Where the remedy is sought in a court of law, the term suit is synonymous with action; but when the proceeding is in a court of equity, the term suit is alone used. The term is also applied to proceedings in the ecclesiastical and admiralty courts.

2. Suit of court, in the sense of an obligation to follow, that is, to attend, and to assist in constituting, a court, is either real or personal.

Suit-real, or rather suit-regal, is the obligation under which all the residents within a leet or town are bound, in respect of their allegiance as subjects, to attend the king's criminal court for the district, whether held before the king's officer and called the sheriff's tourn [Tourn], or held before the grantees of leets or the officers of such grantees, and called courts-leet. [Leet.]

Suit-personal is an obligation to attend the civil courts of the lord under whom the suitor holds lands or tenements; and this is either suit-service or suit-custom. If freehold lands, &c. be holden of the king immediately, or, as it is feudally termed, in chief, suit-service is performed by attendance at the county court, the court held by the king's officer, the sheriff, unless the lands, &c. constituted an entire barony, in which case the suit demandable from the tenant was, his attendance as a lord of parliament. If freehold lands, &c. are held mediately only of the king, but immediately (or in chief) of an inferior lord, the suit demandable is attendance at the court baron of the lord: in either case suit-service is expressly or impliedly reserved upon the creation of the tenure, as part of the services to be rendered for the estate. In manors [Manors] where there are copyhold, that is, customary estates, the custom of the manor imposes upon the copyholder an obligation to attend the lord's customary court; but as this obligation is not annexed by tenure to the land held by the copyholder, but is annexed by custom to his position as tenant, the suit is not suit-service, but suit-custom. In the case of freeholders attending as suitors the county court or the court-baron (as in the case of the antient tenants per baroniam attending parliament), the suitors are the judges of the court both for law and for fact, and the sheriff or the under-sheriff in the county court, and the lord or his steward in the court-baron, are only presiding officers with no judicial authority. But in the criminal jurisdiction of the tourn and leet, the sheriff and the grantee of the leet, or his steward, are the judges; and the suitors act only a subordinate part.

In the customary court, though its functions are confined to matters of a civil nature, yet, on account of the original baseness of the copyhold tenure, the judicial power is wholly in the lord or his steward.

3. Besides suit of court, secta ad curiam, there are other species of personal suit, which, like suit of court, are divisible into suit-service and suit-custom. Of these the most usual is suit of mill, secta ad molendinum, which is where, by tenure or by custom, the freehold or customary tenant is bound to grind his corn at the lord's mill.

SUIT and SERVICE. [Suit.]

SULETIELMA. [Sweden.]

SULEYMAN. [Moors, p. 386; Soliman, Ibn Al Hakem.]

SULI, a mountainous district of Southern Albania, which extends in length about 30 miles from north to south, and about 20 miles in breadth, and is separated to the south-west from the coast of the Adriatic by a strip of lowland in which is Port Fanari, the antient Elæa, at the mouth of the Acheron. On the south-east the highland of Suli is bounded by the plain of Arta, which extends to the gulf of the same name. Towards the north Suli borders on the district of Paramithia, and on that of Janina towards the north-east. The river Glyky, the antient Acheron, coming from the north, flows along a deep valley which intersects the highlands of Suli, and after being joined by several streams enters the Adriatic at Port Fanari. The district of Suli is part of the antient Thesprotia, one of the three great divisions of Epirus. It contains eighteen villages or hamlets, of which ten or eleven are in the highlands, and the rest in the plain at the foot of them. The principal village, called Mega Suli, and by the Turks Kako Suli, lies on a hill near the left bank of the Acheron; not far from it is the village of Kiapha, and higher up the mountain is that of Kungi. In the plain, at the foot of the mountain, the principal village is called Securates. The whole population of Suli, at the time of the war with Ali Pasha, did not amount to more than 12,000, divided into about thirty tribes or clans, each consisting of several families related or allied to one another. The principal tribes were the Zavella, Botzari, Zerva, Pasati, and Drako. The head of each clan was styled captain, and led his contingent in war, subject to a supreme commander styled Polemarch, who was chosen by votes for the time. Their mode of fighting was that of partisans or skirmishers, and they were generally good marksmen.

The oral language of the Suliotes is the Albanian, but they use the modern Greek for their written language. They all belong to the Greek or Eastern church. Their appearance and costume resemble those of the Albanians, but their social habits and traditions are more like those of the Greek race. The mountains of Suli produce only pasture for cattle and timber-trees, but the plain is cultivated, and produces corn, pulse, and other provisions. The houses are rudely built, and the country is altogether poor; but the almost continual state of warfare in which the Suliotes lived towards their neighbours, before their total subjugation, gave them the means of supplying their wants.

Suli has become an historical name on account of its long struggle against the forces of Ali Pasha of Janina, at the end of the last and the beginning of the present century. The political condition of Epirus, or Southern Albania, previous to that epoch, was very peculiar. The country was divided into two pashalicks, Janina and Delvino; but several districts, such as Suli and Chimari, were independent communities, often at war with the pashas sent by the Porte, and at other times friendly, but not subject to them. Other districts, such as Gardiki, Paramithia, Argyrocastro, &c., inhabited both by Christians and Mussulmans, were under the rule of beys, a kind of feudal lords, tributary to the Porte, but often at variance with the pashas. Lastly, there were the Venetian possessions of Prevesa, Parga, and Butrintò, along the coast, supported by the Venetian garrison of the neighbouring island of Corfú, and protected by the Venetian navy, which acted indirectly as a check upon the arbitrary power of the pashas, affording a refuge to those who escaped from their tyranny, and also a market and a place of supply for the Christian population of Epirus. The whole maritime coast of Epirus was in a manner under the protection of Venice. By a treaty between the Porte and the Venetian senate, no Turkish armed ship was allowed to sail into the Adriatic, and the pashas of Epirus were even forbidden from constructing any battery within a mile of the coast.

In the war between Russia and the Porte (1787-92), the Suliotes were among the most active partisans of Russia, and Suli was the centre of the insurrection against the Ottomans, which broke out in various parts of Greece. Ibrahim Pasha of Avlona, and several beys of Epirus, favoured the insurgents. In 1789 Ali Pasha of Janina sent a considerable force against the Suliotes, who defeated it with great loss. In the following year, the Suliotes having joined with the Klephts of Pindus and other mountainous districts, ravaged Acarnania as far as the Achelous, without distinction of Greeks or Turks, and they afterwards overran the territory of Arta and Janina under the very eyes of Ali Pasha. The Suliotes also contributed men and money to the naval armament of the corsair Lambro Canzani, who scoured the Ægean Sea against the Turks. But the peace of 1792, between Russia and the Porte, left the insurgent Greeks and Epirotes exposed to the fearful vengeance of the Turks. Ali Pasha undertook to exterminate the Suliotes. He penetrated with a large force into their district, and took Mega Suli and Kiapha, but being desperately assailed by the people, who had retired to the mountains, under the direction of George Botzari, his troops were completely routed, and fled to Janina. Ali then concluded a peace or truce with Suli, which lasted a few years. Upon the partition of the Venetian states in 1797, when the French republicans occupied the Ionian Islands, Ali, affecting to be friendly towards his new neighbours, and, professing, like them, a great detestation of the old Venetian aristocracy, prevailed upon the French commander to overlook the old convention with Venice about closing the Adriatic, and to allow Turkish armed vessels to land troops near Butrintò, which surprised in the night the Christian populations of Nivizza and San Basilio, which had been till then under the protection of Venice. These populations were partly massacred and partly carried into slavery. War having shortly after broken out between France and the Porte, in consequence of the French invasion of Egypt, Ali Pasha took the opportunity of falling upon the French garrisons of Butrintò and Prevesa, and gained possession of those places. Parga alone preserved its independence, and remained the only ally of the Suliotes. [Parga.]

In May, 1801, Ali Pasha began a war of extermination against Suli, and at last succeeded, as much by treachery and bribery as by an overwhelming force, in conquering that stubborn population. [Ali Pasha.] Many of the Suliotes fell in the struggle, others were murdered by Ali's soldiers, many of the women threw themselves into the river rather than fall into the hands of the Turks; and the rest of the population, about 4000, contrived to reach Parga, from whence they went to the Ionian Islands, then under the protection of Russia. A few, trusting to the promises of Veli Pasha, Ali's son, remained in their desolate villages. In the war for the independence of Greece, a body of Suliotes fought at Missolongi against the Turks, and they were for a time in the pay of Lord Byron.

(Ciampolini, *Le Guerre dei Sulliotti contro Ali Bascià di Jannina*, Florence, 1827; Hobhouse, *Travels in Albania*.)

SULLA is the cognomen of a branch of the Patrician gens Cornelia. This branch originally had the name of Rufus or Rufinus, which appears to have fallen into disuse, and to have given way to the new cognomen Sulla, which had the same meaning as Rufus, and was first borne by the Flamen Dialis.

1. Publius Cornelius Sulla (Gellius, i. 12, § 16), who was Praetor Urbanus, in 212 B.C., and, in accordance with an oracle of the Sibylline books, conducted the first celebration of the Ludi Apollinares. Hence he is said to have received the surname of Sibylla, which was subsequently contracted into Sylla or Sulla. (Macrob., *Sat.*, i. 17.) This account however is fabulous, for as Rufus and Sulla have the same meaning, it is more probable that the change of the one name for the other was only an arbitrary alteration. Plutarch (*Sulla*, 2) states that the dictator Sulla was the first who bore this surname, from which it is evident that Plutarch had read the memoirs of the dictator, or at least that part in which this point was explained, very carelessly.

2. P. Cornelius Sulla, a son of the former (1), was praetor in Sicily in the year B.C. 186. (Liv., xxxix. 6, 8.)

3. Servius Cornelius Sulla, a brother of P. Cornelius Sulla (2). In the year 167 B.C. he was one of the ten Roman commissioners who, after the defeat of Perseus, were sent to Macedonia to arrange the affairs of that country. (Liv., xlv. 17.)

4. L. Cornelius Sulla, the father of the dictator Sulla, of whom nothing is known, except that he was not a man of any great property. (Plut., *Sulla*, 1.)

5. L. Cornelius Sulla Felix, the son of L. Cornelius Sulla (4), was born in B.C. 138, in the consulship of P. Cornelius Scipio Nasica Serapio and D. Junius Brutus Gallaicus. When a young man he lived for a considerable time at Rome in lodgings, and in the same house with a freedman, which was looked upon as a proof of his limited means. But he appears nevertheless to have received an education as good as any of the illustrious young Romans of that time. (Sallust, *Jug.*, 95.) He indulged however in all kinds of debauchery; and women, actors, mimes, and buffoons were his favourite companions to the last years of his life. He appears to have been foremost among the fashionable young nobles of the time, and was always an especial favourite of the women. His stepmother loved him like her own son, and when she died he came into the possession of all her property. Nicopolis, one of his mistresses, who possessed considerable property, also bequeathed it all to him. His fortune being thus improved, he was enabled to enter into competition with others for the honours of the republic. In B.C. 107 he was appointed quaestor, and was sent with a detachment of horse to join the army of Marius, who was then carrying on the war against Jugurtha. The stern warrior was at first somewhat indignant that such an apparently effeminate young noble was sent to him as quaestor in such an important campaign. But Sulla, although he had hitherto appeared totally ignorant of military affairs, soon showed himself to be the most active and skilful officer in the Roman camp, and gained the confidence and admiration of Marius. He also possessed in the highest degree the art of winning the affection of his soldiers. (Sallust, *Jug.*, 96.) In the battle of Cirta, Sulla commanded the horse, and greatly contributed towards the victory over Jugurtha and Bocchus. (Sallust, *Jug.*, 101.) After this victory Bocchus began his treacherous negotiations with the Romans, and Marius sent Sulla and A. Manlius as ambassadors to the king. By his duplicity Sulla induced Bocchus to take a decided course, the consequence of which was that Jugurtha was treacherously delivered up into the hands of the Romans. (Sallust, *Jug.*, 102-113.) Sulla was so proud of having outdone the Numidian king, so famous for his cunning and prudence, that he had a seal-ring made, on which Bocchus was represented in the act of delivering Jugurtha into the hands of Sulla; and this seal he used to the end of his life. (Plut., *Sull.*, 3; Plin., *Hist. Nat.*, xxxvii. 4; Val. Max., viii. 14, 4.)

When Marius, in his second consulship (104 B.C.), undertook the war against the Cimbri and Teutones, he made Sulla his legate, who distinguished himself by making Copillus, a chieftain of the Tectosagi, his prisoner. The year following Sulla remained in the camp of Marius as tribunus militum, and again distinguished himself. But in the third year, 102 B.C., he left Marius and joined the army of Lutatius Catulus, the colleague of Marius, who was stationed with a force in the north of Italy. Plutarch ascribes this step of Sulla to the jealousy of Marius, who, he says, feared lest his own fame might be eclipsed by that of his tribune. But the real cause of this movement was in the actual state of things. Sulla must have been aware that in the army of Catulus, who, although a good man, was not an able general, his services would be much more useful; and that there was a much greater sphere of activity for his talents as an officer in the army of Catulus than in that of Marius. If there existed an ill-feeling at all, it is much more likely that the aristocratic Sulla felt indignant at a plebeian being elected consul uninterruptedly one year after the other. Sulla, while in the army of Catulus, was the soul of all undertakings, and he made several successful expeditions against the Alpine tribes. On one occasion, when the army of Catulus began to suffer severely from want of provisions, Sulla contrived to obtain such plentiful supplies, that Catulus was enabled to send some to the army of Marius.

After the defeat of the Cimbri (101 B.C.) Sulla returned to Rome, where he resumed his old course of life. He did not come forward as a candidate for any public office until the year B.C. 94, when he was a candidate for the praetorship. But he was not elected, because the people, as he himself stated in his Memoirs, wished him first to hold the office of aedile, as they expected that on entering on the aedileship he would amuse them with magnificent games, and exhibit African beasts in the Circus, as it was known that he was a friend of Bocchus, who would easily procure for him rare and beautiful animals. (Plut., *Sull.*, 5.) In the year B.C. 93 however he gained his object by canvassing and bribing: he was made praetor urbanus (*στρατηγία πολιτική*. Plut.; comp. Aurel. Vict., *De Vir. Illustr.*, 75), and exhibited to the people the games which they had expected from his aedileship. (Plin., *Hist. Nat.*, viii. 20.) The year after his praetorship he went as propraetor to Cilicia with a commission to restore king Ariobarzanes to his kingdom of Cappadocia, from which he had been driven through the influence of Mithridates. This object was soon accomplished; and this bold and successful undertaking excited the attention of Arsaces, king of the Parthians, who, while Sulla was staying somewhere near the Euphrates, sent a messenger to him soliciting the friendship of the Roman people. The request was granted, though Sulla, who felt the honour of being the first Roman to whom such an application was made by a Parthian king, treated the ambassador with haughtiness and arrogance. In B.C. 91, when Sulla returned to Rome, Caius Censorinus brought against him the charge of repetundae, or malversation, in his office of propraetor, but did not follow it up. In this year the Marsic or Social War commenced, and for a time delayed the outbreak of the furious hostility between Marius and Sulla, which was kindled by apparently trivial circumstances. (Plut., *Sull.*, 6.) Both Marius and Sulla commanded separate divisions of the Roman army, and the latter distinguished himself much more than Marius, who perhaps already began to incline towards the cause of the Italians. In 89 Sulla was legate of the consul L. Cato, and destroyed the Campanian town of Stabiae. (Plin., *Hist. Nat.*, iii. 9.) He also defeated L. Cluentius near Pompeii, pursued him as far as Nola, and compelled the Hirpini to submit. In Samnium he surprised and routed the army of Motilus, and took Bovianum by storm after a siege of three hours. (Appian, *De Bell. Civ.*, i. 50.) During this war Sulla left nothing untried to gain the goodwill of the soldiers; and he even connived at their gross excesses. Thus when the soldiers beat to death with sticks his own legate Albinus, a man who had filled the office of praetor, Sulla not only did not punish this outrage, but rather boasted of it, saying that his men would fight all the better for it. (Plut., *Sull.*, 6.) When the time approached for electing the consuls for the year following, Sulla went to Rome to offer himself as a candidate. His successful campaigns had gained him such popularity, that he was almost unanimously elected consul for the year B.C. 88. (Vellei. Pat., ii. 17.) He was now in the forty-ninth year of his age. His colleague was Q. Pompeius Rufus, who obtained Italy as his province. Sulla had Asia and the command in the war against Mithridates. The Social War was still going on, and Marius was not only exasperated because his former quaestor was now his equal, but was at the same time anxious to get the command in the war against Mithridates, and with this view he persuaded the tribune P. Sulpicius to give him his assistance in depriving Sulla of the power intrusted to him. A direct attempt to this effect would have been imprudent. Marius and Sulpicius therefore first tried to gain the interest of the Italian allies, and to identify the popular cause, represented by Marius, with that of the allies. With this view Sulpicius proposed two measures, first, to recall those who had been exiled on account of the support they had given to the allies; and, secondly, to distribute those Italians who had obtained the franchise, but had been formed into new tribes, among the thirty-five old tribes, the object of which was to increase the weight of their suffrage. (Liv., *Epit.*, 77; Appian, *De Bell. Civ.*, i. 55.) These proposals met with the most determinate opposition from the old citizens, and the Forum became the scene of terrible violence. The popular party, by far the most numerous, would have carried the day, but Sulla, who was with his army in the neighbourhood of Nola, returned to Rome, and in order to put an end to the violent proceedings in the Forum, he and his colleague proclaimed a justitium for several days. But Sulpicius and his party, armed with daggers, appeared in the Forum, declared the proclamation of the consuls to be unlawful, and endeavoured to compel them to repeal the justitium. This again increased the tumult, and Pompeius was obliged to take to flight, and his son, who had married a daughter of Sulla, was murdered. Sulla himself, who had escaped into the house of Marius, was dragged forth and compelled to repeal the justitium, after which he returned to his army at Nola. In the mean time the rogations of Sulpicius were carried, and the command in the war against Mithridates was given to Marius. When the messengers from Rome came to the camp of Sulla with orders for him to surrender the command, the soldiers, who loved Sulla, and who were of opinion that Marius would not lead them to Asia, where they expected a rich harvest of booty, called on Sulla to lead them to Rome. Several officers in the camp, who were opposed to civil war, retired to the city, while numbers of other persons flocked from the city to the camp of Sulla. All signs and omens, to which Sulla pretended to attribute great importance, were in his favour, and, with the declaration that he was going to deliver Rome from its tyrants, he marched with six legions against the city, which he took by storm. A battle followed within the walls, in which Marius and his party were defeated. Marius escaped to Africa, and Sulpicius, betrayed by one of his slaves, was put to death. Sulla and his colleague on this occasion prevented the soldiers as much as possible from committing any outrage upon the citizens. Besides the two leaders of the popular party, ten others were declared enemies of the republic, their property was confiscated, and agents were sent in all directions to discover them, and either to put them to death or to deliver them up to the consuls. (Appian, *De Bell. Civ.*, i. 60; Plut., *Sull.*, 10.)

After this defeat of the Marian party, Sulla repealed the laws of Sulpicius, but he had no leisure for a thorough reform of the constitution, which he appears to have conceived about this time, as his soldiers were anxious to be led to Asia. Appian indeed ascribes some of the most important regulations of Sulla to this time, and it is not improbable that the law which enacted that no measure should be brought before the people which had not previously obtained the sanction of the senate, and another (lex unciaria; Fest., *s. v.* 'unciaria lex'), by which some disputes between debtors and creditors respecting the rate of interest were settled, belong to this period. The other measures, also mentioned by Appian, may have been discussed at the time, but they were not carried into effect until the dictatorship of Sulla. He remained at Rome until the consuls for the year following were elected. The consuls for the year B.C. 87 were Cn. Octavius and L. Cinna. The latter was a man of the popular party, and Sulla, pretending to be glad to see that the people made use of their freedom in the elections, contented himself with making Cinna promise with an oath that he would not disturb the actual order of things. Sulla in the meanwhile felt that his life was not quite safe at Rome, and was therefore constantly accompanied by a strong body-guard. A short time after, the tribune M. Virginius, instigated by Cinna, prosecuted Sulla, who however, without any concern about it, went to Capua to undertake the command of his army, and to proceed with it to Greece, where he intended to commence operations against Mithridates. He landed at Dyrrachium, collected the Roman troops stationed in Greece, and marched towards Athens, which Archelaus, the general of Mithridates, had made his head-quarters. After a long siege and a desperate defence, Athens was taken by storm (86 B.C.), and the garrison of the Acropolis was soon compelled, by want of water and provisions, to surrender at discretion. Piraeus also fell into the hands of the victor. (Plut. *Sull.*, 11, &c.; Appian, *Mithrid.*, 28-45.) Sulla, who received no supplies from Italy, did not scruple to make use of the rich treasures of the Greek temples, and treated with scorn those who exhorted him not to provoke the anger of the gods. Athens suffered severely, and many of its most magnificent buildings and works of art perished on this occasion, for Sulla's anger had been provoked during the siege by the insulting conduct of Aristion, then tyrant of Athens. Archelaus collected all his forces in Greece, and after having received great reinforcements from Asia, he was determined to dispute with Sulla the possession of Greece. Though the Roman army was far inferior to that of Archelaus, Sulla gained two victories, one at Chaeronea (B.C. 86), and the other at Orchomenos in Bœotia (85 B.C.), after which he destroyed the towns of Anthedon, Larymna, and Halæae. (Plut. *Sull.*, 26.)

Although Sulla might now consider himself master of Greece, and might have carried on the war against Mithridates with the best hopes of success, he thought it advisable not to drive Mithridates to extremities, and therefore consented, soon after his landing in Asia, to conclude a peace with him (84 B.C.). [MITHRIDATES.] There were however other reasons for wishing to put an end to the war. During his absence from Italy the popular party had recovered its ascendency, and his own party was almost annihilated: his institutions were abolished, his house was destroyed, and his property confiscated, and he himself was declared an enemy of the republic. The most distinguished senators had been obliged to take refuge in his camp in Greece, and they, together with his wife Cæcilia Metella, who had likewise fled from Rome, urged and entreated him not to forsake them. Two years before the peace with Mithridates, the consul L. Valerius Flaccus, who was of the popular party, had appeared with a fleet and an army in the Ionian Sea, under the pretext of carrying on the war against Mithridates, but perhaps with the secret intention of attacking Sulla. This plan however had not been realised, for Valerius Flaccus was murdered (B.C. 85) by his own legate C. Fimbria, who placed himself at the head of the troops, and was successful in several engagements with the army of Mithridates. After Sulla had concluded a peace with the king in the plains of Troas, he set out against Fimbria, who was stationed with his army in the neighbourhood of Thyatira in Lydia. Fimbria, being betrayed by his own soldiers, put an end to his life. (Plut., *Sull.*, 25.)

Sulla was now at liberty to return with his army from Asia to Italy, but he had still to satisfy the demands of his soldiers, who had expected to enrich themselves in the war against Mithridates. To raise the necessary money, Sulla resorted to the most oppressive measures. Every provincial was obliged to give to every soldier quartered in his house every day a fixed sum of money, and to provide him and as many as he might choose to invite with a daily meal. Besides this, a very heavy contribution of 20,000 talents was raised; in short, Sulla treated the country, which he pretended to have delivered, like that of an enemy. (Plut., *Sull.*, 25.) After he had thus secured the attachment of his soldiers, he left the province of Asia, intrusted the two legions of Fimbria to his legate L. Licinius Murena (Appian, *Mithrid.*, 64), and sailed with his fleet and the remainder of his army, about 30,000 men, from Ephesus to Piræeus. After a voyage of three days, he reached Athens. He took the library of Apellicon, the father of Aristion, which, according to Athenæus (v., p. 211, &c.), belonged to Athenion, and which contained most of the works of Theophrastus and Aristotle. Sulla, who was well able to appreciate such a treasure, carried it with him to Rome. [ARISTOTLE.] While in Greece, Sulla had an attack of the gout, of which he was cured by the use of the warm baths of Ædepsus in Eubœa. During his short stay there he indulged in his usual diversions, and spent the greater part of his time in the company of actors and dancers. He then marched with his army towards the north, through Thessaly and Macedonia to Dyrrachium, and carried his army over to Brundusium in 1200, or, according to Appian (*De Bell. Civ.*, i. 79), in 1600 ships. This passage probably took place in the spring of the year B.C. 83.

The forces of the hostile party in Italy amounted to 200,000 men. (Vell. Pat., ii. 24.) Cinna had increased his preparations as soon as he heard that Sulla was on his way to Italy. In consequence of a letter which Sulla while yet in Asia had addressed to the senate, it had been decreed that negotiations should be entered into in order to effect a reconciliation between Sulla and his enemies, and that Cinna and Carbo, then consuls, should make no further preparations for war. But the consuls paid no attention to this decree, and made preparations for carrying an army into Dalmatia, in order to bring the war to a close in Greece. But when a part of the army was already transported to Dalmatia, a mutiny broke out among the soldiers, and Cinna was murdered, 84 B.C. (Appian, *De Bell. Civ.*, i. 78; Liv., *Epit.*, 83.) The popular party, deprived of their leader, had no alternative but to continue their resistance or to fall victims to the vengeance of Sulla, who had declared that he would pardon none of his enemies. The Italians had made common cause with the democratic party, for they had reason to think that Sulla would be the last man to leave them in the enjoyment of the rights which they had lately acquired. But Sulla endeavoured to deprive his enemies of this support, and while he led his army from Brundusium through Calabria and Apulia into Campania, he carefully prevented his soldiers from doing any injury either to the fields or the towns of the Italians; and he even entered into negotiations with some of them, and assured them that he would not attempt to deprive them of their newly-acquired rights. (Liv., *Epit.*, 86.) Many Romans of distinction also, who had formerly shown themselves rather neutral, such as Pompey, joined his army, and increased his forces considerably. In the first battle which Sulla fought with the consul Narbanus in the neighbourhood of Capua, he was successful; and while a truce was concluded with this conquered enemy the army of the other consul, L. Scipio, was persuaded to abandon their general. In the year following (B.C. 82), when young Marius and Cn. Papirius Carbo were consuls, the war assumed a more serious aspect. Marius undertook the protection of Rome and Latium, and Carbo that of Etruria and Umbria. Marius however was defeated by Sulla in the battle of Sacriportus, upon which he fled to Praeneste, and Rome was taken by the conqueror, after the praetor L. Damasippus, at the request of Marius, had put to death a great number of nobles, and among them even a pontifex maximus, who were suspected of secretly supporting the cause of Sulla. Carbo, who was successively attacked by Metellus Pius, Pompey, and Sulla himself, was compelled to seek refuge in Africa, after he had made a useless attempt to rescue Marius, who was besieged in Praeneste by Q. Lucretius Ofella. The Samnites and Lucanians, who, under the command of Pontius Telesinus and M. Lamponius, likewise made a fruitless attempt to relieve Praeneste, and then marched against Rome, were defeated in a great battle at the Colline gate, in which both armies fought desperately (B.C. 82). The number of the slain on that day is stated to have been 50,000. Sulla, in his inveterate hatred of the Samnites, on the third day after this victory, ordered several thousands of them, who had been made prisoners, to be cut down in the Campus Martius. During the time that this slaughter was going on, Sulla held a meeting of the senate near the scene of horror, and when the senators became uneasy at the groans of the dying prisoners, he told them to listen to what he was proposing, and not to mind what was doing outside. (Appian. *De Bell. Civ.*, i. 84-94; Liv., *Epit.*, 88; Plut., *Sull.*, 30.) This victory was soon followed by the taking of Praeneste. The Romans who were found there among his enemies were pardoned, but the Samnites and Praenestines, amounting, according to Plutarch, to 12,000, were put to the sword. Marius persuaded a slave to put an end to his life.

Sulla's victory was now complete, although some towns of Italy still continued to offer resistance, and although the war was continued in Africa by Carbo and in Spain by Sertorius. Sulla gratified his vengeance by proscriptions, an invention of his own, by which he was enabled to get rid of those whom he had to fear, and to reward his friends and his soldiers. Many thousands were proscribed, that is, were declared out of the protection of the law, and any one was authorised to kill them; and those who killed a proscribed person, or gave notice of his place of concealment, received two talents as a reward, and those who gave shelter to one forfeited their own lives. Lists containing the names of the proscribed were put up in public, and new names were constantly added. The property of the proscribed was seized and publicly sold or given away. The consequences were, according to the will of the tyrant, to extend to the descendants of the proscribed, inasmuch as they were to be excluded from all honours and public offices. Rome was in a state of utter consternation. But the vengeance of Sulla was not confined to the city. All the Italians who had in any way opposed the party of Sulla were punished in the same manner, and numbers of them were murdered and their property confiscated. Whole cities were punished by the imposition of heavy fines, or by the demolition of their fortifications. Sulla moreover, according to Appian, sent twenty-three, or, according to Livy, forty-seven legions to be distributed as garrisons among the towns of Italy, and granted to them the Roman franchise, together with the lands and houses which he had taken from their former owners. In the same manner as he thus secured for himself a strong party in the towns of Italy, he formed at Rome for the security of his own person a body-guard consisting of ten thousand slaves, to whom he gave their freedom and the franchise, and who were called, after their patron, Cornelii. The people were thus silenced by fear, and all the acts committed by the tyrant were ratified by a decree of the people (Appian, *De Bell. Civ.*, 97), and a gilt equestrian statue was erected to him in front of the rostra, with the inscription 'Cornelius Sulla, Imperator Felix.'

Sulla now caused the senate to name an interrex, and Valerius Flaccus being appointed, Sulla made him propose to the senate to appoint a dictator to regulate the affairs of Rome and Italy. In accordance with his own expressed wish, Sulla was made dictator (B.C. 82), an office which had not existed for the last 120 years, and which he was permitted to hold as long as he pleased. In order however to leave to the people some appearance of liberty, he permitted them to elect consuls as usual, and he himself, in B.C. 80, held the office of consul in addition to that of dictator. In the year B.C. 81, he enjoyed a triumph for his victories in the war against Mithridates, and his splendid games and feastings, which lasted for several days, made the people forget for a time their wretched condition. (Appian, *De Bell. Civ.*, 101.) After his triumph he claimed the surname of Felix, and pretended that all his success against his enemies was owing to the favour of the gods, especially of Venus, which he had enjoyed from his early youth. Hence he also called himself Epaphroditus. But although he sometimes affected gratitude towards the gods, in reality he cared little about them, and he did not scruple to plunder their temples and to treat with scorn and contempt the signs which appeared to deter him from his sacrilegious actions. (Plut., *Sull.*, 12.)

After Sulla had completely annihilated the popular party, he began to direct his attention to a reform in the constitution and in the administration of justice. Zachariae, a great admirer of the political wisdom of Sulla, divides all his laws which are known under the name of 'Leges Corneliae,' into three great classes:—1. constitutional regulations; 2. criminal laws; and 3. those which were intended to improve public morals.

The constitutional laws of Sulla were intended to restore the old aristocratic form of the republic, but such a restoration could only be a matter of form, as it had no longer its hold in the hearts and minds of the Romans. As a politician, Sulla was one of those short-sighted men who believe that old institutions can be revived or preserved by the mere letter of the law, though that which formerly alone gave stability to them, the spirit of the nation, has become entirely altered. The consequence was that the constitution of Sulla did not survive him many years. The principal part of his reform consisted in depriving the comitia tributa of all their legislative and judicial powers, and of the right to elect the members of the great colleges of priests, which the people had exercised for some time. He left to the comitia of the tribes only the power to elect the inferior magistrates, as tribunes, aediles, and quaestors. The power of the tribunes of the people thus received a fatal blow. Some writers are of opinion that Sulla abolished the assemblies of the tribes altogether. The whole of the legislative power was given to the Comitia Centuriata, but in such a manner that no legislative measure could be brought before them, without having previously received the sanction of the senate. He also allowed no appeal to the people from the sentence of a magistrate. The vacancies which had occurred in the senate through the late calamities were filled up by the admission of 300 of the most distinguished equites (Appian, *De Bell. Civ.*, i. 100). [SENATUS.] He increased the number of pontiffs and augurs to fifteen. [AUGUR; PONTIFEX.]

Sulla appears greatest in his laws relating to the administration of justice. All the Roman writers agree that Sulla gave the judicia (either the publica and privata, or the former alone) to the senate. We cannot enter here into an account of the various laws relating to criminal and civil jurisdiction; but, before the time of Sulla, the criminal legislation of Rome was extremely imperfect, and he was the first who brought order and system into this important branch of administration; and this part of his reform was not abolished after his death, but most of his laws continued in force down to the latest times of the empire. His legislation embraced a great variety of subjects. A list of his laws, together with a critical examination of their nature and tendency, may be found in the works mentioned at the end of this article.

The laws which Sulla enacted, with a view to improve the state of public morals, related chiefly to marriage and luxury (leges sumtuariae). But Sulla, though anxious to improve the moral condition of the people, was the last man to observe any laws of the kind. (Plut., *Sull.*, 35; *Comparat. Lysand. c. Sulla.*)

After the annihilation of all his enemies, and the establishment of a new order of things, Sulla once more felt a desire to enjoy those pleasures to which he had been addicted from his early youth, and without the interruption necessarily arising from being at the head of the republic. Accordingly he did not accept the consulship for the year B.C. 79, and soon after declared to the assembled people that he resigned his power and dignity of dictator, and that he was ready to render an account to them of the manner in which he had exercised his power. As might have been expected, no one ventured to take him at his word; only one young man is said to have dared to accuse him, and to have followed the ex-dictator on his way home with bitter invectives, to which Sulla only made this calm remark: 'This youth will prevent any one in future, after having once acquired great power, from being inclined to lay it down.' The abdication of Sulla in the height of his power has called forth the admiration of both antient and modern writers; but an accurate examination of the state of affairs in Rome and Italy, and a consideration of the sensual disposition of Sulla, deprive this act of much of its apparent magnanimity. As regards his own inclination, it can only be said that his love of pleasure unincumbered by public affairs was greater than his love of power. The 10,000 Cornelii remained after his abdication as attached to him as they had been before, and they were ready to take up arms for their patron at any moment, as their own safety depended upon his. The party of Sulla was in possession of all the power at Rome, and in Italy his numerous legions were as ready to take up arms in his defence as the Cornelii. He could therefore withdraw without any danger or fear, and how well he had calculated is clear from Plutarch (*Sull.*, 37), for even during his retirement to private life his will was regarded as law. Soon after his abdication he retired to his villa near Puteoli, where he spent his time partly in literary occupations, partly in hunting and fishing, and partly in giving himself up to the pleasures of the table, and of women, actors, and dancers. (Plut., *Sull.*; 36.) He died in the year B.C. 78, at the age of sixty. The cause of his death is not quite certain. Appian (*De Bell Civ.*, i. 105) says he died of an attack of fever, while others inform us that the loathsome disease called phthiriasis was the cause of his death. (Plut., *Sull.*, 36; Plin., *Hist. Nat.*, xxvi. 86; xi. 39; vii. 44; Aurel. Vict., *De Vir. Illustr.*, 75; Paus., i. 20, 4.) Two days before his death Sulla had finished the twenty-second book of his 'Memoirs,' of which we probably possess a considerable part in his Life by Plutarch. His body was carried to Rome with great pomp, and burnt in the Campus Martius according to his own request. A monument also was erected to his memory in the Campus Martius, with an inscription said to have been written by Sulla himself. (Plut., *Sull.*, 38.)

Sulla was married five times, and left two children, Faustus Cornelius Sulla and Fausta, who were twins by his fourth wife Caecilia Metella. One daughter was borne, after his death, by his fifth wife Valeria.

6. **FAUSTUS CORNELIUS SULLA**, son of the dictator Sulla (5) and of Caecilia Metella (Plut., *Sull.*, 34), was born in 89 B.C. After the death of his father he was under the guardianship of L. Lucullus. He was several times in danger of being compelled to restore the money which his father had unlawfully appropriated to himself. The senate however always prevented an inquiry being instituted, as some of the body would have been compromised by it. In 66 B.C. a tribune of the people renewed the attempt, but Sulla again escaped, chiefly through the influence of Cicero, who spoke for him. (Ascon., in *Cic. Cornel.*, p. 72, Orelli; Cic., *Pro Cluent.*, 34; *De Leg. Agr.*, i. 4.) He served under Pompey in Asia, and in 63 B.C. he was the first who scaled the walls of the temple of Jerusalem, for which act of bra-

very he was richly rewarded. (Joseph., *Ant. Jud.*, xiv. 4; *Bell. Jud.*, i. 7, 4.) In B.C. 60 he gave to the people the gladiatorial games which he had been requested to give by his father in his last will, and on this occasion he treated the people most munificently; he made them donations of money, and allowed them the use of the baths without any payment. (Dion Cass., xxxvii. 51; Cic., *Pro Sulla*, 19.) In the year B.C. 54 he obtained the quaestorship, after he had some years before been made a member of the college of augurs. (Dion Cass., xxxix. 17.) After the murder of Clodius, Faustus was requested by the senate to restore the Curia Hostilia, and it was decreed that after its restoration it should be called Curia Cornelia. (Dion Cass., xl. 50.) Faustus Sulla did not obtain any higher office than the quaestorship; his dissolute mode of life had ruined his fortune. As regards his political views, he had joined the party of Pompey, whose daughter he married. In B.C. 49 Pompey wished him to be sent as propraetor to Mauritania, but it was prevented by the tribune Philippus. (Cæs., *De Bell. Civ.*, i. 6.) During the troubles of the civil war between Pompey and Cæsar, Sulla's only object appears to have been to enrich himself. He was present in the battle of Pharsalus, and thence fled to Africa, where his fate was decided in the battle of Thapsus (46 B.C.). He attempted to escape to Spain, but was taken prisoner and delivered to Cæsar, in whose camp he was murdered during a mutiny of the soldiers. His wife and children however were set at liberty. (Cæs., *De Bell. Afr.*, 95; Appian, *De Bell. Civ.*, ii. 100.) Of his twin-sister Fausta nothing is known, except that she married twice, and each time was guilty of adultery. (Ascon., in *Cic. pro Scaur.*, p. 29.)

7. P. CORNELIUS SULLA, a son of Servius Cornelius Sulla, was a brother of the dictator, and enriched himself considerably during the proscriptions. (Dion Cass., xxxvi. 27; Cic., *De Off.*, ii. 8.) In 66 B.C., P. Cornelius Sulla and P. Autronius Paetus were elected consuls; but both were found guilty of ambitus (bribery), and deprived of their dignity. (Cic., *Pro Sulla*.) He is also believed to have been an accomplice of Catiline in his first conspiracy, and in B.C. 62 he was accused by L. Torquatus of having taken part in both the conspiracies of Catiline. Several men of distinction lent him their protection, and Hortensius and Cicero spoke for him. The speech of the latter is still extant. Sulla was acquitted, but there is every reason for believing that he was guilty of the crime with which he was charged. Cicero's defense was evidently not made without some apprehension and embarrassment. (See also Sallust, *Cat.*, 17.) Cicero subsequently fell out with Sulla, as the latter was to some extent involved in the crimes of Clodius. (Cic., *Ad Att.*, iv. 3.) In the civil war between Pompey and Cæsar, Sulla served as legate in the army of Cæsar during the battle of Pharsalus. (Appian, *De Bell. Civ.*, ii. 76; Cæs., *De Bell. Civ.*, iii. 51, 89.) In 47 B.C., when he was commanded to transport the legions destined for Africa from Italy to Sicily, he was pelted with stones by the soldiers of the twelfth legion, and driven away, for before embarking for Sicily they claimed the money and lands which they had been promised during the campaign in Thessaly. (Cic., *Ad Att.*, xi. 21, &c.) During the confiscations and sales of property in the dictatorship of Cæsar, Sulla acquired considerable wealth by the purchase of such property. (Cic., *De Off.*, ii. 8; *Ad Fam.*, xv. 19.) In the year B.C. 45 he died on a journey: some said that he had been murdered by robbers, others that he died of overeating himself; but the people appear to have rejoiced at having got rid of such a worthless person. (Cic., *Ad Att.*, ix. 10; xv. 17.) He left behind him a son, P. Sulla, and a son-in-law of the name of Memmius, of whom nothing worth mentioning is known. (Cic., *Ad Fam.*, xv. 17; *Ad Q. Frat.*, iii. 3; *Pro Sulla*, 31.)

8. SERVIUS CORNELIUS SULLA, a brother of P. Cornelius Sulla (7). He took part in the conspiracy of Catiline (Sallust, *Cat.*, 17, 47); but he was not condemned to death, although his guilt was so manifest, that no one would undertake his defence. (Cic., *Pro Sull.*, 2.)

The last person of any note bearing the name of Sulla in the history of Rome occurs in the reigns of Claudius and Nero. He was a son-in-law of the emperor Claudius (Suetonius, *Claud.*, 27; Tacitus, *Annal.*, xiii. 23), and was consul in A.D. 52. According to the information of one Paetus, Pallas and Burrhus intended to raise him to the imperial power. This charge was found to be false; but Nero nevertheless dreaded Sulla, believing him to be a cunning and crafty person. Some false report subsequently increased this fear of Nero, who, in A.D. 59, sent him into exile to Massilia. (Tacit., *Annal.*, xiii. 47.) But as the emperor apprehended that Sulla might here induce the German legions to revolt, he ordered him to be put to death, which took place in A.D. 63. (Tacit., *Annal.*, xiv. 57.)

(Respecting the history of the family of the Sullas, see Orelli, *Onomasticon Tullianum*, ii., p. 192, &c.; Drumann, *Geschichte Roms in seinem Uebergange*, &c., ii., p. 426, &c.; Pauly's *Real-Encyclopaed. der Alterthumswissenschaft*, ii., p. 668, &c. For the history of the dictator Sulla, and his legislation in particular, see Zachariae, *L. Cornelius Sulla, genannt der Glückliche, als Ordner des Römischen Freystaates*, Heidelberg, 1834, 2 vols. 8vo.; Vockestaert, *Dissertatio Historico-Juridica de L. Cornelio Sulla legislatore*, Ludg. Batav., 1816, 8vo.; A. Wittich, *De Rei Publicae Romanae ea forma, qua L. Cornelius Sulla dictator totam rem Romanam ordinibus, magistratibus, comitiis commutavit*, Lipsiae, 1834, 8vo.; and a Latin dissertation by C. Ramshorn, which bears the same title as that by Wittich, and was published at Leipzig, in 1835, 8vo.)

SULLY, MAXIMILIEN DE BETHUNE, DUC DE, born at Rosny, on the 13th of December, 1560, was descended from a younger branch of the family of Bethune, in the Netherlands. His ancestors had by their own exertions and wealthy marriages raised themselves to importance in their adopted country of France; but the grandfather of Maximilien had squandered away his inheritance, and left to his son nothing but a proud name and his mother's dowry. François de Bethune, baron of Rosny, was a sagacious man, but not possessed of sufficient talent to re-establish the family fortune, and his adoption of the Protestant religion, by alienating him from his relations, forbade all hopes of improving his inheritance. His eldest son was feeble in mind and body, and the cherished wish to see prosperity return to his house rested upon the second, the more energetic Maximilien. His expectations from this quarter were strengthened by the predictions of astrologers. The first lesson impressed upon the boy's mind was the duty of devoting himself to the aggrandizement of the family. The moral and religious tenets of the Huguenots were at the same time sedulously instilled into him. These early impressions moulded a strong, fearless, and enterprising character, and decided his career in life.

In 1572 François de Bethune carried his son to the court of Henri, the young king of Navarre, then in his twentieth year, having previously commanded the boy in a solemn and impressive manner to live and die with the master he gave him. Young Rosny accompanied the king of Navarre, who was at that time on his way to Paris, to conclude his matrimonial engagement with the king's sister. In Paris he paid his court daily to Henri, but resided at some distance, in the quarter where most of the colleges were situated, with a governor, and attended the classes of the College of Burgundy. By the assistance of the principal of that institution he escaped the massacre of St. Bartholomew, though the horrors of that night left a lasting impression on his mind. At the command of his father he continued to reside in Paris, but his literary studies were abruptly closed. His governor perished in the massacre; and his preceptor was too terrified to remain in Paris. The king of Navarre however supplied the place of the tutor with one who gave Rosny instructions in history and mathematics, and the rest of the boy's time was spent, according to his own account, in learning to read and write well. He continued occupied with these pursuits till the beginning of 1575, when he accompanied Henri in his escape from the state of confinement in which he was kept by the French court.

The Protestants had by this time recovered from the dismay into which the massacre of St. Bartholomew had thrown them; had made common cause with their Roman Catholic fellow-subjects in remonstrating against fiscal grievances; and had at last ventured to take up arms again. The king of Navarre and the prince of Condé were in a great measure identified with the Protestant cause; and the duke of Anjou, who had at this time some cause of quarrel with the court, formed an alliance with them. Immediately after the escape of Henri these three princes found themselves at the head of a mixed army of Roman Catholics and Protestants, amounting to 35,000 men. The civil war, which imme-

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diately broke out, was continued with a few brief intervals of hollow truce till 1594. The studies of Rosny, who accompanied Henri in his flight from Paris, were finally broken off by that event. In his fifteenth year he was immersed in the toils and cares of active life: the death of his father about the same time left him entirely his own master. It was in nineteen years of civil war that he developed and cultivated without guide or master the character and talents which he displayed as minister of France.

At first Rosny accepted an ensigncy in the regiment of foot of which his relation Lavardin was colonel. In the first skirmishes in which he was engaged he evinced so much temerity, that Henri was more than once obliged to rebuke him. It was only in battle however that he showed any degree of boyish thoughtlessness; in the management of his pecuniary affairs he displayed a prudence beyond his years. The rents of his property and the booty he obtained in the storming of several towns, enabled him to maintain a small company of men-at-arms; and with these, resigning his ensigncy, he attached himself exclusively to the person of the king of Navarre. The courage and enterprise of so young a lad, the enthusiasm with which he sought to make himself master of the art of gunnery, and above all the prudence which he manifested in his domestic arrangements, led Henri to cherish so promising a servant. Rosny was made a councillor of Navarre in his twentieth year, with a salary of 2000 livres.

It was soon after this promotion that he was induced to make one in the retinue of the duke of Anjou, who had been invited to assume the sovereignty of the Low Countries. The bait which attracted Rosny was the promise of having his claims to the inheritance of the viscount of Ghent supported by the new king, and the opportunity of reconciling himself to his Flemish relations. He found himself disappointed in both, and returned in 1583 to the king of Navarre, no otherwise benefited by his excursion to the Netherlands than by the acquisition of more knowledge of the world and greater experience in war. He was almost immediately dispatched to Paris to keep an eye upon the intrigues there going forward.

In December, 1583, he married Anne de Courtney, and spent the whole of 1584 with his young wife upon his estate of Rosny. Though retired from public life, he was not idle: he had been obliged on several occasions to deal extensively in horses for the purpose of mounting his troop; and during the year he resided in the country he extended his dealings, sending out agents, who purchased horses in Spain and other countries at mere nominal prices, and sold them at a high rate in the provinces which were the seat of hostilities. His husbandry was so good, that when he rejoined Henri in 1585, he carried not only himself and his troop, but a good round sum of money to assist his master in prosecuting the war. Rosny's devotion to the cause of Henri was deep and unalterable. It was a mixture of personal attachment, of a sense of duty, on account of the solemn injunction of his father, and of a steady belief, resting partly upon the conclusions of his own shrewd judgment and partly upon belief in the predictions of astrologers, that his master was destined to be one day king of France, and himself to rise to eminence in his service. Henri was at the moment in need of such an able and devoted servant. As presumptive heir to the crown of France, he had an interest apart from that of the Protestants; and at the same time the leaders of the Protestant party were anxious to make of France a federation of independent principalities, while his policy was to consolidate the power of the crown. His Roman Catholic retainers were even less to be depended upon than the Protestants, for their aversion to his heresy naturally rendered them lukewarm in his service. In the course of some conferences of the Protestant leaders, Rosny zealously opposed the specious pretexts by which they sought to cloak their efforts for personal aggrandizement, and maintained the necessity of concentrating their forces under one leader. At the close of one of these discussions the king of Navarre told him that now was the time for acting as well as arguing boldly: asked whether he was willing to put all to the hazard in his service, and pledged his honour that, should he succeed, Rosny should share in his prosperity. Rosny promised that all his means should be at Henri's disposal; and was from that moment one of his master's most valued counsellors, as he was one of his bravest soldiers. He was employed in many delicate and difficult negotiations; and at the battle of Coutras (20th October, 1587), where he commanded the small park of artillery, he contributed mainly by his skilful employment of it, to the gaining the victory.

That victory was thrown away in consequence of the disunion of the Protestant leaders; and the ensuing year was wasted in skirmishes which led to nothing. The death of the queen-mother, in January, 1589, followed in rapid succession by the assassination of the duke of Guise and the insurrection of the Parisians, forced on an alliance between Henri III. and his heir presumptive. Rosny was not in a condition to take an active part in the operations which ensued. The death of his wife kept him fettered for some time in hopeless gloom, and when he rejoined the army before Paris, it was in the mood of a man who braved death as a relief from painful thoughts. He was startled out of his despondency by the assassination of the king of France (2nd August, 1589), and the succession of the king of Navarre as Henri IV.

The services of Rosny from this time till the entry of Henri into Paris (21st March, 1594) were many and weighty. He fought at the battle of Arque; he was dangerously wounded at the battle of Ivry; he detected the intrigues on foot among the Roman Catholics with a view of forming a 'tiers parti,' which those who distrusted the League might be induced to join, and which should be equally hostile to Henri. This last discovery opened the eyes of Sully to the impossibility of a Protestant obtaining secure possession of the crown of France; and from that moment his part was taken. He urged upon Henri the necessity of re-entering the Roman Catholic church, and ultimately succeeded in overcoming his not very strong reluctance to the step. Rosny was thus the main instrument in opening the gates of Paris to his master; and to this obligation he added, about the same time, that of gaining for him the services of the grand-admiral Villars and the possession of Rouen. Amid all these occupations he found time to marry again, in May, 1594: his second wife was Rachel Cochefilet, widow of the Sieur de Châteaupers.

Long before Henri, by changing his religion and obtaining possession of Paris, had established himself securely on the throne of France, he had felt severely the dilapidated state of the national finances. One of his first wishes, on finding himself in a state of comparative tranquillity, was to secure the services of Rosny, in whose fidelity and talents he had the greatest confidence, in this important department of the state. Two difficulties prevented the immediate gratification of this wish; the danger of exciting jealousy by advancing a Protestant, and the reluctance of the professional financiers to admit one not of their class into a knowledge of its secrets. The king hesitated for two years before he could gather courage to beat down these obstacles; but the malversations continued to increase so shamelessly, that in 1596 Rosny was formally installed a member of the great council of finance.

His first step was to obtain from the king the appointment of a commission of inquiry into the state of the revenue and its collection in all the districts into which the kingdom was divided for financial purposes. Four of the principal districts were reserved for his own inspection. In the course of a tour he made through them he detected the various means by which money was diverted from the treasury, and the king kept poor at the same time that overexactions were levied upon the people. He collected arrears of taxes which had been allowed to lie over, and returned to Paris not only with evidence of abuses in the management of the finances, but with a considerable sum of money in hand An assembly of notables was held at Rouen soon after his return. The king left Rosny to deal with the representatives of the states, and succeeded in obtaining a grant of some new imposts for the king, and frustrating in a manner that gave no umbrage an attempt made by the assembly to establish a board of control over the royal treasury. He was now promoted to be superintendent of finance, and entered upon the discharge of his duties with a zeal that amounted almost to a passion. He was indefatigable in his examination of the state records, with a view to make himself familiar with the origin and actual character of the different branches of revenue, and the methods of levying them and securing the money they yielded. Having mastered this knowledge, he availed himself of it to organise thoroughly the financial establishment; and he superintended with unremitting vigilance the working of the machine which he constructed. Soon after he commenced operations, he induced the king to order that the surplus receipts of each year should at its close be deposited, in money, in the Bastile. When he undertook the management of the finances, in 1597, the treasury was empty and in debt; after the death of Henri IV., in 1610, forty-two millions of livres were found in it.

The method and regularity which Rosny had introduced into the finances, suggested a wish that he should lend his assistance towards bringing the other departments of government into similar order. He was appointed in succession to be grand-master of the artillery, director of the marine, master of works, and director of bridges and highways. He became in fact sole minister of France. Six days of the week councils were held every morning and evening. On the Mondays, Thursdays, and Saturdays, the council of state and finances sat both in the forenoon and the evening; on the other three days special councils were held—of war, commerce, &c. Rosny attended all, and presided in all whenever the king was absent, which was frequently the case.

In addition to these duties of routine, he was frequently engaged in important negotiations. In 1601 he was delegated to meet Queen Elizabeth at Dover, where arrangements were made for an alliance against the house of Austria. In 1603 he was sent as ambassador to James VI. on his succession. Honours and emoluments flowed in upon him. The grand-mastership of the artillery produced him an annual income of 24,000 livres; his office of counsellor of state as much; he held several governments, the appointment of a counsellor of Navarre, the command of a troop, to all of which considerable pensions were attached, and he received from time to time considerable presents from Henri. In 1606 he was created Duc de Sully and a peer of France. And his advice was taken and his services employed by the king in his most delicate family arrangements, as well as in the affairs of the state.

The murder of Henri IV. in 1610 terminated the career of Sully as minister. He stood alone after the death of him to whom alone he had devoted himself; obnoxious to envy and intrigue on account of his power and wealth, doubly obnoxious as a Protestant. He continued for some time to attend the council as usual, but finding himself systematically thwarted by the favourites of the new court, he made preparations for resigning in the commencement of 1611, and early in that year formally gave up the offices of superintendent of finance and governor of the Bastile.

From that time the château of Villebon became his principal residence. In the spring and autumn of every year he visited Sully and Rosny. He had retained his government of Poitou, and the direction of the artillery, the fortifications, and the roads and bridges; so, though retired from court, his life was neither private nor inactive. He attended at least one conference of the Protestants; but refused to take part in any of their armaments. He retained the respect of the court, and was appointed a marshal of France by Louis XIII., in 1634. The favourite amusement of his declining years consisted in preparing his Memoirs 'of the great and royal economies of Henri IV.' for publication. He took a keen interest in the management of his estates. The prodigality of his son (who died before him) involved him in some disagreeable embarrassments; and the decision against him of a suit which his grandson had been instigated to commence is supposed to have hastened his death. He died at Villebon, December 22, 1641.

Sully was essentially a man of action; except for history, and those branches of knowledge which are useful to the soldier and practical statesman, he seems to have had little literary taste. He was fearless, enterprising, and persevering. His appetites were not inordinate, and were held in constant control by his powerful will. He had a clear and just perception of character. He had naturally a love of order and dispatch, which were strengthened by habit. His theoretical views of society and political economy do not evince much profundity; and the strange and cumbrous arrangement of his Memoirs would seem to indicate that he laboured under the same inability to tell a plain story briefly and intelligibly, which has been observed in others eminent for the clearness of apprehension displayed in their actions. His moral creed seems to have closely resembled that of the contemporary Puritans of England. It is more difficult to conjecture what were his religious opinions. With great temptations to abjure the Protestant faith, he continued to profess it to the last. Yet he advised Henri IV. to reconcile himself to the Roman Catholic church, and his affection for that king is beyond a doubt. Nor can his adherence to Protestantism be explained upon the assumption that he was influenced by a partisan point of honour; for he was more a Frenchman than a Protestant, and invariably sacrificed the party interests of the Huguenots to the broad interests of the nation. His devotion to Henri was not without a tinge of superstition; it was long affected by the predictions of astrologers, if it was ever entirely cleared of them. His love of state, and display in his apparel, household, and attendants, is another indication of something imaginative peeping out from under his stern practical character; as is also the fragment of a romance of the Scudery school found among his papers after his death. Yet he had no tolerance for what weaklings call sentiment, as may be gathered from his own account of his first marriage; and from his sturdy and fearless opposition to the follies into which that weakness frequently led his master. Sully was not exactly a person to be loved, but he was one to be reverenced and implicitly trusted. He was perhaps a servant such as no king but Henri IV. ever had: as Henri on his part was qualified to win the affectionate devotion of such a servant beyond any king who ever existed. The administration of Sully is an important chapter in the history of France: the subsequent fortunes of that nation cannot be thoroughly understood unless by one who has studied attentively his operations.

(The principal authority for the facts stated in this sketch is Sully's own work; but some assistance has been derived from De Thou and other contemporary writers.)

SULLY, HENRY. [HOROLOGY.]

SULMO'NA, a town of the kingdom of Naples, in the province of Abruzzo Ultra II., is the chief town of one of the four districts into which that province is divided. It lies in a deep valley drained by the Sagittario, an affluent of the Pescara, surrounded by high and naked mountains, having the central ridge of the Apennines on the west, and the lofty group of Majella, an offset of the Apennines, on the east. This valley forms an important pass between the central and northern provinces of the kingdom, leading from the valley of the Pescara to that of the Sangro, from whence the road is continued to the valley of the Volturno by Isernia. The antient Sulmo, Ovid's birth-place, which was at some distance from the site of the modern Sulmona, has been completely destroyed; a few remains of a temple of Jupiter are visible at S. Quirini, two miles from Sulmona. The modern town, which is walled, looks old and gloomy, like most towns of Abruzzo. It is a bishop's see, has about 8000 inhabitants, a college, a clerical seminary, some paper mills, and manufactories of catgut, sugar-plums, and sausages. Much wine is made in the neighbourhood, as well as oil, and corn is reaped in considerable quantity. The valley of Sulmona is intersected by several streams, and irrigated by artificial canals. Ovid, in several places of his 'Tristia,' recalls to mind the copious and cool streams of his native country.

Some of the churches of Sulmona are worthy of notice in that of La Badia is the tomb of Giacomo Caldora, a celebrated condottiere in the fifteenth century, who died suddenly in the Abruzzi at the head of his army, whilst supporting the claims of King René of Anjou against Alfonso of Aragon. The latter, having taken Sulmona, is said to have forgiven the town for the sake of its native poet Ovid. Near Sulmona is the splendid monastery of S. Spirito di Morone, belonging formerly to the wealthy order of Celestines, now suppressed. In the town above the barrack gate there is a piece of wretched sculpture, which the inhabitants are pleased to style a statue of their townsman Ovid, of whom they seem very proud.

Sulmo was one of the chief towns of the Peligni, a people of Sabine origin, like their neighbours the Marsi, with whom they were allied. Corfinium, another town of the Peligni, was in the same valley, a few miles north of Sulmo, and the remains of the antient canal cut in the rock are still seen. (Afan di Rivera, *Considerazioni*, &c.) The Peligni, having joined the Marsi and Samnites against Rome, were defeated by the consul M. Fabius, 445 B.C. Four years afterwards, the Peligni, together with the Marsi, Frentani, and Marrucini, sent orators to Rome to sue for peace, which was granted. (Livy, ix., 45, 49.) During the second Punic war we find a body of Peligni, under its præfect Vibius Accuæus, fighting bravely as auxiliaries of the Romans against the Carthaginian commander Hanno, near Beneventum (xxv. 14). The Peligni, were foremost in the confederacy which carried on the Social war against Rome·

and their town Corfinium, under the name of Italica, was made the capital of the league. They were however defeated by the legate Servius Sulpicius (*Epitome*, 73), and they made their submission, together with the Vestini, to the proconsul Cn. Pompeius.

SULO ARCHIPELAGO. [SOOLOO ARCHIPELAGO.]

SULPHATES and SULPHITES. [SULPHUR.]

SULPHOCYANIC ACID and SULPHOCYANOGEN. [SULPHUR.]

SULPHONAPHTHALIC ACID and SULPHONAPHTHALIN. [SULPHUR.]

SULPHOVINIC ACID. [SULPHUR.]

SULPHUR, commonly called *brimstone*, is a solid elementary non-metallic body, which has been known from the remotest antiquity. It is met with pure and in various states of combination: thus it is found combined with numerous metals and in immense quantity, as with iron, forming the sulphuret and bi-sulphuret, with copper, lead, antimony, &c., constituting the principal ores of these metals: it is also found largely combined with oxygen, forming sulphuric acid, which is generally united with an earthy base, as with lime, constituting sulphate of lime, or gypsum, and with barytes, strontia, and magnesia, giving rise to the sulphates of these bases. It occurs also, but in smaller quantity, and principally in mineral waters, such as those of Harrowgate, combined with hydrogen, the resulting compound being sulphuretted hydrogen gas, or hydrosulphuric acid. Sulphur is also a constituent of some animal substances, as eggs, urine, &c.: it is found also in certain plants; in *Liliaceæ*, as in garlic, *Cruciferæ*, as in mustard, and *Umbelliferæ*, as in *Asafœtida*.

Native Sulphur.—This occurs massive and crystallized. Primary form of the crystal a right rhombic prism, the usual form being the secondary one of an acute octohedron with a rhombic base. Cleavage parallel to the lateral faces of the primary form. Fracture conchoidal. Hardness sufficient to scratch sulphate of lime, but is scratched by carbonate of lime. It is very brittle. Becomes negatively electrical by friction. Colour various shades of yellow, sometimes greenish, and reddish. Streak paler. Lustre resinous and shining. Odour slight, unless heated or rubbed. Transparent; translucent; opaque. Refraction double. Specific gravity 2·072.

Massive Varieties.—Amorphous, structure crystalline, granular, compact. Stalactitic; structure compact.

Sulphur is found in veins and beds. In Suabia in veins traversing granite; near Schemnitz in Hungary, in mica slate; and at Bex in Switzerland, in limestone and gypsum of the salt deposit; and in this kind of deposit it occurs most abundantly, generally in beds, or disseminated in large masses.

Sulphur is procured sometimes by the decomposition of iron pyrites, or bisulphuret of iron.

Volcanic Sulphur.—The most remarkable deposit is that of Solfatara near Naples, whence an immense quantity is imported into this country. It occurs also in the fissures of lava near the craters of volcanoes, in Italy, Guadaloupe, Nevis, and the volcanoes of the Cordilleras.

Sulphur is purified in this country, and has different forms given to it according to circumstances; what is called *refined sulphur* is purified by distillation in a large cast-iron still, and it is condensed in an iron receiver kept cool by water. When melted and cast into wooden moulds, it is called *roll* or *stick sulphur*; and when the vaporized sulphur is condensed in a large chamber, it has the form of powder, and is called *sublimed sulphur*, or *flowers of sulphur*.

We shall now describe such of the physical and chemical properties of sulphur as have not been mentioned under *Native Sulphur*. Sulphur is insoluble in water, but dissolves in alcohol, if both substances are exposed to each other in the state of vapour: on the addition of water, the sulphur is precipitated. It is dissolved by boiling oil of turpentine: the solution has a reddish-brown colour, and, on cooling, minute crystals of sulphur are deposited.

Sulphur is a bad conductor of heat: it is very volatile, and when it is rubbed in the dark on a brick, on any other substance by which it is heated, though not sufficiently to inflame it, an extremely weak blue flame arises, exhaling a peculiar odour: this flame is not however occasioned by combustion, it merely accompanies the evaporation of the sulphur, for a cold body held over it is covered with flowers of sulphur. When sulphur is heated, it begins to vaporize before it fuses: at 550° to 600° it is rapidly volatilized, and in close vessels is condensed without change. The specific gravity of the vapour of sulphur is about 6·64. Some metals when heated in it burn vividly. The fusing-point of sulphur is 232°, and between this and 280° it possesses the highest degree of fluidity: at 320° it begins to thicken, and at 482° is so tenacious, that it will not flow from an inverted vessel: from this to 600°, which is its boiling-point, it again becomes liquid, but not so perfectly so as at 280°: when boiling in closed vessels, an orange-coloured vapour is formed. When poured into water in a fluid state, at about the temperature of 428°, it becomes a brown pasty mass, which readily receives and retains any form given to it, and hence it is employed in taking casts.

Sulphur is what is called a *dimorphous* body; that is to say, it crystallizes in two different and incompatible forms. It has been already stated that the primary form of native sulphur is a right rhombic prism, whilst that of sulphur artificially crystallized by fusion and cooling is an oblique rhombic prism.

Oxygen and Sulphur form several compounds, but there is no mere oxide of sulphur, all the compounds of these elements possessing acid properties: the first compound of them which we shall describe is—

Sulphurous Acid.—It is to be observed that oxygen and sulphur do not combine at the usual temperature of the air; but when sulphur is heated in the air to a little above 300°, it takes fire and burns with a pale blue light: in oxygen gas the combustion is much more vivid, the flame is much larger, and is of a bluish-white colour; the product of this action is sulphurous acid gas. This gas was discovered by Dr. Priestley. It is not perhaps possible to saturate oxygen gas with sulphur by burning the latter in the former; but it may be, when obtained in the mode we shall presently point out.

The properties of sulphurous acid gas are, that it is colourless, permanently elastic, that is, not condensed into a fluid or solid by exposure to common degrees of cold under the ordinary pressure; but at a temperature of 45°, and a pressure equal to two atmospheres, it is rendered fluid. Sulphurous acid gas has a pungent and suffocating odour, being that experienced whenever sulphur is burned: its taste is disagreeable and acid: it extinguishes burning bodies, is not inflammable, and is fatal to animals. Water at 60° dissolves from 33 to 37 times its volume of this gas; and by heating the solution it is evolved unaltered. The solution possesses the smell of the gas itself; and, like it, has the property of bleaching some vegetable and animal substances: hence the employment of the vapour of burning sulphur in whitening hops, silk, and wool.

Sulphurous acid gas is composed of—

Two equivalents of oxygen	.	16 or	50
One equivalent of sulphur	.	16 ..	50
Equivalent	. .	32	100

Or it may be regarded as consisting of 100 cubic inches of oxygen gas, weighing 34·4 grains combined with and holding in solution 34·4 grains of sulphur; and as the oxygen suffers no alteration of volume, the 100 cubic inches of sulphurous acid gas weigh 68·8 grains: its density therefore is to that of atmospheric air as 2·22, very nearly, to 1.

The aqueous solution of sulphurous acid, when exposed to oxygen, slowly combines with it, and the result is sulphuric acid; but unless moisture be present, no combination takes place between these two gases.

Sulphurous acid combines with various bases to form salts, which are called *sulphites*. When, for example, this gas is passed into an aqueous solution of ammonia, they readily combine, and the resulting salt is sulphite of ammonia, which may be obtained in prismatic crystals. It is very soluble in water, and produces much cold during solution; by exposure to the air it attracts oxygen, and becomes sulphate of ammonia. When however dry sulphurous acid gas and dry ammoniacal gas are brought into contact, it appears that deep yellow-coloured crystals are formed, which have been termed *sulfimide*: they contain the elements of sulphurous acid and ammonia combined, but in a different mode, to form that which forms anhydrous sulphite of ammonia. By exposure to the air sulfimide becomes white, deliquesces, and gradually becomes sulphate and hyposulphate of ammonia.

The alkalis potash and soda, the alkaline earths, and several metallic oxides, may be combined with sulphurous acid, and they form *sulphites*; but these compounds are not of sufficient importance to require description: by exposure to the air they all become *sulphates*.

Sulphuric Acid. This acid has been long known, and is very extensively employed. When combined with water, in which state it is best known, it was originally, and still is frequently called *oil of vitriol:* first, because it is an oleaginous liquid; and secondly, on account of its being obtained from green vitriol, or copperas, now called sulphate of iron.

This process is still followed at Nordhausen in Germany, and the peculiar compound of sulphuric acid and water produced by it is called Nordhausen oil of vitriol, to distinguish it from common oil of vitriol, a different compound as regards the water which they contain, and obtained by a different process. We shall first describe the original process and product.

Iron pyrites is a well known and very abundant natural substance: it is correctly termed *bisulphuret* of iron, and consists of two equivalents of sulphur 32+28, one equivalent of iron. When certain varieties of this compound are exposed to air and moisture, both the sulphur and iron are oxidized at the expense of the oxygen of the air, and though sulphur by itself is incapable of undergoing this change, yet, when combined with iron, it acquires from the air sufficient oxygen to become sulphuric acid, and the iron attracts enough to become protoxide; and these combining together, and with water, constitute the well-known crystalline body, hydrated sulphate of iron, usually called, for brevity's sake, merely sulphate of iron, and originally green vitriol. This consists of one equivalent of sulphuric acid, one of protoxide of iron, and seven equivalents of water. Sulphuric acid consists of three equivalents of oxygen 24+16, one equivalent of sulphur, =40. In order to procure the acid from it, this salt is moderately heated, so as to expel the greater part of the water: in this state it is put into earthen retorts, and subjected to a very high temperature, during which there comes over and condenses in the receiver a dark-coloured dense fluid, which is the Nordhausen oil of vitriol. The cause of the colour has not been ascertained, but it appears to be an accidental and not a necessary accompaniment: this liquid emits a white vapour when exposed to the air, and hence it is called *fuming sulphuric acid:* it is composed of

Two equivalents of sulphuric acid	80
One equivalent of water . .	9
Equivalent .	89

Now it happens that anhydrous sulphuric acid is more volatile than that combined with water, so that when the above acid is heated in a retort, there first comes over and condenses in the receiver one equivalent of anhydrous sulphuric acid, 40, and there remains in the retort one equivalent of hydrated sulphuric acid 40+9, one equivalent of water, =49.

We shall first and briefly state the properties of the anhydrous acid. It is a colourless crystalline solid; it is tough and elastic; liquefies at 66°, and boils at a temperature between 104° and 122°, forming a transparent vapour, provided no water is present; it unites with moisture when exposed to the air, and forms with it dense white fumes. It is sometimes prepared as a matter of curiosity, but is hardly applied to any use.

The hydrated sulphuric acid, commonly called oil of vitriol, or simply sulphuric acid, is the compound which is so largely employed in numerous chemical operations and manufactures. It is however, and has indeed for many years been, prepared in a much preferable mode to that described by the decomposition of sulphate of iron.

An account of the present method of preparing this acid we shall take, with slight variations, from the last edition of Dr. Turner's 'Chemistry.' Sulphur is mixed with about one-eighth of its weight of nitrate of potash, and the mixture is burned in a furnace so contrived that the current of air which supports the combustion conducts the gaseous products into a large leaden chamber, the bottom of which is covered to the depth of a few inches with water. The nitric acid of the nitre, composed of oxygen and azote, is decomposed, yields oxygen to a portion of the sulphurous acid formed by combustion, and converts it into sulphuric acid which combines with the potash of the nitre, and forms a residue of sulphate of potash. The greater part of the sulphur forms sulphurous acid, by uniting merely with the oxygen of the air during combustion. The nitric acid, on losing oxygen, is converted partly perhaps into nitrous acid, but chiefly into nitric oxide, which, by mixing with the air at the moment of its separation, combines with its oxygen, and gives rise to red nitrous acid vapour. The gaseous substances present in the leaden chamber are therefore sulphurous and nitrous acids, atmospheric air, and watery vapour. Now, when dry sulphurous acid gas and dry nitrous acid gas are mixed together, no action occurs between them; but when a little moisture is added, a white crystalline compound of sulphuric acid, hyponitrous acid, and water is formed; and when this falls into the water of the chamber, it is instantly decomposed, the sulphuric acid is dissolved, and nitrous acid and nitric oxide gases escape with effervescence. The nitrous acid thus set free, as well as that reproduced by the nitric oxide uniting with the oxygen of the atmosphere, is again intermixed with sulphurous acid and moisture, and thus gives rise to a second portion of the crystalline body, which undergoes the same change as the first; and this operation is repeated until the water at the bottom of the lead-chamber is sufficiently acid to be removed for ulterior operations.

It thus appears that sulphur during combustion can combine only with sufficient oxygen to become sulphurous acid; but what is curious is, that sulphurous acid becomes sulphuric acid by taking oxygen from nitrous acid, the nitric oxide of which appears nevertheless to have a stronger affinity for it, since it can take oxygen rapidly from the air, which sulphurous acid cannot. The first attempt at explaining the mode in which nitric acid acts in this operation was made by MM. Clement and Desormes: it was subsequently further explained by Davy and other chemists.

In some cases we believe that the nitrate of potash, instead of being mixed with the sulphur, and burnt with it, is decomposed by the addition of sulphuric acid, in the same mode as that employed for preparing nitric acid. Of late years also sulphuric acid has been made from iron pyrites, the sulphurous acid being formed by combustion, and converted into sulphuric by the agency of nitrous acid.

When the sulphuric acid in the chamber has acquired a density of about 1·6, it is drawn off and further concentrated in open leaden vessels by heat; after this it is again removed either to glass or platina retorts, and heated till it has acquired a density of about 1·845: this is then the sulphuric acid, or oil of vitriol, of commerce, composed of

One equivalent of sulphuric acid .	40
One equivalent of water . .	9
Equivalent .	49

The properties of this acid are, that it is a limpid, inodorous, colourless fluid, of an oily consistence: it boils at about 620°, and distils over unchanged; the boiling-point diminishes with dilution: thus when of specific gravity 1·78 it boils at 435°, and when 1·65 only at 350°, the concentrated acid freezes at −15°, but when it contains two equivalents of water instead of only one, and has a specific gravity of 1·78, it freezes at −40°.

This acid is intensely caustic and acrid, and readily decomposes animal and vegetable fibre, and even when diluted to a very great extent it has an extremely sour taste, and turns vegetable blues strongly red: on the other hand, when concentrated, it turns turmeric-paper of a brownish colour, as the alkalis do, but the effect is not permanent, for it is removed by water. Its affinity for water is very great, attracting it so readily from the air, that in moist weather 3 parts increase to 4 in 24 hours, and by longer exposure the quantity is increased. When suddenly mixed with water, much heat is evolved, and, on cooling, condensation is found to have taken place, the two fluids occupying less space than before mixture. When sulphuric acid is mixed in certain proportions with snow, heat is given out, or cold generated, according to the quantities employed: thus four parts of acid and one of snow evolve heat, but four of snow and one of acid occasion cold.

Sulphuric acid is employed for a vast number of purposes: thus, on account of its great chemical power, it is used for the purpose of separating other acids from bases, as in preparing nitric, hydrochloric, acetic, phosphoric, and carbonic acids, &c. It is used in preparing sulphates, a class of salts we shall presently again refer to.

The salts which sulphuric acid forms with various bases are termed sulphates, sesqui-sulphates, or bi-sulphates, &c.

according to circumstances: they are a very important class of saline bodies, and those of most use will be found described under their respective bases.

Sulphuric acid in its concentrated state acts in general only slightly, if at all, on the metals; and when they are heated together, the acid is generally decomposed, sulphurous acid and a sulphate of a metallic oxide being produced: thus when copper is heated in concentrated sulphuric acid, the acid yields one of its three equivalents of oxygen to the copper, which becomes protoxide; while the sulphur combined with two equivalents of oxygen is given off in the state of sulphurous acid; and this is one of the best methods of procuring sulphurous acid, it being difficult, if not impossible, as already stated, to saturate oxygen with sulphur by burning the latter in the former. When, on the other hand, sulphuric acid is diluted, it has no action, even when heated, on copper; but on zinc, iron, and such other metals as readily decompose water, it acts with great readiness: the metal, being oxidized by the oxygen of the decomposed water, is dissolved by the acid, while the hydrogen of the water is given out in the gaseous state: by this operation, then, we procure a metallic sulphate and hydrogen gas.

Sulphuric acid and all sulphates are decomposed by the salts of barytes and of lead, minute quantities either of the acid or soluble salts being rendered evident by the formation of a dense white precipitate either of sulphate of barytes or lead; and it is found that 116 parts of the former or 152 parts of the latter sulphate, when dry, indicate 40 parts of anhydrous sulphuric acid.

Hyposulphurous Acid.—In 1817 Dr. Thomson inferred the existence of an acid of sulphur in the salts called *sulphuretted sulphites:* this acid and its compounds have been particularly examined by Sir John Herschel.

Hyposulphurous acid has not been obtained in a separate state, but its composition has been determined to be—

Two equivalents of oxygen . . .	16
Two equivalents of sulphur . . .	32
	—
Equivalent	48

This acid is procured by dissolving zinc or iron in close vessels in an aqueous solution of sulphurous acid: solution is effected in this acid without the evolution of any gas, which hardly happens in any other case: the metals thus dissolved form crystallizable salts, which, when decomposed by other acids, yield sulphurous acid and sulphur, previously existing in the proportions above stated, and constituting hyposulphurous acid: this acid is also formed when sulphites are digested in close vessels with sulphur, in which case the sulphur takes half the oxygen of the sulphurous acid; and when iron is dissolved in sulphurous acid, it takes half the oxygen of the sulphurous acid, which, by this loss, becomes hyposulphurous acid, and, combining with the oxide of iron formed, they constitute hyposulphite of iron.

The salts containing hyposulphurous acid, or the hyposulphites, are not important; and the acid undergoes decomposition when they are strongly heated or acted upon by an acid.

Hyposulphite of soda is employed to distinguish between the salts of barytes and strontia, the former of which it precipitates, but not the latter: hyposulphite of lime is also a soluble salt. The existence of a hyposulphite in solution is recognised by its possessing the power of dissolving freshly-precipitated chloride of silver, and forming a sweet compound with it.

Hyposulphuric Acid was discovered in 1819 by Gay-Lussac and Welter. It is prepared by suspending finely-powdered binoxide of manganese in water, and passing sulphurous acid gas into the mixture: if this be not kept cold, sulphuric acid is formed; but otherwise the oxide of manganese is dissolved and hyposulphate of its protoxide formed: to the filtered solution sulphuret of barium is to be added, by which sulphuret of manganese is precipitated, and hyposulphate of barytes remains in solution: when the proper quantity of sulphuric acid is added to this, sulphate of barytes is precipitated, and the hyposulphuric acid is liberated, the filtered solution of which is to be evaporated in vacuo over sulphuric acid till it acquires a density of 1·347: if it be carried further than this, it is decomposed into sulphurous acid, which escapes, and sulphuric acid, which remains dissolved.

This acid has not been obtained free from water: the aqueous solution is sour, inodorous, and reddens vegetable blues: if heated to 212°, it is decomposed into sulphurous and sulphuric acids; and when exposed to the air, it slowly absorbs oxygen, and becomes sulphuric acid. Unlike sulphuric acid, it forms soluble compounds with lime, barytes, strontia, and oxide of lead; but, like diluted sulphuric acid, it acts upon and dissolves zinc, with the evolution of hydrogen gas, and a solution of hyposulphate of zinc is formed; its salts are decomposed at a high temperature, yielding sulphurous acid and sulphates remaining.

It is composed of—

Five equivalents of oxygen . . .	40
Two equivalents of sulphur . . .	32
	—
Equivalent	72

It is therefore equal to a compound of one equivalent each of sulphurous and sulphuric acid, which explains why, when it is heated, it is converted into these two acids.

Azote and Sulphur.—No compound of these elements is known.

Hydrogen and Sulphur combine in two proportions, forming hydrosulphuric acid, frequently called sulphuretted hydrogen gas, and bisulphuret of hydrogen.

Hydrosulphuric acid, formerly known by the name of hepatic gas, exists in sulphurous waters, such as those of Harrowgate: it is stated by some authors, but denied by others, that it may be formed, to a certain extent, by heating or subliming sulphur in hydrogen gas. It is usually produced by the action of hydrochloric acid on sulphuret of antimony, or by acting upon protosulphuret of iron with dilute sulphuric acid: in the former case the hydrogen of the hydrochloric acid unites with the sulphur of the sulphuret, chloride of antimony being also formed; while in the latter, the decomposed water yields hydrogen to the sulphur and oxygen to the iron, which, being then dissolved by the acid, constitutes sulphate of iron. As it is scarcely possible to combine the whole of any given quantity of iron with sulphur, the uncombined portion yields a little free hydrogen with the hydrosulphuric acid; but this, in most cases, is of no consequence: although hydrosulphuric acid is, to a certain extent, soluble in water, yet the gas may for most purposes be received in vessels filled with it.

The properties of hydrosulphuric acid are, that it is colourless, and gaseous at common temperatures and pressures: it has a peculiarly nauseous and fetid odour, resembling that of putrid eggs; its taste is also extremely disagreeable. Its specific gravity is about 1·18: 100 cubic inches weigh about 36·55 grains.

It is composed of—

One equivalent of hydrogen . .	1
One equivalent of sulphur . . .	16
	—
Equivalent	17

Or it may be regarded as consisting of 100 cubic inches of hydrogen gas, holding 34·4 grains of sulphur in combination, the gas, by combining with the sulphur, undergoing no alteration of colour. It reddens moist litmus-paper, but not strongly, and is soluble in about one-third of its bulk of water. At a temperature of 50°, and under a pressure of about 17 atmospheres, it is rendered a limpid liquid, of specific gravity about 0·9: this does not congeal when cooled down to 0. It is extremely poisonous to animals: air containing 1-1500th of its bulk immediately killed a bird, and 1-1000th a middle-sized dog. When mixed and detonated with oxygen gas, the results are water and sulphurous acid.

The aqueous solution of hydrosulphuric acid is employed as a test of metals, and, more especially, it is an excellent substance for the discovery of minute portions of lead, with which it gives a dark-coloured precipitate of sulphuret of lead: with the salts of antimony it gives an orange precipitate, and with arsenious acid a yellow one.

Hydrosulphuric acid forms salts which are termed *hydrosulphates*, and these are probably formed when it is combined with ammonia, potash, soda, and the alkaline earths; but by metallic oxides, properly so called, it is decomposed, the results not being hydrosulphates of metallic oxides, but water and a metallic sulphuret: this is the case with oxide of lead, silver, &c.

Bi-sulphuret of Hydrogen.—This compound cannot be formed by direct combination. To prepare it, equal weights of sulphur and recently slacked lime may be boiled in three times their weight of water for half an hour. The result is a deep reddish-yellow coloured solution of persulphuret of calcium: when clear and cold, it is to be added to an excess of hydrochloric acid diluted with about twice its weight of water: by their mutual action sulphur is precipitated, accompanied with a yellow oil-like fluid, which is the bi-sulphuret of hydrogen. Its properties are, that it is a viscid liquid, of a yellow colour, and of specific gravity about 1·77; its smell is similar to, but not so powerful as that of hydrosulphuric acid; its elements are held together by a feeble affinity, so that even in the cold it is gradually converted into hydrosulphuric acid and sulphur, and this change is immediately produced at 212°.

It is composed of—

One equivalent of hydrogen . .	1
Two equivalents of sulphur . .	32
Equivalent . . .	33

Chlorine and Sulphur appear to form two compounds, the chloride and di-chloride. According to Dumas, when sulphur is acted upon by excess of chlorine, a neutral chloride is obtained, which consists of—

One equivalent of chlorine . .	36
One equivalent of sulphur . .	16
Equivalent . . .	52

It usually contains some di-chloride, from which it is to be purified by repeated distillation at about 140° Fahr.

It may be formed either by heating sulphur in excess of dry chlorine gas, or, at common temperatures, by passing excess of chlorine through a tube containing powdered sulphur.

The properties of this chloride are, that it is liquid, has a reddish-brown tint, and a density of 1·62; that of its vapour being about 3·7. Its boiling-point is 147°.

Di-chloride of Sulphur.—This substance was first obtained by Dr. Thomson. When chlorine gas is passed over powdered sulphur, gently heated, it gradually disappears, and the di-chloride is formed by direct combination: the liquor obtained is to be distilled, and then possesses the following properties:—It is liquid, and is red by reflected, and yellowish-green by transmitted light: it emits acrid fumes when exposed to the air; its density is 1·687, that of its vapour being 4·7; it is volatile below 200°, and boils at 280°. Dry litmus-paper is not altered by it. It is energetically decomposed by and decomposes water, the results being hydrochloric and hyposulphurous acids. It does not combine with alkalis.

It consists of—

One equivalent of chlorine . .	36
Two equivalents of sulphur , .	32
Equivalent . . .	68

Sulphur and Bromine. [BROMINE.]

Having described the principal compounds which sulphur forms with the elementary gaseous bodies, we shall briefly notice those which it yields by combination with the non-metallic elementary solids, and first—

Carbon and Sulphur.—These form by direct action sulphuret of carbon, or rather bi-sulphuret.

It may be obtained either by passing the vapour of sulphur over charcoal heated to redness in a porcelain tube, or distilling a mixture of bi-sulphuret of iron and one-sixth of its weight of charcoal. It may be condensed by being passed into cold water, and to free it from uncombined sulphur and moisture it should be rectified from chloride of calcium at a low temperature.

Its properties are, that it is a colourless transparent liquid, of density 1·272, that of its vapour being 2·668; it has an acrid pungent taste, and a very fetid odour; its refractive power is very high; it is insoluble in water, but combines with alcohol and æther, from which water precipitates it; it is extremely volatile, boils at about 110°, and is not rendered solid at − 60°: owing to its great volatility, it produces sufficient cold under the exhausted receiver of the air-pump to freeze mercury: it is extremely inflammable, the results of its combustion being carbonic and sulphurous acid gases, attended with a brilliant greenish-white flame.

It is composed of—

One equivalent of carbon . .	6
Two equivalents of sulphur . .	32
Equivalent . . .	38

It is a remarkable circumstance that so volatile a liquid should be produced by the combination of two solid bodies. It was discovered by Lampodius in 1796.

Phosphorus and Sulphur. [PHOSPHORUS.]

Iodine and Sulphur. [IODINE.]

Selenium and Sulphur.—[SELENIUM.]

Boron and Sulphur form sulphuret of boron.

According to Berzelius, when boron is heated to whiteness in the vapour of sulphur combustion takes place, with a red flame, and these substances appear to combine in more than one proportion, but their properties have been very imperfectly ascertained.

Sulphur combines also with various compound bodies to form very different substances: some of these we shall briefly mention.

Sulphur and Cyanogen, when made to unite by heating a mixture of sulphur and bi-cyanide of mercury, and by some less direct processes, produce *sulphocyanogen,* or *cyanide of sulphur.* It is a yellow powder, insoluble in water, alcohol, and æther, but dissolves in hot sulphuric acid, from which water precipitates it; concentrated nitric acid decomposes it.

It appears to be composed of—

Two equivalents of sulphur . .	32
One equivalent of cyanogen . .	26
Equivalent . . .	58

Sulphocyanic Acid; Hydrosulphocyanic acid; Sulphocyanhydric Acid. When subsulphocyanide of lead is decomposed by dilute sulphuric acid, or sulphocyanide of silver diffused through water is decomposed by hydrosulphuric acid, sulphocyanic acid is formed; and when purified, it is a colourless liquid, easily decomposed by exposure to air or heat; chlorine also decomposes it, by combining with its hydrogen, and evolves cyanogen. It reddens the solutions of the persalts of iron, exists in the seeds of the cruciferous plants, and in the saliva of man and the sheep.

It consists of—

One equivalent of sulphocyanogen	58
One equivalent of hydrogen . .	1
Equivalent . . .	59

Sulphonaphthalin; Sulphonaphthalic Acid.—This compound was obtained by Faraday from the action of sulphuric acid upon naphthalin; the operation is tedious. Its properties are, that it is crystalline, readily soluble in water and in alcohol; when strongly heated, it is decomposed, at first with the production of napthalin, sulphurous acid, and charcoal; it reddens moistened litmus-paper powerfully, and has an acid bitter taste; it combines readily with alkalis, forming salts which are called *sulphonaphthalates:* these are soluble in water, and most of them in alcohol, and when heated in the air, they burn, leaving sulphurets or sulphates, according to circumstances; it is probably a direct compound of sulphuric acid and naphthalin. Its elementary composition is stated to be—

Twenty equivalents of carbon .	120
Eight equivalents of hydrogen .	8
Two equivalents of sulphuric acid .	80
Equivalent . . .	208

Sulphovinic Acid.—An acid produced by the action of sulphuric acid upon alcohol, and, according to Mr. Hennel, a necessary intermediate substance in the formation of æther. He found that when two equivalents of sulphuric acid and two of alcohol were merely mixed, the acid immediately lost four-sevenths of its power of precipitating oxide of lead, and, undergoing great change of properties, was converted into the acid in question, and composed of—

Two equivalents of sulphuric acid .	80
Two equivalents of alcohol . .	46
Equivalent . . .	126

When an equivalent of this acid is heated, it is decomposed: the two equivalents of sulphuric acid, and one equivalent of water, remain in the retort, while the other elements form an equivalent of æther.

Sulphovinic acid may be procured in solution by accurately decomposing sulphovinate of lead with dilute sulphuric acid; but it has not been obtained in a dry state, except when combined with a base.

Several of the sulphovinates are crystallizable salts, but they are not applied to any particular use.

Sulphur Salts.—These are certain double sulphurets, so designated by Berzelius: the electro-negative sulphurets, constituting *sulphur acids;* and the electro-positive sulphurets, *sulphur bases*. Among the sulphur acids are the sulphurets of arsenic, antimony, tellurium, tin, &c.; and in this class he also includes sulphuretted hydrogen, sulphuret of carbon, and selenium and sulphocyanogen: the sulphur bases include the protosulphurets of the metals of the alkalis and alkaline earths.

SULPHUR is an elementary principle which occurs in great abundance in the mineral, sparingly in the vegetable, and still more sparingly in the animal kingdom. In the vicinity of volcanoes sulphurous fumes issue copiously from the ground, and many mineral waters owe their peculiar odours and much of their virtues to sulphurous impregnations. Plants which contain it have often an offensive smell, to which most probably it contributes, such as assafœtida, garlic, and mustard [SINAPI], in which last it occurs as a constituent of myronic acid, a portion of which probably attaches to the volatile oil of mustard, the odour of which is stronger and more offensive than that of garlic and assafœtida combined. In animals it occurs in conjunction with albumen, and hence white of egg blackens silver egg-spoons.

For medical purposes, it should be as pure as possible, but in the two forms in which it occurs it is seldom perfectly free from admixture. Sublimed sulphur (flowers of sulphur) generally contains some sulphuric acid, which renders it slightly pungent; and precipitated sulphur, or milk of sulphur, mostly contains sulphate of lime. Of the two forms, precipitated sulphur, owing to the extremely fine state of subdivision in which it exists, is in equal quantities more powerful than the sublimed.

Sulphur is insoluble in alcohol, but soluble in oils, both fixed, such as linseed, and volatile, such as turpentine; with the former of which it forms the *balsamum sulphuris simplex*, with the latter the balsamum sulphuris *terebinthinatum*.

Though devoid of any marked sensible qualities, sulphur acts as a stimulant to the living tissues. Applied to the sound skin, it seems to have no effect upon it, but placed in contact with an ulcerated surface, it irritates and excites an inflammatory action. Large doses, such as a pound, given to horses, prove fatal by producing violent inflammation, recognisable during life by the symptoms, and after death by the morbid appearances. These may not have been due entirely to the sulphur, but to the sesqui-sulphuret of arsenic (orpiment) with which sulphur is often contaminated. Hence the increased redness and sensibility of parts affected with cutaneous eruptions when sulphur is applied to them. It is clear therefore that it is by exciting to new action the unhealthy structures that it effects a cure of these diseases, and not by causing a repulsion or transfer of it to some other quarter, though this not unfrequently follows the too rapid healing of such complaints, if they have been spread over a large surface. Taken internally, sulphur gives rise to two distinct orders of effect: the one, its action on the intestinal canal; the other, upon the system generally. Small doses, if they do not increase the digestive power, at least do not disturb it; but larger cause a disagreeable sensation in the epigastric region, followed by alvine dejections, which are generally gentle, and without colic or griping. When it causes alvine evacuations, it does not produce marked general effects; but when given in small doses, with a sufficient interval between each to favour its absorption, its general action is commonly very apparent. The pulse becomes more frequent, the animal heat and perspiration are increased, and the presence of sulphur may be recognised in all the excretions of the body, or a transudation of it in the form of hydrosulphuric acid (sulphuretted hydrogen). In this way silver worn in the pocket of a person using sulphur becomes blackened.

The long-continued use of it gives rise to still more obvious stimulant effects. General excitement of the system takes place, increased arterial action leads to hæmorrhages, &c., accompanied by restlessness, sleeplessness, and thirst. The appearance of these symptoms should point out the propriety of suspending its further use till they can be removed by antiphlogistic means.

Sulphur should not be used for very plethoric individuals, or those inclined to high vascular action, till those states have been lessened by diet and other means.

Internally sulphur has been given in chronic catarrhs and humid coughs, as well as in some of the forms of asthma. In these some of the numerous combinations with oils and other substances, called balsams of sulphur, were chiefly used. From the power which sulphur undoubtedly possesses over mucous membranes, especially the bronchial, these were often serviceable; but in the asthmatic affections complicated with organic disease of the heart or great vessels, nothing can be more hurtful.

In chronic rheumatism sulphur, from its diaphoretic properties, is of much utility either alone or with antimonials. In those forms of dysentery which may be regarded as rheumatism of the intestines, sulphur is perhaps the best aperient in combination with ipecacuanha. It is also beneficial in those forms of paralysis which have resulted from rheumatism. It is stated to effect a cure of intermittents, and considering its power of rousing the vascular system, and its subsequent diaphoretic action, it may be used in those cases where arsenic fails and quinine is too expensive.

Sulphur is given as a laxative in hæmorrhoids, stricture of the rectum, and habitual constipation. For these cases it is usually combined with bi-tartrate of potash, or magnesia, or electuary of senna. A small quantity of the compound cinnamon-powder, or aromatic confection, is a valuable addition, as it lessens any tendency to griping, and also restrains the disposition to the disengagement of sulphuretted hydrogen gas, which is often a distressing consequence of the use of sulphur. The dose varies much in different individuals, but in all cases it should be ample, as an insufficient quantity is most prone to generate flatus. Persons of a sedentary habit, afflicted with constipation, find this combination of unspeakable service, as, unlike many others, it is not followed by greater constipation than before, but keeps the bowels moderately open for a considerable time. It is one of the most appropriate medicines for children or pregnant females.

Sulphur is generally given internally at the same time that it is used externally for the cure of cutaneous diseases. For one of these (*scabies*) it is regarded as almost a specific. Sulphur ointment is the form generally employed for this disease. It should never be applied to more than a fourth part of the body at one time. The compound sulphur ointment is more powerful, but requires still more caution in its employment from the veretrine it contains. In workhouse practice, the preferable mode of employing sulphur is by uniting it with soft-soap, which not only does not stain and grease the clothes, but assists in cleansing them as well as the patients, when washed. Besides, the potash of the soap aids the cure. Many cutaneous diseases are more readily cured by a condensation of sulphur with potash than by either singly. This combination, called Potassii sulphuretum, or liver of sulphur, may be applied in various ways, particularly in baths, forming artificial Harrowgate-water. The natural waters of Harrowgate, Moffat, and other sulphurous springs, owe their peculiarities to it.

Sulphur in combination with iodine, forming ioduret of sulphur, when made into an ointment with a large quantity of lard or cerate, is a valuable agent in some cutaneous diseases.

Sulphur in a state of combustion evolves sulphurous acid gas. This is sometimes employed as a fumigation in some obstinate cutaneous affections, especially psoriasis inveterata, which often continues about the joints, especially the elbow, when it has been cured in every other part. The employment of this requires caution, and on no account must the face be exposed to it, as it is irrespirable.

SULPHUR TRADE. Although sulphur exists in Iceland, Teneriffe, St. Vincent's, and some other places, the expense of obtaining it is so great, that Sicily alone has furnished the supply required. The average consumption of England in the five years, from 1820 to 1824, was 7080 tons. In 1825 the duty was reduced from 15*l.* to 10*s.* a ton, and in the following ten years the annual consumption averaged 15,140 tons; and during the last four years of this period the average was 32,000 tons. In 1837 it amounted to 37,486 tons. The consumption of Sicilian sulphur in France, which was nearly stationary from 1825 to 1833, and averaged 11,844 tons, increased 57 per cent. during the next five years to 1838, averaging 18,625 tons. In 1840 the importation into France reached 40,618 tons, and the stock in bond amounted to 27,495 tons: in October, 1838, the quantity in bond in the United Kingdom was 20,349 tons; so that in both countries the importation had greatly exceeded the wants of the home market. From 1833 to 1838 England took 49 per cent. of the whole quantity of sulphur exported from Sicily, and France 43 per cent., leaving only 8 per cent. for all other countries; and part of this was shipped for Malta, and eventually reached England. The sulphur trade gave employment to 30,000 tons of British shipping.

The Sicilian sulphur-mines are the property of individuals, and from fifteen to twenty English firms settled in Sicily are engaged in the trade. In 1836 M. Taix, a Frenchman, laid before the Sicilian government a project for establishing a company which was to have the exclusive right during ten years of purchasing Sicilian sulphur at fixed prices, on condition of spending 10,000*l.* a year in constructing roads, and exporting one-third of the quantity produced in Sicilian vessels. The British merchants becoming alarmed, the Sicilian government, in reply to the British ambassador, stated that no such project would be adopted. It would have been in direct contravention to certain commercial treaties between the two governments. The Sicilian government did however enter into a contract with M. Taix, and on the 4th of July, 1838, notice was given at Palermo that the monopoly would come into operation on the 1st of August ensuing. The negociations respecting this monopoly were conducted with great secrecy, and it came into operation so suddenly that twenty-four vessels lost their cargoes. The British lessees of mines, and all others, were compelled to produce only a fixed quantity of sulphur; prices rose from 6*l.* 10*s.* or 7*l.* to 13*l.* and 14*l.* per ton, and contracts could not be completed. Previous to the monopoly 484 British vessels sailed from the ports of Sicily to the United Kingdom; but in the first fifteen months after the monopoly the number was only 157. The importation of sulphur, which was 44,653 tons in 1838, was only 22,160 tons in the year ending 10th October, 1839, of which only 5400 were brought direct from Sicily. A cargo was brought from Iceland. At length the British government took very decided steps to put an end to a monopoly established in the face of commercial treaties: the coasts of Sicily and Naples were blockaded by our ships of war; and the Sicilian government, no longer daring to uphold the monopoly, accepted the mediation of the king of the French in adjusting the dispute with the British government. The monopoly was abolished in July, 1840, and a mixed English and Sicilian commission was appointed in November to investigate the claims of British subjects whose interests had been injured by it. The claims amounted to 65,610*l.*, of which 21,307*l.* were awarded; and as it was stipulated that the awards should bear interest at the rate of six per cent. so long as they remained unsettled, the Sicilian government agreed, in January, 1842, to pay them without any delay. The sulphur trade is now placed on the same footing as before the 4th of July, 1838.

(*Sulphur Trade of Sicily*; *Journ. of Statistical Society*, vol. ii., part 6; *Papers relative to the Sulphur Question*, presented to the House of Commons, February, 1842.)

SULPHURIC ACID. (Chemistry.) [SULPHUR.]

SULPHURIC ACID, MEDICAL PROPERTIES OF. This, which is regarded as the most potent of the mineral acids, is never taken internally in a concentrated state except by accident, or with the intention to commit suicide or murder. In such cases it acts as a violent corrosive poison, causing complete disorganization of the tissues it comes in contact with, its course being obvious from the black and charred state of the parts. This effect it is thought to produce from its strong affinity for water, depriving the tissues of its elements, and leaving the carbon free. This peculiarity distinguishes poisoning by it from the other mineral acids. Notwithstanding the extensive destruction of important organs, such as the stomach, immediate death rarely results from it, but the patient lingers sometimes for days, and in some cases ultimately recovers.

Sulphuric acid is sometimes employed in an undiluted state as a caustic application to the bites of rabid animals, or to destroy warts or portions of the eyelids in entropium and ectropium.

In a considerably diluted state, if it be applied to the skin, it occasions a painful impression, followed by numbness and a contraction of the parts, and even whiteness, owing to the diminished calibre of the capillaries. But shortly the afflux of blood to the part recurs, and soon increases, so that the action of the vascular system appears to become more developed than before. As it is presumable that a similar series of actions takes place when received in a diluted form into the stomach, by bearing these phenomena in mind it is possible to explain its therapeutic influence in many of the cases where it is used.

Taken internally in a diluted but still strong state it makes a powerful impression on the stomach, followed by an instantaneous sympathetic chill of the whole system: hence its power in checking hæmorrhage long before its particles can be received into the circulation and constringe the vessels by immediate contact with their sides. From the same cause it acts as a useful refrigerant in fevers and other inflammatory diseases when the animal temperature is too high. In many of the transient diseases of the skin attended with much heat and itching, a solution of sulphate of magnesia, with an addition of dilute sulphuric acid, quickly relieves them. It has also been given at a late stage of typhus in some mild diluent, such as barley-water. In combination with cinchona, it is of decided utility in purpura hæmorrhagica. Nothing so certainly checks the colliquative sweats which attend hectic fever as the compound infusion of roses. In chronic diarrhœa and dysentery it is also sometimes of service. Hæmorrhoidal fluxes are often restrained by its use. In some forms of dyspepsia it is a valuable tonic, and may be longer persevered with than any other mineral acid except phosphoric. In calculous diseases with a phosphatic diathesis, it is much to be commended, from the length of time it can be used. In such cases it is best given in infusion of chamomile made with cold water. It is employed largely diluted as a gargle in the sore-throat of scarlet fever. Many cases of cutaneous diseases have been cured by the internal use of sulphuric acid. The aromatic sulphuric acid, called elixir of vitriol, has more tonic properties than the simple acid. A few drops of it, ten or twelve, in a cup of cold water, relieve very certainly the squeamishness of the stomach which is felt in the morning after an excess of wine. In case of poisoning by sulphuric acid, lime-water, calcined magnesia, or plaster from the wall, or a solution of soap, should instantly be given.

The unguentum acidi sulphurici is a most effectual application in obstinate cases of itch. It chars the linen.

SULPHUROUS ACID. [SULPHUR.]

SULPI'CIA, a Roman poetess, of whose productions we possess only one Satire, consisting of seventy verses, which is usually called 'De Edicto Domitiani, quo Philosophos Urbe exegit.' She is generally supposed to be the same as the Sulpicia mentioned by Martial (x. 35 and 38), and to have been the wife of Calenus: she was accordingly a contemporary of Domitian and of Martial. The poem of Sulpicia is on the whole stiff, and shows little imagination. It is usually annexed to the editions of Persius and Juvenal; the best separate edition is that by J. Gurlitt, 'Cum Commentariis C. G. Schwartzii,' 2 parts, 4to., Hamburg, 1819. It is also printed in the 'Anthologia Latina' of Burmann, and Wernsdorf, 'Poetae Latini Minores.'

(Burmann, *Antholog. Lat.*, ii., p. 408, &c.; Wernsdorf, *Poet. Lat. Min.*, iii., p. lx., &c., and p. 83, &c.)

In the fourth book of the 'Elegies' of Tibullus there are several letters written in the name of Sulpicia, which in their character and diction present some slight differences from the other poems of Tibullus. Some modern critics, as Barth (*Adversaria*, lix. 16) and Broeckhuis (ad Tibull., p. 384), have therefore supposed that they were written by the Sulpicia above mentioned. This opinion however cannot be reconciled with several historical allusions in these letters, which clearly point to the age of Augustus. For this reason Heyne (ad Tibull., iv. 2, p. 350, &c.) conjectured that they were the work of a Sulpicia who lived in the time of Tibullus. But this opinion too rests on very weak grounds, and we cannot indeed see any sufficient reason for supposing that these letters, notwithstanding their slight peculiarities, were not written by Tibullus himself.

(Compare Bähr, *Geschichte der Röm. Literatur*, p. 250 and 279.)

P. SULPICIUS RUFUS was born in the year B.C. 124, and was ten years older than the orator Hortensius. In the year B.C. 94 he prosecuted C. Norbanus for the offence of majestas, under the provisions of the Lex Apuleia, a circumstance which brought him into notice. (Cic., *Off.*, ii. 14.) In the following year he was quaestor, and he served in the Social war as legate of Cn. Pompeius Strabo. He was tribunus plebis in the year B.C. 88, and supported the faction of Marius. Cicero heard many of his speeches during his tribunate, and thoroughly studied his style of oratory: 'He was,' says Cicero, 'of all the orators that I ever heard, the most dignified, and, if one may use the expression, the most tragic: his voice was powerful, sweet, and clear; his gesture and every movement graceful; and yet he seemed as if he were trained for the forum, and not for the stage: his language was rapid and flowing, and yet not redundant or diffuse.' (Cic., *Brut.*, 55; comp. Cic., *De Orat.*, iii. 8.) Among other measures of his tribunate, Sulpicius brought forward and carried a rogatio, by which the command of the Mithridatic war was transferred from Sulla to Marius. Sulla, who was then at Nola with his army, marched to Rome, of which he took possession. [SULLA.] Twelve persons were proscribed, among whom were Marius and Sulpicius. Marius escaped; but Sulpicius was betrayed by his slave, and murdered in a villa near Rome.

Sulpicius left no writings, and Cicero states that he had often heard him say that he was not accustomed to write, and that he could not write. (*Brut.*, 56.) There were however orations attributed to him, but they were supposed to be the work of P. Canutius. P. Sulpicius is one of the interlocutors in Cicero's dialogue 'De Oratore.'

It does not appear how P. Sulpicius was related to Servius Sulpicius Rufus. As he was a tribune, he must have been of a plebeian family, or at least must have been adopted into a plebeian family, and it may be that he was of a different family from Servius Sulpicius.

SULPICIUS LEMONIA RUFUS, SERVIUS, the friend and contemporary of Cicero, was nearly about the same age as Cicero (*Brut.*, 40), and consequently was born about B.C. 106. He was of a patrician family, and yet Cicero says that his father was only an eques. He began his career as an orator, and might have attained the first place or have been only inferior to Cicero, if he had not directed his energies to the study of the law. It is said that on one occasion he applied to Q. Mucius Scaevola the Pontifex for his advice on a question of law, and that Scaevola, perceiving Servius did not understand what he said, reproached him for his presumption in undertaking the conduct of causes, when he was ignorant of the law which was necessarily involved in them. This determined him to devote himself to the law. The time at which Servius began his legal studies does not appear. He accompanied Cicero to Rhodes, B.C. 78 (*Brut.*, 41), and it may be inferred from the passage of the 'Brutus' that he commenced his legal studies after his return, or perhaps it was after his return that he devoted himself exclusively to the law. His object in visiting Rhodes was to improve himself.

Servius filled several public offices. He was quaestor of the district of Ostia (Cic., *Pro Muren.*, 8), curule aedile, and praetor for Quaestiones Peculatus. The first time that he was a candidate for the consulship he was rejected, and L. Murena was elected, whom Servius prosecuted for ambitus (bribery): Murena was defended by Hortensius, M. Crassus, and Cicero. In the year B.C. 51 he was elected consul with M. Claudius Marcellus, in preference to Cato, who was rejected. In the year preceding his consulship he had been interrex, in which capacity he returned Cn. Pompeius as sole consul. In the war between Cæsar and Pompey he does not appear to have taken any decided part, though it seems probable that he most inclined to Cæsar's side; at least, after the defeat of Pompey at Pharsalia, Cæsar made him governor of Achaea, where he was at the time when Cicero addressed to him one of his extant letters (*Ad Div.*, iv. 3). During the residence of Sulpicius at Athens, his former colleague Marcellus was assassinated in Piraeus; Sulpicius had him honourably buried in the gymnasium of the Academia, where a marble monument was erected to his memory. This tragical event is communicated by Sulpicius to Cicero in an extant letter, which is characterised by great simplicity. After the death of Cæsar he was sent by the senate, with L. Philippus and L. Piso, on a mission to Antony, who was then besieging D. Brutus in Mutina, for the purpose of negotiating with Antony before the senate declared him an enemy to the state. He was then in bad health, and only just lived to reach the camp of Antony, where he died, B.C. 43. Cicero pronounced a eulogy on his friend in the senate, and on his motion a bronze statue was erected to the memory of Servius, which existed for some time. (Cic., *Phil.*, ix.; *Dig.*, i., tit. 1, s. 2, § 43.) The terms of the senatus consultum, which was drawn up by Cicero (*Phil.*, ix. 7), included the honours of a public funeral. He left a son, Servius, who is mentioned by Cicero: his wife's name was Postumia. (Cic., *Ad Div.*, iv. 2.) The fourth book of Cicero's letters (*Ad Diversos*) contains his letters to Sulpicius and two letters from Sulpicius to Cicero.

Servius was an accomplished man, as well as a distinguished orator; but as a lawyer he was, in the opinion of Cicero, pre-eminent and unrivalled. His teachers were L. Lucilius Balbus and C. Aquilius Gallus. Cicero (*Brut.*, 41) attributes his excellence as a lawyer to the philosophical discipline which he had undergone. He observes that others possessed a knowledge of the law, but Servius alone possessed it as an art. This art, he adds, he could never have derived from mere knowledge of the law; but he had acquired that dialectic skill, the greatest of all arts, which enabled him to dispel the obscurity that characterised the responsa and speeches of other lawyers. 'He distributed the matter of a thing into its parts, he developed by definition what was latent, he cleared up what was obscure by correct interpretation: he first ascertained and then separated what was ambiguous; lastly, he had a measure by which to estimate truth and falsehood, and to determine what consequences followed and what did not follow from premises.' To these acquirements and to a profound knowledge of the law he added an acquaintance with letters and an elegant diction. Such a combination of talent seldom appears.

Servius was a voluminous writer. Cicero speaks of his works as being unequalled. We may judge of his style from his letter of consolation to Cicero on the death of his daughter Tullia. (Cic., *Ad Div.*, iv. 5.) He wrote nearly a hundred and eighty treatises on law, many of which existed in the time of Pomponius, that is, in the time of Antoninus Pius. He probably wrote a commentary on the Twelve Tables: he was also the author of a treatise on the Edict, and notes on a work on the civil law by Q. Mucius Scaevola the Pontifex (Gell., iv. 1); of a book 'De Dotibus,' and several books 'De Sacris detestandis' (adoption, probably). There are extant various fragments of his belonging to treatises the titles of which are not known. He is often mentioned in the 'Digest,' particularly by Alfenus, but there is no excerpt from his works in that collection. It seems a probable conjecture that when Alfenus quotes another person without mentioning a name, his master Servius Sulpicius is meant. (Bynkershoek, *Observ.*, viii. 1.)

Servius founded a numerous school of lawyers, but we are only acquainted with the names of those who were known as writers. His most celebrated pupils were Alfenus Varus and Aulus Ofilius: there were also among others Aufidius Tucca, C. Ateius Pacuvius, and Antistius Labeo, the father of a more distinguished son.

Our information about Servius Sulpicius is mainly derived from his friend Cicero, who gives him a high character for integrity. He is said to have written some erotic poems. (Ovid., *Trist.*, ii. 1, 141; Plin., *Ep.*, v. 3.)

SULPI'CIUS, SEVE'RUS, a Christian writer belonging to the end of the fourth and the beginning of the fifth century of our æra. He is generally supposed to have been born about the year A.D. 366, in Aquitaine, and was descended from a distinguished family. He first followed the legal profession, and gained great reputation as an orator; but after the death of his wife, who belonged to a consular family, and died at an early age, Sulpicius withdrew himself entirely from the world, and with a few friends led a retired and monastic life as a presbyter in Aquitaine. He commenced this life about A.D. 392, at the same time that his intimate friend Paulinus adopted the same mode of life, who, in his letters commends Sulpicius for his conduct, and the more as the father of Sulpicius had disinherited his son for the step he had taken. (Paulin., *Epist.*, v. 1; xi. 5; xxiii. 3, &c.) But what Sulpicius thus lost through the anger of his father, was amply made up by the munificent liberality of his father-in-law. Sulpicius made several journeys to Tours, the bishop of which place, Martinus, inspired him with such admiration, that Sulpicius, who gradually formed an intimate friendship with him, resolved to become his biographer. Further particulars respecting the life of Sulpicius are not known, except that during his last years he abstained altogether from speaking, as he considered his former habits to have been rather loquacious, for which he meant to atone by perfect silence. (Gennadius, *De Viris Illustr.*, 19.) The time of his death is very uncertain: some assign it to 420, others to 422, and others again to 432; but the most probable opinion is that he died about A.D. 410, or soon after.

We possess of Sulpicius Severus four different works 1. 'Vita Sancti Martini Turonensis,' which is written in the panegyrical style, and is full of miraculous events in the life of his hero. It was however not published till after the death of Martinus, about A.D. 400. The work is preceded by an epistle 'Ad Desiderium Fratrem,' and at the end of it there are three letters describing the death, burial, and those virtues of Martinus which were not sufficiently set forth in the biography itself. 2. 'Historia Sacra,' or 'Chronica Sacra,' in two books. This is a brief history of religion from the creation down to the consulship of Stilicho and Aurelian (A.D. 400). The first book and the first twenty-six chapters of the second treat of the history of the Jews; and the remaining portion chiefly contains accounts of the life of Christ, the persecutions of Nero, the history of Constantine, and in general of the most important events in the early history of Christianity. Here too, as in his Life of Martinus, the author shows a great partiality for what is marvellous. 3. 'Dialogi Tres,' or it should rather be 'Dialogi Duo,' as the second dialogue is only a part of the first: the principal object of these dialogues is to describe the merits and virtues of the monks and hermits of the East. 4. 'Epistolae,' the genuineness of some of which is very doubtful.

Notwithstanding the superstitious tone which pervades all the works of Sulpicius, they have a charm arising from their purity of diction which scarcely any other writer of this age possesses. His language is clear and concise, and he seems to have taken Sallust as his model in this respect. Some writers have therefore called him the Christian Sallust.

His 'Vita Martini' has often been printed. The editio princeps of his 'Historia Sacra' appeared at Basel, 1556, 8vo.; it was followed by the editions of Sigonius with a commentary, Bononiae, 1581, 8vo.; and of J. Drusius, Arnhemii, 1607, 8vo. A collection of his works appeared under the title 'Severi Opera emendata et illustrata à V. Giselino,' Antwerp, 1574, 8vo., and Paris, 1575, fol. The latter however only contains his 'Vita Martini' and the 'Historia Sacra.' Other editions of all the works of Severus are those by G. Hornius, Lugdun. Bat., 1647, 1654, 1665, 8vo.; by J. Vorstius, Berolini, 1668, 12mo., Lipsiae, 1703, 1709, in 8vo. The best edition is that by Hieronymus de Prato, Veronae, 1741 and 1754, 4to., which however does not contain the letters. His works are also printed in the 'Bibliotheca Patrum Max.,' Lugdun., vol. vi., p. 324, &c., and in Galland's 'Bibliotheca Patrum,' vol. viii., p. 355, &c.

(G. Vossius, *De Historicis Latinis*, p. 209, &c.; Bähr, *Geschichte der Röm. Lit.*, 2te abtheil, *Die Christlich-Römische Theologie*, p. 219, &c.)

SULTA'N, an Arabic word meaning 'a despotic ruler, or a man who is the arbiter of the life and property of a set of men.' It is the usual title of royalty among the Arabs and Turks. From sultán the Italians have made their *soldano*, and the Spaniards have their *sultán*. The lawful wife of a sultán, who has children by him, is called by us a sultana.

SULTANIYAH. [PERSIA, p. 476.]

SULZER, JOHANN GEORG, the youngest of a family of twenty-five children, was born October 16th, 1720, at Wintherthur, in the canton of Zürich, where his father held the office of 'Seckelmeister,' or registrar of public accounts. Losing his parents, both of whom died on the same day, while he was yet in early youth, it was with difficulty that he was enabled to pursue his education for the church, according to their wishes, but with little inclination on his own part. In 1736 he was placed at the gymnasium at Zürich, and immediately on quitting it, three years afterwards, was ordained and became curate to the pastor of Maschwanden. Ill health however soon compelled him to resign his clerical duties, nor did he ever re-assume them. He now returned to his first and favourite studies of natural history, mathematics, and philosophy, and after residing about four years at Magdeburg as private tutor in the family of a wealthy merchant, received the appointment of professor of mathematics at the Joachimsthal gymnasium, Berlin, in 1747; and so recommended himself both by his ability as a teacher and by his attainments, that in 1750 he was admitted into the Academy of Sciences. The same year was that of his marriage with an amiable woman, whom he had the misfortune to lose in 1760; in consequence of which bereavement he quitted Berlin, and made a visit to his native country, where he recovered his wonted health and spirits, and where he first conceived the plan of his great work, the 'Theory of the Fine Arts.' He would have gladly remained in Switzerland, and he made application to that effect, but instead of listening to it, the king made him a professor at the newly established *Ritter-Academie*, or military college, with a very considerable pension, and also bestowed on him a piece of ground in the immediate environs of Berlin, where he afterwards built himself a villa and laid out a botanical garden. He accordingly returned to Prussia in 1763, where he remained till 1775, when he was advised to travel for the benefit of his health, then greatly impaired. He visited the south of France, Switzerland, and Lombardy, of which tour he kept a journal that was published shortly after his death. On his return to Berlin, his health, which had been considerably improved, again declined. He died February 25th, 1779.

Great as was the distinction he acquired among his contemporaries in other and far different branches of knowledge, Sulzer's fame now rests chiefly upon his 'Allgemeine Theorie der Schönen Kunste,' a cyclopædia of literature and the fine arts; and, as Herder says of it, one that is in itself an entire academy. To the plan itself it may be objected that the alphabetical arrangement, though recommended by its convenience, is not the best; and that as a dictionary the work now stands in need of considerable additions and augmentations; nevertheless it is a very remarkable one, not so much on account of the mere literary industry it displays, as for its unity and consistency, and for the original and philosophical mind which pervades the whole, and which stamps it as a well-constructed system of æsthetics. Although this work was announced by its author in 1760, it did not appear till 1771-4, for Sulzer had not calculated upon the time it would take to render its execution satisfactory to himself as well as the public. The second edition, in four large volumes, 8vo., with a supplement containing additions and corrections, was published 1792-4; and in 1799 came out an appendix to it, forming a complete 'Index' of all the writers, artists, &c. referred to in it. There are also distinct works intended as accompaniments to the 'Allgemeine Theorie:' one by Blankenburg, entitled 'Literary Additions,' &c., 3 vols. 8vo., 1796-8; the other 'Nachträge' (supplementary articles), by Schatz and Dyck, 8 vols. 8vo., 1792-1808. Of Sulzer's other writings the principal are: 'Moral Reflections on the Works of Nature,' Berlin, 1741; and 'Philosophical Pieces,' 1773-86.

(Jörden's *Lexicon*; Wolff, *Ency. National-litteratur*.)

SUM AND DIFFERENCE. There is no need to define the arithmetical meaning of these terms: a few words only are necessary to put them in their proper position in algebra. When quantities receive their proper algebraical signs, and those signs their interpretations [SIGN; NEGATIVE, &c.], they are said to be added to a quantity when they are allowed to produce their effect, and subtracted when they are allowed to produce a contrary effect. And when quantities are put together so that each produces its simple effect, they are said to be added together; while any parcel which is either withdrawn, or compensated by others of equal and opposite effects, is said to be subtracted. We are not here discussing principles, but settling terms; and it is enough if the notions appended to them are proper foundations for clear and good deduction; and an additional advantage if common ideas and received phraseology are also suited, provided that nothing be assumed from such ideas and phraseology to the prejudice of the dependence of the deduction upon the prescribed definitions.

To form a just idea of the property of any person, we take the sums which he owes away from his assets; that is, we take away, not his debts, but sums out of his assets equal to his debts. To say that this is taking away his debts would not be correct; for taking away his debts would be merely destroying his liabilities, without making his assets answerable: a person who pays another's debts himself takes them away. A court of justice which decides a claim against the assets of any one, annexes or puts on a liability; and this is in algebra *adding*: if the decision should be reversed on appeal, this liability to pay is removed, and this is in algebra subtracting. In the phrase 'to gain a loss,' the word 'gain' is used in the preceding sense of simple adjunction: if it were as common to talk of losing a loss, the verb to lose would be used in the sense of to remove or to get rid of: the other form of the word would be less of a bull, for to *loose* a loss would be to detach it. In a third form, the idiom is still plainer; to *release* [from] a loss would be precisely the idea of algebra, answering to subtracting a loss. Such things we mention, because by some persons those ideas of algebraical operation to which common idioms adapt them selves are easily received, as if the understanding of these common idioms were the same as that of the algebraical proposition; while other operations which have no such common phrases to illustrate them are difficulties.

SUM (in the sense of Integral). Before the organization of the formal integral calculus, the isolated operations of integration which were attained were expressed in words borrowed apparently from the notion of indivisibles. [CAVALIERI.] Thus the title of one of Halley's papers is 'An Easy Demonstration of the Analogy of the Logarithmic Tangents to the Meridian Line or Sum of the Secants.' Here the sum of the secants means what we should now denote by $\int \sec x.dx$.

SUM, SUMMATION. In the articles INTEGRATION, FINITE, and PROGRESSION, some ideas and rules are given upon the subject of the summation of a finite number of terms of a series; and in SERIES will be found examples of the inverse process of development. In the present article we are to give some account of the methods of actual summation which are in use in the higher branches of mathematics; referring for the demonstrations to the Differential Calculus in the Library of Useful Knowledge (cited by the letters D. C.). We shall dwell upon this at greater length than would appear to be altogether in keeping with the extent of the articles above cited; the reason being that many persons to whom the following rules might be practically useful never hear of them because they are locked up in Treatises on the Differential Calculus, or in works which are not generally read. The merest elements of differentiation and integration are enough to enable a beginner to *use* results, the *proof* of which must be reserved for a more advanced stage of his progress.

1. When the terms of a series are alternately positive and negative, as in $a_0 - a_1 + a_2 -$ &c., the sum of the series *ad infinitum* may thus be expressed [DIFFERENCE] (D. C., pp. 556-560):—

$$\frac{a_0}{2} - \frac{\Delta a_0}{4} + \frac{\Delta^2 a_0}{8} - \frac{\Delta^3 a_0}{16} + \ldots\ldots$$

which is frequently more convergent than the series itself: in fact, the less convergent the series is, the more convergent is the transformation. Dr. Hutton's method of obtaining the transformed series is as follows:—Take a number of the successive sums a_0, $a_0 - a_1$, &c., and let

$$S_0 = 0\ ,\ S_1 = a_0\ ,\ S_2 = a_0 - a_1\ ,\ S_3 = a_0 - a_1 + a_2\ ,\ \&c.$$

Take the half sum of S_0 and S_1, the half sum of S_1 and S_2, the half sum of S_2 and S_3, &c. Let these be T_0, T_1, T_2, &c. Repeat the process: take the mean of T_0 and T_1, that of T_1 and T_2, &c., which call U_0, U_1, &c. Take the mean of U_0 and U_1, that of U_1 and U_2, &c., which call V_0, V_1, &c. Then the set S_0, T_0, U_0, V_0, &c. will severally approach nearer and nearer to the series required: in fact

$$T_0 = \frac{a_0}{2}\ ,\ U_0 = \frac{a_0}{2} - \frac{\Delta a_0}{4}\ ,\ V_0 = \frac{a_0}{2} - \frac{\Delta a_0}{4} + \frac{\Delta^2 a_0}{8}\ ,\ \&c.$$

It would however be somewhat easier to proceed as follows:—having formed differences as far as may be thought necessary, say up to $\Delta^n a_0$, take half $\Delta^n a_0$ from $\Delta^{n-1} a_0$, half the result from $\Delta^{n-2} a_0$, half the result from $\Delta^{n-3} a_0$, and so on until a_0 has been used: after which halve the result again. In either case we need not begin at the beginning of the series: if it be more convenient to begin after a_{10} let $A_{10} = a_0 - a_1 + \ldots. - a_9 + a_{10}$, and calculate this separately: then calculate $a_{11} - a_{12} + \ldots$ from the rule, and we have $A_{10} \cdot (a_{11} - a_{12} + \ldots)$ for the series required. The following is an instance from Dr. Hutton (*Tracts*, vol. i., p. 191), the series being $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots.$

Suc. Sums.	The several orders of means.					
1						
0·5						
833333						
583333						
783333						
616666						
759524	688095					
634524	697024	692560				
745635	690080	693552	693056			
645635	695635	692858	693205	693131		
736544	691090	693362	693110	693158	693144	693147
653211	694878	692984	693173	693142	693150	

The result is ·693147, which is correct to the sixth place, and is more than could be got from the series itself by actual summation of a million of its terms. Dr. Hutton begins in forming the means with $1 - \frac{1}{2} + \ldots. + \frac{1}{7}$: we shall therefore try the other method, beginning with $\frac{1}{7}$.

Suc. Terms.	Orders of differences.				
	−	+	−	+	−
·142857	17857	3968	1190	432	179
·125000	13889	2778	758	253	
·111111	11111	2020	505		
·100000	9091	1515			
·090909	7576				
·083333					

2)−179
−89·5
432
2)521·5
260·8
−1190
2)−1450·8
−725·4
3968
2)4693·4
2346·7
−17857
2)−20203·7
−10101·9
142857
2)152958·9
76479·5

$1 - \frac{1}{2} + \ldots - \frac{1}{6} =$ ·6166666
·0764795
·6931461

This last process will be found on trial the easier of the two.

2. The sum of the series $a_0 - a_1 + a_2 -$ &c. *ad infinitum* may be thus expressed (D. C., p. 555):—

$$\frac{a_0}{2} - \frac{a'_0}{4} + \frac{a'''_0}{48} - \frac{a^{\mathrm{v}}_0}{480} + \frac{17a^{\mathrm{vii}}_0}{80640} - \&c.$$

where a_x, a function of x, generates the several terms by making $x = 0, 1, 2$, &c. in succession, and a'_0, a'''_0, a^{v}_0, &c. mean the values of the odd differential coefficients of a_x, when x is $= 0$. This transformation is useful when the values just mentioned are not considerable. Another form, which is sometimes more convenient, is—

$$\frac{a_0}{2} - \frac{a'_0}{4} + \frac{a'''_0}{2\,[4]} - \frac{3a^{\mathrm{v}}_0}{2\,[6]} + \frac{17a^{\mathrm{vii}}_0}{2[8]} - \&c.$$

where $[m]$ means 1.2.3.....m. In the instance before us, and that we may begin from the same term as before, let

$$a_x = \frac{1}{7+x}\ ,\ a_0 = \frac{1}{7}\ ,\ a_1 = \frac{1}{8}\ ,\ \&c.$$

$$a'_0 = -\frac{1}{7^2}\ ,\ a'''_0 = -\frac{[3]}{7^4}\ ,\ a^{\mathrm{v}}_0 = -\frac{[5]}{7^6}\ ,\ a^{\mathrm{vii}}_0 = -\frac{[7]}{7^8};$$

whence the series required from and after $\frac{1}{7}$ is—

$$\frac{1}{14} + \frac{1}{4.7^2} - \frac{1}{2.4.7^4} + \frac{3}{2.6.7^6} - \frac{17}{2.8.7^8}.$$

Call these terms (1), (2), &c., and begin with $\frac{1}{2} + \ldots - \frac{1}{6}$ or ·616666....: we have then—

	·6166666667
(1)	·0714285714
	·6880952381
(2)	·0051020408
	·6931972789
(3) −	·0000520616
	·6931452173
(4)	·0000021250
	·6931473423
(5) −	·0000001843
	·6931471580
True Answer	·6931471806

The result of this comparatively easy process is as correct as the summation of fifty millions of terms of the series.

3. The sum of any large number of terms of a series may be found by summing the whole series *ad infinitum*, then doing the same with the terms following the last term which is to be retained, and subtracting the second result from the first.

4. The sums of such series as are included under $1^{-n} + 2^{-n} + 3^{-n} +$ &c., such as

$$1 + \frac{1}{4} + \frac{1}{9} + \ldots\ ,\ 1 + \frac{1}{8} + \frac{1}{27} + \&c.$$

continued *ad infinitum*, may be given for reference in the following table. The first term will presently be explained. More will be found in D. C., p. 554.

n.	Sum of Series.
1	·5772156649015329 + log ∞
2	1·6449340668482264
3	1·2020569031595943
4	1·0823232337111382
5	1·0369277551433700
6	1·0173430619844491
7	1·0083492773819227
8	1·0040773561979443
9	1·0020083928260822
10	1·0009945751278180
11	1·0004941886041194
12	1·0002460865533080

The first line means that the sum of the series is infinite, but that the expression for a large number of terms contains the logarithm of that number, which being removed, the rest of the expression approximates as the number of terms increases, to ·577215....

5. The series $1^{-n}-2^{-n}+\dots$ is connected with $1^{n}+2^{n}+\dots$ by the following simple law:—

$$1^{-n}-2^{-n}+3^{-n}-\dots=\left(1-\frac{1}{2^{n-1}}\right)\left(1^{-n}+2^{-n}+3^{-n}+\dots\right)$$

6. The sum $a_0+a_1+a_2+\dots$ *ad infinitum* may be thus transformed:—

$$\int_0^\infty a_x dx+\frac{1}{2}a_0-\frac{1}{6}\frac{a'_0}{2}+\frac{1}{30}\frac{a'''_0}{[4]}-\frac{1}{42}\frac{a^{\text{v}}_0}{[6]}+\text{\&c.}$$

where the notation is as previously explained, and $\frac{1}{2}, \frac{1}{6}, \frac{1}{30}$, &c. are the series of NUMBERS OF BERNOULLI. To apply this, for example, to $1^{-2}+2^{-2}+3^{-2}+\dots$, it will be convenient to begin from some term which will make the series more convergent. Let $a_x=(10+x)^{-2}$: we have then for $10^{-2}+11^{-2}+\dots$ the following:—

$$\frac{1}{10}+\frac{1}{2}\frac{1}{10^2}+\frac{1}{6}\frac{1}{10^3}-\frac{1}{30}\frac{1}{10^5}+\frac{1}{42}\frac{1}{10^7}-\text{\&c.},$$

which may be easily calculated, and the preliminary series $1^{-2}+\dots+9^{-2}$ may then be added.

7. The finite series $a_0+a_1+a_2+\dots+a_{x-1}$ (x terms) is thus transformed (D. C., p. 266):—

$$\int_0^x a_x\,dx-\frac{1}{2}(a_x-a_0)+\frac{1}{6}\frac{a'_x-a'_0}{2}$$

$$-\frac{1}{30}\frac{a'''_x-a'''_0}{[4]}+\frac{1}{42}\frac{a^{\text{v}}_x-a^{\text{v}}_0}{[6]}-\frac{1}{30}\frac{a^{\text{vii}}_x-a^{\text{vii}}_0}{[8]}+\text{\&c.},$$

in which the detached coefficients are again the numbers of Bernoulli. Or, if the sum of the series *ad infinitum* be known, S, the preceding may be expressed as follows:—

$$S-\int_x^\infty a_x\,dx-\frac{1}{2}a_x+\frac{1}{6}\frac{a'_x}{2}-\frac{1}{30}\frac{a'''_x}{[4]}+\text{\&c.}$$

But when the complete series is divergent, the set of terms $a_0+a_1+\dots+a_{x-1}$ may be thus expressed:—

$$C+\int_0^x a_x\,dx-\frac{1}{2}a_x+\frac{1}{6}\frac{a'_x}{2}-\frac{1}{30}\frac{a'''_x}{[4]}+\text{\&c.},$$

where C must be determined by an instance. Thus if we make $a_x=(1+x)^{-1}$ we have for $1+2^{-1}+\dots+x^{-1}$ the following series:—

$$C+\log{}^{*}(1+x)-\frac{1}{2}\frac{1}{1+x}-\frac{1}{12}\frac{1}{(1+x)^2}+\frac{1}{120}\frac{1}{(1+x)^4}$$

$-$ &c.

Add $(x+1)^{-1}$ to both sides, and write $x-1$ for x, which gives for $1^{-1}+\dots+x^{-1}=$

$$C+\log x+\frac{1}{2x}-\frac{1}{12x^2}+\frac{1}{120x^4}-\text{\&c.}$$

To determine C, choose such a number for x as shall make this series convergent, say $x=10$. Calculate $1^{-1}+\dots+10^{-1}$, term by term, which is easily done, and equate the sum to

$$C+2{\cdot}302585093+\frac{1}{20}-\frac{1}{1200}+\frac{1}{1200000}-\text{\&c.},$$

which gives C=·5772156 ..., the number mentioned at the head of the table for series of inverse powers already given. With the value of C thus determined, and a sufficient table of logarithms, the larger the number of terms in $1^{-1}+\dots+x^{-1}$, the more easily is its approximate value calculated.

8. The series $\log 1+\log 2+\dots+\log x$ is of sufficient importance to have an article to itself. Make $a_x=\log(1+x)$, and proceed as in the last example, which will give for $\log(1.2.3\dots x)$ the following series:—

$$C+\log x.\,x-x+\frac{1}{2}\log x+\frac{1}{12x}-\frac{1}{360x^3}+\dots$$

C might be determined as before, but a particular mode of investigation shows it to be $\log(\sqrt{2\pi})$, where $\pi=3{\cdot}14159\dots$, as usual. This gives

$$1.2.3\dots x=\sqrt{2\pi x}\,x^x.\ \varepsilon^{-x+\frac{1}{12x}-\frac{1}{360x^3}+\text{\&c.}},$$

a result of the greatest use, particularly in the more complicated applications of the theory of probabilities.

9. The series $0^n+1^n+2^n+\dots+x^n$, in which $a_x=x^n$, n being integer and positive, is by the case of § 7, and adding x^n to both sides,

$$C+\frac{x^{n+1}}{n+1}+\frac{x^n}{2}+\frac{1}{6}\frac{nx^{n-1}}{2}-\frac{1}{30}\frac{n(n-1)(n-2)x^{n-3}}{2.3.4}+$$

&c.; but this vanishes when $x=0$, whence C must be taken accordingly in every instance. To take an example which shall require a little extension of the series beyond the terms used above, let it be required to find $0^7+1^7+\dots+x^7$. Looking at the article NUMBERS OF BERNOULLI, we find a supply of coefficients in

$$\frac{1}{6}\,\frac{1}{30}\,\frac{1}{42}\,\frac{1}{30}\,\frac{5}{66}\,\frac{691}{2730},$$

and the sum required is

$$C+\frac{x^8}{8}+\frac{x^7}{2}+\frac{1}{6}\frac{7x^6}{2}-\frac{1}{30}\frac{7.6.5\,x^4}{2.3.4}+\frac{1}{42}\frac{7.6.5.4.3\,x^2}{2.3.4.5.6}$$

$$-\frac{1}{30}\frac{7.6.5.4.3.2.1}{2.3.4.5.6.7.8},$$

which vanishes when $x=0$, whence

$$C+\frac{1}{30}\frac{7.6.5.4.3.2.1}{2.3.4.5.6.7.8}=0,$$

and the rest may be reduced to

$$\frac{x^8}{8}+\frac{x^7}{2}+\frac{7x^6}{12}-\frac{7x^4}{24}+\frac{x^2}{12},$$

or $(3x^8+12x^7+14x^6-7x^4+2x^2)\div 24$.

SUMACH. [RHUS.]

SUMAROKOV, ALEXANDER PETROVITCH, whose name was, after that of his contemporary and literary rival Lomonosov, almost the only one that, until of late years, was at all known in this country as that of a Russian poet, was born at St. Petersburg in 1718, and was the son of a general officer. He was educated first at home, and afterwards in the Land Cadet Corps, where he soon distinguished himself by his ability. The study of Corneille and Racine inspired him with a taste for dramatic composition; and at about the age of twenty-five he began to attempt it. His tragedies were at first performed at court before the empress Elizabeth, for there was then no public theatre, and as they satisfied the principal person, they were loudly applauded by the rest of the audience. This success encouraged Sumarokov, who was naturally of a vain disposition, and he determined to establish a permanent theatre in the capital; an attempt in which he was greatly aided by the influence of his father (Peter Pankratievitch), who, besides being a person of some consequence in other respects, held a post near the person of the grand-duke Peter. The result was, that the theatre was opened in 1756, under the immediate patronage of the court, and

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[*] The Naperian logarithm, which is always used in mathematical investigations, unless the contrary be expressed. It is 2·302585093 × comm. log.

Sumarokov appointed its director; whence he has been generally considered the founder both of the Russian theatre and the Russian drama. But dramatic entertainments were not totally unknown to his countrymen before his time, for they had been introduced at court at the close of the preceding century, and the scriptural pieces of Demetrius, bishop of Rostov, had been performed (b. 1651, d. 1709). At the very time too that Sumarokov was organising his plans, there was not only a small theatre at Yaroslav, but it was thence that he obtained his chief performers, including the celebrated Volkov [VOLKOV] and Dmitrevsky, who afterwards obtained the appellation of the Russian Garrick.

Still, if not literally the originator, Sumarokov may be regarded as the founder of the drama in Russia: he brought it at once to comparative perfection; and frequently approached and perhaps would have surpassed his models, if he had not allowed himself to be trammelled by them, and if he had not, while aiming at the merits, adopted all the defects, the conventionalities, and rigorous poetical etiquette of the French stage and its rhymed Alexandrine versification. Among his tragedies, his 'Semira,' and 'Sinov and Truvor,' are his best and most original productions, notwithstanding they are not, like his 'Demetrius,' on the list of acting pieces. As a comic writer, he hardly deserves mention, for his dramas of that class are little more than farces, occasionally coarse in expression, but less gross and less immoral than many comedies that, being less indelicate, are tolerated as decent. They have one merit, that of setting the example of prose dialogue as the most suitable for the drama of ordinary life: but their language is now become quite antiquated: a disadvantage more sensibly felt in Sumarokov's prose than in his poetry. There are indeed many exceedingly beautiful passages in his tragedies; so poetical in sentiment, and so felicitously turned, that they hardly suffer at all by comparison with any specimens of Russian poetry at the present day. Sumarokov attempted not only every species of the drama, including operas, but almost every form of poetical composition. He versified the 'Psalms' in ten books, and wrote a vast number of odes, satires, epistles, fables, eclogues, elegies, sonnets, epigrams, songs, and other pieces, besides several in prose, including some historical and didactic ones, and his 'Dialogues of the Dead,' &c. The first complete edition of his works was published in ten volumes, 8vo., in 1787, ten years after his death, which happened at Moscow, October 1, 1777. If no longer read, Sumarokov is certainly not forgotten, for he is one of those who have earned for themselves a traditional fame in literature that very long survives their works.

(Gretch, *Opuit Istorii, &c.*; *Otetchest. Zapiski.*)

SUMATRA is a large island in the Indian Ocean, and the most western of the Sunda Islands. The equator traverses the island nearly in the middle. Sumatra extends full six degrees to the south of that line, and nearly as much to the north. The most western point, Acheen Head, is in 95° 20′ E. long., and the most eastern part, the coast between Lucepara Point and the First Point at the southern entrance of Banca Strait, is in 108° E. long. The general direction of the island is nearly north-west and south-east, and its length rather exceeds 900 miles. The width south of 1° N. lat. is on an average 210 miles, but farther north not more than 140 miles. According to a rough estimate, its area is rather more than 160,000 square miles, exceeding by more than 40,000 square miles, or one-third of their surface, the extent of the British Islands.

The south-west side of Sumatra is bounded by the Indian Ocean; the northern part stretches into the Bay of Bengal; to the north-east it is divided from the Malay Peninsula by the Straits of Malacca. Between the southern extremity of these straits and the Island of Banca, it is washed by the Chinese Sea. It is divided from Banca by the Strait of Banca. The coast south of that strait is washed by the Java Sea, and its southern extremity is separated from Java by the Straits of Sunda.

Coast.—Sumatra terminates at the southern extremity on the Straits of Sunda in three promontories, including the bays of Lampong and Samangka; the latter is also called Keyser's Bay. The capes are called, from east to west, Tanjong Toca, or Hog's Point, Tanjong Kamantara, and Tanjong China. The two first-named capes are formed by rocks of moderate elevation, but the last is the eastern extremity of a low and woody tract which extends about seven miles westward to Flat Point, which is likewise low. The two bays lying between these capes, and containing several good and safe anchorages, are generally surrounded by a low tract, which however rises rapidly at a short distance from the sea, and soon attains the elevation of mountains.

The south-western coast from Flat Point to Manna, a distance rather exceeding 150 miles, rises with a steep ascent and generally to a considerable elevation. There are several indentations along it, but they are not deep, and are open to the surf so as to be unfit for vessels, with the exception of Croi and Cawoor, which are rather small. Along this part of the coast soundings are only found at a short distance from the shore. From Manna to Bencoolen, which are about 60 miles distant from each other, the coast continues to be high, and the cliffs descend with a gentle slope, so as to leave a narrow beach, which near Manna is more than half a mile wide for ten miles. There are several tolerably good harbours, as at Manna and Poolo Bay. The coast is clear of rocks, and there are only a few shoals. The soundings are regular, and extend from 20 to 25 miles from the coast. From Bencoolen to Tapanooly Bay, a distance of about 450 miles, the coast-line is alternately low and high, but the cliffs are of moderate elevation, and not often steep. This part of the coast, especially from Indrapura to Tapanooly, is lined with a considerable number of islands, most of them rather high, and in many places shoals of some extent occur. Though these islands and shoals render the navigation difficult, they protect the shipping against the tremendous surf to which the south-west coast of Sumatra is exposed, and make numerous good anchorages. Soundings are found almost everywhere, but in some places they are irregular. Though rather numerous, the headlands do not project far into the sea: good anchorage is found in their vicinity, and between them are several good harbours. Tapanooly is so large and spacious, and possesses so many advantages, that it is considered as hardly surpassed by any harbour on the globe: many small islands are dispersed over it, and subdivide it into numerous smaller harbours or coves, where ships are sheltered from all winds. It is said that all the navies in the world might ride here with perfect security in all weather. The coast continues to be lined with small rocky islands as far as Passage Island (2° 22′ N. lat.), north-west of the mouth of Singhel river. But north of Tapanooly Bay the coast-line is low and generally with a sandy beach, and thus it continues to the vicinity of Acheen Head, a distance of more than 300 miles. There occur several good harbours, sheltered from all winds; and as the surf in these parts is less violent, they supply good anchorage. The soundings are regular. Along these coasts there are also some small rocky islands, but they are less numerous than south of Passage Island.

Between 3° N. lat. and 3° S. lat., a chain of larger islands stretches parallel to the coast from north-west to south-east, at the distance of 60 or 70 miles. The sea between this chain of islands and Sumatra has soundings, but outside of the islands no soundings have been obtained. Between some of these islands there are safe channels. No coast perhaps is exposed to a more tremendous surf than the south-west coast of Sumatra, especially that portion of it which is south of the equator. This surf is very remarkable on account of its irregularities, for which no sufficient reason has been discovered. It seldom preserves the same degree of violence for two days together; often it rises like mountains in the morning and nearly subsides by night. It does not seem to be influenced by the winds, though it is much stronger during the south-eastern than during the north-western monsoon. Generally no landing can be effected in European boats, but only in catamarans. The spring-tides along this coast are estimated to rise four feet; the smallness of this rise is attributed to the open and unconfined situation of the coast, which prevents any accumulation of the tide, as is the case in narrow seas.

The north coast of Sumatra, between Acheen Head and Diamond Point, is called the coast of Pedir, and extends about 150 miles. The whole of this coast is high, and mostly steep, especially in the middle near Possangan Point. The sea is clear of rocks and shoals, and deep. At the distance of from 12 to 15 miles there are no soundings, and anchorage is seldom found farther than 6 miles from the beach. Most of the harbours are open roadsteads, but otherwise the anchorage is good.

The north-eastern coast of Sumatra, from Diamond Point to the mouth of the Rakan River, a distance of about

300 miles, is low, but well defined. North of Delli it is lined with sand-banks, and south of that place with mud-banks, which are traversed by a narrow channel, through which the rivers reach the sea. Along this coast the spring-tides rise from 8 to 10 feet. To the east of the mouth of Rakan River lies a headland, called Onjong Perbabean, to the north-west of which a mud bank extends about 11 or 12 miles. In this part the navigation of the Malacca Strait is very dangerous, as various sand-banks extend across it, with gaps and narrow channels of mud-soundings between them. Farther south is the Island (Pulo) of Rupat, extending about 25 miles in every direction. The Salat Rupat, or strait, which divides this island from the main body of Sumatra, admits only small vessels.

Between 1° 36′ and 35′ N. lat. there are three large islands, called Bacalisse, Padang, and Rankan, which are divided from Sumatra by Brewer's Strait, or Salat Panjang. This strait is from 1 to 5 miles wide, but navigable for large vessels. The strait dividing Bucalisse from Padang is called Salat Padang, and that which runs between Padang and Rankan is Salat Ringit: both of these can only be used by boats. The coast-line of these islands and that of Sumatra in these parts is low and generally swampy. In Brewer's Strait the spring-tides rise 15 feet.

South of the southern extremity of Brewer's Strait, as far as the Strait of Banca, and along the western shores of this strait to Cape Lucepara, the coast-line of Sumatra is exceedingly low. A great part of it is inundated at high-water, and it is surrounded by shoal mud-banks, which extend in some places from 2 to 3 miles from the shore. From Lucepara Point to the eastern entrance of the Strait of Sunda, the coast-line is likewise low, but well defined: it is lined with shoals and mud-banks, which run out from 7 to 10 miles from the shore in some places.

Physical Regions, Surface, Soil, Climate, and Productions.—The north-eastern side of Sumatra is a low and level plain; the south-western is either mountainous or hilly. On looking at our maps, one would suppose that each of these two regions occupies one-half of the island; and so it may be: but it must be borne in mind that no European traveller has advanced from the north-east shores far enough inland to reach the base of the mountains; nor has any one, after departing from the south-western coast and traversing the mountains, descended into the plain, with the exception of an officer under the administration of Raffles, who went from Bencoolen to Palembang; but as no account of his journey has been published, the line which divides the two great regions is not known, except where it borders on the sea.

The *Mountain Region* begins on the shores of the Straits of Sunda, with the elevated promontories of Tanjong Toca and Tanjong Kamantara. At a short distance from the first-named cape, and near the eastern shores of Lampong Bay, is the Raja Bassa Peak, which is about 1600 feet high. This mountain-summit is connected with the extensive mountain-masses which separate Lampong Bay from Samangka Bay, and on which the Keyzer's Peak probably rises to 5000 feet. Another range of mountains, which rises at the back of the flat tract between Tanjong China and Flat Point, runs north-west, and joins the great mass north of the innermost recess of Samangka Bay. The mountain-region thus formed seems to occupy between 6° and 4° 30′ S. lat. a tract exceeding 40 miles in width, if we include the lower ridges, which come close to the shores of the Indian Ocean. In this part of the mountain-region the watershed of the rivers, which flow eastward and westward, is at no great distance from the shores; and the rivers which descend from it to the Indian Ocean are only torrents, rushing down with incredible velocity during the rainy reasons, and destitute of water the remainder of the year. The country along the sea is a succession of high hills and narrow valleys, very little cultivated, and very thinly inhabited. It produces however much pepper. The ridge which forms the watershed does not appear to rise to a great elevation. East of this range a much more elevated chain of mountains occurs at about 20 miles from the shores of the Indian Ocean. It is however much more broken, as all the waters collected in the intermediate space break through it, and find their way to the eastern plain. Some of the summits are visible from the sea. Several ridges which detach themselves from these masses run eastward, and extend to a considerable distance into the eastern plains. The space enclosed by the two parallel ridges is an elevated table-land, the surface of which is very broken and hilly; and it contains several large lakes, as those of Ranan and of Lukitan. The level undulating country which surrounds these lakes is of great fertility, well cultivated, and comparatively well settled. It produces pepper, cotton, indigo, tobacco, sugar-cane, maize, rice, sweet potatoes, and several other roots; and also plantains and pine-apples. Gold is said to exist in this region. The numerous rivers which flow eastward constitute the principal branches of the two large rivers Tulan Booang and Palembang.

The central mountain-region may be considered as extending from 4° 30′ S. lat. to Tappanooly Bay, or 1° 40′ N. lat. It contains the highest ranges in the whole system, and occupies a much larger tract in width than the other portions of the mountain-region; but the mountains do not advance close to the shores of the Indian Ocean, being divided from it by a comparatively low tract, generally 20 miles in breadth, in some places less, and in others widening to 30 miles. This lower tract we are better acquainted with than any other portion of Sumatra, as several European settlements have existed here for two centuries. The surface of this tract, as Marsden says, is intersected and rendered 'uneven to a surprising degree by swamps, whose irregular and winding course may in some places be traced in a continual chain for many miles, till they discharge themselves either into the sea, some neighbouring lake, or the fens that are commonly found near the banks of the larger rivers, and receive their overflowings in the rainy monsoon. The spots of land which these swamps encompass become so many islands and peninsulas, sometimes flat at top, and often mere ridges, having in some places a gentle declivity, and in others descending almost perpendicularly to the depth of a hundred feet. In few parts of the country of Bencoolen, or of the northern districts adjacent to it, could a tolerably level space of 400 yards square be marked out. The hollows and swellings are for the most part smooth and regularly sloping, so as to exhibit not unfrequently the appearance of an amphitheatre; and they are clothed with verdure from the summit to the edge of the swamp. Many of the swamps have no apparent outlet.' Marden attributes this surprising irregularity of surface to the springs of water with which these parts of the island abound. The general level of the country rises very gradually to the base of the mountains, where the ascent is very abrupt and rather steep. The soil consists of a fine red vegetable clay, covered with a layer of black mould of no considerable depth. Few stones are found in it. The whole region, except the small isolated spots which are cultivated, is either covered with rank grass, brushwood, or timber-trees, according as the country has remained uncultivated a longer or shorter time. To the south of Bencoolen it is almost an impervious forest. No country is better supplied with water than this part of Sumatra. Springs are abundant, and the rivers are very numerous. Though the course of none of the rivers perhaps exceeds 50 miles, and their upper part is full of shoals and cataracts, they are usually navigable for small craft from the point where they enter this low tract to their mouth. But all these rivers have a bar across their embouchure, the effect of the surf which breaks along this coast-line.

There are only two seasons, the dry and wet, and they are regulated by the monsoons. In most parts of India to the north of the equator the north-east monsoon prevails when the sun is in the southern hemisphere, and the south-western when the sun is in the northern hemisphere [MONSOON]; but on this coast of Sumatra the monsoons are changed by the direction of the land, the north-eastern into a north-western, and the south-western into a south-eastern monsoon. The south-eastern monsoon begins about May and leaves off in September; the north-western monsoon begins in November and blows to the end of March. These winds for the most part commence and leave off gradually; and in the intervening months, April and May, October and November, the weather and winds are variable and uncertain The south-eastern monsoon blows with great force and steadiness from the end of June to late in September; and during this period rain seldom falls, except in showers, and generally in the night. When the north-west monsoon is strongest, from November to January, the rain is abundant, though in a much less degree than on the coast of Coromandel. The rains do not sensibly abate until March. The quantity of rain which falls annually has not been determined. Thunder and lightning are very frequent. In the south-east monsoon the lightning is more constant; but the coruscations are less vivid, and the thunder is scarcely audible. The atmosphere is generally more cloudy than in Europe, which is perceived from the unfrequency of clear star-light nights. The fog, which is observed to rise every morning among the distant hills, is dense to a surprising degree, and it seldom disperses till about three hours after sunrise. When the monsoons are in full strength, they commonly pass over the country; but when they abate, and during the intervals, sea and land breezes prevail. The sea-breeze sets in between nine and ten o'clock in the morning, subsequent to a calm, and declines with the setting sun; the land-breeze begins early in the night, and continues till eight or nine o'clock in the morning. The sea-breezes are regular and steady; but the land-breeze is subject to many irregularities, especially during the north-west monsoon. The land-breezes are rather cool, a circumstance which influences the temperature of the night. The heat in the day-time is considerable, but rather less than might be expected near the equator. At Bencoolen the thermometer never rises above 86°, and even at Natal not above 88°: at sun-rise it is usually as low as 70°, on account of the cool land-breeze which descends from the mountains, covered with clouds, and bathed in constant vapours or rain. The mean annual temperature is probably between 82° and 83°. As this region is traversed by the equator, the temperature is nearly equal all the year round.

Although the country is thinly inhabited and ill cultivated, except near the European settlements and a few ports which are visited by traders, it produces several articles of export, as pepper, camphor-barus, gold-dust, ivory, and benzoin; but only the first and the last are obtained within this lower tract; the others are brought from the country at the back of it. The soil is indeed not distinguished by fertility, but when cultivated it produces rice, maize, tobacco, cotton, indigo, sugar, coffee, and the most exquisite fruits of the Indian Archipelago, as the mangusteen, durian, jack-fruit, plantains, oranges, and others, with several roots which are used as food.

The mountain-region which lies at the back of this low tract has only been partially explored by Europeans. It appears to be traversed by three, and in some parts by more than three, ranges, running parallel to the coast in the direction of the island from south-east to north-west. The two most western ranges run at a short distance from one another, and the most eastern of them constitutes the watershed of the rivers which flow east and west. The country east of this last-mentioned range, which occupies the greater part of the mountain-region, is partly occupied by mountain-masses, enclosing wide valleys, and partly extends in plains of a hilly surface. This region contains several volcanoes, which may be considered as the connecting link between the chain of volcanoes which traverse Java and the Lesser Sunda Islands [Sunda Islands], and those which extend northward through the Bay of Bengal, over Barren Island and Narcondom, to the coast of Aracan, and of which traces have been found as far north as the Tipperah Mountains. [Silhet.] The most southern of the volcanoes in Sumatra, Gunong Dempo, which is known, is near 3° 40′ S. lat. Its three peaks rise to about 12,000 feet above the sea, and are always enveloped in smoke. A volcano of moderate elevation occurs about 30 miles east of Bencoolen, which made an eruption about a century ago, and emitted smoke for a long time. Near 1° 30′ S. lat. is the volcano of Gunong Api, or Berapi, which rises to a great elevation. In the elevated mountain-masses which enclose the table-land of Menangcabau on the north are the volcanoes of Berapi, 13,195 feet above the sea, and the Gunong Sinkalang, which is 12,468 feet high. They lie near 9′ S. lat., east and west of one another. Mount Ophir, or Gunong Pasaman, which is near 5′ N. lat., and 13,850 feet above the sea, has also the form of a volcano, but is not active. The most northern of the volcanoes of Sumatra is the Batagapit, which is near 3° 42′ N. lat., in the eastern range of the mountains.

Several parts of this region have been visited, as the wide valley of the river Musi, between 3° and 4° S. lat., the country of Sungei Tenang, between 2° and 3° N. lat., and the country of the Korinchi, north of 2°; and it was found that the western mountain-ranges and their declivities and valleys were nearly uninhabited, but that the valleys and plains of the central portion of the mountain-region exhibited a considerable degree of agricultural industry, and were rather well peopled. Pepper plantations are frequent and extensive; maize is grown to a great extent, and also sweet potatoes and tobacco. Near the lakes, as near that of Korinchi, or St. George's Lake, there are rice-fields. Indigo, cotton, and sugar-cane are also cultivated. The mountains which separate these cultivated tracts from the Indian Ocean attain a great elevation, as appears from the thermometer descending here in the night-time to 40°. The most remarkable of these countries enclosed within the mountain-region is that of Menangcabau, which extends from 1° S. lat. to near the equator. It is a plain, extending about 50 miles in every direction, and surrounded by high mountains. The ranges which lie west of it, and separate it from the lower tract along the Indian Ocean, are only from 5500 to 6500 feet high, but those which lie south of it are much higher: one of the summits, the Buckit Talang, is 10,032 feet above the sea-level. The range which lies east of the plain contains no lofty summits. But on the north-east stands the mountain-mass of the Kasumba, the highest mountain in Sumatra, which rises to about 15,000 feet above the sea-level, and west of it are the volcanoes of Berapi and Sinkalang. The surface of the plain is rather hilly and broken than undulating, and the lowest part of it is occupied by the lake of Sincara, which is 1035 feet above the sea-level. The whole country is one continued scene of cultivation, interspersed with numerous towns and villages shaded by the cocoa-nut and fruit trees. It is not inferior to the best-cultivated parts of the Island of Java; and Sir Thomas Raffles thinks that the population cannot be less than a million. Every kind of grain, fruit, or root cultivated in any part of Sumatra is grown here in abundance, and the people apply themselves also to manufactures. The waters which descend from the neighbouring mountains to the lake of Sincara are carried off by a river called Ambilang, the most remote source of the river Indragiri, which falls into the China Sea between 0° and 30′ S. lat. It is thought that it might be used as a channel of conveyance from the place where it issues from the lake to its mouth.

The plain of Menangcabau, not being greatly elevated above the level of the sea, does not materially differ in climate from the lower country along the shores of the Indian Ocean; but other parts are more elevated, and beyond the most western ridge the temperature is much lower, so that the inhabitants light fires in the morning and continue them till the day is advanced. To this cold the backwardness in the growth of the cocoa-nut is attributed, which is sometimes 20 or 30 years in coming to perfection, and often fails to produce fruit.

The northern part of the mountain-region, or that which extends from 1° to the most northern extremity of the island, contains a low plain, which lies along the Indian Ocean, and may be about 10 or 12 miles in width, and rather a hilly tract, which lies at the back of the plain, and is about 25 miles across. The plain is generally low and level. Along the coast it is chiefly covered with jungle, but farther inland with high forest-trees. The greater part of it is uncultivated, and very thinly inhabited. Between the plain and the mountain is a tract of very broken surface, full of steep rocks and covered with woods, but uninhabited. The mountain-tract is traversed in the direction of the island by three or four ridges, which occupy only a small width and are separated by extensive plains. None of the mountains are visible to a great distance from the sea. The central ridge seems to rise to the greatest height, and at its most northern extremity, south-east of the town of Acheen, is the Queen's Mountain, whose summit is at least 6900 feet above the sea-level. The most southern ridge terminates in Acheen Head, a bluff but not very lofty promontory. The ridges themselves are overgrown with forests, in which the camphor-tree is frequently met with south of 3° S. lat., and also the cassia-tree, and the tree from which benzoin is obtained. The plains in some places are level, and in others full of small hills, but the whole country is cleared, and either planted with rice and maize, or used as pasture-grounds for buffaloes, cattle, and horses. Pepper plantations are very numerous in these plains, and they occur also frequently in the low tracts along the sea. The watershed in this region is generally formed by the eastern ridge of mountains, and consequently the rivers which drain the plains and longitudinal valleys have a longer course and are less rapid than farther south, and are used for inland navigation. One of the plains between the mountains is occupied by a large lake, the Laut Ayer Tawar lake, which, according to the information obtained from the natives, is of great extent, but it has never been seen by a European. The coun try about the lake is said to be in a high state of cultivation. The climate of this region differs in one respect materially from that south of the equator. The dry season does not take place during the south-eastern, but during the north-western monsoon, as is the case on the coast of Malabar, but showers occur frequently during the dry season.

The hilly tract which extends along the north coast of Sumatra, from the valley of Acheen and Queen's Mountain on the west to Diamond Point on the east, a distance of about 130 miles, may be considered as an appendage of the mountain-region. From the high coast which bounds the sea the country rises gradually to the south with an undulating, and, in some parts, hilly surface, until it attains an elevation of about 1000 feet above the sea. The highest part of this tract lies at the back of Pasangam Point, where, at the distance of 10 miles, an abrupt conical peak, called Elephant Mountain, rises to a considerable elevation. West of Pasangam Point the country is less elevated, and Diamond Point is quite low, but the tract behind it is a table-land of moderate elevation. The climate of this country rather resembles that of Hindustan than that of the western coast. The monsoon blows from south-west from May to October, and during its strength, from May to September, the weather is very cloudy and much rain falls, but only in showers. At the change of the monsoon, in October and November, westerly winds prevail and little rain falls. The dry season takes place during the north-east monsoon, which regularly sets in towards the end of November, and blows steady to March. Towards the end of March the north-eastern winds are light and very variable, and so they continue in April. As the rains are not continual, and moderately abundant, and the soil is light and mixed with sand, it quickly absorbs the moisture. Consequently no rivers are formed by the rains, and as the slope of the eminences is very gentle and regular, no swamps are produced, which renders the climate of this tract more healthy than that of the other parts of Sumatra. The soil is tolerably fertile, and produces abundance of rice, much of which is exported, cotton and the finest tropical fruits, such as the mangusteen, mango, and jack, with several esculent vegetables. Cattle, horses, and goats are numerous. The principal commercial productions are betel-nuts and pepper. The country is well cultivated and rather populous.

The *Great Plain*, which extends over the eastern and probably greater part of Sumatra, from Diamond Point to Tanjong Toca, presents only some variety along the coast, but as far as the interior is known it has a nearly uniform character. The northern part of it, as far south as the mouth of the Rahan river, though low, is sufficiently elevated above the level of the sea to be out of the reach of its inundations at spring-tides. The surface is level, or rather slightly undulating. The rivers which traverse this tract have not a long course, but several of them form tolerable harbours at their mouths, though they are rather difficult of access on account of the sand or mud banks between which their entrances generally lie. The country is rather fertile, and its northern districts are tolerably peopled and cultivated. It produces a large quantity of pepper, gambier, tobacco, and rice, with several fruits and vegetables, but is deficient in domestic animals.

The central portion of the plain, extending from Rahan river to Lucepara Point, is extremely low along the sea-coast, and a large portion of it is covered with water at spring-tides, and thus converted into a large swamp. This swamp is thickly wooded, and resembles in every respect the Sunderbunds in Bengal. It is uncultivated, and nearly uninhabited, except by some straggling families on the banks of the rivers. This low inundated tract extends from 10 to 30 miles inland. At the back of it the country rises with a moderate elevation and stretches out into a level plain to the base of the mountain-region. It is traversed by several large rivers, which on entering the low part of the country expand to a great width. They are navigable to the places where they leave the mountain-region, and in some cases even before they issue from its valleys. The more elevated portion of the country resembles in soil, fertility, and productions the country north of Rahan river. The cultivation of coffee was introduced some thirty years ago, and coffee now constitutes one of the most important articles of export. The country is tolerably well peopled.

The southern part of the plain, or that which fronts the Java Sea between Lucepara Point and Tanjong Toca, is less known than any other part of Sumatra near the sea. Though low, it seems to be sufficiently elevated to be beyond the reach of the inundations at high tides. Towards the interior the land rises, but the rivers, and among them the large river Tulan Boong, run through a wide depression, which during the rainy season is entirely covered with water by the inundation of the rivers. The productions of this tract have not been noticed.

The distinction of dry and wet seasons can hardly be applied to this plain. Neither the north-east nor the south-west monsoon is felt in all its force. The south-west monsoon is repelled from it by the mountain-region, which shelters the plain in that direction, and the influence of the north-east monsoon is broken by the range of high lands which traverse the Malay peninsula from north-north-west to south-south-east. The prevailing winds from March to September are the land and sea breezes, which are usually steady in the night, but faint and frequently interrupted by long calms in the day. Sometimes light winds varying between south-east and south-west are experienced, which may be considered as the effect of the south-west monsoon. In this season the Sumatras, as they are called, blow, especially in the first part of the night. They are sudden squalls, sometimes extremely severe. They come from the west, and are accompanied with tremendous thunder and lightning and heavy rain. The north-westers, which are less frequent, are likewise severe at the beginning, but they soon abate. The greatest quantity of rain falls in this season. The north-east monsoon is somewhat more regular, only interrupted by the land and sea breezes. Calms are less frequent than in the south-west monsoon, and the breezes are steady. The weather is much more settled, and thunder and rain less frequent, but still sufficiently abundant to render artificial irrigation unnecessary for agricultural purposes. The heat in summer is great, and at that period the air is saturated with moisture. In the dry season, on the other hand, it is moderated by the steady breezes. Though no meteorological observations have been made on this part of Sumatra, it is well known that the range of the thermometer is comparatively small, and it is supposed that it hardly exceeds 15° in the whole year. The climate is considered unhealthy for Europeans, especially along the southern low and swampy coast.

The islands which lie near the north-eastern coast of Sumatra, within the Strait of Malacca, are uniformly low, and their soil appears to be chiefly composed of alluvium. But the south-western coast of the island, between 3° N. lat. and 3° S. lat., is fronted by a chain of islands distant from it a little more than a degree. As they are of a different description, they require a short notice.

The most northern is called by our navigators Hog Island, by the Malays Pulo Babi, and by the natives Si Malu. It extends nearly north-west by west and south-east by east about 50 miles, and is about 10 or 12 miles broad, high, hilly, and covered with trees. The highest land probably does not exceed 1500 feet above the sea-level. Buffaloes and hogs are met with here in great plenty. No safe anchorage is known, and the island is seldom visited.

Pulo Nias, the largest island of this chain, extends nearly in a south-east direction about 70 miles, with an average width somewhat exceeding 18 miles. Many small islands line its shores, and the coast is generally steep. The land is usually high, well clothed with trees, and partly cultivated by the natives with rice. The inhabitants are very numerous, which may be inferred from the circumstance that formerly 1500 of them were annually sold as slaves, most of whom were sent to Batavia, where the females were held in high esteem on account of their great docility and talents. When the English were in possession of the western coasts of Sumatra, this traffic was put down, and it is not stated that it has been revived by the Dutch. Pulo Nias produces rice, yams, and beans for exportation, also poultry, buffaloes, cattle, and goats in abundance. It has several good harbours, as Seirombo on the western, and Tello Dalam, at the southern extremity.

Pulo Batu, commonly called Pulo Mintao, extends north and south about 48 miles, and is about 16 miles wide. It is situated immediately south of the equator. The land is moderately elevated, hilly, and the shores on both sides lined by many small islands, with a moderate depth of water around them, so as to form safe bays or harbours, which however are little known to Europeans. Only the northern part of the island is inhabited. It produces sago, cocoa-nuts, hogs, poultry, and trepang. Dammar, cocoa-nuts, cocoa-nut oil, and trepang are exported to Padang.

Si Beeroo, or North Porah, called Great Fortune by the Dutch, extends nearly north-west and south-east about 80 miles, with an average breadth of 12 miles. It is generally high land, covered with wood, higher in the middle than towards the extremities. Marsden says that this island contains a volcano. We find nothing noticed respecting its productions. Between this island and South Porah is Seaflower's Channel, which is more than eight miles wide, free from danger, and at present much used by vessels bound to Padang and Bencoolen.

Si Porah, or South Porah, extends from north-west in a direction nearly south-east, about 36 miles in length, and is nearly 18 miles wide at the northern part, but decreases gradually to the southern extremity. There are three good harbours on the east side, Hurlock's Bay, Si Ooban Bay, and Si Labbah Bay. It is also hilly, but less elevated than Si Beeroo. The highest land is near Si Labbah Bay. The western side is very rocky, and the sea breaks high upon the shore: it is destitute of inhabitants. The eastern side is thinly inhabited, and produces sago, yams, and cocoanuts, with hogs and poultry.

Between this island and North Poggy is Nassau Strait, which is about 10 miles wide, and very safe. Then follow North and South Poggy islands. [NASSAU ISLANDS, vol. xvi., p. 93.]

At a great distance to the south is Engano Island, which has a triangular form, and is about 24 miles long and 18 broad in the widest part. It is moderately elevated, but when viewed from a distance has a level appearance. It is protected by a rocky shore. On the east side is an anchorage, but landing is very difficult. The inhabitants are much averse to any intercourse with foreigners. They speak a language quite different from that of the other islands and of Sumatra. They have neat canoes formed of two planks fastened together.

In the long and wide strait which separates the chain of islands just noticed from the main body of Sumatra, are the Baniah Islands or Pulo Bania (*i.e.* many islands), which consist of two principal islands a little separated, one lying to the eastward of the other, with several small ones contiguous to them. On the most northern island is a peak like a sugar-loaf, but otherwise this group is not much elevated above the sea, though rocky. These islands produce chiefly trepang and edible birds'-nests.

According to Marsden, these islands, with the exception of Engano, whose inhabitants seem to belong to another race, are occupied by two nations, both of which belong to the race of the Malays, but considerably differ in stature and language. The inhabitants of the islands north of 1° S. lat. are called Maruwis. Their complexions, especially in the women, are lighter than those of the Malays; they are smaller in their persons and shorter in stature; their mouths are broad, noses very flat, and their ears are extended in length in an extraordinary manner. They are, as already observed, remarkable for their docility and expertness in handicraft work, and soon become excellent carpenters and joiners. Their language has a radical affinity to that of the Battas in Sumatra, and they are Mohammedans. The nation inhabiting the islands south of 1° S. lat. are called Pagi, and are heathens: they are noticed under NASSAU ISLANDS [vol. xvi., p. 94].

Rivers.—The most important of the rivers which drain the south-west coast, which are navigated by small craft to some distance from their mouth, are from south to north as follow:—the Kataun (3° 20′ N. lat.), the Ipoo (3° 5′ S. lat.), the Indrapura (2° S. lat.), the Tabuyong (40′ N. lat.), the Batang Tara (1° 25′ N. lat.), and the Sinkel. The last-mentioned river is much the largest on this coast, and its course considerably exceeds 100 miles. It rises 30 miles from the sea, and flows through a wide valley nearly parallel to the shore for more than 70 miles to the south-east, when it bends to the south and enters the low country, where it is joined by the Sikeri about 20 miles from its mouth, which is near 2° 18′ N. lat. It is navigable for the greater part of its course for boats, and up to its confluence with the Sikeri the river is deep enough for vessels of considerable burden, but the bar at its mouth is dangerous, not having more than six feet of water at low-water, with a rise also of about six feet.

The rivers which rise in the mountain-region, and, traversing the eastern plain, fall into the Straits of Malacca and Banca, or into the China Sea, are larger and much better adapted for inland navigation. The most northern of them is the Delli river, which reaches the sea in 3° 46′ S. lat. Its mouth is a quarter of a mile wide, and has two fathoms depth at its bar at low-water, so as to admit vessels of moderate size. This depth continues for some distance from the sea, but the river then divides into several branches hardly deep enough for boats. The Battoo Barra river enters the sea in 3° 13′ N. lat., and forms a small harbour at its mouth only accessible for small vessels. The Assahan river, which falls into the sea near 3° N. lat., has a much longer course, and forms at its mouth a harbour for small vessels, which however is difficult of access on account of the mud-banks that surround it.

The Rakan river is rather a wide æstuary, which receives two considerable streams, than a river. The upper part of these two rivers, of which the southern and larger is called Sanahputeh river, is not known; but they must have a long course, for at their confluence, which is more than 30 miles from the sea, they are about a mile and a half wide. The river formed by their confluence is about two miles wide, and continues so for several miles, when it enlarges to four miles, and where it reaches the sea it is 15 miles wide. At its mouth there are two low and woody islands, between which is the entrance to the river. The navigation of this river is very dangerous, on account of the excessive rapidity of the tides, which run seven miles an hour, have a rise and fall of 30 feet, and produce a very high bore, by which the depth of the water is increased from four feet to two fathoms and a half in less than a minute. The river is almost dry at low-water of spring-tides.

The Siack river, which runs more than 200 miles, measured along its course, rises in the mountain-region, and probably on the northern declivity of Mount Kasumba or in its neighbourhood. It becomes navigable for boats before it issues from the mountains at Patapahan, and where it enters the plain the sloop navigation begins, which continues uninterrupted to its mouth. In this way the gold which is collected in the mountains of Menangcabau is brought to the Strait of Malacca. The river is comparatively narrow, for even at its mouth it is only three-quarters of a mile wide, but it is very deep. The entrance of the river also is narrow, as a sandy spit, which is nearly dry at low-water, extends almost across it, but otherwise it is safe and deep. It falls into Brewer's Strait, and this probably is the reason why it has no bore, like the other rivers along the north-eastern coast of Sumatra. The tides rise about 12 feet at full and change, and their velocity is about two miles and a quarter per hour.

The Kampar falls into the Strait of Malacca at its most southern extremity, nearly opposite the Strait of Singapore. Its upper course lies within the mountain-region, or at least it drains a hilly country, which may be inferred from the great quantity of coffee which is brought down the river and sent to Singapore. It is said to be formed by two large branches, which unite near its mouth, and each of these branches runs for twelve or fourteen days' journey through a well-cultivated country studded with villages, and is navigable for large boats. The harbour at the mouth of the river is not much visited by European vessels, on account of the velocity of the tides, which rise 15 feet, and run from four to six miles per hour. They produce a considerable bore. The coffee and other articles of trade are brought from this river to Singapore by the Malays in boats of 50 to 200 pekuls burden, which is equal to from 4 to 16 tons.

The next river is the Indragiri, which falls into the Strait of Durian opposite the island of Lingin, and appears to be still larger than the Kampar or the Siack river. It rises in the centre of Menangcabau, in the lake of Sinkara, a little more than 1000 feet above the sea-level, and runs about 100 miles within the mountain-region in a south-eastern direction. Its exit from that region is marked by a cataract near a place called Saluka. It is not known whether the river is navigated above the cataract, but probably it is so, for large boats from 5 to 20 tons burden are used below it. At Lubok Ramo-ramo, about 60 miles lower down, the sloop-navigation begins, and is not interrupted. The mouth of the river is very wide, but subject to a very dangerous bore: it is rarely visited by European vessels, but the Malays bring from it great quantities of rice to Singapore. The whole course of the Indragiri probably is not less than 300 miles.

The Iambie river drains a great extent of country: according to the best maps, all the waters from the eastern part of the mountain-region between 1° and 2° 30′ S. lat.

find their way to it. One of its upper branches rises in St. George's Lake, in the country of the Korinchi. The several branches which flow from the mountains unite nearly midway between the mountains and the shore, about 100 miles from the mouth of the river. To this place large vessels may ascend, or at least to the town of Iambie, which is 60 miles from the sea. Below the town the river divides into two arms, which unite about 30 miles lower down, and enclose an island about 10 miles wide. Not far from the place where the river begins to run in one channel it divides again into two arms, which enclose a large delta. The western arm is called Qualla Nior, and the eastern Qualla Sadda, and both of them divide again as they approach the sea. Only the most eastern and western arms are navigable for vessels of small burden, and even in these the navigation is intricate and dangerous, on account of the shoals and sand-banks. This river however has no bore, which is probably owing to the circumstance that its embouchures run northward into the sea, and are protected by the projecting cape called Tanjong Bon, or Jabon, from the swell of the sea.

The largest river of Sumatra is the Palembang, whose numerous upper branches originate in the mountain-region between 2° 30′ and 5° S. lat. The most southern of them brings down the waters of the large lake of Ranan, but this branch is little known. The best-known of these rivers is that which rises in the district of Musi, immediately at the back of the range of hills visible from Bencoolen, and, on that account, has the name of Ayer Musi in the early part of its course, but in the lower is named the Tatong. The Musi river becomes navigable for boats before it leaves the mountain-region at Muara Mulang, which is about 250 miles from the sea. Most of the southern districts of the mountain-region send their goods to Palembang, and receive by this river those foreign articles which are consumed by the inhabitants. Most of the branches fall into the Tatong in the vicinity of the town of Palembang, where the river is above a mile wide, and is navigated by vessels not drawing more than 14 feet. Vessels of a larger description may navigate it, but they meet great difficulties on account of the numerous shoals. From Palembang downwards the river is called Palembang river. After the confluence of its numerous branches it turns northwards, and begins to divide into several arms, reaching the sea with four mouths, which, with the intervening islands, occupy a space of more than 24 miles on the shores of the Strait of Banca. These arms are called from east to west Salsee river, False river, Palembang river, and Salt river. The depth of these rivers varies between 3 and 10 fathoms: but in front of their mouths is an extensive bank of hard sand, with a thin superstratum of black mud, which is hardly covered at low-water. The channels across this bank have only from 1½ to 2 fathoms at low-water. At the full and change of the moon the tide rises from 7 to 8 feet.

The Tulan Booang is the most southern of the larger rivers of Sumatra. It rises also in the mountain-region, but very little is known of its course, and nothing has been noticed respecting its navigability.

Climate.—The great equability of temperature on all the coasts and lower parts of Sumatra is mainly owing to the circumstance of the island being comparatively narrow, for the wind which comes directly from the sea is not so warm as that which has passed over large tracts of land in tropical countries. On the west coast, south of the equator, earthquakes are frequently felt; but in general they are very slight, compared with those of South America and other countries. Marsden however mentions one which was experienced at Manna in 1770, and produced great changes in the surface of a considerable tract. Waterspouts are very frequent along the western coast.

Productions.—Rice is cultivated in the lowest plains and in the elevated valleys of the mountain-range. The kinds of rice are very numerous; but all are divided into two classes, upland or dry rice, and lowland or marshy rice: the former is less prolific, but more valued. Sometimes the produce is so great that it yields 140 times its seed, but generally only 30 for one. Rice forms an important article of export from Acheen to Hindustan, and from the north-eastern coast to the British settlements on the Strait of Malacca. No other grain seems to be cultivated, except maize. Neither wheat nor millet is cultivated. The most common esculent vegetables are different kinds of yams, both red and white; the St. Helena yam, sweet potatoes, common potatoes only in the more elevated districts; bredy, a kind of spinach; lobuck, or the Spanish radish; the large purple brinjall, or egg-plant; and many different sorts of beans, with white and green peas, and onions. The peas and onions are articles of export from the north-eastern coast to Penang and Singapore. Chili or capsicum, tumeric, ginger, coriander, and cummin-seed, are raised, especially on the western coast. Hemp is extensively cultivated, but only for smoking with tobacco. Tobacco is also grown, and is an article of export from the harbours on the north-eastern coast. Melons are raised on the plains, and sometimes attain an extraordinary size. Sesamum is cultivated for its oil; and the Palma Christi, from which castor-oil is obtained, grows wild. The sugar-cane is only cultivated for chewing; no sugar is manufactured, but it is imported from Java. The plantations of betel-vines are extensive. Indigo and cotton are raised for domestic use only.

Sumatra, like all the islands of the Indian Archipelago, is noted for the variety of its fruit-trees. The most important is the cocoa-nut tree, which grows even in the districts whose elevation does not much exceed 1000 feet above the sea-level, as in Menangcabau. There are also plantations of plantains, banana, the bread-fruit tree, jack-tree, mangusteens, durians, mango, different kinds of orange and lemon trees, especially the shaddock: the pine-apple, the jambo, the guava, the papaya, the custard-apple, the pomegranate, and the tamarind. European fruit-trees do not succeed: vines have been planted by Europeans, but with indifferent success. Besides these fruits, which are cultivated, Marsden enumerates fifteen kinds which grow wild and bear edible fruit. A dwarf species of mulberry is planted for the silk-worms, which are reared, but not to any extent: raw silk is imported from Singapore.

Other plants and trees are cultivated as producing articles for exportation. The most important is the pepper-vine, of which extensive gardens occur all over the island, except in the most elevated districts. From no other country on the globe are such quantities of pepper exported. The second as to importance is the areca-palm, which is grown most abundantly on the coast between Acheen Head and Diamond Point. On the eastern coast the plant from which gambier is obtained is largely cultivated. Coffee has lately been cultivated to a great extent on the shores of the Kampar river and in Menangcabau. Sago is grown in several places on the eastern plain, but especially on the island of Rantau: large quantities go annually to Singapore. In 1798 the English brought from the Moluccas the clove and nutmeg trees, and planted them on the west coast, near Bencoolen, where they succeeded so well, that a considerable quantity of mace and cloves was exported before the Dutch got possession of this coast: the nutmegs do not attain the size of those from the Banda Islands.

The tree from which the camphor-barus is obtained grows only in the northern districts, between 0° and 3° N. lat., north and south of the town of Baroos, from which the article has received its distinguishing name. This expensive article goes to China by way of Singapore. The wood is much valued for carpenters' purposes, being easy to work, light, durable, and not liable to be injured by insects. In the same district the tree grows from which benjamin, or benzoin, is obtained; and those which yield cassia. Dammer, a kind of resin, which flows from several kinds of trees, is collected abundantly. In most places there are the dragon's-blood trees, and some kinds of trees from which caoutchouc is obtained. Agila-wood is common. Extensive tracts of the eastern plain are covered with different kinds of canes, known by the general name of rattans, large quantities of which go to Europe and China. The forests, which cover perhaps more than three-fourths of the island, contain an inexhaustible store and endless variety of timber-trees, but the teak-tree is not among them. The most useful are the poon, used for masts and spars; the marbau, used as beams for ships and houses; the iron-wood tree, the ebony-tree, and the rangi, which resembles mahogany. Timber is occasionally exported to the Dutch or English settlements. Sapan-wood, lacca-wood, and some dye-wood go to Padang and Singapore from the eastern coast.

The most useful of the domestic animals is the buffalo, which attains an extraordinary size. It is generally used for agricultural purposes and as an animal of burden. There are two kinds, white and black. The flesh is eaten, but that of the black kind is preferred. The milk is employed in making butter. Black cattle are not numerous, except on the coast of Pedir, where the plough is drawn by oxen. The horse is of a small breed, but well made and hardy. Those of the coast of Pedir are larger, and exported to the British settlements, where they are much valued. Sheep are few, and of a small size. Goats are numerous, but they are also small. A kind of wild goat found in the forests is much larger. The hog is of the Chinese breed. Few domestic animals are kept by the inhabitants of the great plain.

Elephants are very numerous, especially in the forests of the plain, but they have not been domesticated. The natives kill them with poison for the tusks and skin. The buffalo is found in a wild state. The rhinoceros is common, both that with a single horn and the double-horned species. The hippopotamus is rare. Bears are numerous, and among them is the sun-bear. There are different kinds of deer, among which is that diminutive animal the kanchil, called by Buffon 'chevrotin,' whose extreme length is only sixteen inches, and the height ten behind and eight at the shoulders. The wild hog and the hog-deer are frequently met with. The varieties of the monkey-tribe are innumerable, and among them the orang-utan is met with. There are sloths and squirrels. The tiger is very large, and frequently destroys men and most animals. There are also tiger-cats, civet-cats, polecats, porcupines, hedgehogs, and pangolins, a species of *manis*. Bats are very numerous. Alligators abound in most of the rivers. There are several species of lizards, of which the guana is eaten. Chameleons and flying lizards (*Draco volans*) are frequent. Snakes occur in great variety, among which is the boa. A few of them are poisonous. The turtle is found in the sea; but the land-turtle is imported from the Seychelles Islands. There is a great variety of shell-fish, among which is the gigantic keema (*chama*) in Tappanooly Bay, which is more than three feet in its longest diameter, and more than two feet across. The shell is perfectly white, several inches thick, and worked by the natives into armlets. Oysters are frequently found adhering to the roots of the mangrove-trees with which the coast is lined, especially towards the south.

No part of the ocean is so abundant in fish as the sea which surrounds the Indian Archipelago; but fish seem to be less plentiful on the western than on the eastern coast. Many families on the shores of the Strait of Malacca, and on the coast of Pedir, subsist by the produce of their fishing. The largest fishery is in Brewer's Strait opposite the town of Berkit Batu, where about 100 boats are engaged at all seasons in fishing the trubu, which is a fish about a cubit long; the roe is an article of trade, and the dried fish are sent into the interior of the island. In the Strait of Malacca is the dugong (Halicorn dugong) and great numbers of sharks, the fins of which are exported from the north-eastern coast to Singapore, whence they go to China.

Besides the common fowl, which is as abundant as in most other countries, there is a much larger kind of domestic fowl in the Lampong country, where there is also that diminutive kind called the bantam. The wild-fowl which is found in the woods differs little from the common sort, except in the uniformity of its brown colour. Among the wild birds the Sumatran pheasant is conspicuous for its beauty. Peacocks, eagles, and vultures are very rare, but kites, crows, and jackdaws are very common, as well as woodpeckers and kingfishers. The hornbill is abundant. There are several species of storks, pigeons, and doves; and quails and partridges are common. The swallow which builds the edible nest is only found in a few places along the west coast. There are also parrots, the Indian goose, the duck, and the teal.

The island swarms with insects. The variety of ants is astonishing. Bees are very abundant, but the honey is inferior to the English: wax is exported from almost every trading place of the coast. The silk-worm is reared in a few places.

Sumatra was once noted for its gold, and a considerable quantity is still exported. The places in which it abounds are the mountains which surround the table-land of Menangcabau, but it is also found south and north of that country. The largest quantity goes from the mountains to the east coast, where it is exported to the European settlements and Southern Asia. Tin occurs in several places on the great plain, but is very little worked, as large quantities are obtained in the island of Banca [Banca], where it is got with less labour. Copper is found in the northern portions of the mountain-region (between 2° and 3° N. lat.), to the south-east of Analaboo, where it occurs in great abundance in an extensive tract: it contains gold, but is not much worked. There is iron of superior quality in the mountains of Menangcabau, where it is worked to a small extent, and also made into various articles. But English and Swedish bar-iron are imported, especially on the eastern coast. Sulphur is obtained from some of the volcanoes, and arsenic is found in several places, and is an article of trade. Saltpetre is extracted from the earth of some caves near the banks of the river Kataun, but is of inferior quality: it is used by the natives for making gunpowder. Coal has been found in one or two places on the western coast, but it is of inferior quality. Very little salt is made, but large quantities are imported.

Inhabitants.—The interior of most of the larger islands of the Indian Archipelago is occupied by a race of negroes called Australian; but it does not appear that such a race is found in Sumatra. Marsden indeed mentions two different races which are dispersed in the woods, and avoid all communication with the other inhabitants, and he says that they are called Orang Kuba and Orang Gugu. They live in the tract that separates the country of Labung from Palembang, speak a peculiar language, and eat whatever the woods afford. The bodies of the Gugu are said to be covered with long hair, so that they resemble the Orang-utan. Another race is mentioned as inhabiting some mountainous tracts near Samangka Bay. They are called Orang-Abung, and nothing is known of them, except that, according to their custom, no man can marry till he has brought to his chieftain the head of a stranger.

If these small tribes are not the remnants of the aborigines of the island, the present inhabitants must be considered such. They all belong to the same race. Their languages also may be considered as dialects of the same original language, though they have adopted different modes of writing them. There are however some differences in these points, which have led writers on this subject to divide them into five nations: the Acheenese, the Battas, the Malays, the Sumatrans, and the Lampongs.

The Acheenese occupy the most northern part of the island, and differ considerably from the other nations, being in general rather taller, stouter, and of a darker complexion. They are supposed to be a mixture of Battas and Malays with Chulias, as the natives of the peninsula of Hindustan are called, who have frequented the ports of this country in all ages. They are more active and industrious than their neighbours, and they resemble the Bugis, or inhabitants of Celebes, in address and dexterity in business. In writing they use the Malay characters. They are Mohammedans, and as they have much intercourse with foreigners of the same faith, the forms and ceremonies of their religion are observed with some strictness.

The Battas occupy the sea-coast on the west side of the island from the river Sinkel to that of Tabuyong, and extend across the island to the east coast; but their territories have been encroached upon by the Malayan and Acheenese establishments in the most convenient maritime situations. They are rather below the stature of the Malays, and their complexions are fairer. Horse-flesh they esteem the most exquisite meat, and for this purpose they fatten horses with great care. They have a language and written character peculiar to themselves: their language contains a smaller number of Malay roots than the other languages of the island. It is remarkable that those who can read and write are much more numerous than those who cannot; and still more, that a nation, who in this respect, and in their agriculture, dress, and manners, show that they have made great progress in civilization, should be fond of human flesh, and eat prisoners taken in war and criminals condemned to die. They have not embraced Islam, and are heathens: they acknowledge three deities as the rulers of the world. [Battas.]

The Malays occupy, to the exclusion of all other nations, the whole of the great plain from the river Rakan on the north to that of Masusi on the south, and also the shores north of the Rakan river as far as Timian. It does not appear that they are in possession of any part of the mountain-region, except the country of Menangcabau. This mountain table-land was, according to the history of the Malays, the original seat of their nation, and from it they are supposed to have spread over the Indian Archipelago. [Malays.] The inhabitants of Menangcabau are still dis tinguished from all other nations of Sumatra by the advanced state of their agriculture, their manufactures, and civilization; while the Malays, who inhabit the shores of the Strait of Malacca, appear to be a degenerated tribe, and are chiefly occupied in piracy. The Malays who inhabit the country of Palembang however show greater diligence in cultivating the ground, and in several branches of industry, which is attributed to the circumstance that this part of Sumatra was for a long time subject to the kings of Java, during which period many Javanese settled in the country. The Malays are Mohammedans, but not strict observers of the ceremonies of their faith.

The name of Sumatrans comprehends all the tribes that inhabit the west coast, from the river Tabuyong (40′ N. lat.) on the north to the river Padang-guchi (4° 40′ S. lat.) on the south, and also occupy the mountain-region south of Menangcabau as far as 5° S. lat. They are rather below the middle stature. Their limbs are generally slight, but well shaped, and particularly small at the wrists and ancles. Their eyes are uniformly dark and clear; the eyes of the southern women particularly bear a strong resemblance to those of the Chinese, being narrow and somewhat lower at the inner angles. The hair is strong and of a shining black. The men are beardless, but they naturally have a beard, which however they take great care to eradicate as soon as it appears. Their complexion is yellow, and much lighter than that of the Hindus. In those of the superior class, who are not exposed to the rays of the sun, particularly in their women of rank, it approaches to fair. It seems that they speak several dialects, which contain a great number of Malay roots; and accordingly they are only considered as dialects of that language, but in writing them they use characters different from the Malay. Many individuals have been converted to the Mohammedan faith, but the remainder are heathens, and have no kind of religious ceremonies.

The Lampongs occupy the most southern part of the island, both the mountain-region south of the river Padang-guchi and the plain south of the river Masusi. They have a strong resemblance to the Chinese, particularly in the roundness of the face and the form of the eyes; otherwise they do not differ in their persons from the Sumatrans. They are the fairest people in the island, and the women are the tallest and handsomest. Their language differs considerably, though not essentially, from that of the Sumatrans, and contains a great number of Javanese words, the Javanese having been in possession of the greater part of the country for some time. In writing they use characters peculiar to themselves. The Mohammedan religion has made considerable progress among them, and most of their villages have mosques, but they have still preserved some superstitions of their old religion. Nearly all the nations inhabiting Sumatra are on a level with respect to civilization. The most advanced are those of Menangcabau and of Acheen, who in no respect appear to be inferior to the Javanese, the most civilized nation of the Indian Archipelago, in agriculture, the arts of civilized life, and even in literature, though respecting the last-mentioned point our knowledge is far from enabling us to form a correct judgment. The other nations are certainly a degree lower in civilization, but this is chiefly to be ascribed to the defect of their political institutions.

According to the history of the Malays, the whole island was once subject to the sovereign of Menangcabau, and this assertion is strongly supported by the veneration which is still shown by nearly all the inhabitants towards those who are connected with the reigning family of that country. From the advanced state of civilization of the inhabitants of Menangcabau, we may infer that the whole island must have been in a much more advanced state when their sovereigns extended their sway over all Sumatra. At present there is in most parts hardly a political union. Every village or town has its chief, who acknowledges only nominally one of the princes or sultans, of which there are several in the island, but he acts quite independently, and makes war on his neighbours as often as he pleases. There is an almost uninterrupted state of war, the consequence of which is that the condition of the people retrogrades. The influence which now for more than a century has been exercised by the European settlers and governments has been attended by the happy effect of diminishing these petty wars and promoting peace among the natives.

According to the latest estimate, the population of Sumatra is stated at four millions. Though the data which we possess are few, and refer only to a small portion of the island, we think that this estimate is certainly not too high, and will eventually turn out to be much too low.

Political Divisions, Towns, and Places of Trade.—Sumatra is partly subject to native sovereigns and partly under the sway and influence of the Dutch. The independent states lie on the north-eastern coast, along the Straits of Durian and Malacca, from 2° S. lat. to the most northern extremity of the island, and extend along the south-western coast as far as 2° N. lat. The remainder of the south-western coast, with a considerable part of the mountain-region, and the north-eastern coast as far north as 1° 30′ S. lat., is either immediately subject to the Dutch or governed by princes dependent on them. The independent states are Acheen, Siack, Indragiri, and Iambie on the coast, and that of the Battas in the interior.

1. *Acheen* occupies the most northern part of the island. When its government was in full force, it extended as far as the town of Baroos on the south-west coast, and as far as the river Batu Bhara on the east coast. It terminated in the interior at the mountains, in which the Sinkel river rises, and where the Batta territories begin. In course of time the powerful vassals on the east coast obtained their independence, but those on the north and west coast are still considered subjects of the king of Acheen, though they frequently refuse to pay their tribute. The area of the whole country is probably 20,000 square miles. A short description of it and of the capital is given under ATCHEEN. The capital is the principal seaport, but there are several other ports, which are annually visited by some foreign vessels, and also carry on a considerable commerce in their own ships. On the coast between Acheen Head and Diamond Point, from west to east, are the harbours of Acheen, Pedada, Lawang, Pedir, from which the whole tract is called the Coast of Pedir, Pakan, Selu, Burong, Sarong, Murdoo, Samalangan, Passangan, Junka, Teluksamoy, Chunda, Passy, and Curtoy, among which those of Pedir and Teluksamoy, next to the capital, are the most thriving and commercial. The chief article of export from these ports is areca-nut. Along the south-west coast, from north to south, are the harbours of Pulo Ryah, Annalaboo, Senangkan, Tarang, Taddow, Tareepuli, Scimeyon, Qualla Battoo, Soosoo, Manghin, Labuan Haji, Telapow or Tallapow, Sama Dua, Tampat Tuan, Kavalat, Saluhat, Pulo Dua, Rambong, Sebadi, Tarooman, Ayam Dammah, Sinkel, at the mouth of the river of that name, and Tapoos. Large quantities of pepper, benzoin, and camphor-barus are sent from these ports. The chief trade of Acheen is with the British settlements in the Strait of Malacca, and especially Penang; but there has also long existed a direct commercial intercourse between it and Bengal, Madras, and Bombay. Besides this the ports are visited by American vessels, French ships, Arabian vessels from Mocha and Jidda, Parsee vessels from Surat and Bombay, vessels from the Maldive Islands, and Portuguese vessels from Macao and Goa. Some English ships bound directly for China take in parcels of areca-nut for that country. In 1823 twenty-seven American vessels obtained cargoes on the western coast, chiefly pepper in exchange for Turkish opium and Spanish dollars, to the value of about a million of dollars. The articles of export, according to their value, range as follows: areca-nut, pepper, camphor, benzoin, gold-dust, Acheen piece-goods, dammar, rattans, bees'-wax, rice and paddy, elephants'-teeth, and tobacco. Minor articles are brimstone, buffalo-hides, coir rope or gumooty, fish-maws, oil and ghee, shark-fins, and sandal-wood. The amount of these articles brought from the ports of Acheen to Penang in 1837-38 was somewhat more than 400,000 Spanish dollars, and perhaps an equal amount was shipped for Calcutta and Madras. If the articles sent to Malacca and Singapore are added, it is very probable that the export trade to the British possessions in the Straits of Malacca and in Hindustan does not fall short of a million. In exchange for these articles there are imported opium of Bengal and Malwa, and the manufactured goods of Hindustan and Great Britain, such as piece-goods from Coromandel, broad-cloth, chintzes, white cloth, carpeting, iron, steel, cutlery, brass-ware, arms and ammunition, China goods, stick-lac from Ava and Siam, salt and salt-fish from the Maldives. Four or five large Arabian vessels from Jidda, Mocha, and Surat touch annually at Acheen, landing pilgrims on their return from, and conveying others to

Mecca, to the number of one thousand. They import salt, dates, and Surat piece-goods.

The countries south of Diamond Point, which were formerly subject to the sultan of Acheen, but at present are governed by their own independent rajas, or sultans as they are called, contain several ports, among which those of Langkat, Balu, China, Delli, Sardang, Batu Bhara, and Assahan are the principal. The sultans of the four last places are nominally dependent on the king of Siack. It appears that the authority of these petty princes does not extend far from the sea, as the inland country is inhabited by the Battas, who however send the greater part of their produce to these ports in exchange for foreign goods. Pepper is the great staple of the four first-named places, but some other articles also are exported, to a considerable extent, as rattans, rice, paddy, and several kinds of pulse, especially white and green peas, gambier of very good quality, especially that of Balu China, ivory, gold, tobacco, bees'-wax, and dragons'-blood. The imports, besides opium and salt, consist of a great variety of manufactured goods, as coarse China-ware, gold-thread, white cotton-cloth, coarse country cloth, broadcloth, ironmongery, tin, sabres, blunderbusses, swivels, gunpowder, looking-glasses, brass-plates, Pulicat-cloth with handsome borders, palempores, silk and gold wrought cloth from Tringano, Palembang, Siack, and Batu Bhara. The commerce of this coast with Penang is very active, especially that of Balu China and Delli. These two places are only a few miles from each other, and each is built on the banks of a river, which is navigable for brigs to the town, and for large boats to a considerable distance from the sea. The advantages of this easy navigation have attracted the whole commerce of the country of the Battas to these two harbours. Traders from the interior (as Allas and Gacoa) and even from the banks of the Sinkel river and other places near the south-west coast, come over with various articles and carry back manufactured commodities. By the Balu China river, which is navigable to Soonghal, the interior of the Batta country is supplied with such goods. Sardang, which is only a few miles south of Delli, has only a harbour for small vessels, but it exports some articles which do not grow in the plain, as camphor, benzoin, and gold-dust: these articles are brought from the mountain-region of the Battas. Batu-Bhara is the largest and most populous place on the north-east coast. The surrounding country produces only rattans, salt-fish, horses, and slaves, as articles of export. But Batu Bhara is a free port, and mostly inhabited by merchants and shipowners. It is stated that 600 large trading boats belong to this port. These vessels are the carriers of this coast. They go in great numbers to Sardang, Delli, Batu China, Langkat, and other pepper ports, and to Assahan, from whence they bring large quantities of produce to Penang. Batu Bhara is also a manufacturing place: large quantities of fine silk-cloth are made here, which is in great esteem in all the neighbouring countries, and largely exported. Considerable quantities of raw China silk are imported into Batu Bhara. The last place on this coast is Assahan, which had formerly a much more active commerce than at present, but even now 80 large boats belonging to the country are engaged in conveying the produce of the well-cultivated tract on both sides of the river to Malacca and the other British settlements on the strait, besides many from Batu Bhara, which come to Assahan to procure rice and paddy. No pepper is grown in the neighbourhood. The exports, besides grain, consist of an immense quantity of rattans, wax, dye-wood, horses, dragons'-blood, and tobacco.

2. *Siack* is the largest state on the north-east coast, extending from the vicinity of the Assahan (3° N. lat.) to the river Kampar (0°), and being bounded by Indragiri to the south, by Menangcabau on the west, and by the Battas and Assahan on the north. It is considered to extend even to 4° N. lat., but the chiefs of the tribes between Assahan and Delli are only nominally dependent on it, and even those south of 3° N. lat. are frequently at war with the king. The trading-places within this large tract are, from north to south, Bila, Panai; Tana Putch, Kubu, and Rakan, on the Rakan river; Bukit Batu on Brewer's Strait, Siack on Siack river, and Pulo Lawang on the Kampar river. The trade of the five first-named places is not important. Bukit Batu has no commerce except in the roe of the trubu and in dried fish, the produce of its fishery. The town of Siack is situated on the right bank of the river of the same name, about 65 miles from its mouth. It was a place of great trade twenty years ago, and though the trade has greatly decreased owing to the continual internal wars, it still sends many vessels to Malacca and Singapore with rattans, dammar, gambier, dye-wood, ebony, agila wood, wax, ivory, silk, cloth, camphor, salt-fish, fish-roes, and gold. Coffee also has lately become an article of export. Formerly at least three pekuls of gold-dust were annually exported, but this article, which was obtained from Menangcabau, has greatly decreased. The imports consist of cotton-cloth from the neighbouring countries, which is called coast cloth, chintzes from Surat and Europe, white cloth from Europe, raw silk and cotton, silk stuffs, especially taffetas, gold-thread, gum-lac, coarse plates and dishes, cooking-pots from Siam, called *quallies*, iron and steel in bars and tubs, Java tobacco, precious stones from Ceylon, gunpowder, tin, muskets, and swivels. The most important articles are salt and opium. Occasionally a large quantity of timber is exported from Siack to Penang. Pulo del Lawang and other places on the Kampar river have lately risen into notice as trading-places on account of the great quantity of coffee which is annually brought by numerous small fleets, consisting of from 10 to 12 prahus, to Singapore. The other articles of export, which however are not important, are gambier, bees'-wax, twine, cassia of an inferior quality, ivory, rhinoceros-horns, and rattans. In return are taken blue and unbleached Madras cloth, raw silk and cotton, and English shirtings; cambrics and chintzes, balick and imitation balick handkerchiefs and salendangs, camlets, lead, iron, steel, Chinese gold-thread, Java tobacco, and stick-lac. The islands which lie on the east of Brewer's Strait belong to Siack. The largest of them, Rankan, is low and marshy: it produces a large quantity of raw sago, which is imported into Malacca and Singapore for the manufacture of pearl sago.

3. *Indragiri* is a kingdom of small extent, comprehending only the countries on both sides of the river of that name, but extending to the very base of the mountain-region, where it borders on Menangcabau. Its territories are said to be fertile, and capable of producing abundant crops of rice, of which considerable quantities have within a few years been imported into Singapore. It exports nearly all the articles mentioned as exports of Kampar, but in smaller quantity. Opposite the mouth of the river is the island of Lingin, and from that island northward to the capes of Burus and Romania and the port of Singapore, the sea is literally strewed with islands and innumerable rocks. Such a sea is favourable to piracy; and as this extremity of the China Sea is much navigated, partly on account of the rich countries in its vicinity (Java, Borneo, Sumatra), and partly as being the great thoroughfare of the commerce between Eastern and Western Asia, the pirate nation of the Illanos or Lanus [PHILIPPINES, vol. xviii., p. 87), whose original country is the island of Magindanao, have pushed their settlements, which are found in all parts of the Indian Archipelago, as far as the shores of Indragiri, where they settled at a place called Ritteh 30 years ago, or less than ten years before the foundation of Singapore. This is the most western settlement of these pirates.

4. *Iambie* is the most southern of the independent states of Sumatra. The boundary-line between it and the Dutch kingdom of Palembang begins on the shores of the sea near 2° S. lat., and extends south-west to the mountain-region, where it terminates near 3° S. lat. The present capital, Tanapileh (chosen land), is situated a day's voyage above Old Iambie, which is 60 miles from the sea. The population is about 4000, among which there are fifty Arab families. The produce of the country is dragon's-blood, gambier, benzoin, and a variety of rattans, with some gold-dust. These articles are taken to Singapore, which supplies Iambie with Chinese and European coarse ware, as well as opium and Siamese salt, which finds its way hence into the interior of the island.

5. The country of the *Battas* occupies the interior of the island between 4° and 2° N. lat., and is only separated from the sea by a narrow tract of land, which is settled by the Malays and Acheenese, and governed by petty chiefs of those nations. In this country the greatest part of the camphor, benzoin, and cassia is collected, which is exported from Sumatra, as also large quantities of pepper and ivory, with other articles: a small portion of these products goes to the numerous small harbours of Acheen on the south-west coast of the island, but the larger part is brought to Balu China, Delli, and Sardang, on the Strait of Malacca. The

country of the Battas is divided among many independent hereditary chiefs, who are frequently at war with each other.

The Dutch possessions extend perhaps over half the area of the island. The southern portion of the plain is subject to them as far north as a line which begins near the mountains in the vicinity of 3° S. lat., and on the shores of the China Sea terminates near 2° S. lat. The greatest part of the mountain-region south of 2° N. lat., though governed by their own chiefs, acknowledges the supreme authority of the Dutch government. It is not well known what parts of the last-mentioned region have still preserved their independence. As the larger part of these possessions has been acquired within the last 20 years, the Dutch government a few years ago thought it expedient to introduce a new political division into five regencies, Palembang, Lampong, Bencoolen, Padang, and Ayer Banghis. The first two are placed under the governor-general of Java, and the three last-mentioned regencies constitute the government of the west coast of Sumatra.

1. The Regency of Palembang comprehends the kingdom of that name, and though the king keeps his title, the country is under the administration of the Dutch regent, but the power of the regent is very much circumscribed by that of the native chiefs. The boundary-line between Palembang and Lampong is mainly formed by the river Masusi, which runs near 4° S. lat. This extensive country is thinly inhabited, the population being stated not to exceed 140,000 individuals; the town of Palembang however contains 25,000 inhabitants. The houses are of wood or bamboo, except the palace of the sultan and the principal mosque, which are of stone, and in the centre of the town. Though this place is about 70 miles from the mouth of the river, it carries on a considerable commerce, as the river is navigable for large vessels. It exports the surplus of its produce to Java, Banca, Rhio, and Singapore. The exports consist of gold-dust, ivory, rattans, pepper, gambier, resin, bees'-wax, benzoin, mats, and silk stuffs, dried fish and copper-ware: the imports are opium, salt, cotton-cloth, sugar, oil, gold-wire, iron and steel, ironmongery, cutlery, raw silk, tea, and some minor articles.

2. The Regency of Lampong comprehends that portion of the plain which lies south of the river Masusi, and that portion of the mountain-region which surrounds the bays of Lampong and Samangka. It terminates on the west near Flat Point. This part of Sumatra was formerly part of the possessions of the sultan of Bantam in Java, and passed with the other possessions of that monarch to the Dutch. The level part of the country is very thinly inhabited, and exports to Batavia only rice, pepper, and a little cotton. The only settlement of the Dutch, and the place where the regent resides, is Mangala, on the banks of the Tulan Booang. There is another settlement within the mountain-region on Lampong Bay at Telok Bitong. The inhabitants of this tract gain their subsistence partly by selling provisions to the vessels which sail through the Straits of Sunda.

3. The Regency of Bencoolen begins on the south at Flat Point, and extends northward to 1° 55′ S. lat., comprehending the greater part of the mountain-region which is subject to the Dutch. South of 5° S. lat. the coast is difficult to be approached, and only one small harbour exists at Croi; but farther north they are more frequent, as Kawur, Manna, Silebar, Bencoolen, Laye, Ipoo, and Moco-moco. From all these places pepper is exported, and this is almost the only article of export, with the exception of some gold-dust and dried fish. The imports are chiefly opium, salt, piece-goods, iron and steel. Bencoolen is the seat of the resident. [BENCOOLEN.] The population of this regency is estimated at 100,000 inhabitants.

4. The Regency of Padang comprehends the mountain-region and the west coast between 1° 55′ S. lat. and the equator. It therefore encloses the antient kingdom of Menangcabau, whose population Raffles estimated at more than a million, and which a few years ago was subjected to the Dutch. In this regency there are numerous mines of gold, of which those situated in the district of Tiga Blas-Kotta are considered as very rich, more especially those of Songui Pago and Si-Payong. They lie to the east and south-east of Padang. The exports of this regency consist of a large quantity of coffee and of pepper, with cassia, benzoin, and gold dust: the imports are opium from Bengal and Malwa, cotton-cloth and handkerchiefs from Coromandel, raw cotton, salt, and tobacco from Java, and a few other articles. The town of Padang, the residence of the governor of the west coast of Sumatra, and of the regent of Padang, is a small but well-built place. Ayer Adji is a small port.

5. The Regency of Ayer Banghis comprehends the mountain-region and the west coast between the equator and 2° N. lat. Along the coast it extends somewhat farther north, as the town of Baroos is also subject to the Dutch. In the southern districts of the mountain-region also there are several gold-mines, especially in those called Rawer or Ran and Mandilling. The two best harbours of Sumatra, the bays of Ayer Banghis and Tappanooly, are within these territories, and there is a good harbour also at Natal. Ayer Banghis, the seat of the resident, is a new place, and was hardly known by name some years ago. Natal is rather a populous town, inhabited by settlers from Acheen, Ran, and Menangcabau, all of whom are engaged in trade. On the Bay of Tappanooly are a few European commercial settlements. The exports of this regency consist of gold, pepper, camphor, benzoin, cassia, and a few minor articles: the imports are those noticed under the regency of Padang.

Manufactures.—Nothing perhaps shows more clearly the advanced state of civilization of the inhabitants of Sumatra than their manufacturing industry. The most important manufactures are those of iron and steel, which are carried to a considerable degree of perfection in Menangcabau, where iron has been worked from time immemorial. The kris (dagger) blades made here are famous all over the Indian Archipelago. Common implements of agriculture and several kinds of tools are made. Large quantities of fine silk-cloth are made at Batu Bharra, and this branch of industry seems to be much attended to along the eastern coast, as raw China silk is imported at nearly all the trading-places. Silk-cloth is also made at Acheen. The manufacture of cotton-cloth was formerly equally extensive. Marsden commends many of these cloths for their fineness and the taste of the patterns; but though this branch of industry is still carried on in many parts, the produce in others has been superseded by the introduction of British cotton goods. Earthenware is made on an extensive scale at several places, especially at Menangcabau, whence Padang and Bencoolen are supplied with this article. The beautiful gold and silver fillagree-work made in this island has long been admired, though it is executed with very coarse and imperfect tools. There are goldsmiths at every trading-place on the west coast.

History.—Some writers are of opinion that Sumatra is the Taprobane of the Greek and Roman writers; but others, with more reason, apply that name to Ceylon. Marco Polo notices it under the name of Java Minor. The name of Sumatra occurs first in the travels of Nicolo di Conti, who visited it before 1449. It is not known whence this name is derived, and it is unknown to the natives. The Malay name of the island is Pulo Percha. The Portuguese navigators reached the coast of Pedir in 1509, under Diego Lopez Sigueira. At this time it appears that the antient kingdom of Menangcabau, which, according to the Malay history, extended over the whole island, had already been dismembered; but Acheen was then governed by a powerful king, who prevented the Portuguese from gaining a footing in the island, and even tried to expel them from the town of Malacca. In 1575 a fleet of the Acheenese destroyed the shipping of the Portuguese in the harbour of that town; and in 1582 another fleet tried to get possession of the town itself, though without success. From that time the kingdom of Acheen began to be distracted by internal wars, and continual discord between the sovereigns and the hereditary chiefs, and fell by degrees into insignificance. The Hollanders appeared first on the north coast towards the close of the sixteenth century, and the English in 1602. The pepper-trade was the great object of these two nations: the Dutch formed a settlement at Padang in 1649 or shortly before, and the English at Bencoolen in 1685. The English afterwards pushed their commercial establishments southward to the vicinity of Flat Point, and erected others at Natal and round the Bay of Tappanooly; whilst the Dutch increased theirs in the intermediate space. But the Dutch had also got a firm footing in the southern districts of the island. As allies of the sultan of Bantam, they had erected a factory on the river Tulan Booang, in the country of the Lampongs; and in 1664 had extorted permission from the king of Palembang to establish one in the capital of that country. Thus affairs remained to the year 1811. Both the Dutch and the English had acquired authority with the petty chiefs who governed the countries adjacent to their settlements, not by force of arms, but by conciliatory means; and they had induced them to leave off the continual wars, and to attend to the cultivation of the pepper and other articles of export. In 1811 the Dutch possessions, together with the island of Java, fell into the hands of the English. Shortly before that event the Dutch had a quarrel with the king of Palembang; and to avenge it, the British, in 1812, sent an armed force to his capital, took possession of it, and obliged the king to surrender the island of Banca, where, up to that time, the Dutch had only had some mercantile establishments for the purchase of tin. [Banca.] After the peace of Paris, in 1816, the Dutch colonies on the Indian Archipelago were restored to them, together with the island of Banca. Besides this, the Dutch acquired a right to the possession of the country of the Lampongs, which they derived from the English. That country had always been considered as an appendage of the kingdom of Bantam in Java. In 1813 the sultan of that country had voluntarily made over his sovereignty to the English government, in consideration of an annual pension of 10,000 dollars, and thus the country of the Lampongs came into the possession of the English; and, in 1816, of the Dutch. A few years afterwards the Dutch acquired the same right to the kingdom of Palembang. The king of that country had, in 1821, expelled the Dutch troops stationed in his capital, but was soon obliged to yield to the army which was sent against him, and to surrender his power to the Dutch government, though the country is still governed in his name. In 1824 the Dutch acquired the British settlements on Sumatra by treaty. These settlements had always been a burden to the East India Company: the expenses which they caused generally amounted to four times the revenues. On the other hand, the Dutch, after having recovered the possession of Malacca, found that their commerce in the Strait of Malacca was much confined by the English, who had a settlement on Pulo Penang, and established another in 1819 on the island of Singapore. [Penang; Singapore.] Thus the Dutch found it expedient to give up to the English the town of Malacca and some settlements in Hindustan in exchange for the British settlements on the west coast of Sumatra. The latest accession of territory to the Dutch possessions took place in 1835, in consequence of a war with the Padries. The Padries are a religious sect which began to appear in the country of Menangcabau about the beginning of this century. As the inhabitants of the country are Mohammedans, many of them go on a pilgrimage to Mecca. One Hadjee Miseken, who had been there, was, on his return from Mecca, the first teacher of the tenets of the Padries. He recommended the suppression of those practices which led to ruinous consequences, gambling, smoking opium, and drinking intoxicating liquors, to which vices he attributed the commission of murders, thefts, robbery, fraud, and the depraved state of society. For about fifteen or sixteen years this doctrine was propagated only by conviction and persuasion, and he acquired many adherents; but about 1815 or 1816 a society was formed among the principal adherents of this new doctrine, for the purpose of compelling the other inhabitants to conform. The wars which arose devastated for many years the country of Menangcabau and some adjacent districts. The fanatical Padries were mostly victorious, especially under the conduct of Tooaka Passumman, who subjected a large tract of country to his sway. It is said that several members of the antient royal family fell by his hand, and he cruelly oppressed those whom he had conquered. Some of the small chieftains who inhabit the country between Padang and Menangcabau applied to the Dutch for protection, and the Dutch government took up their cause. Though the issue of the war which thus commenced was doubtful for two years (1833 and 1834), the military skill of Europeans was superior to the fanaticism of the Padries, and the result has been that the whole country of Menangcabau is now included in the Dutch possessions. Thus the Dutch, in somewhat more than twenty years, have succeeded in founding an extensive empire in Sumatra.

(Marsden's *History of Sumatra*; Crawfurd's *History of the Indian Archipelago*; Heyne's *Historical and Statistical Tracts on India*; Anderson's *Account of a Mission to the East Coast of Sumatra*; Lady Raffles, *Memoirs of the Life and Public Services of the late Sir T. S. Raffles*, &c.; Moor's *Notices on the Indian Archipelago*, Singap., 1837; Anderson's *Acheen and the Ports on the North and East Coasts of Sumatra*; Hogendorp's *Coup-d'œil sur l'Isle de Java et les autres possessions Neerlandaises*, &c.; and Horsburgh's *Indian Directory*.)

SUMBA, SUMBAWA. [Sunda Islands, Lesser.]

SUMY, a large town in the government of Slobodsk-Ukraine, in European Russia, is situated in 50° 50′ N. lat. and 35° E. long., on the river Psol, at its junction with the Suma. It is surrounded by a wall and ditch, and has also an antient citadel. It has two stone churches and eight of wood, of which material most of the houses are likewise built. There are several charitable institutions, public depôts, and warehouses. The number of inhabitants is above 12,000, whose chief employments are tillage, gardening, pasturage, and distilling. They have no manufactures, but a considerable traffic in the productions of the country, especially at five great annual fairs, which are much frequented. At one of those fairs large purchases of horses are made on account of government for the Russian cavalry.

(Schneller's *La Russie et La Pologne*; Hassel; Hörsohelmann.)

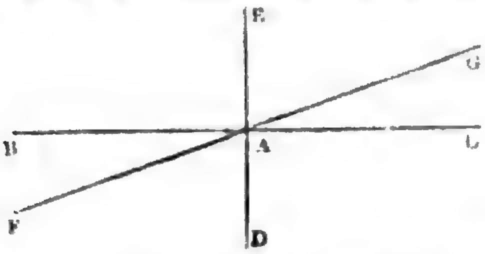
SUN (Latin, *Sol*; Greek, ἥλιος, Hēlios). In the present article we confine ourselves to the astronomical characters of the sun's orbit, and to what we know of its physical constitution. For more particulars on the measurement of time, see Time; on chronology as dependent on this body, and on the more common characters of its motion, see Year. See also Moon; Seasons; Astronomy; Zodiac (on mythology); Zodiacal Light; Twilight, &c.

It is needless to say that if the utility of the subject of an article were to determine its length, the one we are now commencing ought in justice to occupy several volumes of the work: were we however seriously to mete out the importance of the sun in columns of a Cyclopædia, our panegyric would not be more quaint than that of Sir John Hill, who says that this luminary is 'enough to stamp a value on the science to which the study of it belongs.' In relation to astronomy this is particularly true; for it would be possible to preserve life on the earth, and to keep order, without any knowledge of the moon, planets, or stars; but to do this without any acquaintance with the sun's motions would be absolutely impossible. The source of light and heat, and through them of the alternations of the vegetable world, is, in the highest secondary sense, the giver and sustainer of life; but this very importance ensures names to so many results of solar phenomena, that the present article is stripped of details, by their entering more appropriately into others.

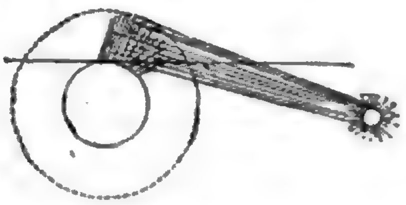
The motions of the sun are in fact those of the earth, written in the heavens. If the diurnal motion of the earth were stopped, the sun would appear to move slowly among the stars, from west to east, at the rate of about twice its own diameter in twenty-four hours by the clock. This [Motion] is the consequence of the orbital motion of the earth, which is communicated in appearance to the sun. If the earth's orbital motion were stopped, the diurnal motion continuing as usual, the sun would appear to move round daily, from east to west, as at present; but since there would then be no motion of that body among the stars, those stars which are at any one time hidden by the daylight would always be hidden, and the face of the heavens at any given hour of night would be the same at all times of the year. The effect of the orbital motion of the earth combined with the diurnal motion is that the solar day, or the interval between two meridian passages of the sun, is a little longer than the sidereal day (about four minutes), or than the actual revolution of the earth; so that all the stars have their turn, and every star in the course of the year comes on the meridian at every period of the natural or solar day. [Synodic; Time.]

The great phenomena of day and night are attended with very different circumstances in different parts of the globe. We are not speaking now of the high polar regions, north and south, in which the sun never sets for days together, but of those parts of the earth in which there is actual appearance and disappearance of the luminary, or real day and night. Let us take the day of the vernal equinox as a specimen, when the sun is in the equator (we presume in our reader a knowledge of the terms and notions in Sphere, Doctrine of the). If we take one fixed line to represent the horizon of different places, as BAC, the sun will rise to a place on the equator so as to move along the circle DAE, and to come directly up from the horizon; while at a place near the pole it will move, relatively to the horizon (still

BAC), along the circle FAG. Now the first evidence which the sun gives of its approach is this (the diagram, though



of very distorted dimensions, may be of use): before it has risen above the horizon of the place, so as to be visible, it



can throw its rays into the atmosphere above the place, which atmosphere reflects something both of light and heat to the place itself. This period is call the twilight, and it is said that there is more or less of twilight as long as the sun is not more than 15° below the horizon: though certainly the twilight which saves candlelight does not last so long. But, be the number of degrees which are allowed to twilight more or less, it is obvious that at the equator, where the whole of the sun's way is made directly to or from the horizon, the intermediate period of twilight must be much shorter than at a place near the pole, where the motion towards the horizon is very oblique, instead of being all ascent, as before rising, or descent, as after setting. The consequence is well known: in the tropics, the warning is short, and soon after the light begins to break the sun makes its appearance, and it is broad and hot day; while after the setting the light as soon disappears, and it is dark night. With us, on the contrary, and still more in higher northern latitudes, there is a long warning of the approach of the luminary before the sunrise, and a long remembrance of it after sunset. In all climates the transition from day to night is broken by the two circumstances mentioned in **Seasons**. In the same article it is pointed out that the heat received during the winter and summer halves of the year is the same over the whole earth.

Immediately after sunrise, the form of the luminary appears somewhat elliptic, the horizontal diameter being longer than the vertical one. This is the effect of **Refraction**, which varies so rapidly near the horizon, that the upper end of the vertical diameter is less elevated than the lower end by a sensible quantity, while the two ends of the horizontal diameter are equally elevated. The same phenomenon occurs with the moon, when rising at the full, and would also be seen in the planets, if they were large enough in appearance. It must also be noted that both sun and moon appear larger when near the horizon: but this, as to the sun, is delusion, since when measured with instruments its apparent diameter is the same at all parts of the day. It is true that both bodies, when in the zenith, are nearer to the spectator than when in the horizon, by what may be called without error a semidiameter of the earth; the moon is near enough to show the effect of this in instrumental measurements of its diameter, but it is not so with the sun.

Before looking at what we know of the physical appearances of the sun, its distance from the earth must be mentioned, to which we may add at once the other elements of its orbit. Its equatorial horizontal **Parallax**, at its mean distance, is 8″·5776, and its apparent semidiameter 16′ 0″·9. It is then distant from the earth by 24,000 semidiameters of the earth, or about 95 millions of miles. Its diameter is 111⅓ times as great as that of the earth, or upwards of 880 thousand miles; and its bulk is 13 hundred thousand times as great as that of the earth. But its mass, as determined from its action on the planets, is only 355 thousand times as great as that of the earth; whence its average density is only one-quarter of that of the earth. But this last result takes into the body of the sun all that is seen of it: if the surmise presently to be mentioned, of its having a luminiferous atmosphere of considerable extent, be well founded, the real body of the sun may have as much density as the earth, or more. It revolves on its axis in 25⅓ of our mean solar days; according to Delambre, in 25·01154 days: the axis being inclined to the ecliptic at an angle of 82½°.

The ecliptic is the circle in which the sun appears to move, in common language. In strictness however the earth does not move round the sun in a true plane, though it does so very nearly. The centre of gravity of the earth and moon (a point near the earth) does much more nearly describe a plane; that is, a spectator situated at that point would more nearly see the sun move in a great circle than we do. But to us, the sun is sometimes on one side and sometimes on the other of this mean ecliptic; and therefore generally has some *latitude*, though a very small one: the column entitled 'the Sun's latitude' in The Nautical Almanac is a puzzle to those readers whose astronomy is drawn from the usual elementary writings: in truth, it is only a fraction of a second, and the sun crosses the mean ecliptic twice in every lunation. The obliquity of the mean ecliptic, for January 1, 1845, is 23° 27′ 34″·23, and it is diminishing yearly by 0″·457: thus this same obliquity for January 1, 1842, is 23° 27′ 35″·60. If this diminution could go sufficiently far, it would in time bring the ecliptic and equator to coincidence, or equalize days and nights all over the world; and if it could be held to have continued long enough, would entitle us to presume that the poles were once in the plane of the ecliptic, or that every part of the earth went through all gradations in a year from equal days and nights to a polar day and a polar night. But the cause of this diminution of the ecliptic is known from the theory of gravitation; and it is also known that, under existing causes, it cannot be permanent, but must diminish in quantity and finally turn into an increase before its effect has amounted to many degrees. Persons acquainted with the phenomena of the heavens, but not with the results of the theory of gravitation, remembering the fact of tropical productions being found buried in high latitudes, sometimes imagine that they can look back to the time when the poles were so near the ecliptic, that these same high latitudes were within the tropics. This however is a pure fancy, and they had better imagine another cause; the one they think of will not do.

The mean longitude of the sun, at Greenwich mean noon on the 1st of January of the year $1800 + t$, may be determined from

$$280° 53' 32''\cdot75 + 27''\cdot605844t + \cdot0001221805t^2 - 14' 47''\cdot083f$$

where f is the remainder of t divided by 4, or 4 if the remainder be 0; that is, the number of years after the *Julian* leap-year, or after the *Gregorian* leap-year for all years after 1804. The mean motion in longitude in a mean solar day is 59′ 8″·33.

The eccentricity of the sun's orbit is ·016783568 (according to Laplace ·01685318), or the greatest and least distances of the sun from the earth are in the proportion of 1·017 to ·983, or as 30 to 29, or more nearly as 91 to 88. The greatest equation of the centre [Time] is 1° 55′ 27″·3. The eccentricity diminishes by ·00004163 in a century.

The mean longitude of the perigee, at noon, January 1, 1801, was 279° 30′ 5″·0. It has a real yearly increase of 11″·8, which, with the precession of the equinoxes, makes an increase of longitude of 61″·9.

The appearance of the sun is simply that of a ball of intense light, such as the human eye cannot bear, unless a hazy atmosphere or a dark glass be used as a screen. This light is so strong, that the brightest flames which human art can produce, when held before the sun, disappear, and ignited solids become dark spots. 'The ball of ignited quicklime,' says Sir J. Herschel, 'in Lieut. Drummond's oxy-hydrogen lamp, gives the nearest imitation of the solar splendour which has yet been produced. The appearance of this against the sun was however as described,' merely a dark spot, 'in an imperfect trial at which I was present. The experiment ought to be repeated under favourable circumstances.' A very small portion of the rays collected into one spot [Burning-Glasses] is sufficient to melt metals. On examining the face of the sun with a telescope (of course with a dark glass before the eye), two circumstances are observed. The disc is not uniformly bright 'The ground is finely mottled,' to use the words of the observer just quoted, 'with an appearance of minute dark dots, or *pores*, which, when attentively watched, are found to be in a constant state of change. There is nothing which represents so faithfully this appearance as the slow subsidence of some flocculent chemical precipitates in a transparent fluid, when viewed perpendicularly from above; so faithfully indeed, that it is hardly possible not to be impressed with the idea of a luminous medium intermixed, but not confounded, with a transparent and unluminous atmosphere, either floating, as clouds in our air, or pervading it in vast sheets and columns like flame, or the streamers of our northern lights.' The mind is lost in wonder at the idea of such a body of luminous material: but it is important to remember that living, as we must, under an atmosphere, we cannot positively assert anything as to what may take place beyond it. It is possible, though not very probable, that we should neither feel sensible of light nor heat, if we could meet the sun's rays before they have entered the air.

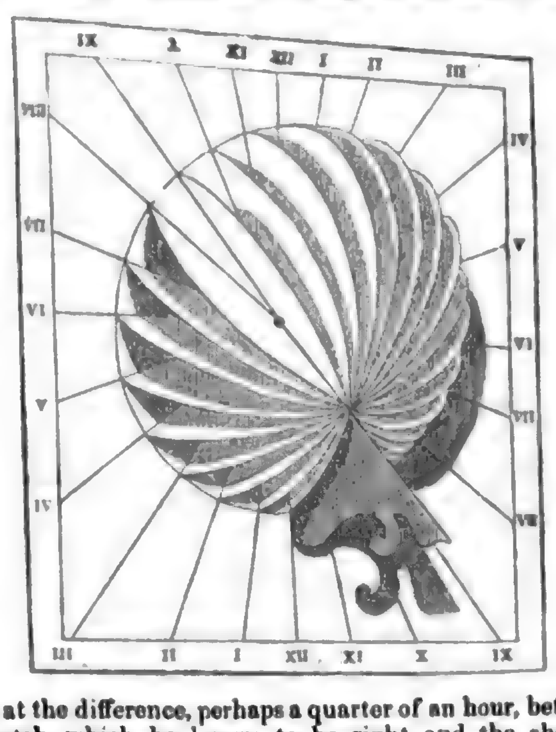
The other circumstance which is noticed on the sun's disc is the existence of black spots, by the regular motion of which the rotation of the body on its axis has been determined. These spots are of various irregular shapes, and are always surrounded by a border or penumbra, not so dark as the spot. They are of various sizes, from the least visible to the twentieth part of the sun in diameter. In their neighbourhood are frequently observed streaks on the disk more luminous than the rest, called *faculæ*, in which streaks spots frequently begin their appearance. The spots themselves alter in size, and gradually vanish, lasting various times, from a few days to six or seven weeks; the borders approaching each other in a manner which calculation shows must answer to hundreds of miles a day. Various theories have been invented to account for them, but none which has any appearance of probability, except that of W. Herschel (*Phil. Trans.*, 1801). He supposes that the sun has an atmosphere of greater density and depth than that of the earth; and that above this atmosphere, or else mixed with the higher strata of it, is another atmosphere of self-luminous clouds, of very variable depth, sometimes showing the lower atmosphere uncovered, which last reflects the light of the luminous atmosphere above it. A spot on the sun is a portion of the body of the sun itself, laid bare by some commotion which removes both atmospheres, or the greater portion of them: the penumbra round the spot, its never-failing attendant, arises from the ridges of the lower atmosphere, which form the banks of the opening. The faculæ, and general mottled appearance of the sun, arise from the luminous atmosphere having waves or ridges. From some measures of the light of different parts of the sun, Herschel thought that the non-luminous atmosphere reflects a little less than one-half the light it receives from the luminous atmosphere, and the solid body of the sun less than one-tenth. He also supposed that the presence of spots and other disturbances indicated a large formation of heat and light in the sun, and was a prognostic of hot weather and fine seasons. This he imagined he had verified by such comparisons as existed of the state of the sun at different times with the prices of wheat immediately following: he found that, as far as his data went (and he gives a proper warning as to their insufficiency), the price of wheat always rose when the sun was without spots, and fell when they began to re-appear. We have not heard of any extensive attempt to verify or refute this theory; but so far as the hypothesis of the two atmospheres is concerned, it is one of high probability: we could hardly ask for a likely result of such a combination which does not actually make its appearance. If it be correct, the sun may very possibly be a globe habitable by living beings, perpetually illuminated by its upper atmosphere, the lower atmosphere preventing too much of either light or heat from reaching them.

But as to the process by which this enormous manufactory is kept up, no theory gives the means of forming even a conjecture on the subject. Not but that conjectures have been formed: for example, it has been thought that comets carried supplies of the necessary material. That comets may occasionally fall into the sun is very possible; but as far as our knowledge of them goes, it would be as reasonable to expect that the steam-engines in our factories should be kept in repair by throwing their own cinders upon them, as that comets should supply what is needful for the maintenance of the solar rays.

SUNDIAL. Up to a comparatively recent period the science of constructing sundials, under the name of Gnomonics, was an important part of a mathematical course. As long as watches were scarce, and clocks not very common, the dial, which is now only a toy, was in actual use as a timekeeper. Of the mathematical works of the seventeenth century which are found on book-stalls, none are so common as those on dialling. All that is now necessary is to give some idea of the principles on which such instruments are constructed, as an illustration of a leading fact in astronomy. If a person were to place a staff in the ground, so as to point either vertically or otherwise, and to watch its shadow at the same hour, on different days at some intervals from each other, marking its direction at each day's observation, he would in all probability find that the direction of the shadow, the hour being always the same, varied from day to day. He might however find that the shadow was always in one direction at the same hour, and this might happen in two different ways. First, he might by accident fix the staff in a direction parallel to that of the earth's axis, in which case the direction of the shadow would always be the same at the same hour, at all times of the year, and for every hour. Secondly, having fixed the staff in a position not parallel to the axis of the earth, he might happen to choose that particular hour, or interval between two hours, at which the shadow of a staff in *that one direction* always points one way. But if, as is most likely, he were to fix the staff in a direction which is not that of the earth's axis; and if, as is again most likely, he were to choose any time of observation but one, the shadow would certainly point in different directions at different periods.

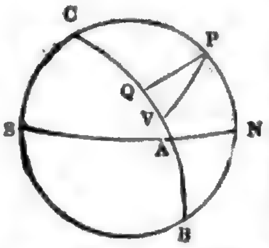
A sundial consists of two parts: the *style*, which is the staff above mentioned, usually supplied by the edge of a plate of metal, always made parallel to the earth's axis, and therefore pointing towards the north; and the dial, which is another plate of metal, horizontal or not, on which are marked the directions of the shadow for the several hours, their halves and quarters, and sometimes smaller subdivisions. In the accompanying diagram, the style is seen throwing its shadow between the directions marked IX and X, on the western side, and indicating that it is about a quarter past nine in the morning. But there is one prominent part of the figure which is never seen on a dial, namely, the hour circles, which are represented as all passing through the edge of the style. As the diagram stands, a skeleton globe of hour-circles only is made a part of the construction, to assist in the explanation.

Let us suppose the sun to move with an equable motion, so that it shows the same time as the clock. It does not do so in reality, but the consideration of this point belongs to the article TIME. A large sundial is frequently furnished with a table of the correction of sun-time, to turn it into clock-time, engraved on its face; but this is generally soon corroded. Nor is knowledge of the simplest elements of astronomy so widely diffused as to make such a table of any great use. A person who stations himself in any place of resort which has a sundial, will soon find a lounger who looks in amazement at the difference, perhaps a quarter of an hour, between his watch, which he knows to be right, and the shadow. The church-clock and the sun, in both of which he implicitly believes, are at variance, and he is hardly able to



resist the melancholy conclusion that his watch has gained or lost a quarter of an hour in a ten minutes' walk. Neglecting the cause of this, which is an irregularity of solar time, and has nothing to do with any particular mode of reading the results, let us suppose that it is nine o'clock in the morning, solar time. This means that the sun is in that hour-circle which belongs to three hours before noon, or is 3×15 or 45 degrees from the meridian hour-circle towards the east. The meridian hour-circle is that which cuts the plate of the dial in the line XII XII; and the hour-circle in question (the right-hand one of the two which are not shaded) cuts the dial-plate in IX IX. Now when the sun is in the continuation of any plane, the shadow of that plane is only that of the edge presented to the sun. The upper edge of the style is common to all the hour-circles; and its shadow is therefore, for the time, part of that of the hour-circle in which the sun is. Hence at nine o'clock before noon the line OIX will be the shadow of the style, O being at the intersection of the edge of the style and the dial-plate (marked by a large dot in the figure). In the diagram, the day has moved on about a quarter of an hour after the time just described, and the shadow has advanced accordingly. There is in it a trifling error of shading (it was taken from De Parcieux's Trigonometry, a work which is very rich in well-drawn solid figures), which will serve to illustrate the subject. The time being between nine and ten o'clock, the sun ought to be looking directly into the crevice between the hour-circles IX and X, in which crevice there ought therefore to be no shadow; but the crevice which is entirely devoid of shadow is that between the hour-circles VIII and IX, so that the sun is made to tell one story on the north side, and another on the south, of the figure. The reader will easily set this right, and will see that as far as the whole hours are concerned, the crevices themselves might be made to answer the purpose of a sundial.

Though the preceding figure was drawn for a horizontal dial, yet any other plane might be substituted. The objections to a dial are, that the shadow of the style is not sufficiently well defined to give very accurate results, even for ordinary purposes: that refraction, which always makes the sun appear a little too high, throws the shadow a trifle towards noon at all times, that is, makes the time too fast in the morning, and too slow in the evening; and that a correction is always necessary in order to find mean or civil time. Even if the first objection could be got over, the corrections requisite for the two latter would prevent persons in general from making use of the instrument. If the edge of the style be not very narrow, it is necessary to have the morning and evening halves of the dial separated by the breadth of that edge.



Those who understand spherical trigonometry will easily see that the general problem of a sundial consists in that of finding out where the hour-lines cut a given circle, as follows. Let BQC be the circle in which the plane of the dial produced cuts the heavens, and let the angle CAS, which it makes with the horizon (h), and CBN, which it makes with the meridian (m), be given. From P, the pole, draw QP perpendicular to the plane of the dial; and the line joining P with the centre being the continuation of the style, that joining the centre with Q is the continuation of what is called the *substyle*. Now in the right-angled triangle ANB, we have

$$\cos \mathrm{NB} = \frac{\cos h}{\sin m},$$

whence NB is found; to which add the latitude of the place, PN, and PB is found. The equations

$$\tan \mathrm{PB} \,.\, \cos m = \tan \mathrm{QB}, \qquad \sin \mathrm{PB} \,.\, \sin m = \sin \mathrm{PQ}$$

show how to place the substyle with respect to B, the point answering to noon; and also how to place the style with respect to the substyle. To find the point V at which any given hour-line, PV, cuts the circle CB, first find the angle QPB from

$$\cot \mathrm{QPB} = \tan m \,.\, \cos \mathrm{PB};$$

and VPB, the hour-angle from noon of the sun (V being a point in the shadow). The difference of these angles, QPV, or their sum, is then known; and QV is found from

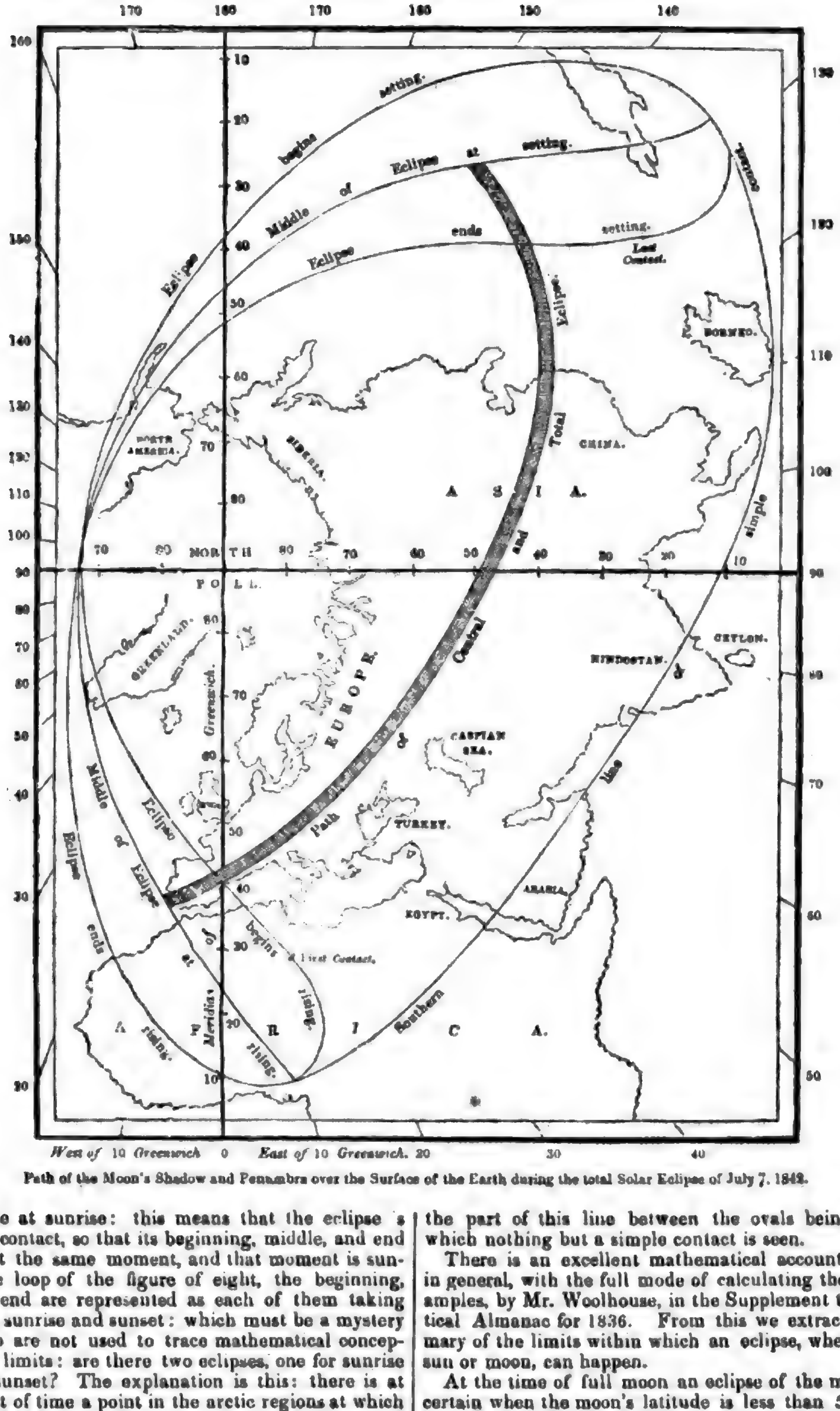
$$\tan \mathrm{QV} = \tan \mathrm{QPV} \,.\, \sin \mathrm{PQ}.$$

It will be better for the beginner to verify these steps on a correctly-drawn figure, or to modify them, than to make purely algebraical alterations. Also it is to be remembered that the position of the dial may require both sides of it to be graduated, and the style to extend in both directions, to suit all times of the year and all hours of the day.

SUN, ECLIPSE OF THE. The phenomena of an eclipse of the sun resemble those of the moon in one respect only, namely, that the body of the luminary disappears. In all other respects there is so great a difference, both in the cause of the phenomenon and its attendant circumstances, that it is a pity one term, eclipse, should be used in senses so different. In the first place, the disappearance of the moon arises from the earth intercepting the light which she ought to receive, while that of the sun is the consequence of the moon coming between the sun and the earth. The body of the moon is never absolutely hidden, and is even slightly visible through a telescope during the darkest eclipse: but the body of the sun is really hidden by the intervention of the opaque substance of the moon. Again, the phenomena of an eclipse of the moon are the same for every point of the earth at which they are visible: the beginning, middle, and end of the phenomenon happen at the same instant of absolute time everywhere, and the same portion of the moon is hidden from all the earth at the same instant. But in a solar eclipse, it entirely depends upon the position of the spectator whether there is any eclipse at all; and of two persons at different parts of the earth, at the same instant, one may see the sun totally eclipsed, while the other may, by the brightness of the sun's rays, not know that the moon is almost close to him. A screen held before a candle may be an eclipse of the candle for one person in the room, but not for another, on account of their difference of place; this is an illustration of the solar eclipse: a ball thrown into a dark corner may be invisible to all the persons in a room at the same time; this is the same illustration of a lunar eclipse.

If the earth had no motion of rotation, the inhabitants of any one place would see something exactly resembling a lunar eclipse; the sun being in place of the moon, and the moon in place of the earth's shadow. But different places would see different kinds of eclipses, some losing more of the sun's body, and others less. The rotation of the earth, without materially altering the character of the phenomenon, makes it much more difficult to calculate: for it is as if each spot of the earth, instead of standing still to witness one phenomenon, or one simple eclipse, were constantly taking into view portions of different phenomena, a part of one followed by a subsequent part of another. In an eclipse of the moon, whatever may be the phase for the time being, from the disappearance of the first to the reappearance of the last edge, the only question as to whether such phase will be visible or not at any place is the following:—Will the moon be above the horizon at that place when the phase occurs? Suppose, for instance, it were asked, what places on the earth will see the beginning of the eclipse, the disappearance of one edge of the moon, at the instant when the moon rises? The answer is, calculate the absolute instant of the beginning of the eclipse, find out the spot to which the moon is vertical at that instant, and all places 90° distant from it will be exactly in the same predicament with respect to the eclipse. But in an eclipse of the sun, the beginning at two different places does not happen at the same instant; the inhabitants of any the same circle see very different phases, and a line drawn through all the places which see the same sort of phase under the same position of the luminaries with respect to their horizons will be very different from a circle. Without attempting to give any account of the modes of ascertaining all these points, we subjoin, from the Nautical Almanac, a projection of the eclipse which is to take place on the 7th of next July, 1842.

The southern line passes through all the places which see a simple contact of the luminaries and nothing more: the edges of the luminaries unite for a moment and then separate. This line touches the two ends of a large figure of eight divided by another line passing through its loop; and the portion of the earth which at any time sees a total eclipse is contained in the broad shaded band. On the line marked 'beginning of eclipse at sunrise' live those to whom the luminaries rise in contact: the other lines are similarly explained. The eclipse is first seen at the place marked 'First contact' on the line just mentioned. One point is marked as having both beginning, middle, and end


Eclipse begins setting.
Middle of Eclipse at setting.
Eclipse ends setting.
Last Contact.
BORNEO.
Total and Central Path
Eclipse
NORTH AMERICA.
SIBERIA.
A S I A.
CHINA.
NORTH POLE.
GREENLAND.
Greenwich.
EUROPE.
CASPIAN SEA.
HINDOSTAN.
CEYLON.
TURKEY.
ARABIA.
EGYPT.
Middle of Eclipse at rising.
Eclipse ends rising.
Eclipse begins rising.
First Contact.
Meridian of
A F R I C A.
Southern simple line
West of 10 Greenwich 0 East of 10 Greenwich. 20 30 40

Path of the Moon's Shadow and Penumbra over the Surface of the Earth during the total Solar Eclipse of July 7. 1842.

of the eclipse at sunrise: this means that the eclipse is there only a contact, so that its beginning, middle, and end take place at the same moment, and that moment is sunrise. At the loop of the figure of eight, the beginning, middle, and end are represented as each of them taking place both at sunrise and sunset: which must be a mystery to those who are not used to trace mathematical conceptions to their limits: are there two eclipses, one for sunrise and one for sunset? The explanation is this: there is at every moment of time a point in the arctic regions at which the sun is making its first appearance or its last appearance previously or subsequent to the long polar day or night. As this moment approaches the days shorten, if the disappearance be coming on, and begin from nothing if the appearance be coming on: the long day or night being preceded by the ordinary days or nights of the rest of the earth. Now the point which is at the loop is that point of the earth at which the sun and moon are in contact (without any further eclipse) at the moment when the sun first grazes their horizon after their polar night: so that their day is but a moment, and at that moment the contact takes place.

The figure of the projection is not always like that of the preceding: sometimes the loops become two ovals separated by a line which is continued through the middle of them, the part of this line between the ovals being a line on which nothing but a simple contact is seen.

There is an excellent mathematical account of eclipses in general, with the full mode of calculating them, and examples, by Mr. Woolhouse, in the Supplement to the Nautical Almanac for 1836. From this we extract the summary of the limits within which an eclipse, whether of the sun or moon, can happen.

At the time of full moon an eclipse of the moon will be certain when the moon's latitude is less than 51′ 57″, impossible when it is greater than 63′ 45″, and doubtful between these limits. For the doubtful cases an eclipse will result when the moon's latitude is less than

$$\frac{61}{60}(p+\pi-\sigma)+s+16'',$$

p and s being the equatorial horizontal parallax and semidiameter of the moon, and π and σ those of the sun.

At the time of new moon an eclipse of the sun will be certain when the moon's latitude is less than 1° 23′ 15″, impossible when it is greater than 1° 34′ 52″, and doubtful between these limits. For the doubtful cases, an eclipse will happen when the moon's latitude is less than

$$p-\pi+\sigma+s+25''.$$

It is hardly necessary to state that eclipses of the sun are frequently wholly partial, that is, not total for any one moment to any one part of the earth. Sometimes, though the eclipse be central, it is not total on account of the moon not being near enough to hide the whole of the sun: in which case part of the latter is seen as a bright ring round the part hidden by the moon, and the eclipse is called annular.

An appearance of a surprising character has been often observed in total and annular eclipses of the sun, as soon as the moon begins to leave or approach the internal border of the sun. In the former case the separation is not always instantaneous, but threads of black appear to connect the edge of the moon and sun, 'as if the edge of the moon were formed of some dark glutinous substance which by its tenacity adhered to certain points of the sun's limb, and by the motion of the moon was thus drawn out into long threads, which suddenly broke and wholly disappeared.' . . . 'The moon preserved its usual circular outline during its progress across the sun's disk, till its opposite limb again approached the border of the sun, and the annulus was about to be dissolved. When, all at once (the limb of the moon being at some distance from the edge of the sun), a number of long, black, thick, parallel lines, exactly similar in appearance to the former ones above mentioned, *suddenly darted forward* from the moon and joined the two limbs as before; and the same phenomena were thus repeated, but in an inverse order. For, as these dark lines got shorter, the intervening bright parts assumed a more circular and irregular shape, and at length terminated in a fine curved line of bright beads (as at the commencement), till they ultimately vanished, and the annulus consequently became wholly dissolved.' The preceding is from Mr. Baily's paper on the solar eclipse of 1836 (*Mem. Astron. Soc.*, vol. x.), in which an account will be found of preceding appearances of the same kind. Several other observers saw the same thing in the same eclipse. No account whatever can be given of the reason of this remarkable appearance.

SUN-BIRDS. *Soui-mangas,** *Cinnyridæ*, a family of birds of brilliant plumage, living upon the juices of flowers, and representing in the Old World the TROCHILIDÆ, or *Humming-Birds* of the New Continent and its islands.

Cuvier, in defining his genus *Cinnyris*, states that the species composing it have the tail no longer worn; the bill long and very slender, with the edge of the two mandibles finely serrated; and the tongue, which can be protruded from the bill, terminating in a fork. They are, he observes, small birds, the plumage of whose males glitters in the season of love with metallic colours, approaching in splendour that of the humming-birds, which they represent in this respect in the Old Continent, where they are found principally in Africa and the Indian Archipelago. They live, he adds, on flowers, from which they pump the juices: their nature is gay, and their song agreeable. Their beauty makes them much sought after in our cabinets; but as the plumage of the females and that of the males during the interval between the seasons of love is entirely different from its nuptial brilliancy, it is difficult to characterise the species. (*Règne Animal.*)

Cinnyris, in Cuvier's arrangement, stands between *Melithreptus* and *Arachnothera*.

Mr. Vigors considers the *Tenuirostres*, or *Suctorial* birds, the most interesting group, perhaps, of the animal world. 'Deriving,' says that author, 'their subsistence for the most part from the nectar of flowers, we never fail to associate them in idea with that more beautiful and perfect part of the vegetable creation, with which, in their delicacy and fragility of form, their variety and brilliancy of hues, not less than by their extracting their nourishment from vegetable juices, they appear to have so many relations. As the tribe is confined exclusively to the torrid zone and the southern hemisphere, the naturalists of our northern latitudes have little opportunity of observing their manners or of inspecting their internal construction. Much confusion has consequently arisen in assigning them their respective stations, more particularly among the *Honeysuckers* of New Holland, which have been indiscriminately scattered among every group of the order. In the absence of that certain and perfect information which alone can authorise us to decide upon the station of any bird in nature, I cannot, at present, undertake to fill up the details of this tribe with much pretension to accuracy. The following sketch however of the Suctorial families will, I imagine, be found to afford some approach, in its general outline, to the natural divisions into which the tribe branches out, and to the order in which they succeed each other:—*Nectariniadæ ? Cinnyridæ, Trochilidæ, Promeropidæ, Meliphagidæ.* Arranged according to their typical characters, they thus succeed each other:—

Normal Group.

Bills and feet comparatively slender (gracilioribus) . .	*Cinnyridæ.* *Trochilidæ.*

Aberrant Group.

Bills and feet comparatively strong (fortioribus) . . .	*Promeropidæ ?* *Meliphagidæ ?* *Nectariniadæ ?'*

Mr. Vigors then proceeds to state that Illiger was the first who separated the true *Certhia* of the present day from the groups of the Linnean *Certhia*, which feed upon vegetable juices, and which he therefore distinguished by the generic name of *Nectarinia*. This latter genus, observes Mr. Vigors, comprising two distinct and strongly marked groups, has again been separated by Cuvier into two divisions: for the first of which, consisting of birds whose bills are shorter and stronger than those of the second, and whose feet are also in general more robust, he has retained the name of *Nectarinia;* while he has distinguished the latter division, where the bills are longer and more attenuated, and the legs and feet are proportionally more delicate, by the appellation of *Cinnyris*. The two first families in the arrangement of Mr. Vigors accord with these views; and he remarks that, besides the difference in their structure, the two groups may be separated by their geographical limits. The *Nectariniadæ*, as far as Mr. Vigors can trace out their extent, are confined to the New World; while the *Cinnyridæ* are circumscribed within the bounds of the antient continent and its adjoining islands. In looking to the succession of affinities in the tribe, Mr. Vigors remarks that the *Nectariniadæ* appear to hold, by the comparative strength of their feet and bill, an intermediate rank between the *Creepers* and the typical groups of the present tribe. The *Certhiadæ*, as we have seen [CREEPER], employ, he observes, the feet in climbing; the *Nectariniadæ* hop from flower to flower, seeking the nectar of each; while the *Cinnyridæ* and *Trochilidæ* make no use whatever of the foot as they extract their food, but during the process of feeding are poised entirely on the wing. The two last-mentioned families, he adds, again approach each other in the slenderness of their bill, the vividness and changeable lustre of their plumage, and the habit of hovering on the wing when they feed. They are chiefly separated by the comparatively stronger foot and bill of the *Cinnyridæ:* but the geographical distribution of the two families points out a line of demarcation. Mr. Vigors concludes this part of his observations by acknowledging that these two typical families are the only groups in the tribe of whose situation he can speak with any confidence; and these two families form the subject of this article. (*Natural Affinities that Connect the Orders and Families of Birds*, in *Linn. Trans.*, vol. xiv.)

Mr. Swainson considers the *Cinnyridæ*, or *Sun-birds*, so called by the natives of Asia in allusion to their splendid and shining plumage, the subtypical family of the *Tenuirostres*. He observes that the affinity is obvious between this family and the MELIPHAGIDÆ; but whether the direct passage is made by the short-billed honeysuckers (*Dicæum*, Cuv.) or by the spider-suckers (*Arachnothera*, Temm.) is uncertain. 'The plumage of the meliphagous birds of New Holland,' says Mr. Swainson, 'is almost universally dull, or at least destitute of those gay and beautiful tints which are so strikingly developed in the sun-birds: a rich golden-green, varied on the under parts with steel-blue, purple, bright orange, or vivid crimson, decorates nearly all the species, and produces a brilliancy of colours only rivalled by those of the humming-birds. The bill is very long, slender, and acutely pointed, the margins being dentated in the most regular and delicate manner: yet these teeth are so small as scarcely to be seen by the naked eye; the tongue is formed into a bifid tube, or rather, as we suspect, into two flattened filaments; thus differing materially from that of the honey-suckers, which always ends in a brush: the bill also is never notched. The difference between the two structures is softened down by the intervention of the nectar-birds (*Nectarinia*, Ill.), whose bill shows a union of both characters, the margins being finely dentated, and the tip distinctly notched. The species of the latter are few; and while *Cinnyris* is restricted to the tropics of the Old World, *Nectarinia* represents them in the New. Some few other forms, found in Australia and in the Oceanic Islands, belong to this group, and they are arranged in the genera *Melithreptes* and *Dicæum*, but their habits are imperfectly understood.'

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* Cuvier states that *Soui-mangas* signifies, it is said, in the 'jargon' of Madagascar, sugar-eater

The genera arranged by Mr. Swainson under the family *Cinnyridæ* are *Melithreptes*, *Cinnyris*, *Anthreptes*, *Nectarinia*, and *Dicæum*. The family stands between the *Meliphagidæ* and the *Trochilidæ*. (*Classification of Birds*.)

Mr. G. R. Gray makes the *Nectarinidæ*, as he writes the word, the second family of the tribe *Tenuirostres*, placing it between the *Upupidæ* and the *Trochilidæ*.

The *Nectarinidæ* in his arrangement comprise the following subfamilies and genera:—

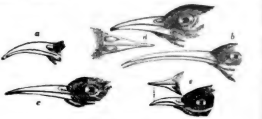
Subfam. 1. *Nectarininæ*.

Genera:—*Moho*, Less. (*Merops*, *Certhia*, Gm.; *Gracula*, Merr.; *Meliphaga*, Temm.). *Drepanis*, Temm. (*Certhia*, Gm.; *Melithreptus*, Vieill.; *Vestiaria*, Flem.). *Arachnothera*, Temm. (*Cinnyris*, Horsf.; *Certhia*, Lath.). *Nectarinia*, Ill. (*Certhia*, Linn.; *Mellisuga*, Vieill.; *Cinnyris*, Cuv.; *Rhyndace*, Mœhr.). *Ptiloturus*, Sw. (*Promerops*, Less.; *Upupa*, Gm.). *Anthreptes*, Sw. (*Mellisuga*, Vieill.; *Cinnyris*, Sw.). *Certhionyx*, Less. (*Certhia*, Cuv.). *Dicæum*, Cuv. (*Certhia*, Gm.)

Subfam. 2. *Cœrebinæ*.

Certhiola, Sundev. (*Furnarius*, Steph.; *Nectarinia* (Ill.), Less.; *Certhia*, Linn.). *Dacnis*, Cuv. (*Certhia*, Linn.). *Uncirostrum*, Lafr. and D'Orb.

Upon the whole we take the arrangement of Mr. Swainson. The following cut is after his figures in the *Classification of Birds*.



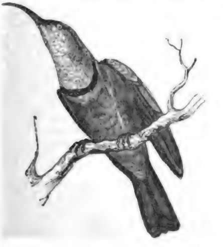
Bills of Cinnyridæ.

a. Melithreptes. b. Cinnyris. c. Anthreptes. d. Nectarinia. e. Dicæum.

Family Character of Cinnyridæ.—Wings with the outermost quills more or less shortened or graduated. Bill more or less curved, generally entire. Nostrils short, oval, membranaceous, opening by a lateral slit. Feet moderate. Bill entire. (Sw.)

Genera.

Melithreptes, Vieill. Bill long, sickle-shaped; the sides considerably compressed; the culmen elevated, and the tips entire. Nostrils very short, opening by a semicircular slit. Tongue long; the tip only terminated by a bunch of short filaments. Wings moderate; the three first quills nearly equal. Feet robust, long. Lateral toes equal. Tarsus almost twice as long as the hind toe. Pacific Islands. (Sw.)



Cinnyris chalybeia, Lesser Collared Creeper. (Sw., *Zool. Ill.*)

Example, *Melithreptes Pacifica*.

Cinnyris, Cuv. Bill long, slender; the tips very acute and entire; the margins minutely denticulated; base of the upper mandible folding over, and partly concealing that of the lower. Nostrils short, oval. Tongue retractile, simply forked. First quill spurious, second shorter than the third. Tail even or rounded. India and Africa. (Sw.)

Example, *Cinnyris chalybeia*.

Description.—Golden green, with brown wings and tail, and narrow pectoral red band bordered above by another of steel blue; upper tail-covers blue.

This, according to Mr. Swainson, is *Certhia chalybeia*, Lin., Gmel., *Le Soui-manga à collier*, Vieill., and *Collured creeper*, Lath.

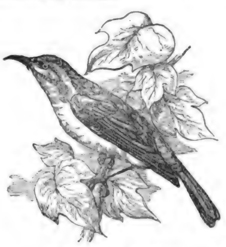
Mr. Swainson remarks that another bird very nearly resembling this has been figured by Le Vaillant under the name of *Le Sucrier à plastron rouge* ('Ois. d'Afr.,' pl. 300), but that Le Vaillant's reasons for separating them are, he thinks, sufficient, at least until more forcible ones are adduced than mere conjecture.

Anthreptes, Sw. Bill moderate, rather strong, slightly curved; widening towards the base, which is much broader than it is high. Base of the under mandible thickened, and not partially covered by the upper. Wings, feet, and tail as in *Cinnyris*. (Sw.)

Example, *Anthreptes Javanica; Nectarinia Javanica*, Horsf.

Description.—Glossy metallic purple above, olive yellow beneath; scapulars, rump, and rather broad lateral stripe extending from the corner of the bill to the breast with a slight curvature, glossy violet; the throat chestnut; tail black.

Mr. Swainson describes this bird as a *Cinnyris* in the 'Zoological Illustrations,' and by the name here adopted in his 'Classification of Birds.' These changes however leave his declaration that it is not a *Nectarinia* (a genus confined to the New World) untouched.



Anthreptes Javanica. (Sw., *Zool. Ill.*)

Nectarinia, Ill. Bill in general shorter than the head, wide at the base, compressed from the nostrils. Tip of the upper mandible with a distinct notch; the margins entire. Wings long; the three first quills nearly equal. Lateral toes unequal. South America only. (Sw.)

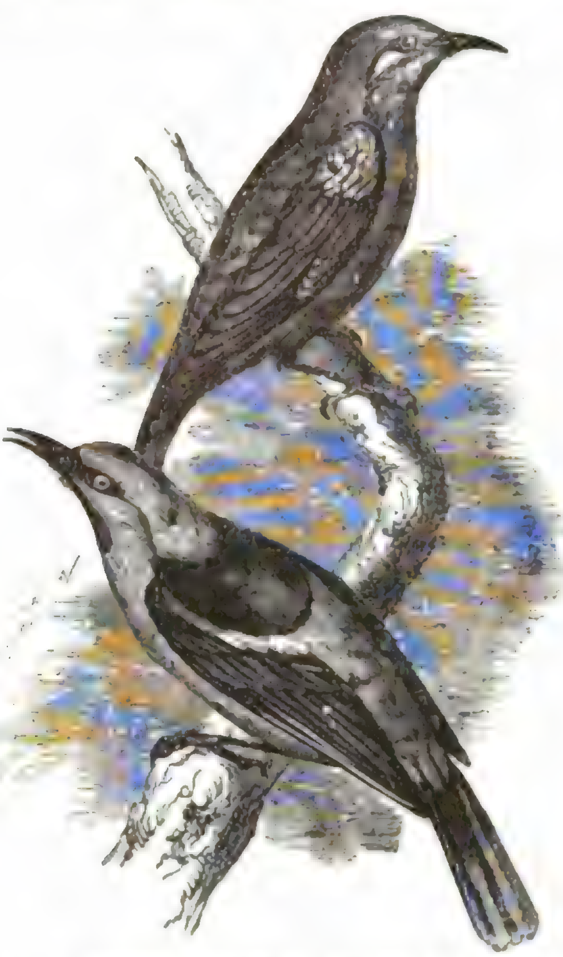
Example, *Nectarinia cyanocephala*.

Description.—(Male.)—Changeable blue; throat, back, tail, and wings black; the quills edged with blue.—Female green; head, cheeks, and scapulas bluish; throat grey. (Sw.)

This, according to Mr. Swainson, is (Male) *Motacilla Cayana*, Linn., Gmel., *Sylvia Cayana*, Lath.; *Pepit bleu de Cayenne?* Briss.; *Cayenne Warbler*, Lath.; and *Sylvia Cayenensis cærulea*, Briss. (Female) *Motacilla cyanocephala*, Gmel.; *Sylvia cyanocephala*, Gmel.; *Sylvia viridis*, and *Le Pepit verd*, Briss.; *Blue-headed Warbler*, and *Blue-headed Creeper?* Lath.

Mr. Swainson states that the habits of this bird are pefectly the same as those of the rest of the *Nectariniæ*. 'It is,' he says, 'one of the commonest birds of Brazil, and appears spread over the whole extent of that country. It frequents the same trees as the humming-birds, hopping from flower to flower, and extracting the nectar from each; but this is not done on the wing, because its formation is obviously different from the humming-birds, which, on the contrary, poise themselves in the air during feeding.' This is the passage alluded to and quoted by Mr. Vigors (see p. 284).

Mr. Swainson remarks that the young males, as usual before moulting, have the colours of the female, and that the rich sky-blue of the male, in some lights, becomes greenish, and in others dark-blue.



Nectarinia cyanocephala. (Sw., *Zool. Ill.*)
Upper figure, female; lower, male.

Dicæum, Cuv. Bill short, remarkably broad at the base, and suddenly compressed beyond; the tips entire; the margins minutely denticulated; nostrils triangular. Wings, feet, and tail as in *Nectarinia*. Indian and Australian Islands. (Sw.)

The figure referred to by Cuvier gives an incorrect notion of this genus [CREEPER], and there must be some mistake; but the reader will find a most elegant and characteristic drawing of *Dicæum hirundinaceum* in Mr. Gould's grand work of the 'Birds of Australia.'

Mr. Gould states that the *Swallow Dicæum* has neither the habits of the Pardalotes nor of the Honey-eaters: it differs, he says, from the former in its quick, darting flight, and from the latter in its less prying, clinging, and creeping actions among the leaves, &c. 'When perched on a branch,' continues Mr. Gould, 'it sits more upright, and is more swallow-like in its contour than either of the forms alluded to: the structure of its nest and the mode of its nidification are also very dissimilar. Its song is a very animated and long-continued strain, but is uttered so inwardly that it is almost necessary to stand beneath the tree upon which the bird is perched before its notes can be heard. Its beautiful purse-like nest is composed of the white cotton-like substance found in the seed-vessels of many plants; and, among other trees, is sometimes appended on a small branch of a *Casuarina* or an *Acacia pendula*. It was on the latter tree that I found a nest containing three or four young: a second nest, with the eggs, was given to me in Sydney. The ground-colour of the eggs is dull white, with very minute spots of brown scattered over the surface: they are nine lines long, by five and a half lines broad. The *Male* has the head, all the upper surface, wings, and tail black; throat, breast, and under tail-coverts scarlet; flanks dusky; abdomen white, with a broad patch of black down the centre; irides dark-brown; bill blackish-brown; feet dark-brown. The *Female* is dull-black above, glossed with steel-blue on the wings and tail; throat and centre of the abdomen buff; flanks light-brown; under tail-coverts a pale scarlet.'

Locality.—The Australian continent, generally.

SUN-FISH, a fish so named on account of its almost circular form and shining surface. This most remarkable fish belongs to the family *Gymnodontidæ*, and genus *Orthagoriscus*. As in others of the family, the sun-fishes have the jaws provided with an ivory-like substance, divided internally into laminæ, which represent the teeth, these being united as it were into a solid mass. The opercula are small, and the branchiostegous rays are five in number; the body is compressed; the pectoral fins are of moderate size; the dorsal and anal fins, both of which are long, are united with the caudal, and thus surround the hinder portion of the fish, which appears as if it had been truncated. The short sun-fish (*Orthagoriscus mola*, Schneider) has been found on various parts of the British coast; when however observed in our seas, they have generally, Mr. Yarrell remarks, appeared as though dead or dying, and floating along on the side, presenting the broad surface of the body to view. 'Dr. Neill says, of one that was brought to him, the fishermen informed him that, when they observed it, it was swimming along sideways, with its back fin frequently above water. It seemed to be a stupid, dull fish: it made little or no attempt to escape, but allowed one of the sailors to put his hands under it and lift it fairly into the boat. The sun-fish has been generally mentioned as remarkable for its phosphorescence, but this specimen did not exhibit that phenomenon so distinctly as a haddock or a herring.'

This fish is said to feed on sea-weeds: its body, viewed sideways, presents nearly a circular figure; the jaws are slightly produced; the eye is rather small, and the pectoral fin is small and rounded. Occasionally this species attains the length of four feet, and weight of upwards of three hundred pounds: the skin is very rough, and chiefly of a silvery colour.

The oblong sun-fish (*Orthagoriscus oblongus*, Schneider), usually found at the Cape of Good Hope, is said also to have occurred on the British coast. Dr. Turton describes the body of the oblong sun-fish as being nearly three times as long as it is deep.

A third species of the present genus, of small size, is sometimes met with in the Atlantic: it is the *Orthagoriscus spinosus* of Bloch.

SUN-FLOWER, the English name of a genus of plants called Helianthus, from ἥλιος, the sun, and ἄνθος, a flower. Two reasons have been assigned for giving the plants of this genus this name: first, the resemblance of the large disk and ray of their flowers to the sun; and second, the tendency of these flowers, in a stronger degree than in other plants, to present their face to the sun. From this circumstance the French *tournesol*, Italian *girasole*, and English *turnsol* have been given. This is a genus consisting of very stately herbaceous plants, and containing upwards of forty species, all of which are indigenous to America. It belongs to the natural order Compositæ, and has the following characters: head composed of many flowers, the flowers of the ray being ligulate and neuter, the flowers of the disk tubular and hermaphrodite; involucre irregularly imbricated, the outer scales foliaceous, the inner ones scaly; receptacle plane or convex, covered with oblong acute scales; tube of the corolla of discoid flowers short, 5-toothed; style appendiculated; fruit an achenium compressed laterally; pappus in the form of two lanceolate acute deciduous scales. The leaves are opposite, sometimes superiorly alternate, and either entire or toothed. The whole plant is scabrous or villous. The flowers are solitary, and of a yellow or orange colour.

H. annuus, annual sun-flower, is an herbaceous annual plant with thick rough stems from 6 to 20 feet in height; leaves alternate, petiolate, nearly heart-shaped, crenulated or dentated, rough; the heads are large, from one to two feet in diameter, and composed of a multitude of flowers of a beautiful yellow colour, terminal, solitary, inclined, the disk vertical and oftenest facing the south. This species is the largest of the genus: it is indigenous in Mexico and Peru; it was early introduced into Europe after the discovery of America, and has since been very generally cultivated in gardens, on account of its very large and handsome yellow flowers. The plant however in Europe never attains the height nor the flowers the size they do in their native soil and climate. The albumen of the seeds of this plant contains a large quantity of oil: and it has been proposed to cultivate it for the sake of obtaining this oil, which is very palatable, and might be used for the table. For this purpose the Society of Arts some years ago offered a prize for the raising a quantity of the seed: some experiments were made, but they do not appear to have been followed up in this country. In France it has been cultivated in fields to some extent, and from the variety of uses to which the plant may be applied, it would seem to deserve further attention. The quantity of oil to be obtained from the seeds varies: they do not produce so much in this country as in the south of France, nor so much there as in Spain and America. M. Henry found that 25 pounds of the achenia, when deprived of their pericarps, gave 8 pounds of albumen, which yielded by expression, cold, 13 ounces of a citron-coloured oil, and the same quantity hot yielded 19 ounces of oil slightly acid. In Spain the seeds are said to produce half their weight of oil. (Pouchet, *Traité de Botanique*, tom. ii., p. 193.) The fruit of this plant has been strongly recommended for feeding various kinds of domestic animals. Cows and oxen, horses, sheep, pigs, rabbits, and poultry are all fond of it. For this purpose the fruit should be reduced to the state of meal, and can either be given dry or made into a cake. The cake also that is left after expressing the oil may be used for feeding animals. Small cage-birds, as canaries, finches, &c., are very fond of the seeds. When torrified in the same manner as the seeds of coffee, they make an agreeable drink, which may be used as a substitute for that article. The liber of the bark of the stem is composed of a very tough woody tissue, which may be manufactured into twine and cordage, and a very good paper may also be made from the same tissue. The pith of this plant is almost entirely composed of the vegetable principle called *medullin*, and has been used in Russia for the manufacture of moxas for medical purposes. All parts of the plant contain a considerable quantity of nitre, and on this account when dried they form an excellent material for fuel. In the garden it is a handsome ornament, opening its large heads of flowers in July and August, which are then a favourite resort of bees.

H. multiflorus (many-flowered sun-flower) is not so high a plant as the last, nor are its flowers so large. It has vivacious roots, which produce numerous herbaceous stems, which are branched and rough; its leaves are alternate, petiolate, dentated, the inferior ones are heart-shaped, the superior oval and acuminate; the heads of flowers are numerous and not inclined. It is a native of Virginia. A variety of this species is common in gardens, and is called double, but the apparent doubleness consists in the corollas of the disk, which are usually tubular, becoming ligulate. It continues in flower longer than the last, and is much cultivated in Paris, where, in the autumn, it is the pride and glory of the parterre. It is easily propagated by dividing its roots in the spring or autumn.

H. tuberosus (the tuberous sun-flower, or Jerusalem artichoke). This latter name is a barbarous corruption of the Italian *Girasole*, this species having been introduced into Europe at the Farnese garden at Rome, from whence it was originally distributed. The roots are composed of a number of oblong tubercles, very large and fleshy, reddish outside and white within, resembling a potato; the stems are herbaceous and upright; the leaves are alternate and opposite, petiolate, oval, rough; the heads of flowers are yellow and small compared with the two preceding species. It is a native of Brazil. In France it is also known by the name of *Topinambour* and *Poire de terre*. According to Braconnot and Payen, the tubers do not contain fecula, but a vegetable principle called *Inuline* or *Dahline*. These tubers when cooked form a good substitute for potatoes, and by some are even preferred. Many animals eat them with avidity, and they are especially recommended for sheep. Payen has succeeded in obtaining from them by fermentation a liquor resembling beer, which might be used as a substitute for that beverage. This species is not easily produced from seed in this country, but it may be propagated by its roots, which will produce stems for many years if allowed to remain in the same place. It will grow in almost any soil, but the better the soil is the more vigorous and productive will be its growth.

Some of the species secrete a resinous juice, which is found to exude from the various organs of the plant. This is most observable in the *H. thurifer*, in which the resinous matter runs down the stem. This is sometimes observed to occur in the flowers of *H. annuus*. The *H. indicus* of Linnæus and our gardens is probably only a variety of *H. annuus*, and is not a native of India, as its name would imply. This last species, according to Dr. Royle, is cultivated by the natives of India for the purpose of obtaining oil from its seeds.

SUNDA ISLANDS is a term of unknown origin, but generally applied to the western and larger portion of the Indian Archipelago. The sea which lies between the island of Java on the south and that of Borneo on the north was formerly generally known by the name of the Sunda Sea, but at present it is very frequently called the Java Sea. Properly speaking, only the islands which enclose that sea were called the Sunda Islands, and then the term was only applied to the large islands of Java and Borneo, which lie south and north of it, and to those of Sumatra and Celebes, which enclose it on the west and east. These four islands are still generally called the Greater Sunda Islands; but as there was no general name for that chain of islands which extend from the eastern extremity of Java to the coast of New Guinea or Papua, the name of Sunda Islands was extended to them by geographers, and they go now under the general name of the Lesser Sunda Islands; so that under the term Sunda Islands the whole of the Indian Archipelago is comprehended, with the exception of the Moluccas, the Sooloo Archipelago, and the Philippines. The greater Sunda Islands [BORNEO, CELEBES, JAVA, and SUMATRA], with their dependencies [BANCA, BILLETON, and MADURA], are noticed under separate heads.

SUNDA ISLANDS, LESSER, are situated between 5° and 11° S. lat., and between 114° and 135° E. long. Although these islands were early visited by the Portuguese, who formed small settlements on some of them, and although the Dutch East India Company afterwards kept a small establishment on many of them, they were almost entirely unknown in Europe until lately. The Dutch Company had no other object in occupying them than the destruction of the cloves and nutmeg-trees for the purpose of appropriating to themselves the exclusive commerce in the produce of these trees; and accordingly they prevented other Europeans from approaching these islands, and withheld all information respecting them. But since the abolition of the company, the Dutch government has taken into its own hands the government of its possessions in the East Indies, and some accounts of these islands have been published in Holland. Some of them have also been recently visited by whaling-vessels, and since the formation of a British colony on the north coast of Australia an active intercourse has been established between Port Essington and the eastern groups of the Lesser Sunda Islands; and it is probable that these islands will acquire a greater value in the eyes of Europeans, and in a short time we shall become better acquainted with them.

The Lesser Sunda Islands consist of four large groups, which, from west to east, are called the Timor Islands, the Serawatte Islands, the Tenimber group, and the Aroo Islands. The term Lesser Sunda Islands is frequently applied to the Timor Islands alone.

The *Timor group*, so called from the largest of the islands, extends from 114° to 127° 30′ E. long., and comprehends the greater part of the islands and the larger islands of the whole chain. Between 114° and 119° it consists of three large islands, Bally, Lombok, and Sumbawa, which lie west and east of one another. But between 119° and 127° the islands constitute a double row, of which the northern, lying between 8° and 9° S. lat., comprehends Comodo, Flores, Solor and Adinara, Lombten, Pantar, Ombay, and Wetter. The southern row forms a curve towards the south, advances nearly to 11° S. lat., and consists of the islands of Sumba or Sandalwood, Savu, Rotti, Simao, and Timor. The straits which separate these islands from one another are often navigated by vessels bound to or from China, when they reach these seas in seasons during which the navigation through Sunda Strait is either dangerous or tedious.

Lombock Strait, which separates Bally from Lombock, is more than 40 miles long, and at the southern extremity it is divided into two channels by an island called Banditti Island. At this part it is about 30 miles wide, but towards its northern extremity it narrows to about 12 miles. It is rarely navigated by vessels coming from the north, as a strong current generally sets through the strait from the south, and there are no soundings in the middle of it. But as there are a few anchorage-places on each side of the strait where the current is weak, it is frequently used by vessels from the south.

The *Strait of Allas*, which extends between Lombock on the west and Sumbawa on the east, is more than 50 miles long, and about 12 miles wide on an average, but it narrows in some places to 7 miles. This strait is more used by vessels going to or returning from China through the seas lying east of Borneo, than any other of the straits between the Lesser Sunda Islands, because the current is very moderate, never exceeding two knots per hour, and though there are no soundings in the middle of the strait, anchorage is generally found along the shores of the island of Lombock.

The island of *Sumbawa* extends from west to east about 180 miles, but its width varies between 50 and 20 miles; two large bays, Sallee and Bima bays, enter deeply into the island from the north. The average width may be 40 miles, which gives an area of 7200 miles, or about 800 miles less than that of Wales. Along the southern shores of this large island extends a mountain-range, which begins on the shores of the Strait of Allas and terminates on those of Sapy Strait. Seen from the sea, this chain seems to consist of two parallel ridges, rising one above the other to a great elevation. About the middle of this chain, and opposite the Bay of Sallee, which cuts it nearly in two, is a deep depression in the range, which is not much above the sea-level, and is covered with thick forests. The shores of this mountain-tract are high and steep. It is not known how much of the island is covered by these mountains. The remainder of the island is generally hilly, but a few of the elevations rise considerably above the rest. The most remarkable of them is Tumbora Peak, a volcano, whose eruption in 1815 is one of the most terrible on record: the island suffered dreadfully; whole towns and villages were destroyed by the ashes, of which a vast mass was thrown out, and which were carried as far as Surabbaya in Java, and to the islands of Macassar and Amboyna. Its elevation above the sea, according to different estimates, is between 6000 and 9000 feet. The low and level tracts occupy only a comparatively small part of the island, and they generally occur at the innermost recesses of the bays along the northern coast, and along the Strait of Sapy. The Strait of Allas presents a high and rocky coast, which however towards the north is lined by many low rocky islands, between which and the main body of Sumbawa the sea is deep enough for vessels of considerable size, but it is not much navigated, owing to its rocky bottom. The soil of this island seems to be much inferior to that of Lombock or Balli, but it does not differ in vegetable productions, except that in the forests, which cover a considerable part of its surface, there is a great number of teak-trees. In the vicinity of the sea however there are no large trees, which is owing to the great consumption for ship-building. The animals are also the same as in Balli, but buffaloes are very numerous, which are rather scarce in Balli. The horses of this island, especially those of Bima, are the finest breed in the whole Archipelago, and are extensively exported. These ponies—for they are never more than thirteen hands high—possess strength, symmetry, and beauty, and bear some resemblance to the Arabic breed. Sumbawa seems to have minerals; at least gold is collected in some of the small rivers. Pearls are found in Sallee Bay. The island is divided into six petty states, Bima, Sangar, Tumbora, Papekat, Sumbawa, and Dimpo, which are independent of each other, but united together by a defensive alliance. The Dutch have established a kind of authority in the eastern districts; but the western states, Sumbawa and Dimpo, are quite independent. Very little is known of the commerce of this country, except that some intercourse exists between Bima and Java, and that the trading boats from Ceram and Celebes visit the port of Sumbawa. These seem to be the only places from which the produce of the island is exported.

To the east of Sumbawa is the *Strait of Sapy*, which on the other side is formed by the island of Comodo. This strait is about 40 miles long, and towards the southern entrance, where the narrowest part of it occurs, about 12 miles wide. It is considered safe for ships, and was formerly much frequented, but it is not so convenient as Allas Strait, for the tides are rapid in the narrow part, where some rocky islands separate the strait into several small channels. There is however good anchorage in Sapy Bay, on the island of Sumbawa. The northern part is divided into two channels by the island of Gilibanta, which is of considerable size, and has a peak near the centre. Near the northern entrance of Sapy Strait is the island of Goonong Apee, which is very high, and formed of a large mountain with two summits, of which the south-eastern is called the Lawa Peak, and is a volcano. The island of Comodo consists of a high rocky mass covered with wood, and is not further known. On the east of it is the *Strait of Mangerye*, which is not frequented on account of the numerous rocky islands with which it is studded, and which render the navigation intricate and dangerous.

East of this strait is the island of Flores, so called by the Portuguese. [FLORES.]

East of the Strait of Flores are five islands of considerable extent: Sebrao and Solor, already mentioned; and Lomblen, Pantar, and Ombay, each comprehending an area of from 300 to 400 square miles. All of these are very high and bold, especially the three last mentioned. A peak on Lomblen is visible at the distance of 50 miles. On Pantar are three summits, the highest of which is an active volcano. The inhabitants of Sebrao are Christians, and connected with Larantuca and Delli. Solor is dependent on the Dutch of Coopang, and sends to that place large quantities of wax and fish-oil. The wax is obtained from the Haraforas, who inhabit the most elevated part of the island, and the fish-oil from that species of whale which is called black-fish, and which is extremely abundant in the sea between Solor and Sandalwood. It produces oil inferior only to the spermaceti. The inhabitants of the coast are Mohammedans. The inhabitants of Lomblen, Pantar, and Ombay are numerous, and mostly if not entirely belong to the Haraforas: they avoid any communication with foreigners, and these islands are very rarely visited by Europeans, and not frequently by Bugis, who obtain from them large quantities of wax. Whalers sometimes are supplied from them with stock. The straits that divide the islands are not safe, and are very rarely used. Alloo Strait, between Lomblen and Pantar, though without soundings, is frequented by the junks and vessels which sail from Celebes, or from Macao to Timor. It is better than Pantar Strait between Pantar and Ombay, being wider and the land on each side not so high; consequently it is less liable to calms, squalls, and irregular currents of wind and water.

The island of Sandalwood, the native name for which is Sumba, lies south of the Strait of Sapy and of the island of Flores, being divided from the latter by a strait about 36 miles wide. It extends from north-west to south-east about 100 miles, with an average width of 50 miles, which gives a surface exceeding 5000 square miles. This island is not low, as is commonly supposed, but forms a table-land of considerable elevation; most parts of the southern coast of which are visible at the distance of 30 miles. Its surface however is only undulating, except towards the west, where there is a peak, which can be seen at the distance of 60 miles. The inhabitants are Haraforas, but the Dutch had succeeded in forming a commercial establishment there: they were however expelled, because they cut down some sandal-wood trees, as the inhabitants have the belief that for every tree of this kind which is cut down one of the natives loses his life. There is now no other communication between this island and the rest of the world than by the Bugis of Endé in Flores, who go there to obtain large quantities of bees'-wax and birds'-nests. The coast of this island is generally steep and without soundings. Anchorage is found only on the north-east coast in Padewawy or Baring's Bay.

Between Sandalwood and Timor are the islands of Sáwu and Rotti. Sawu is about 20 miles long from south-west to north-east, and on an average 10 miles wide: its area is 200 square miles, or equal to Rutlandshire. It is hilly throughout, and has a stony soil, but in good seasons it is tolerably fertile. The supply of water is very scanty. The cultivation of the ground is much neglected: it produces only small quantities of maize, millet, kachang, and sweet potatoes, and sufficient cotton for home consumption. In dry seasons, when the crops fail, the inhabitants derive subsistence from the sugar of the lontar-trees (*Borassus flabelliformis*). This sugar is also the only article of export, and is carried off by the Bugis. Their domestic animals are those of the other islands. The wild animals are hogs and deer, but they are not numerous. The inhabitants, about 5000 in number, have frizzled hair, and resemble those of Timor. They are governed by four chiefs, who acknowledge the supremacy of the Dutch, who have an interpreter here. The only advantage which the Dutch derive from this island is men for soldiers.

Rotti extends from south-west to north-east about 60 miles, with an average width of 20 miles: its area is about 1200 square miles, or equal to that of Staffordshire. The surface is a succession of low hills and narrow valleys; the soil is very stony, but productive. The rivers are few and small, and the supply of water generally scanty. Rice in small quantity, with Indian corn, millet, sweet potatoes, and kachang are cultivated, but the crops are only equal to the consumption of the inhabitants. In dry seasons they depend on the sugar of the lontar-trees. Cotton is grown, but not enough for consumption; some is imported from Celebes. The horses, or rather ponies, are better than those of Timor, but not equal to those of Sumbawa. The population is stated to exceed 50,000, or about 42 to a square mile. The inhabitants have long lank hair, whilst nearly the whole of the inhabitants of the surrounding islands have frizzled hair. Their features are also much more prominent, and they bear a stronger resemblance to the natives of Hindustan than to those of the Indian Archipelago. The language, though many words are the same as in the Timorese, presents such material differences that at present the natives of the two islands do not understand each other. They are governed by eighteen chiefs, who acknowledge the supremacy of the Dutch, and an interpreter is stationed on the island. Some of the chiefs profess Christianity, but the majority are pagans. The trade is almost entirely confined to the exchange of palm sugar with the Bugis for cotton; of horses and buffaloes with the whalers and other ships for muskets and ammunition; and of their bees'-wax with the inhabitants of Coopang for such small articles of European, China, and India manufacture as they require. This last trade amounts annually to 4000 Spanish dollars. As the inhabitants are good soldiers, the Dutch employ them frequently in their wars with the natives of Timor.

The island of *Timor* is the largest of the Lesser Sunda Islands, being 300 miles long from south-west to north-east, and on an average 45 miles wide. This gives an area of 13,500 square miles, or half the extent of Ireland. A chain of mountains runs through the middle of the island from one extremity to the other, and some of the summits attain such an elevation that Flinders compares them with the mountains of Teneriffe. Along the southern coast the land fronting the sea is generally low or slightly elevated, but at a short distance there are hills which rise in gentle declivities towards the mountains. On the northern coast the land is uniformly high at a short distance inland, sloping down in many parts towards the sea. Though the greater part of the island consists of a succession of narrow valleys, and hills or mountains with steep sides, there are a few large plains, of which one of the largest is at the bottom of Coopang Bay, which is more than ten miles square. All the rivers are small, and descend so rapid a declivity, that none of them are navigable beyond the tidal point; though the tide is nine feet at the full and change, it seldom ascends above 400 yards from the mouths of the rivers, and only in one of them as much as two miles. The soil in many places is fertile, but the greater part of the interior has not been visited by Europeans. In the plain of Bow-Bow, near Coopang, the average crop of rice is upwards of seventy fold. The principal objects of agriculture are rice, maize, millet, pulse, sweet potatoes, and cotton. Rice is in general not much cultivated, owing to the hilly nature of the country. Maize is the principal article of food, but the produce is not equal to the consumption, for except in very plentiful seasons the inhabitants depend for subsistence during a part of the year on the sugar of the lontar-palm. In some parts of the island a species of sago-palm is found, and used as food. Small quantities of sugar-cane are raised, but not for the purpose of making sugar. Cocoa-nut and areca-palms are very scarce, but different kinds of fruit-trees common to these islands abound, as oranges, jack-fruit, &c. The domestic animals are horses, buffaloes, sheep goats, dogs, and cats. The wild animals are buffaloes, deer, hogs, a species of large wild-cat, and one kind of monkey, all which are eaten by the natives, except the monkeys and cats. Gold is found in several of the rivers, both in lumps and in small particles, and some of the lumps weigh two ounces. But superstitious motives prevent the natives from collecting it. Native copper is said to abound in the Philaran Mountains, which are situated near the centre of the north-west side of the island. The natives are of a very dark colour, with frizzled bushy hair, but they resemble the Papuas less than the natives of Endé. They are below the middle size, and rather slight in figure. In the form of their face they resemble the South-Sea Islanders rather than any of the Malay tribes. Human sacrifices are made on certain occasions, but in the vicinity of Coopang they have been put down by the authority of the Dutch governor. The island is divided among many petty chiefs. It is supposed that they are either dependent on the Dutch or on the Portuguese. The whole southern coast is considered to belong to the Dutch, but as there are no harbours the Dutch have formed no establishments, and their authority is only nominal. The eastern part of the north coast, as far west as Batoo-Gedé, is under the authority of the Portuguese, but west of that place the possessions of the two nations are completely mixed.

Coopang is situated near the western extremity of the island, and is a large bay, about 12 miles wide at the mouth, and upwards of 20 miles deep. It is formed by the island of Semao on the south-west and a projecting point of Timor on the north, and has excellent anchorage. In the easterly monsoon it is a safe harbour, but as it is open to the north-west, ships cannot lie there when the monsoon blows from that quarter. Then however they find shelter either under a small island called Pulo Tekoos, on the north side of the bay, or in the strait which divides the island of Semao from the main body of Timor. Fort Concordia, the principal settlement of the Dutch, is situated on the south side of the bay. The trade of this place is considerable, and is said to amount annually to rather more than 1,200,000 Spanish dollars. The principal articles of export are wax, sandal-wood, earth-oil, and cattle. The cattle go chiefly to the islands of Mauritius and of Amboyna. The imports are coarse blue and white cotton-cloth, large-pattern chintzes and handkerchiefs, China silks, China ware, China umbrellas, muskets, gunpowder, iron, coarse British cutlery, and lead. The Chinese and the Bugis visit this place.

The Portuguese have three settlements on the northern coast, Batoo-Gede, Dilli, and Manatatoo. Dilli is the principal settlement: the harbour is open to all winds from west-north-west to east-north-east, but is perfectly defended from the swell of the sea by a reef of rocks (dry in some parts at low-water), which extends across it, leaving only a narrow passage at the north-west end, by which large ships enter the harbour. The town is rather populous, but meanly built, and the small houses of which it consists are scattered over a large tract. The commerce of this place seems not to be inferior to that of Coopang. The principal articles of export are slaves, wax, sandal-wood, benzoin, and ambergris, most of which are exported to Macao, except the slaves, which go to other islands of the Indian Archipelago, especially to Celebes. The imports are the same as at Coopang, with rather a greater proportion of Chinese goods.

To the north of Timor is the island of *Wetter*, which is about 65 miles long, and 20 miles wide on an average. This gives an area of 1300 square miles, or a little more than the extent of Wiltshire. It is a high rocky mass, but much less elevated than Timor. The Dutch had formerly a small establishment on the south coast at Saaw. But at present the inhabitants have no commercial intercourse, except with those of Kisser, who fetch wax, sandal-wood, rice, and maize, and give in return cotton-cloth, linens, and iron. The domestic animals are sheep, hogs, fowls, and buffaloes. The bulk of the population are Haraforas, but on the coast there are some settlers of Malay race.

The *Serawatti* group, situated between 9° and 6° S. lat., and between 127° and 131° E. long., consists of two rows of islands, which extend between Timor and Wetter on the west and Timorlaut on the east. Thougn the Dutch for nearly two centuries have had some establishments on these islands, they were a few years ago so little known, that even in Hamilton's 'East India Gazetteer' only two of the islands are named, and none are described. Lately this group has been visited by Kolff, and some British vessels from Essington, which went there for provisions.

The southern series consists, besides several smaller islands, of which the greater number are uninhabited, of seven islands of moderate size, which, from west to east, are Kisser, Lettu, Moa, Lakor, Locan, Sermatte or Serawatti, and Baber or Babá.

Kisser is about 18 miles in circumference, and the surface is hilly; many of the hills have a rugged and irregular appearance. In the valleys, which have a fertile soil, and on the sides of many of the hills, rice is grown, with the sugar-cane, yams, sweet potatoes, tobacco, cotton, and many culinary vegetables, scarcely an available spot being left uncultivated. It contains between 7000 and 8000 inhabitants, more than 1700 of whom are Christians of the Dutch Protestant creed; about 500 of them are descended from the Dutch, who formerly resided on the island. Two dialects are spoken, which differ so much, that individuals are often met with in the island who cannot understand one another. The natives are of the middle size and generally well made; their colour is dark brown; the hair generally straight, but often slightly curled; and the features are by no means so broad as those of the Malays; indeed many might pass for Europeans, if it were not for the darkness of their complexions. The descendants of the Dutch are often as fair as Europeans. Though this island is well provided with domestic animals, as buffaloes, cattle, pigs, sheep, and fowls, a great number of these animals are brought from the other islands, and there exchanged for cotton-cloth, ammunition, glass, coarse cutlery, &c. The island is the resort of traders from Celebes, Amboyna, and Banda, and therefore an emporium for foreign goods, to obtain which it is visited by the natives of the islands to the eastward. The inhabitants have many trading-boats, some of them 40 or 50 tons burden, with which, towards the end of the dry season, they visit the other islands to dispose of their foreign goods for the produce of the country. The goods imported at Kisser are chiefly cottons, iron, earthenware, muskets, gunpowder, spirits, brass-wire, cutlery, and beads; the exports are tortoise-shell, bees'-wax, rice, cotton, native cloths, tobacco, sandal-wood, maize, and live stock of all descriptions. The women manufacture considerable quantities of cloth from the cotton produced on the island, the greater portion of which is disposed of to the people of the neighbouring islands. The yarn is dyed before the cloth is manufactured. The coast of the island is steep and rocky, but there are many small inlets for boats. At the western extremity, and on the south-eastern coast, there is anchorage for larger vessels.

Lettu, which lies farther east, and is larger than Kisser, is surrounded by reefs at the distance of about half a mile. The interior is mountainous, but surrounded by a lower tract, which at a short distance from the shores rises into hills, on which the villages are built. In productions it does not differ from Kisser, but it is much less populous, and not so well cultivated. Many of the inhabitants have been converted to the Protestant creed by the Dutch. *Moa* is perhaps twice as large as Kisser. It has good anchorage on the east side. The surface is level, except that there is a high mountain, called Karban, at its north-eastern end. This peak resembles that of Teneriffe, but is not so high. Cultivation is very limited, the greatest part of the island being used as pasture for buffaloes, cattle, sheep, goats, and pigs. There are no horses on this island, nor on any other east of Timor. Many of the inhabitants have embraced Christianity. Moa is the last island on which the Christian religion has made any progress: most of those who have become Christians have learned to read and write. *Lakor* consists of coral rocks, is low and level, and only covered with a thin layer of earth. It contains no large trees, except cocoa-nut palms, and nearly the whole island is covered with low bushes. There is no fresh water, and the inhabitants use rain-water, which is collected in tanks. Cultivation is very limited; only small quantities of maize, yams, and sweet potatoes are grown. Many hogs and sheep are kept, and also a few buffaloes. The population is small. Kolff found only two Christians among them. *Locan* is surrounded by submarine reefs; there are several small islands on the reefs, which are uninhabited, but cultivated. Locan itself consists of an elevated mountain, which is visible to a great distance, and the island is only inhabited at the north-eastern base of the mountain, where it is covered with extensive plantations of cocoa-nut and sago-trees. Goats and hogs are plentiful, and exported. But the most important productions are trepang and tortoise-shells. Locan is the most western of the Lesser Sunda Islands, where that kind of holothuria from which the trepang is obtained is found abundantly and of excellent quality. The trepang-banks are near the reefs which surround the islands. All these articles are exported to Banda, Amboyna, and Celebes, whence several vessels annually visit this island. They give in return for the above-mentioned articles cotton-cloth, cutlery, gongs, and some other Chinese manufactures. *Serawatti*, or, as Kolff calls it, Sermatte, is not visited by Europeans, because no anchorage is found near it. It consists of one mass of rocks, running east and west, and rising abruptly out of the sea. It is said not to be well inhabited: it produces rice, maize, yams, &c., which, with some domestic animals, are brought to Locan for coarse cloth and a few other articles. The most eastern of the southern row of the Serawatti islands is *Babber*, or, as Earl calls it, Babá. It is nearly 30 miles long, with an average width of 10 miles. The surface is mountainous. It has good anchorage at the western extremity, near the village of Tepa. The interior of the island is uninhabited, and also the northern side. All the villages are in the west and south-east districts. As articles of cultivation, maize, yams, and cocoa-nut trees are mentioned. The domestic animals found in the other islands are plentiful here, and in the uncultivated parts there are wild hogs and goats, and many kinds of birds. This island is not much visited. Only once or twice annually a coasting vessel from Banda comes to fetch the produce of the island, especially animals, and brings in exchange coarse cotton-cloth and a few other articles.

The northern series of the Serawatti Islands contains, besides a few smaller islands, four larger islands, Roma, Damma, Nila, and Seroa. The three last mentioned contain active volcanoes, which constitute the connecting link between the volcanoes of the Sunda Islands and those of the Malaccas. *Roma* is about 24 miles in circumference, and has an anchorage on the south and another on the north-west coast. The surface is a succession of hills and valleys. The island is covered with trees, except on the south coast, which alone is inhabited and cultivated. The inhabitants have made more progress in civilization than those of the other islands, except Kisser. Many of them can read and write, and are Christians. The articles of export are wax, sandal-wood, edible birds'-nests, and great quantities of tortoise-shell, as the small neighbouring islands are the resort of numerous turtles. *Damma* is mountainous, but not very high, except the Peak of Damma, near the north-east coast, which always emits smoke: at its base there are hot-springs. It is not very fertile, and the inhabitants live mainly on the produce of their cocoa-nut and sago plantations, cultivating only a little maize, yams, and sweet potatoes. Game is very abundant, especially wild hogs and many kinds of birds. A few of the inhabitants are Christians. *Nila* is a round mass of rocks rising with a steep ascent from a deep sea. There is a volcano on the east side, and on the north side an anchorage for small vessels. Its productions for exportation are hogs, fowls, and cocoa-nuts, which are brought to Banda by the islanders themselves. *Siroa*, called Serra by Kolff, is likewise a mass of volcanic rocks: in 1693 there was a terrible eruption, in which a part of the mountain subsided, and a lake was formed filled with burning matter. The population is small.

The *Tenimber Islands* are situated between 6° 30′ and 8° 20′ S. lat., and 131° and 132° 20′ E. long., and consist of one large island, Timorlaut, and three of moderate size, Cerra, Larrat, and Vordate, and a great number of smaller islands, with which the seas along the north-west coast of Timorlaut are dotted. The channels by which these islands are divided from one another are only wide enough for small prahus: they contain numerous trepang-banks. The larger of the Tenimber Islands have only lately begun to be known. *Timorlaut* extends nearly 90 miles from south to north, and is 40 miles wide in the broadest part. We know nothing of it, except that the surface is rather undulating than hilly, and that it is surrounded either by reefs or by mud-banks, which extend to a considerable distance from the shores and render access impossible for large vessels. The natives are very unfriendly to strangers, and the crews of some European vessels who have been incau-

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tions have been killed and the vessels destroyed. *Cerra*, which lies west of Timorlaut, is very populous. The inhabitants are the traders of this group of islands, and export their cattle, which however only seem to be found in Timorlaut, and other domestic animals, and also tortoise-shell and trepang to Banda. *Larrat*, a considerable island, to the north of Timorlaut, resembles it in surface. *Vordate*, north-east of Larrat, contains lofty hills, and is described as very fertile, and rich in all the products of these islands, except cattle. It is very populous. Sago-trees and cocoa-nut trees are abundant.

The inhabitants of the Tenimber Islands differ materially from those of the other groups. They are well made, and their complexion is not so dark. In their features they have so little of the characteristics of the other nations which inhabit the Indian Archipelago, that they, like the inhabitants of Rotti, might be taken for Europeans, if their complexion was lighter. They have also attained a considerable degree of civilization, which may be inferred from their dwellings, which are from 20 to 30 feet long and from 12 to 15 feet wide, and divided into several rooms. They have vessels, about 50 feet long and from 10 to 12 feet wide, which are constructed with great skill, though without any iron. They pay also great attention to the cultivation of the ground.

The most eastern group of the Lesser Sunda Islands are the *Arroo Islands*, which are situated between 5° 20′ and 7° S. lat. and between 34° and 35° E. long. When the account of these islands in vol. ii., p. 397, was printed, our information was not derived from an eye-witness, but since that time the voyages of Kolff have been published, which contain much information respecting them. According to his map, this group consists of one large island, called Kobrore, which is 70 miles long and about 30 miles wide on an average, and two other considerable islands, Tranna and Mykor, which lie west of Kobrore, and are divided from it by a narrow strait. To the north of Kobrore and Mykor are eight or ten islands of moderate size, of which *Wammer*, *Wokan*, and *Wadyier* are the most remarkable. All these islands are moderately elevated, and they have a slightly undulating surface: Kolff thinks that the base of these islands is isolated rocks, and that the intervals between them have been filled up by polypiaria. The channels which divide these islands from one another are narrow, and the tides in them are very irregular. The islands are not rich in productions. Cultivation is limited to the planting of sago-trees and the raising of yams. Rice is imported from Banda. Of domestic animals there are only hogs, goats, and fowls. Wild hogs are very numerous. The bird of paradise is found only here and on Papua, and the feathers are an article of export. The principal articles of export however are drawn from the sea, of which trepang is the most important. The trepang-banks are mostly situated to the east and south of the islands, and are very extensive. There is also an export of mother-of-pearl shells and of tortoise-shells. The imports are coarse cotton-cloth of different colours, coarse cutlery, thin and thick copper-wire, coarse China, arrack, anis-spirits, gongs or Chinese drums, very small red corals, and some other minor articles. Only the smaller islands, which form the northern part of the group, are visited by country vessels from Celebes, Amboyna, and Banda: sometimes a large vessel from Soorabbaya in Java arrives. The inhabitants of these islands go to the southern and eastern islands in their own boats, where they buy trepang and other articles. The number of foreign vessels visiting the islands amounts, according to Kolff, annually to about thirty, and they all go to Dobo, a port on the island of Wammer. Above two centuries ago the Dutch formed a commercial establishment on the island, and had for some time a military post. But though the trade was at first very lucrative, it soon yielded little profit, probably because the market was overstocked with those articles which were in request among the people; and the Dutch company abandoned the islands entirely. During their stay, the Dutch had introduced Christianity, which still maintains its ground in the islands of Mykor, Wammer, and Wockan, whilst the inhabitants of Wadyier have embraced the Mohammedan creed, which has extended thus far south from the Moluccas, but the number of Mohammedans is small. There are no clergymen on the islands, but there are a few schoolmasters, natives of Amboyna, who instruct the youths, read some parts of the bible and sing hymns with the congregation, which meet in small churches built by the Dutch. The majority of the inhabitants however are heathens, and it is even pretended that they have no religion. They seem however very much inclined to become Christians, but hitherto no missionaries have been sent to them. The heathens are Haraforas, according to Kolff, and quite different from the Christian and Mohammedan inhabitants, as to whom he does not state if they belong to the pure Malay race or not.

Inhabitants.—The Lesser Sunda Islands are evidently inhabited by two, if not three, different races of men. Those which lie west of Sapy Strait seem to be entirely peopled by the Malay race; but farther west the great bulk of the population has features materially different from the Malay, as is proved by their darker colour, their frizzled hair, and the form of their limbs. It is said that in these islands the Malays are mixed with Haraforas or Australian negroes. But the intermarriage between these two races seems to be doubtful, when the peculiar character of the natives of Cooksland or New South Wales, and of Van Diemen's Land, is considered. From the latest accounts it appears that the inhabitants of the northern coast of Australia, though they differ little in stature and features from those of the southern parts, are of a different character, and much superior in intellectual powers, and that a few of them have been converted to Mohammedanism. Information on this point will probably be collected at the new colony at Port Essington, when we shall be able to decide whether a mixture of the two races has taken place in these islands. The Haraforas who inhabit the Arroo Islands are certainly much more advanced in civilization than the natives of the southern coasts of Australia. In the interior of the larger of the Lesser Sunda Islands, as Timor and Wetter, a race of Haraforas however seems to exist, who in their intercourse with foreigners exhibit more the character of the Southern Australian than that of the inhabitants of the Arroo Islands. Perhaps a third race of men is found on the Tenimber Islands and on Rotti, for the inhabitants are described as exhibiting little or nothing of those features which distinguish the Malay race, and as resembling more the Europeans than any other people of Southern Asia. They seem also to speak a different language.

(Stavorinus's *Voyages to the East Indies*; Horsburgh's *India Directory*; Raffles's *History of Java*; Crawfurd's *History of the Indian Archipelago*; Moor's *Notices of the Indian Archipelago*, Singapore, 1837; Kolff's *Reize door den Weinig bekenden Zuidlijken Molukschen Archipel*; Earl's account of Kisser, in *Lond. Geogr. Journ.*, vol. x.)

SUNDA, THE STRAIT OF, is the most frequented thoroughfare between the Indian Ocean and the China Sea, and is generally navigated by vessels which proceed from the Atlantic to the islands of the Indian Archipelago and the eastern countries of Asia. It extends between 5° 40′ and 6° 50′ N. lat., and between 104° 55′ and 106° E. long., from south-west to north-east. Its northern shores are formed by the southern coast of Sumatra, and its south-eastern by the western parts of Java. Its length, measured along a line drawn through the middle of the strait, is about 68 miles; but along the coast of Sumatra, not including the wide and deep bays by which this part of the island is intersected, it is above 70 miles; and along the coast of Java, measured along the projecting headlands, it is about 85 miles. The strait is wide towards the Indian Ocean, but rather narrow where it opens into the Java Sea. The two headlands which form its western entrance, Flat Point in Sumatra, and First Point in Java, are nearly 55 miles from each other, and the two islands preserve in general this distance for nearly 50 miles proceeding eastward; but towards the eastern extremity of the strait the peninsula of Raja Bassa projects southward from the main body of Sumatra, and approaches the north-western coast of Java within 18 miles. This constitutes the width of the eastern portion of the strait for somewhat more than 20 miles. A row of islands, four in number, lies across the strait in an oblique direction between First Point in Java and the peninsula of Raja Bassa, and divide it into five straits. The largest, called Prince's Island, or Pulo Pontangh, is divided from First Point by a strait about 4 miles wide, called Prince's Strait, or the Behouden (Safe Passage), which was formerly used, and recommended as the best passage both to enter and depart from the strait; but, although it is still used by many ships, the preference is now generally given to the Great Channel, between Prince's Island and Crockatoa, or to that between the latter and Tamarind Island. Prince's

Island has the form of a horse-shoe: in extends north and south 10 miles, and about 18 miles east and west along the northern side. Towards the west the island is level and low, but towards the east it is hilly: two of the hills near the eastern shore rise to a considerable elevation, and serve as beacons. Nearly the whole island is covered with trees, and is only inhabited by some fishermen. The Great Channel, between Prince's Island and Crockatoa, is about 20 miles wide; and although without soundings or anchorage, it is much frequented, being the widest passage of the strait, and remarkably free from danger. The island of Crockatoa, extending north-north-west and south-south-east about 6 or 7 miles, and 4 or 5 in breadth, rises with a steep ascent on all sides, and has a peak at its southern extremity, which rises to a great elevation, so as to be considered the Fairway Mark in entering the Strait of Sunda from the westward. It does not appear to be inhabited. The channel between Crockatoa and Tamarind Island is about 10 miles wide; and as it has regular soundings from 18 to 28 fathoms (mud), where ships can occasionally anchor, it is often preferred to the Great Channel, particularly by ships working out against the westerly monsoon. Tamarind Island, or Pulo Bessy, is nearly as large as Crockatoa, and also contains a high peak resembling a sugar-loaf. The channel between Tamarind Island and Pulo Sebooko is only three miles wide; and though free from danger, it is not much frequented. Pulo Sebooko is somewhat less than Tamarind Island; but also high, and covered with wood. The channel between this island and Raja Bassa Road is about 8 miles wide, and is frequently navigated by vessels returning from China, as it offers a more speedy voyage during the north-western monsoon, and as Raja Bassa Road is an excellent place for procuring good water and provisions.

Nearly in the centre of the eastern and more narrow portion of the strait is the island called Thwart-the-Way, which is more than four miles long from south to north, and moderately elevated, but surrounded by a sea inconveniently deep for anchoring. The channel between this island and Sumatra, called Zutphen Channel, is much frequented in the north-west monsoon by ships from the China Sea bound westward. At other seasons the preference is given to the southern channel, between Thwart-the-Way and the coast of Java, which is called Bantam Channel. Both passages are free from any danger, except near the shores of Java and Sumatra, where there are some islands and rocky shoals. The tides in this narrow part of Sunda Strait seem to be greatly influenced by the winds, and frequently resemble currents more than regular tides. The strongest current occurs in Zutphen Channel, in February and March, when it runs from 4 to 4½ miles an hour to the west-south-west, and requires great caution on the part of the navigator, especially in the vicinity of Hog Point, the most southern cape of Raja Bassa peninsula. At other times it runs about 3 miles an hour, more or less. In Bantam Channel, and near the island of Thwart-the-Way, its velocity varies between 2 and 3½ miles an hour; but near the coast of Java, only from 1 to 2 miles. The ebb-tide generally lasts fourteen hours, and is strong; whilst the flood-tide, which sets to the north-east, is moderate, except during the strength of the north-east monsoon.

Though this strait is the maritime high-road which connects the most populous and civilised countries of the globe, there is no town on its shores, not even a large village, though there are several places which afford safe and convenient anchorage. The most important and most frequented are Raja Bassa Road, on the eastern side of Lampong Bay in Sumatra, and Anger and Mewen Bay in Java.

(Stavorinus's *Voyages to the East Indies*; and Horsburgh's *India Directory*.)

SUNDAY, the first day of the week. [Week.] Besides the name of 'Sunday' (*dies solis*), it was called by the early Christians 'the Lord's day' (ἡ ἡμέρα ἡ κυριακή, *dies dominicus*, or simply κυριακή, *dominica*) from its being the day on which the resurrection of Christ took place; and it was kept sacred in commemoration of that event. [Sabbath.] The mode of keeping it appears to have varied with the circumstances of the Christians. In the first ages it is very improbable that they abstained entirely from worldly business, as the time of many of them was not at their own command. They seem however, as far as it was practicable, to have devoted the day to religious worship. For this purpose they were accustomed to assemble before daybreak; and we may infer from passages in the *Acts*, *Epistles*, and in Pliny's celebrated *Letter to Trajan*, that singing hymns, reading the Scriptures, prayer, preaching, and the celebration of the Lord's supper, formed parts of these services.

We have a few notices of the mode of keeping the Sunday during the first three centuries. As early as the end of the second century, abstinence from worldly business seems to have been customary. (Tertullian, *De Orat.*, c. 23.) It was accounted a day of rejoicing, a feast and not a fast, and to fast upon this day was deemed unlawful. Upon it the Christians prayed standing, instead of kneeling, to intimate the elevation of their hopes through their Lord's resurrection. The public worship of the Christians on the Sunday in the first two centuries is described by Justin Martyr (*Apolog.*), whose account is particularly interesting, and by Tertullian (*Apolog.*, c. 39; compare Euseb., *Hist. Ecc.*, iii. 3, and iv. 23.)

As soon as the Christian religion came to be recognised by the state, laws were enacted for the observance of the Sunday; Constantine (in 321) ordered the suspension of all proceedings in the courts of law, except the manumission of slaves, and of all other business except agricultural labour, which was allowed in cases of necessity (*Cod. Justin.*, iii., tit. 12, § 2, 3; *Cod. Theodos.*, viii., tit. 8, § 1, 3); and, as Eusebius tells us (*Vit. Const.*, iv., 18, 19, 20) he forbade all military exercises on Sunday. The laws of Constantine were repeated by subsequent emperors, with additions, of which one of the most important is that of Theodosius II. (in 425), by which the games and theatrical exhibitions were forbidden on Sunday. (*Cod. Theodos.*, xv., tit. 7, § 1, 5.) The most strict of these laws is that of Leo and Anthemius. (460, *Cod. Justin.*, iii., tit. 12, § 8.) It should be observed that the provisions of most of these laws extend to all the principal sacred days observed by the Church.

In all Christian communities the Sunday has been observed with more or less strictness, the degrees of which seem to depend on three different views which are held respecting its character. Some regard all the provisions of the fourth commandment as extending to it, admitting however an exception in the case of 'works of necessity and mercy;' others agree with these in abstaining from worldly business and amusements, because they think that only thus can the mind be fitted for the religious services which are observed on this day; while others, viewing it as a day of rejoicing, a Christian festival, devote a part of the day to religious worship, and the remainder to recreation. To these views ought to be added a fourth, which, though never adopted, we believe, by any church, has been the opinion of many eminent theologians, namely, that there is no divine authority for making a distinction between Sunday and other days. The discussion of this question has been referred to under Sabbath.

(Mosheim's *Eccles. Hist.*, cent. i., pt. ii., c. 4; cent. ii., pt. ii., c. 4; cent. iv., pt. ii., c. 4; Neander's *Geschichte*, i., p. 513; ii., p. 640.)

SUNDAY, the first day of the week, a day kept holy by Christians. The common law is silent as to the observance of Sunday, and it seems once to have been the practice not only to exercise worldly callings on that day, but also especially to devote some part of it at least to sports and pastimes, such as now prevail in Continental countries, both Protestant and Roman Catholic. This practice continued till some time after the Reformation. Plays are said to have been performed on Sundays at the court of Elizabeth, and even of Charles I. The first restriction that appears among the printed statutes is by the 27 Hen. VI., c. 5, which enacts that all fairs and markets held on Sundays shall cease (the four Sundays in harvest excepted), on pain of the forfeiture of the goods exposed for sale. Immediately after the Reformation in England the legislature regulated the observance of Sunday. The first statute relative to the subject, the 5 and 6 Ed. VI., c. 3, recites that there is not any certain time, or definite number of days, prescribed in scripture to be kept as holy-days, but the appointment of them is left to the church, to be assigned in every country by the discretion of the rulers and the ministers thereof. (It is said to have been debated at Geneva whether the Reformed, for the purpose of estranging themselves more completely from the Romish church, should not adopt Thursday as the Christian Sabbath.) The statute proceeds to enact that certain days mentioned, such as Christmas Day, Good Friday, &c., and all Sundays in the year, shall be kept holy-days; but it provides that in harvest, or any other time when necessity shall require, any kind of work may be done upon those days. No penalty is attached to the infringement of this act. It is said to have been drawn up under the inspection of Cranmer. By the 1 Eliz., c. 2, all persons having no lawful or reasonable excuse to be absent, are to resort to their accustomed parish church or chapel on Sundays, or to forfeit twelve pence, which was recoverable before justices. The party so offending is also made amenable to ecclesiastical censure, but is only liable to one punishment, be it ecclesiastical or civil. Soon after this time the Puritans and other strict religionists attained political influence. Heylin, in his answer to Burton (1636), says that their speculations about Sunday were first broached about forty years before, and that in none of the fathers, nor the early authorities of the church, can anything of the kind be found. They appear to have entertained a greater predilection for the history and economy of the Jews, as contained in the Old Testament, than had hitherto been exhibited in the Christian world. Borrowing its phraseology, they styled and considered themselves God's people, while they bestowed upon their enemies the title of Egyptians and Amalekites. At the same time they began to style Sunday, a term which they thought profane, as derived from Saxon idolatry, the 'Sabbath,' or 'The Lord's Day,' names which are not used in the statutes previous to that period. In accordance with this mode of thinking, they seem to have been of opinion that the Christian Sunday ought to be observed in the same manner as the Jewish Sabbath. It was with a view to counteract such opinions, that, in 1618, James I. wrote his 'Book of Sports,' in which he declares that dancing, archery, leaping, vaulting, May-games, Whitsun-ales ('ales,' Warton says, means 'festivals'), and morris-dances were lawful, and that no such honest mirth or recreation should be forbidden to his subjects on Sundays after evening service. He says the prohibition of them led to filthy tippling and drunkenness. Before his time the practice of archery on holy-days had been enjoined by various acts of parliament; and butts were directed to be set up for that purpose, at which the parishioners were to shoot after divine service. James however restrains Popish recusants from such liberty, as being unworthy of it from not having attended church, and commands each parish to use such recreations by itself, and prohibits all unlawful games, such as bear-baiting, bull-baiting, interludes, and bowling by the meaner sort. The 'Book of Sports' was re-published by Charles I. in 1638. (5 'Harleian Miscellany,' 75.) The Puritans however becoming the stronger party, their opinions prevailed, and there followed a rapid succession of enactments in furtherance of them. The 1 Ch. I., c. 1, enacts that there shall be no concourse of people out of their own parishes on the Lord's day for any sports or pastimes, and that no unlawful games, such as bear-baiting, &c., shall be held in any parishes, under a penalty of 3*s.* 4*d.* for each offence. The 3 Ch. I., c. 1, enacts that no carrier with any horse or horses, nor waggonman, carman, wainman, nor drovers, shall travel on the Lord's day, under a penalty of 20*s.*; and prohibits butchers from killing on that day. But the most important statute on the subject is 29 Ch. II., c. 7, which enacts (sect. 1) that no tradesman, artificer, workman, labourer, or other person whatsoever, shall do or exercise any worldly labour or business or work of their ordinary callings on the Lord's day (works of necessity and charity only excepted); and it prohibits the sale and hawking of wares and goods. Sect. 2 prohibits drovers, horse-coursers, waggoners, butchers, higglers, and their servants from travelling, and the use of boats, wherries, lighters, or barges, except on extraordinary occasions. By sect. 3 the dressing of meat in families, the dressing and selling it in inns, cook-shops, or victualling-houses, and crying milk before nine and after four, are excepted from the operation of the act. By sect. 6 persons are prohibited from serving or executing any process, warrant, &c. (except in cases of treason, felony, or breach of the peace) on the Lord's day: the service, &c. is made void, and the person serving it is made liable to damages, as if he had acted without any writ, &c.

By the 10 and 11 W. III., c. 24, mackerel are permitted to be sold before and after divine service on Sundays, and forty watermen are allowed to ply between Vauxhall and Limehouse. The 21 Geo. III., c. 49, enacts that no house, &c. shall be open for any public entertainment or amusement, or for publicly debating on any subject, on Sundays.

The 7 and 8 Geo. III., c. 75, repeals that part of 29 Ch. II. which relates to travelling by water. By 34 Geo. III., c. 61, bakers are enabled, between nine and one o'clock on Sundays, to bake for persons things which are brought to their oven. By 1 and 2 W. IV., c. 22, drivers of hackney-carriages may ply, and are compellable to drive on Sundays. The 3 W. IV., c. 19, empowers the court of aldermen, or two justices, to regulate the route of stage-carriages, cattle, &c. on Sundays. These two statutes relate to London only. The 3 and 4 W. IV., c. 31, provides that the election of corporate officers, &c., required to be held on any particular day, shall take place on Saturdays or Mondays, when the day specified in the act happens to be a Sunday.

Under these enactments the courts have determined that a contract or sale which, though made on Sunday, is not in the exercise of the ordinary calling of the parties, is valid. Thus a contract of hiring between a farmer and a labourer, and a bill of exchange drawn on a Sunday, have been held to be good. The owner of a stage-coach is not included within the provisions of any of the statutes on the subject, the words 'other person whatever,' in 29 Ch. II., being restricted in application to persons of the same classes as those enumerated by name. An action therefore may be maintained against him for neglecting to take a passenger. Only one offence can be committed by the same party against the provisions of 29 Ch. II., c. 7, by exercising his ordinary calling on a Sunday.

(Com., *Dig.*, tit 'Temps,' B. 3; Burns's *Justice*, tit. 'Sunday;' Heylin's *History of the Sabbath*; D'Israeli's *Obs. on James I.*)

SUNDAY SCHOOLS. [SCHOOLS.]

SUNDERBUNDS. [HINDUSTAN, p. 217.]

SUNDERLAND, a parliamentary borough, partly in the eastern division of Chester ward, but chiefly in the northern division of Easington ward, in the county of Durham; 367¼ miles from the General Post-office, London; namely, by railway to Warrington, 191 miles; and from thence to Manchester, 19¼ miles; Normanton, 50 miles; York, 23¼ miles; Darlington, 44¼ miles; and Stockton, 12 miles; in all 340¼ miles by railway; and from Stockton 27 miles by coach to Sunderland. The distance by the coach-road through Barnet, Baldock, Alconbury, Stamford, Newark, Doncaster, Boroughbridge, Thirsk, and Stockton is only about 269 miles.

The parliamentary borough of Sunderland comprehends the parish of Sunderland; the townships of Bishop Wearmouth and Bishop Wearmouth Pans, on the south side of the river Wear, in Easington ward; and the townships of Monk Wearmouth, Monk Wearmouth Shore, and Southwick, on the north side of the river, in Chester ward. The area of the borough is estimated at 5095 acres (*Report of the Commissioners of the Boundaries of Municipal Corporations*), or 5215 acres, according to the statement given in the Population Returns; with a population, in 1831, of 40,735, thus distributed:—

	Area in Acres.	Houses.			Families.	Persons.
		Inhabited.	Uninhab.	Building.		
Sunderland parish	120	1744	49	4	4,478	17,060
Bishop Wearmouth township	3280	2226	61	65	3,442	14,452
Bishop Wearmouth Pans ditto	5	28	..	..	84	363
Monk Wearmouth ditto	590	234	22	1	354	1,498
Monk Wearmouth Shore ditto	250	670	16	6	1,601	6,061
Southwick ditto	970	231	10	6	257	1,301
	5215	5133	157	82	10,216	40,735

Northern or Monk Wearmouth was a place of some note in the Anglo-Saxon and Anglo-Norman period. A monastery was founded here in the year 674; and it is probable there had been a previous monastic foundation here, but of short duration. The monastery was destroyed by the Danes in the ninth century, and the site remained desolate above two hundred years, till after the Norman conquest, when it was restored, but was soon after reduced to be a cell of the monastery of St. Cuthbert, Durham. The revenues of the cell at the dissolution were only 25*l.* 8*s.* 4*d.* clear. The first notice of South or Bishop Wearmouth is in a charter of Hugh Pudsey, bishop of Durham, towards the close o the twelfth century, recognising a borough in the parish, and granting privileges to the burgesses similar to those of the burgesses of Newcastle. The borough is in the charter termed Weremue (Wearmouth), but it appears from its very origin to have had also the name of Sunderland.

Towards the close of the reign of Elizabeth the shipping of coal began, and the town of Sunderland increased considerably. In A.D. 1634 it received a new charter of incorporation from Bishop Morton. In the civil war of Charles I. it was garrisoned for the parliament, and several smart skirmishes were fought near it.

The parish of Sunderland, which was formed in 1719 by detaching a part of Bishop Wearmouth, occupies the point of land at the south side of the mouth of the Wear, and, with the exception of the town-moor or common of 70 acres, is covered with houses, all of them of considerable age. There is one street, broad and handsome, communicating with the High-street of Bishop Wearmouth, and lined with good houses: the other streets are merely narrow lanes, so densely peopled as to be dirty, and, apparently at least, unhealthy. Bishop Wearmouth was some time since a distinct town from Sunderland, but the progress of building has united them: the High-street of Wearmouth and of Sunderland form one line extending above a mile in length from north-north-east to south-south-west. The newer part of the town adjoining Sunderland has good streets and excellent houses: the wealthier classes reside here. Bishop Wearmouth is rapidly increasing; several new streets have been recently built, or are in course of building. The principal streets in Sunderland and Bishop Wearmouth are paved and lighted. Bishop Wearmouth Pans comprehends a small but densely peopled part along the bank of the river: it has glass-houses and iron-works for the manufacture of articles required by the shipping. Monk Wearmouth Shore is immediately opposite to Sunderland and a part of Bishop Wearmouth: it has a dense population, but few of the higher class. Monk Wearmouth adjoins Monk Wearmouth Shore, but lies back from the river. On the bank of the river, half a mile higher up than Monk Wearmouth, and extending inland, is Southwick; and opposite Southwick, in the township of Bishop Wearmouth, is the hamlet of Deptford, which is from a quarter to half a mile distant from Bishop Wearmouth town.

The river is crossed by an iron bridge of one arch, erected near the close of the last century. The abutments are piers of nearly solid masonry, twenty-four feet in thickness, forty-two feet broad at bottom, and thirty-seven at the top; the arch is of iron, and forms the segment of a large circle, having a span of 236 feet: the height above low-water is 60 feet to the spring and 94 feet to the centre of the arch, so that ships of 300 tons pass under it very readily by lowering their top-gallant masts. The superstructure is of timber planked over, with flagged foot-paths and iron balustrades. The cost of this bridge was as follows:—

	£	s.	d.	£	s.	d.
Obtaining act of parliament	687	2	6			
Consulting architects .	888	4	8			
Purchase of ground and houses	1,231	5	11			
				2,806	13	0
Materials for the bridge	13,547	4	1			
Labour, floats, boats, &c.	13,861	3	9			
				27,408	7	10
Interest of capital during building				2,699	18	9
Purchase of Sunderland Ferry . . .	6,300	0	0			
Purchase of Pann Ferry	1,600	0	0			
Law expenses thereon.	985	0	5			
				8,885	0	5
Total amount . .				61,800	0	0

Above the bridge, on the Bishop Wearmouth side, are very extensive staiths for shipping coals, belonging to the trustees of the late countess of Durham and the Hetton Coal Company; and on the opposite side other straiths, belonging to Messrs. Pemberton and Co. Their pit is distant only a few hundred yards. It is the deepest in England, being 280 fathoms below the surface. A little way higher up are the bottle-works of Ayre's Quay. The local staiths of the Durham and Sunderland Railway Company are situated on the lowest reach of the river on the Sunderland side. This Company conveys the coals of various collieries in the vicinity of the railway, which extends nearly to Durham; and being connected with other railways in the southern part of the county, it has also a considerable traffic in goods and passengers. A wet-dock, containing an area of nearly eight acres, with a tidal basin attached to it of about one acre, has been lately constructed by a private company on the low ground between Monk Wearmouth Shore and the sea, on the northern side of the river, and near the entrance to the harbour. An opening has been made through the North Ric to communicate with the river. A branch railway from the dock joins the Brandling Junction Railway, which again is connected with the Newcastle and Carlisle Railway; and thus a communication is established between the Irish Sea and the German Ocean.

Sunderland church is a spacious brick building, erected in the earlier part of the last century, with a square tower. There is an episcopal chapel, erected in 1769, near the east end of the town-moor; and a new church has been erected within the last few years with the aid of the parliamentary commissioners. The church of Bishop Wearmouth was very much altered in the early part of the present century; the chancel is antient, and has a fine east window divided into five lights with tracery. There are three episcopal chapels in the parish: one of these is at Ryhope, not in the borough of Sunderland; the others are within the borough. Monk Wearmouth church is a mutilated and irregular building, but has, especially in the tower, some very antient features. There is an episcopal chapel in Monk Wearmouth parish. There are a considerable number of dissenting places of worship.

There are a custom-house, an excise-office, and an exchange: the last is a neat building, erected nearly thirty years since, and comprises a merchants' walk, commercial room, news-room, auction-mart, and justice-room. On the town-moor of Sunderland are extensive barracks. There are a theatre and an assembly-room. There are also baths adjoining the town-moor, and at Hendon, a little way south of the town, where bathing-machines are much used in the season. There are a commodious and spacious market, and water-works and gas-works on a large scale. A new cemetery has lately been formed in a deep ravine contiguous to the town of Bishop Wearmouth, called the Rector's Gill. There has been lately erected in Bishop Wearmouth an elegant building, called the Athenæum, containing a large hall, with lecture theatre, museum, library, and other apartments for literary and scientific purposes. It cost about 5000*l.*

The preservation and improvement of the port and harbour of Sunderland are entirely owing to the exertions of commissioners who have been appointed under successive acts of parliament for levying certain dues and applying them to the cleansing and improving of the harbour. Of late years the amount of these dues averages annually about 16,000*l.* These works, and particularly the construction of piers on both sides of the mouth of the river, have had so great an effect in improving the port, that ships drawing from 15 to 18 feet of water can now enter and depart from the harbour with great safety. The building of the south pier was one of the first operations of the commissioners. It was commenced in 1723, and was extended in various lengths from time to time. In 1746 it was 333 yards long and 30 feet broad, built entirely of stone. The north pier was commenced in 1786 with timber or carcase-work, but a length of 700 feet of this pier was afterwards built with masonry upon piles. In the beginning of this century both piers were very considerably extended; but being executed in a superficial manner, they soon showed symptoms of decay, and it was considered necessary to rebuild the eastern or seaward portion of both of them. In 1821 that celebrated engineer the late Mr. Rennie recommended certain lines to be adopted; and 230 yards of the south pier wall was built under the superintendence of Mr. Mitton, then engineer to the commissioners, in a very substantial manner with ashlar masonry in blocks of stone varying from 5 to 7 tons in weight. This wall was properly backed with rubble-stone. The top of this portion of the pier is about 40 feet in width, divided into two parts the one raised about 2 feet above the other as a promena-. A handsome parapet divides the raised platform from th rubble backing, which is now having its exterior surface rough-paved with the largest and heaviest blocks. The whole breadth of the pier from the harbour-wall to the foot of the glacis, in the widest part, is 250 feet. The length of this pier to its present eastern extremity is 650 yards. The eastern part of the north pier has been for the last ten years in course of being rebuilt, under the direction of Mr. Murray, the present engineer to the commissioners, nearly in the same manner as the south pier just described, and the works are now rapidly drawing to a conclusion. The length of the north pier from its west to its east head is 590 yards. Near the termination of the north pier, in the year 1802, there was built an elegant octagonal lighthouse of polished stone, 62 feet in height from the cornice to the surface of the pier, which is here 12 feet above high-water of ordinary spring-tides. The top of the dome was 16 feet above the cornice, making a total height of 78 feet. Its breadth at the base was 15 feet, and 9 feet at the cornice. It was lighted with coal-gas from nine patent burners with parabolic reflectors. This lighthouse stood in the direct line of the new pier, and it was intended in the course of time to take it down and rebuild it in a proper situation. But in the beginning of 1841 an alarming breach took place in the old pier, contiguous to the site of the lighthouse, which made it imperative either to take down the building or to repair the pier in an expensive manner. Mr. Murray, the engineer, suggested to the commissioners the removal of it in an entire state to the eastern extremity of the new pier, a distance of nearly 150 yards. In April, 1841, the Board decided that he should commence operations. On the 15th of June the masons began to cut holes for the reception of a cradle, or platform of timber, which was threaded through the building balk after balk. This cradle was supported upon bearers with about 250 wheels of cast-iron of 6 inches diameter, which were made to traverse on eight different lines of rails. The shaft of the lighthouse was tied together with bands, and its eight sides were supported with timber braces from the cradle upwards to the cornice. On the 2nd and 7th of August the building was carried 28 feet 6 inches in a north-easterly direction on to the new pier: it then took till the 30th of August to shore up the timbers and change the direction of the rails to carry it to the eastward. On the 4th of October it was finally brought to its destination in the centre of the new pier-head; and the timbers have been since removed, and the masonry underset with solid stone and pozzuolana mortar. There is not the slightest appearance of a crack in any part of the building. The light was exhibited nightly during the operation of removal. The gross weight moved was 338 tons. This was effected by three winches fixed upon the pier a little way in front of the building, and these were connected with the cradle above mentioned by ropes passing through twofold and threefold sheaves. Ten men to each winch were employed to carry the building forward when it was required. The total sum expended on this work was 827*l.* The original cost of the building, in 1802, was upwards of 1400*l.* Mr. Murray has, since the completion of this undertaking, received the thanks of the Board of Commissioners for his exertions, and a piece of plate of the value of 100*l.* has been presented to him as a further acknowledgment of his services on that occasion.

The principal manufactures of Sunderland are of bottle and flint glass, anchors, chain-cables and other iron goods for ships, and cordage. Ship-building is carried on to a greater extent than in any other seaport of the British empire. Upwards of 300 ships of various burthens were launched during the year 1839. Pigot's 'Directory' for 1834 enumerates about a hundred and thirty firms engaged in business in connection with this branch of industry, as ship-builders, boat-builders, chain-cable manufacturers, sail-cloth manufacturers, anchor and ship smiths, rope, sail, mast, block, or pump makers; besides ship owners, brokers, and chandlers. Some of the ropewalks are on a very large scale. Brick-making, digging coal, and the quarrying of grindstones are carried on in the neighbourhood; and there are copperas-works, brass-foundries, potteries, hat-manufactories, lime-works, timber-yards, saw-mills, flour-mills, tan-yards, and breweries. The town is however more important from its commerce than its manufactures. In shipping coal it is exceeded only by the port of Newcastle, and lately perhaps by Stockton. The state of the coal-trade in 1838-9 was as follows.—

	1838. Tons.	1839. Tons.
Shipped coastwise .	948,429	913,960
Shipped to foreign parts	308,168	370,620
	1,256,597	1,284,580

The export of lime is another principal branch of trade also the export of glass and grindstones. The imports are timber and iron from the Baltic; butter, cheese, and flax from Holland; and a variety of goods brought coastwise. A considerable fishery is carried on. The number of registered vessels belonging to the port in 1832 was 728, their tonnage 129,309; the number of men composing their crews 5728. There are six banking establishments. The market, formerly held on Friday, is now on Saturday: there is also a cattle-market, and there are two yearly fairs.

The living of Sunderland is a rectory, united with the chapelry of the Episcopal chapel: the joint clear yearly value is 386*l.*, with a glebe-house. The living of Bishop Wearmouth is a rectory (to which one of the Episcopal chapels in the borough is united), of the clear yearly value of 2899*l.*, with a glebe-house. The living of Monk Wearmouth is a parochial chapelry, of the clear yearly value of 225*l.* Monk Wearmouth is in the rural deanery of Chester; Sunderland and Bishop Wearmouth in the rural deanery of Easington: all are in the archdeaconry and diocese of Durham.

Sunderland was made a Parliamentary borough by the Reform Act; and its boundaries (given above) were determined by the Boundary Act. It returns two members. The number of voters on the register, in 1835-6, was 1484: in 1839-40, 1657.

The corporation of Sunderland had gone nearly into disuse at the time of the Municipal Reform Act: the corporate body consisted of twelve freemen and eighteen stallingers: they had no jurisdiction or municipal authority: they held the town-moor and some other property of little account: the paving, lighting, watching, and cleaning the town were executed under a local act. By the Municipal Reform Act, the parliamentary boundaries were adopted for those of the municipal borough, which was to have a commission of the peace, and to be divided into seven wards, with 14 aldermen and 42 councillors. The Commissioners of the Boundaries of Municipal Corporations have recommended a more contracted boundary, and a division into six wards instead of seven.

There were in the borough, in 1834, one infant and one dame-school, with 136 children (57 boys and 79 girls); ninety-seven day-schools of all sorts, with 4253 children (2465 boys and 1752 girls, and 36 children of sex not stated): two of the day-schools were also Sunday schools, and were attended on Sunday by 505 children (301 boys and 204 girls). There were also twenty-five Sunday-schools, with 3367 children, namely 1617 boys and 1750 girls. There were an auxiliary Bible society, a ladies' church missionary association, a religious tract society, an infirmary, a dispensary, numerous almshouses, and friendly and benefit societies, a mechanics' institute, a subscription library, a reading society, news-rooms, a law library and a Wesleyan library. Two weekly newspapers are published at Sunderland.

(Surtees's *Hist. of Durham; Parliamentary Papers.*)

SUNDERLAND, HENRY SPENCER, FIRST EARL OF (of that name), was born in 1623, and was the eldest son of Henry, second Baron Spencer of Wormleighton, which title he inherited on his father's death in December, 1636. While still a minor he married the beautiful lady Dorothy Sydney, daughter of the earl of Leicester, and sister of Algernon Sydney, the Sacharissa of the poet Waller; but on the breaking out of the civil war, and the erection of the royal standard at Nottingham, in August, 1642, Lord Spencer conceived himself bound in honour to repair thither, although, like many others who took the same course, by no means desirous of setting the prerogative above the law, but rather siding with the king against the parliament as only the least unhappy alternative offered by the crisis. Some confidential and affectionate letters to his wife, which are printed in Collins's 'Sydney State Papers,' show the position in which he found himself, and the feelings with which he regarded the royal cause. In one dated Shrewsbury, 21st September, 1642, he says: 'How much I am unsatisfied with the proceedings here, I have at large expressed in several letters. Neither is there wanting, daily, handsome occasion to retire, were it not for grinning honour. For let occasion be never so handsome, unless a man were resolved to fight on the parliament side, which, for my part, I had rather be hanged, it will be said without doubt that a man is afraid to fight. If there could be an expedient found to salve the punctilio of honour, I would not continue here an hour. The discontent that I and other honest men receive daily is beyond expression.' Very much of the discontent here spoken of seems to have arisen from the influence in the royal councils possessed by the popish party, already strong in the support of the queen. Lord Spencer however, although he did not accept any military commission, drew his sword with the rest, and distinguished himself by his gallantry when the two armies joined battle for the first time at Edgehill, 23rd October, 1642. The following year, on the 8th of June, he was raised (it has been said, as a reward for accommodating the king with the loan of 15,000*l.*) to the title of Earl of Sunderland, a title which had become extinct about three years before by the death of Scrope, earl of Sunderland (previously Lord Scrope), upon whom Charles had conferred it in the beginning of his reign. But on the 19th of September thereafter, the new-made earl fell at the (first) battle of Newbury, the same fatal fight which deprived the king of the earl of Carnarvon, and Clarendon's great hero Lord Falkland. The royalist historian describes the Earl of Sunderland as 'a lord of great fortune, tender years (being not above three and twenty years of age), and an early judgment; who, having no command in the army, attended upon the king's person under the obligation of honour; and, putting himself that day in the king's troop a volunteer, before they came to charge was taken away by a cannon bullet.' By his wife, who afterwards married Robert Smythe, Esq., he left a son, who succeeded him in the peerage, a daughter, Dorothy, who became the wife of Charles II.'s famous minister, the first marquis of Halifax, and another daughter, Penelope, who died unmarried.

SUNDERLAND, ROBERT SPENCER, SECOND EARL OF, the only son of Henry, the first earl, was probably born in 1641 or 1642. His first entrance into public life appears to have been in 1671, in the latter end of which year he was nominated ambassador to Spain. In 1672 he went to Paris in the same capacity, and he was one of the three plenipotentiaries appointed to proceed to Cologne in the following year, when England and France were engaged in a war with the Emperor, Spain, and Holland, to open negociations for a general peace, which however proved abortive. He had already evinced a remarkable talent in the conduct of affairs. 'Lord Sunderland,' says Burnet, in mentioning this appointment, 'was a man of a clear and ready apprehension, and a quick decision in business. He had too much heat both of imagination and passion, and was apt to speak very freely both of persons and things. His own notions were always good (the bishop seems to mean correct or judicious); but he was a man of great expense......He had indeed the superior genius to all the men of business that I have yet known.' In 1678, on the recall of Mr. Ralph Montague from Paris, at the instigation of the duchess of Portsmouth, whose enmity and vengeance he had incurred by being detected in making love at the same time to herself and her daughter, Sunderland was again sent ambassador to France; but on the change of government at home in the beginning of the following year, he was recalled and made secretary of state in the room of Sir Joseph Williamson. From this time at least, if not from an earlier date, Sunderland especially attached himself to the duchess of Portsmouth, availing himself of her patronage or instrumentality as one of the principal props of his ambition. At first he and lords Essex and Halifax united in opposing Shaftesbury on the question of excluding the duke of York, and, keeping the chief direction of the state in their hands, they were popularly styled the triumvirate. 'Lord Sunderland,' says his friend and admirer Burnet, 'managed foreign affairs, and had the greatest credit with the duchess of Portsmouth.' This original triumvirate however did not last long: before the end of the year Sunderland had shaken off both the others; and the kingdom was now governed by a new junta, consisting of himself, Lord Hyde, and Godolphin. To this date is to be assigned the commencement of Sunderland's relation with the prince of Orange, afterwards King William. Burnet states that he entered into a particular confidence with the prince, 'which he managed by his uncle, Mr. Sidney, who was sent envoy to Holland.' He and Godolphin now also followed the duchess of Portsmouth in declaring openly for the exclusion. But immediately after the dissolution of the last of the exclusion parliaments, in March, 1681, another change of government suddenly threw Sunderland, with the rest of the popular members of the administration, out of office. Evelyn has a notice of him immediately after this, which is interesting: —'16 May (1681). Came my Lady Sunderland to desire that I would propose a match to Sir Stephen Fox for her son Lord Spencer to marry Mrs. Jane, Sir Stephen's daughter. I excused myself all I was able. She was now his only daughter, well bred, and likely to receive a large share of her father's opulence. Lord Sunderland was much sunk in his estate by gaming and other prodigalities, and was now no longer secretary of state, having fallen into displeasure of the king for siding with the Commons about the succession; but this I am assured he did not do out of his own inclination, or for the preservation of the Protestant religion, but by mistaking the ability of the party to carry it.' Evelyn, pressed by the lady, went through the form of executing her commission; but his interview with Sir Stephen merely ended in an understanding between them that nothing more should be done in the matter, and that he should 'put it off' as civilly as he could. Sunderland's fortunes however soon brightened again. In January, 1682, he was recalled to office: 'the king,' says Burnet, 'had so entire a confidence in him, and Lady Portsmouth was so much in his interests, that, upon great submissions made to the duke, he was again restored to be secretary.' Hyde, now created Viscount Rochester, was, it seems, the person who prevailed upon the duke to accept the said submissions, for which he incurred the implacable enmity of Halifax, who, Burnet tells us, 'hated Lord Sunderland beyond expression, though he had married his sister;' but this did not prevent Sunderland from, a few years after, becoming Rochester's rival and enemy. He remained in power during the rest of this reign; and notwithstanding that he had again been detected towards its close in intriguing, along with the duchess of Portsmouth, Godolphin, and the French ambassador Barillon, for the exclusion of James from the throne, when that prince became king he was not only retained in office, but acquired a greater ascendancy in the administration than ever. This extraordinary fortune he owed in part to his admirable talents for business, which made him almost indispensable; in part to his equally unrivalled skill in the art of insinuation, a skill moreover which he practised with the great advantage of being utterly unrestrained either by principle (at least as commonly understood) or by any attempt to preserve the appearance of consistency.

He now found a new patron in the queen, to whom he professed to give himself entirely up. When the marquis of Halifax was turned out for refusing to vote for the repeal of the Test Act, Sunderland was, in the beginning of December, 1685, declared president of the council, still retaining his place of secretary. 'Lord Sunderland,' writes Evelyn, in February following, 'was now secretary of state, president of the council, and premier minister.' And again, on the 12th of May, 1687,—'Lord Sunderland, being lord president and secretary of state, was made knight of the garter and prime favourite.' It is worthy of notice that all this success in political life was achieved by Sunderland without the faculty of public speaking: he scarcely ever opened his lips to express more than a simple assent or dissent either in parliament or at the meetings of the cabinet. There is a curious account of his drawling, affected mode of utterance, when he did say a few words, in North's *Examen*, p. 77. One of his methods of dispatching business also was sufficiently singular, if we may believe Lord Dartmouth, who, in a note upon Burnet's 'History,' tells us, on the authority of one of Sunderland's clerks, that 'he never came to the secretary's office, but they carried the papers to him at his house, where he was usually at cards, and he would sign them without reading, and seldom asked what they were about.'

Throughout James's unhappy reign the principal direction of affairs was in the hands of Sunderland and Father Petre (whom he made use of with his usual dexterity), they two constituting what was called the secret council. At last Sunderland, about the end of the year 1687, fairly turned Roman Catholic. 'He made the step to popery,' says Burnet, 'all of a sudden, without any previous instruction or conference; so that the change he made looked too like a man who, having no religion, took up one rather for to serve a turn than that he was truly changed from one religion to another.' To make matters even however Lady Sunderland took to professing a hotter Protestantism than ever. The princess (afterwards queen) Anne writes to her sister the princess of Orange, 13th March, 1688: 'This worthy lord does not go publicly to mass, but hears it privately at a priest's chamber, and never lets anybody be there but a servant of his. His lady too is as extraordinary in her kind; for she is a flattering, dissembling, false woman; but she has so fawning and endearing a way that she will deceive anybody at first, and it is not possible to find out all her ways in a little time. She cares not at what rate she lives, but never pays anybody. She will cheat, though it be for a little. Then she has had her gallants, though maybe not so many as some ladies here; and, with all these good qualities, she is a constant church woman: so that to outward appearance one would take her for a saint, and, to hear her talk, you would think she were a very good Protestant; but she is as much one as the other; for it is certain that her lord does nothing without her.' And again, under date of the 20th:—'I can't end my letter without telling you that Rogers's wife (*i.e.* Lady Sunderland) plays the hypocrite more than ever: for she goes to St. Martin's morning and afternoon because there are not people enough to see her at Whitehall chapel, and is half an hour before other people come, and half an hour after everybody is gone, at her private devotions. She runs from church to church after the famousest preachers, and keeps such a clatter with her devotions that it really turns one's stomach. Sure there never was a couple so well matched as she and her good husband; for as she is throughout in all her actions the greatest jade that ever was, so he is the subtilest working villain that is on the face of the earth.' (Dalrymple's *Memoirs*, Append., part i., pp. 299-301.) Against all this indeed, Lady Sunderland, who was undoubtedly a woman of remarkable talents, ought to have the benefit of the high character given of her by Evelyn, who, after telling us that she is one whom, for her distinguished esteem of him, from a long and worthy friendship, he must ever honour and celebrate, adds, 'I wish from my soul the lord her husband, whose parts and abilities are otherwise conspicuous, was as worthy of her as, by a fatal apostasy and court ambition, he has made himself unworthy. This is what she deplores, and it renders her as much affliction as a lady of great soul and much prudence is capable of.' (*Diary*, 18 July, 1688.) It is known now however that if Lady Sunderland professed to Evelyn to be opposed to the courses her husband pursued, she must have been imposing upon him; for she was certainly his confidant and associate in the darkest of his political intrigues and duplicities. As for Sunderland, one excuse that has been made on highly probable grounds for the worst things he did during his administration of affairs under James is, that he was all the while in secret league with the Prince of Orange and doing his best to drive matters to a revolution. 'After the revolution,' says Lord Dartmouth, 'he and his friends for him pleaded that he turned papist for the good of the Protestant religion;' and Burnet, in the passage to which this note is appended, admits that his change of religion had since been imputed to his desire 'to gain the more credit, that so he might the more effectually ruin the king.' James however at last either came to suspect him or thought to lighten the crazy vessel of the state by throwing the unpopular minister overboard. He was dismissed on the 28th of October, 1688. 'This change,' says the 'History of the Desertion,' 'pleased all men, but it came too late.' Evelyn writes, under date of the 29th, 'Lady Sunderland acquainted me with his majesty's taking away the seals from Lord Sunderland, and of her being with the queen to intercede for him. It is conceived that he had of late grown remiss in pursuing the interest of the Jesuitical counsels; some reported one thing, some another; but there was doubtless some secret betrayed which time may discover.'

On the arrival of the Prince of Orange, Sunderland went over to Amsterdam, whence however he and his wife wrote to the prince, claiming his protection on the ground that they had all along been in his interest. (See their Letters, in Dalrymple, Append., part ii., pp. 3-5.) On the 23rd of March, 1689, also, Sunderland published at London a defence of his conduct in the form of a letter to a friend, which is printed in the 'History of the Desertion,' pp. 28-33, and in Cogan's 'Tracts,' vol. iii. Here he professes, but does not support his assertions by any evidence, to have all along done his utmost, though unsuccessfully, to check James's illegal and headlong course, only taking blame to himself for consenting to remain in office when his advice was so entirely disregarded. The statement contains also some very thickly laid on flattery of King William. 'Sometime after,' he says in one place, 'came the first news of the prince's designs, which were not then looked on as they have proved, nobody foreseeing the miracles he has done by his wonderful prudence, conduct, and courage; for the greatest thing which has been undertaken these thousand years, or perhaps ever, could not be effected without virtues hardly to be imagined till seen nearer hand.' The conclusion of this precious effusion is rich:—'I lie,' says his lordship, 'under many other misfortunes and afflictions extreme heavy, but I hope they have brought me to reflect on the occasion of them, the loose, negligent, unthinking life I have hitherto led, having been perpetually hurried away from all good thoughts by pleasure, idleness, the vanity of the court, or by business; I hope, I say, that I shall overcome all the disorders my former life had brought upon me, and that I shall spend the remaining part of it in begging of Almighty God that he will please either to put an end to my sufferings or to give me strength to bear them; one of which he will certainly grant to such as rely on him, which I hope I do, with the submission that becomes a good Christian.' Sunderland, who had of course been excepted out of the act of indemnity, remained abroad about two years, and then, not a little to the surprise of the general public, returned to be taken into favour by the new king. Under date of the 24th of April, 1691, Evelyn writes: 'I visited the Earl and Countess of Sunderland, now come to kiss the king's hand, after his (the earl's) return from Holland. This is a mystery.' For some years he did not take any public office, but it was well understood that he was nevertheless William's principal adviser. The admission of the Whigs to a share in the government, which took place in 1693, when Trenchard was made secretary of state and Somers keeper of the great seal, was well known to be his doing. Burnet says, 'The bringing these men into those posts was ascribed chiefly to the great credit the Earl of Sunderland had gained with the king; he had now got into his confidence, and declared openly for the Whigs.' In the course of a progress through the northern counties, in November, 1695, his majesty spent seven or eight days at Sunderland's magnificent house at Althorpe, 'which,' says Burnet, 'was the first public mark of the high favour he was in.' On the 1st of December following, Evelyn records, 'I dined at Lord Sunderland's (in London), now the great favourite and underhand politician, but not adventuring on any character, being obnoxious to the people for having twice changed his religion.' Immediately after this he was made lord chamberlain: Lord Dartmouth asserts that the king gave the Earl of Dorset 10,000*l.* to resign in his favour; 'upon which,' he adds, 'Lord Norris fell very violently upon him in the House of Commons, as a man whose actions had been so scandalous during his whole life, that he never had any way to excuse one crime but by accusing himself of another; therefore hoped they would address his majesty to remove him from his presence and councils, which, though not seconded, was universally well received.' In a note on the same passage of Burnet's 'History,' Lord Hardwicke says, 'I have always been persuaded, from the signal confidence which King William reposed in this lord through the whole course of his reign, that he had received some particular services from him at the time of the Revolution which no one else could have performed.' According to the usage of that day, Sunderland, as lord chamberlain, took his seat at the council-table; and he continued to direct affairs as the acknowledged head of the government for about two years longer. At last, in the end of the year 1697, he thought proper suddenly to resign his office, and to retire into private life. 'He was often named,' says Burnet, 'in the House of Commons with many severe reflections, for which there had been but too much occasion given during the two former reigns. The Tories pressed hard upon him, and the Whigs were so jealous of him, that he, apprehending that, while the former would attack him, the others would defend him faintly, resolved to prevent a public affront, and to retire from the court and from business; not only against the entreaties of his friends, but even the king's earnest desire that he would continue about him: indeed, upon this occasion his majesty expressed such a concern and value for him, that the jealousies were increased by the confidence the court saw the king had in him. During the time of his credit things had been carried on with more spirit and better success than before; he had gained such an ascendant over the king, that he brought him to agree to some things that few expected he would have yielded to; he managed the public affairs, in both Houses, with so much steadiness and so good a conduct, that he had procured to himself a greater measure of esteem than he had in any of the former parts of his life; and the feebleness and disjointed state we fell into after he withdrew contributed not a little to establish the character which his administration had gained him.' A note of Speaker Onslow's upon this passage, which is too long to be extracted, records some curious particulars which show the panic precipitation with which Sunderland fled from what his fears represented to him as impending restruction. He never returned to court, but spent the demainder of his life at Althorpe, where he died on the 28th of September, 1702.

It is said that when Edmund Smith was applied to by Addison, at the instance of the Whig ministry of Queen Anne's time, to write the history of the Revolution, he started an objection to which no reply could be made, by asking, 'What shall I do with the character of Lord Sunderland?' The best thing perhaps that can be done in the case, is to allow the facts of his history to speak for themselves—which they do plainly enough.

Lord Sunderland's wife was Anne, daughter of George Digby, second earl of Bristol. Pepys, speaking of Lord Bristol, under date of 1st July, 1663, says, 'I hear also of another difficulty now upon him, that my Lord of Sunderland (whom I do not know) was so near to the marriage of his daughter, as that the wedding-clothes were made, and portion and everything agreed on and ready; and the other day he goes away, nobody yet knows whither, sending her the next morning a release of his right or claim to her, and advice to his friends not to inquire into the reason of this doing, for he hath enough for it; and that he gives them liberty to say and think what they will of him, so they do not demand the reason of his leaving her, being resolved never to have her.' If this strange story be true, Sunderland would seem to have been at his manœuvres and mysteries at a very early age, and long before he commenced his political career. There are numerous notices of Lady Sunderland in Evelyn's 'Diary.' She seems to have taken pains to ingratiate herself with the good old man. Of the children of Lord and Lady Sunderland, the eldest son, Robert, died unmarried, in France, before his father, so that the title fell to the second son, Charles. Evelyn, who knew all the family well, speaks very unfavourably of the elder brother. Of several daughters, one, Elizabeth, was married to the earl of Clancarty in Ireland; another, the Lady Anne, described by Evelyn as 'a young lady of admirable accomplishments and virtue,' to James Lord Arran, the eldest son of the duke of Hamilton, but she died in 1690, before her husband succeeded to the title.

SUNDERLAND, CHARLES SPENCER, THIRD EARL OF, the second son of Robert, second earl, was born in 1674. Evelyn mentions him in 1688 as 'a youth of extraordinary hopes, very learned for his age, and ingenious, and under a governor of great worth.' From Swift's 'History of the Last Four Years of Queen Anne,' this governor or tutor appears to have been Dr. Trimnell, afterwards Bishop of Winchester. He was returned to the House of Commons for Tiverton at the general election in 1695; and he sat for the same place in the three succeeding parliaments, which met in December, 1698, in February, 1701, and in December, 1701. The death of his father made him a peer about six months after the accession of Anne, and before her first parliament met. He had become Lord Spencer, by the death of his elder brother, before 1690; but in his father's lifetime,' says Swift, 'while he was a member of the House of Commons, he would often, among his familiar friends, refuse the title of Lord (as he hath done to myself), swear he would never be called otherwise than Charles Spencer, and hoped to see the day when there should not be a peer in England.' It is remarkable that in the lists of members given in the 'Parliamentary History' he is always called 'Charles Spencer,' without any title. Afterwards however it was noted that he had 'much fallen from the height of those republican principles with which he began.' His first public employment was his appointment as envoy extraordinary and plenipotentiary to the court of Vienna in 1705, on the accession of the emperor Joseph. Some years before this he had married (for his second wife) a daughter of the duke of Marlborough; and this connection led to his being selected by the Whig section of the ministry to displace Sir Charles Hedges, when, in December, 1707, they found themselves strong enough to force the queen to give them a person of their own politics as one of the secretaries of state, their opponent Harley still continuing to be the other, which he did however only for a few months. The history of this movement is told at great length by the duchess of Marlborough, in her 'Account of her Conduct,' p. 172, &c. Its result was to produce a completely Whig government, in which Sunderland retained his office of secretary till June, 1710, when his dismissal, without any reason being assigned, was the first intimation of the complete break-up of the ministry, which immediately followed. It is said that Anne, who never liked the notion of taking away a man's income, even when she wished to deprive him of power, offered to compensate Sunderland when thus turned off by a pension of 3000*l.* a year, to which he replied, that 'he was glad her majesty was satisfied he had done his duty; but if he could not have the honour to serve his country, he would not plunder it.' He remained out of office for the rest of this reign; but the ability he had shown during the short time he was a member of the government, and the prominent part he continued to take in the debates of the House of Lords, made him be generally regarded as the head of the Whig party, and the man most likely to be placed at the head of affairs when the Hanover family should come to the throne. When George I. came over, in September, 1714, he was received with distinguished marks of regard by his majesty; such indeed as could not be omitted to one who had always been looked upon as the most devoted friend of the Hanoverian succession: but it had already excited some surprise that he had not been nominated one of the lords justices to whom the government was committed on the death of the queen, and it soon appeared that there was another interest more powerful than his at the new court. His rival was Lord Townshend, the friend of Walpole, who had obtained the first place in the favour of Bothmar, the Hanoverian resident, and who, on his recommendation, was now appointed secretary of state, while Sunderland was obliged to put up with the lord-lieutenancy of Ireland, which he considered a kind of exclusion and banishment. 'Though he did not openly show his disgust,' says Coxe, 'yet he scarcely took any active part in defending the measures of government. He, who was before accustomed to make a conspicuous figure in every debate, seems to have remained almost uniformly silent; and from the accession of George I. till the beginning of 1717 his name seldom occurs in the proceedings of the House of Lords.' It is probable that his relationship to the duke of Marlborough, who was personally disliked by George I., had much to do with his being thus kept in the background. In August, 1715, soon after the death of the marquis of Wharton, he was made lord privy seal; but this place still gave him little or no share in the direction of affairs, and did not remove his disgust. Nor did he remain inactive. On the contrary, he sought support for himself, and the means of annoying and weakening his opponents, from all quarters. He 'increased his party,' says Coxe, 'with a number of disaffected persons. He particularly gained among the Whigs Carleton, Cadogan, Lechmere, and Hampden; courted the Tories; entered into cabals against his colleagues; and was prepared to use all his efforts and employ any opportunities which might offer to prejudice the king against them.' His majesty had gone over to Hanover, attended by secretary Stanhope, in July, 1716. 'One of the principal charges,' says Coxe, 'which Stanhope had received from his friends in England was to be on his guard against the intrigues of Sunderland, who had, under pretence of ill health, obtained the king's permission to go to Aix-la-Chapelle. Although at the time of his departure he had given the most positive assurances of repentance and concern for his late endeavours to remove his colleagues, and, after the most solemn professions of friendship and union, had condescended to ask their advice for the regulation of his conduct at Hanover, to which place he intended to apply for leave to proceed, Townshend and Walpole suspected his sincerity; they had experienced his abilities; they knew his ambition; and they dreaded the ascendancy which he might obtain, through the channel of the Hanoverians, over the king. But they implicitly trusted in the sagacity and integrity of Stanhope, either to prevent his appearance at Hanover, or, if he came, to counteract his views. Stanhope however did not follow their directions; for when Sunderland demanded access to the king, instead of opposing, he promoted the request with all his influence.' The result was that Sunderland, who had arrived at Hanover in the latter part of October, soon acquired the complete confidence both of the king and of Stanhope. Lord Townshend, after much complicated manœuvring and intriguing by the faction in whose hands the king was, and much indecision on the part of his majesty himself, was removed; Sunderland was in the first instance appointed treasurer of Ireland for life, resigning his office of lord privy seal to the Duke of Kingston; and finally, in April, 1717, a complete reconstruction of the ministry was effected by the resignation of Walpole, Devonshire, Pulteney, and others of their friends, and by the appointment of Sunderland and his friend Addison as secretaries of state (the former also holding for some months the presidency of the council, which he eventually resigned to the Duke of Kingston), with Stanhope as first lord of the treasury and chancellor of the exchequer—an arrangement which about a year after was modified by Stanhope (now a peer) taking the office of secretary, and Sunderland, who had all along been the head of the government, going himself to the treasury, the chancellorship of the exchequer being given to Mr. Aislabie. [STANHOPE, JAMES, EARL.] About the same time the opportunity was taken of substituting Craggs for Addison as the other secretary.

On the 5th of March, 1719, the famous bill for limiting the number of peerages was first brought into the House of Lords. 'This bill,' says Coxe, 'was projected by Sunderland: his views were to restrain the power of the Prince of Wales when he came to the throne, whom he had offended beyond all hopes of forgiveness, and to extend and perpetuate his own influence by the creation (of course the reverend historian must mean before the measure should pass) of many new peers.' The bill was abandoned that session; but it was brought forward again in the next, the first of a new parliament, when it was passed by the Lords, 30th November, 1719, apparently without a division, and was only defeated in the Commons, after it had been read a second time, on the motion for its committal, principally by the strenuous exertions of Walpole. Coxe asserts that before the new parliament met no means had been left unemployed by Sunderland to secure the success of this measure; 'bribes were profusely lavished; promises and threats were alternately employed, in every shape which his sanguine and overbearing temper could suggest.' Now that he found himself signally beaten however — for Walpole's eloquence and influence had procured the triumphant majority of 269 to 177 against the ministerial project—he deemed it his best policy to enter into an alliance with the potent commoner; and accordingly, in the beginning of June, 1720, Walpole and his friend Townshend were both reinstated in the government, the former being appointed paymaster of the forces, the latter president of the council. This proved a fortunate arrangement for Sunderland: in the beginning of the following year came the investigation by the House of Commons into the transactions connected with the South Sea scheme, in which Sunderland, with others of the ministers, had been deeply involved; the secret committee had reported that of the fictitious stock distributed by the directors of the company, with the object of influencing or bribing the government and the legislature, 50,000*l.* had been given to Sunderland; Lord Stanhope and Secretary Craggs, who were also implicated, had only escaped prosecution by having both suddenly died in the midst of the investigation, nor did even his death save the estate of the latter; Aislabie, the chancellor of the exchequer, had already been expelled and committed to the Tower; when, on the 8th of March, Walpole's earnest entreaties with difficulty prevailed upon the House to adjourn the consideration of the part of the committee's report relating to Lord Sunderland till the 15th. In the interval Walpole exerted himself privately to gain votes for an acquittal by representing to his Whig friends in strong colours the disgrace and possible ruin that would be brought upon their party by the conviction of the prime minister. 'His personal weight,' to adopt the language of Coxe, 'his authoritative and persuasive eloquence, were effectually employed on this occasion, and, aided by the influence of government, met with success. The minister was acquitted by a majority of 61 votes, 233 against 172.' It is right to state however that the evidence in support of the charge was far from being perfectly satisfactory, coming as it did principally from one of the directors, himself convicted of gross fraud. 'Although the public voice,' Coxe adds in a note, 'notwithstanding his acquittal by so large a majority, criminated Sunderland, yet several extenuations may be urged in his favour. For it appears from private documents which have casually fallen under my inspection, that so early as July he had refused to recommend to the directors any more lists for subscriptions; that he did not at least enrich himself or his friends; that he expressed great satisfaction that neither himself nor his friends had sold out any South Sea Stock, as he would not have profited of the public calamity.' It is said that if he had sold out the stock he held at one time, he might have realised by it not less than 300,000*l.*

Notwithstanding his acquittal, it was found impossible to retain him in office; he was very reluctant to go out, and the king was equally averse to parting with him: in particular, it is said, he desired to be allowed to retain the disposal of the secret service money; but he was at last forced to give up everything, and on the 3rd of April Walpole was appointed both to his place of first lord of the treasury, and to that of chancellor of the exchequer, of which Aislabie had been deprived. Sunderland however still retained the most unbounded influence over the king; he even regulated the appointments to the highest offices in the government, carrying his nominations in several instances against the united efforts of Townshend and Walpole. Coxe asserts, on the evidence of private papers, that he not only set himself industriously to undermine the cabinet, but even intrigued with the Tories, and made overtures to Bishop Atterbury, the agent of the Pretender. He proposed to the king, it seems, when the ferment of public indignation occasioned by the explosion of the South Sea scheme was at its height, to dissolve the parliament, with the view of bringing in a Tory majority, who under his conduct would quash all inquiry on the subject: the project obtained his majesty's concurrence, but was defeated by the firmness and intrepidity of Walpole. 'The Pretender and the Jacobites certainly at this time,' Coxe adds, 'entertained the most sanguine hopes. Sunderland became a great favourite with them and the Tories, his health was constantly drank by them, and they affected to be secure of attaining, by his means, the accomplishment of their wishes.' There are some strong assertions by Pope as to Sunderland's dealings with the Pretender, both at this and at an earlier period, in Spence's 'Anecdotes,' p. 313. It also appears that he had contrived a plot for the political annihilation of Walpole by persuading the king to offer to make him postmaster-general for life, with the view that if Walpole accepted the office, it would take him out of parliament, or, if he refused it, that he would give offence to his majesty. The king however, when he found that Walpole had never expressed any desire for the place, nor was even acquainted with Sunderland's proposal, refused to allow the offer to be made to him. Sunderland, nevertheless, by persevering, or shifting his mode of attack, might possibly have succeeded ere long in effecting the downfall of his rival; but in the midst of his intrigues he was suddenly arrested by death, on the 19th of April, 1722, being as yet only in the forty-seventh year of his age. He had been thrice married: first, in 1695, to the Lady Arabella Cavendish, daughter of Henry, duke of Newcastle, by whom he had a daughter; secondly, in or before 1702, to the Lady Anne Churchill, second daughter of the duke of Marlborough, by whom he had three sons, and who died 15th April, 1716; thirdly, to Judith, daughter of Benjamin Tichbourne, Esq. (a younger brother of Viscount Tichbourne, in Ireland), by whom, according to some of the peerages, he had no issue, but who is stated in other works of the kind to have borne him a son, who died three days after himself, a daughter who died in infancy, and a second son, which came into the world five months after his death, and died at six months old. Of his three sons by his second wife, Robert, the eldest, succeeded to the earldom, and died unmarried, 27th November, 1729; Charles, the second, became earl of Sunderland on the death of his elder brother and on the death of his aunt, in 1733, became duke of Marl borough; and John, the youngest, who then succeeded to the family estates, was the father of the first Earl Spencer.

Lord Sunderland, who associated much with the wits and literary men of his day, was one of the members of the famous Kit-Kat Club, and was also one of the set of noblemen who, about the beginning of the last century, used to make a weekly perambulation among the old book-shops in the metropolis in search of early-printed books, scarce pamphlets, manuscripts, and other rarities and curiosities of literature. To this fashion of collecting early literature, which then prevailed, we are undoubtedly indebted for the preservation of many things of more or less interest or value; and the great libraries of Althorpe, Devonshire House, Blenheim, and the Harleian collection of manuscripts, probably acquired in this way many of what are now accounted their most precious articles.

SUNDGAU, a subdivision of the province of Alsace [Alsace], comprehending the southern part, and having Béfort, Mulhausen or Mühlhausen, Altkirch, Cernay, and Thann for its chief towns: it was a dependency of the bishopric of Basel, or Bâle, and was held by the archdukes of Austria. It was ceded to France by the treaty of Münster, A.D. 1648, and is now included in the department of Haut Rhin. [Rhin, Haut.]

SUNDSWALL. [Angermanland.]

SUNNAH. This is the name given by the Mohammedans to the traditionary portion of their law: which was not, like the Korán, committed to writing by Mohammed, but preserved from his lips by his immediate disciples, or founded on the authority of his actions. It holds in Mohammedan theology the same place as the Mishna in the Jewish doctrine, and the names agree in their derivation. The orthodox Mohammedans call themselves Sunnites, in distinction to the various sects which are comprehended under the term Shiites, whose distinguishing characteristic is that they recognise as lawful khalifs Ali and his descendants. The Turks as a nation are Sunnites, and the Persians Shiites. Shiah, from which this latter name is derived, signifies a party or troop.

SUPERFICIAL DEPOSITS. [Surface of the Earth.]

SUPERFICIES, the Latin form of the word surface, used in the sense of surface, and sometimes of area. The quantity of an area is called its superficial content, as distinguished from linear content or length, and solid content or bulk.

SUPERIOR, LAKE. [Canada; Mississippi, River.]

SUPERSE'DEAS, in law, the name of a writ used for the purpose of superseding proceedings in an action (Tidd's *Practice*; Archbold's *Practice*): in bankruptcy it is the writ used for the purpose of superseding the fiat. It is obtained on application by petition to the court of bankruptcy, and is granted on the ground that the fiat is invalid in point of law, has not been duly prosecuted, &c. [Bankruptcy.] (Deacon's *Law of Bankruptcy*; Eden's *Bankruptcy Law*.)

Supersedeas also in its more general sense is used to express that which supersedes legal proceedings, although no writ of supersedeas may have been used for that purpose. Thus if a writ of certiorari be delivered to an inferior court for the purpose of removing a record to a superior court, the writ of certiorari is said to be a supersedeas of the proceedings before the inferior court.

SUPPLEMENT (Trigonometry). The defect of an angle from two right angles. Also chords or arcs of a circle or other curve which have a common extremity, and together subtend an angle of two right angles at the centre, are sometimes called supplemental chords or arcs.

SUPPLY. [Parliament, Imperial, vol. xvii., p. 271.]

SUPPURATION. [Abscess; Inflammation.]

SUPRALAPSARIANS. In the discussions of the doctrines of predestination and election, which arose out of the teaching of the school of theologians at Geneva, two different views came to be taken by the Calvinistic party. Some held that all the occurrences which take place on the earth have been from eternity the subject of a special decree of God: that God decreed to create man solely for his own glory, and to display his glory in the eternal happiness of some and the damnation of others: that this decree respected not merely the end, but all the means, direct or indirect, by which that end was to be wrought out; and that sin, the fall of man, and the introduction of evil into the world, were decreed by God to happen as necessary means to the end proposed, and God therefore so constituted man, and placed him in such circumstances that he could not but fall. The persons who held these views were called *Supralapsarians* (*supra lapsum*), because, according to their system, the decrees of God respecting the salvation of some men and the rejection of others were in no sense consequent or dependent upon the foreseen fall of man, which itself (on the contrary) took place in consequence of a divine decree.

The other party were called *Infralapsarians*. They considered the decrees of God for fixing the eternal state of man as equally eternal and unchangeable, but they maintained that God did not create man in order that he might fall, but left him free to act for himself; and, though foreseeing that he would fall, did not interfere to prevent him, but decreed that the consequences of this foreseen fall should result in increased glory to himself, and the eternal happiness of the greater part of men.

Beza, Gomar, and Voetius were of the Supralapsarian party.

The synod of Dort adopted the views of the Infralapsarians. 'Modern Calvinists,' generally, go no farther than Infralapsarianism, and often not so far.

(Mosheim's *Eccles. Hist.*, cent. xvii., sec. ii., pt. ii.; c. ii. s. 10-12; and the principal works on systematic theology.)

SUPREMACY is a term used to designate supreme ecclesiastical authority; and is either papal or regal. Papal supremacy is the authority, legislative, judicial, and executive, exercised until nearly the middle of the sixteenth century by the pope over the churches of England, Scotland, and Ireland, as branches and integral parts of the Western or Latin church, and which continues to be exercised *de facto* over that portion of the inhabitants of those countries who are in communion with the Church of Rome. The extent of the legislative authority of the pope was never exactly defined. Whilst it was regarded as nearly absolute at Rome and at Madrid, it was, at Venice, and still more at Paris, sought to be reduced within very narrow limits.

The papal supremacy was abolished by the legislatures of the three kingdoms in the sixteenth century. In order to ensure acquiescence in that abolition, particularly on the part of persons holding offices in England and Ireland, an oath has been required to be taken, which is generally called the oath of supremacy, a designation calculated to mislead, it being in fact an oath of *non*-supremacy rather than of supremacy; since, though in its second branch it negatives the supremacy of the pope, it is silent as to any supremacy in the king. This oath is therefore taken without scruple by persons who are not Roman Catholics, whether members of the Anglican church or not. The form of the oath, as established in England by 1 Wm. & Mary, c. 8, is as follows:—'I, A. B., do swear that I do from my heart abhor, detest, and abjure, as impious and heretical, that damnable doctrine and position, that princes excommunicated or deprived by the pope, or any authority of the see of Rome, may be deposed or murdered by their subjects, or any other whatsoever. And I do declare that no foreign prince, person, prelate, state, or potentate hath or ought to have any jurisdiction, power, superiority, pre-eminence, or authority, ecclesiastical or spiritual, within this realm. So help me God.' Under this, and many former statutes, all subjects were bound to take the oath of supremacy when tendered; but by the 31 Geo. III., c. 32, s. 18, no person, since the 24th June, 1791, is liable to be summoned to take the oath of supremacy, or prosecuted for not obeying such summons; and Roman Catholics, upon taking the oath introduced by that Act, s. 1, in which the *civil* and *temporal* authority of the pope are abjured, may hold office without taking the oath of supremacy; which, as it now no longer operates to harass Roman Catholics, or to exclude them from office, is become almost an unmeaning form.

Regal supremacy is not legislative, but judicial and executive only. Henry VIII. was first acknowledged as supreme head of the church by the clergy in 1528. This supremacy was confirmed by parliament in 1534, when, by the statute of 26 Hen. VIII., c. i., it was enacted 'that the king our sovereign lord, his heirs and successors, kings of this realm, shall be taken, accepted, and reputed the only supreme head in earth of the Church of England, and shall have and enjoy, annexed to the imperial crown of this realm, as well the style and title thereof, as all honours, dignities, pre-eminencies, jurisdictions, privileges, authorities, immunities, profits, and commodities to the said dignity of supreme head of the same church belonging and appertaining; and shall have power from time to time to visit, repress, redress, reform, order, correct, restrain, and amend all such errors, heresies, abuses, offences, contempts, and enormities, whatsoever they be, which, by any manner of spiritual authority or jurisdiction, may lawfully be reformed, repressed, ordered, redressed, corrected, restrained, or amended, most to the pleasure of Almighty God, the increase of virtue in Christ's religion, and for the conservation of the peace, unity, and tranquillity of this realm; any usage, custom, foreign laws, foreign authority, prescription, or any other thing to the contrary notwithstanding.'

Dr. Burn observes, 'that after the abolition of the papal power there was no branch of sovereignty with which the princes of this realm, for above a century after the Reformation, were more delighted than that of being the supreme head of the church, imagining (as it seemeth) that all that power which the pope claimed and exercised (so far as he was able) was by the statutes abrogating the papal authority annexed to the imperial crown of this realm, not attending to the necessary distinction that it was not that exorbitant lawless power which the pope usurped that was thereby become vested in them, but only that the antient legal authority and jurisdiction of the kings of England in matters ecclesiastical, which the pope had endeavoured to wrest out of their hands, was re-asserted and vindicated. The pope arrogated to himself a jurisdiction superior not only to his own canon law, but to the municipal laws of kingdoms. And those princes of this realm above mentioned seem to have considered themselves plainly as popes in their own dominions. Hence one reason why a reformation of the ecclesiastical laws was never effected seemeth to have been because it conduced more to the advancement of the supremacy to retain the church in an unsettled state, and consequently more dependent on the sovereign will of the prince.' (Burn's *Ecclesiastical Law*, tit. 'Supremacy.')

Regal supremacy over the church is not recognised by the established Presbyterian Church of Scotland, which boasts that it has no head upon earth. Notwithstanding this bold assertion, the king possesses a controlling power over the acts of the General Assembly of the Church of Scotland even *in spiritualibus*, though since the accession of the house of Brunswick it has been seldom if ever exercised.

SUR, or SOUR. [TYRE.]

SURAT, or, as the natives pronounce it, *Soorut* ('beauty'), a large city on the western coast of Hindustan, in the presidency of Bombay and province of Gujerat, stands on the south bank of the Taptee, in 21° 12′ N. lat. and 72° 50′ E. long.: the river falls into the Gulf of Cambay about 18 miles west from the city. Surat is about 120 miles north from Bombay, direct distance: it is situated in a fertile country, with woody hills, long sheltered lanes, and patches of dense jungle; and is a favourite hunting district, wild hogs and other game being abundant. There are numerous villages and farms in the neighbourhood.

The city of Surat is in the form of a semicircle; the Taptee is the chord, near the centre of which is a citadel or small fortified castle. The city is surrounded by a wall about six miles in circuit, in good repair, with semicircular bastions, and with battlements. Milburn (*Oriental Commerce*) and others speak of two walls, one round the city and another round the suburbs, the outer wall being twelve miles in circuit, and a mile distant from the inner wall; but as bishop Heber, who was there in 1825, and Mrs. Postans, who visited it in 1838, only mention one wall, it is to be presumed that the wall round the suburbs has been taken down. The citadel is garrisoned by a few sepoys and European artillerymen.

Surat, though a large city, is by no means a handsome one. The streets are narrow, winding, unpaved, in the wet season muddy, and in the dry season dusty. The houses are generally high, and are mostly constructed of a framework of timber (often bamboos) filled up with bricks or sun-dried mud; most of the upper stories project over the lower ones. The houses however of some of the principal merchants are of stone, and are large and well-built, but there are no public buildings worthy of notice as specimens of architecture, and indeed the only structure which has much of interest attached to it is the hospital for aged and diseased animals: it occupies a large piece of ground, surrounded by high walls, and is divided into compartments or wards, with every arrangement requisite for the comfort of the different classes of animals, as horses, oxen, sheep, goats, &c. It has been said that offensive and noxious vermin were kept, but Mrs. Postans denies that this was the case in 1838. It is an establishment founded by the Jains, and is richly endowed by them. The residence of the nawâb is modern, but is not at all striking. There is a neat English church, which was consecrated by bishop Heber in 1825. A large and picturesque burying-ground, outside the city, contains numerous tombs of former servants of the East India Company. These tombs are constructed in the Mohammedan style of architecture, some of them being 150 or 200 years old; that of Sir George Oxenden, for size and solidity, is worthy of one of the founders of the English empire in India.

The population of Surat was estimated, in 1796, when its prosperity had confessedly declined, at 800,000, which was probably too much, but it was perhaps not less than 600,000. It is now very much reduced, the greatest part of its commerce having been transferred to Bombay. The inhabitants at present probably do not exceed 150,000, perhaps not 100,000. They consist of Hindoos, who are mostly Jains, of Mohammedans, many of whom are Boras, of Parsees, and of Armenians, Jews, and various other races, besides Europeans The Parsees and the Boras are the most flourishing part of the population. The Parsees are of Persian origin, followers of Zoroaster, and of course fire-worshippers, who, when driven out of Persia by the Mohammedans, found an asylum at Surat, where they have continued ever since. Heber thought that half the houses in the city belonged to the Parsees: the Boras, he says, carried on a lucrative trade as banians and money-lenders. There are also great numbers of religious mendicants in this city and its neighbourhood, Fakeers, Yogies, and Gosaens, who enforce charity from the superstition both of Hindoos and Mohammedans.

Surat is the station of a British military force: it is also the seat of the supreme court of justice for the whole presidency of Bombay, of a circuit court, and of a board of customs with a collector. The English society is numerous, and of the best kind.

The Taptee at Surat is a wide river, but the navigation is dangerous, from shifting sand-banks, even to boats; and large vessels are prevented from entering it by a bar, and therefore anchor in the Surat Roads, or Swally Roads, as they are commonly called, from the small sea-port of Swally, at the mouth of the river, where the ships discharge and take in their cargoes. The boats which navigate the river are generally of 30 and 40 tons, half-decked, with two masts and two large latteen-sails. The river opposite the city is brackish: water for domestic purposes is raised by oxen from wells, and there are also large tanks to collect the rain.

The imports to Surat are chiefly from Arabia, Bombay, and Brazil, and consist of grain and other articles of food, piece-goods, raw materials to be worked up into manufactures, and bullion. The exports are mostly manufactures of Surat and the neighbouring districts, raw cotton, and a few other articles of native produce. The vessels are chiefly English, Arabian, and Portuguese.

The history of Surat is eventful and interesting. It is a place of such antiquity as to be mentioned in the antient Sanscrit poem 'The Râmâyana.' After the conquest of Hindustan by the Mohammedans, it was the chief port at which they embarked on their pilgrimage to Mecca; and when the Europeans first discovered the passage by the Cape of Good Hope, was the greatest place of maritime commerce on the continent of India, being in immediate communication with the richest provinces in the Mogul empire, and conveniently situated for trading not only with the western coast of that continent, but with the gulfs of Persia and Arabia. The Portuguese were the first Europeans that reached the western coast of India by sea: after establishing themselves at Calicut, Goa, and Damaun, they began to trade with Surat about 1561. In 1603 Mr. Mildenhall, a London merchant, reached Agra, and in 1606 obtained an ample grant of commercial privileges by a firmaun from the emperor Jehanghir. In 1610 Sir Henry Middleton, on proceeding to Surat, found some Portuguese ships ready to oppose him, and was therefore obliged to fight for our first trifling trade with the inhabitants of Hindustan; and this was the commencement of a series of actions fought with the Portuguese by Captain Best in 1612 and 1613, and by Captain Downton in 1614, in all of which the English were successful. The consequence of these successes was, that a factory was established at Surat by treaty with the governor of Ahmedabad, in Dec., 1612, and confirmed by an imperial firmaun in 1613. The Dutch also came to Surat about this time, and became powerful rivals to the English, as well as to the Portuguese: they carried on a thriving trade for about a century. The French were long after the Dutch and English in trading to Surat; and though they had a factory there, they never prospered, and at last abandoned it without paying their debts. In 1615 Sir Thomas Roe landed at Surat, whence he proceeded to the emperor at Agra, and obtained grants for the establishment of factories at Surat, Cambay, and elsewhere. Surat now became the chief station of the East India Company on the west coast of India. In 1635 however a rival association was formed in England, at the head of which was Sir William Courten, one of whose ships seized and plundered two native junks belonging to Surat and Diu. In reprisal the president and council were imprisoned by the Mohammedan governor of Surat (the nawâb), and the property of the factory was confiscated. Though the factory was soon afterwards re-established, the English trade continued in a declining state. In January, 1664, Sevajee, the founder of the Mahratta power, made a predatory attack on Surat. The inhabitants fled into the country, and the nawâb shut himself up in his castle. Sevajee proceeded to plunder the city, and at the same time invested the castle, and demanded the surrender of the factory. Sir George Oxenden was then the chief of the English factory. Sir George's answer to Sevajee's demand was, 'We are here on purpose to maintain the house to the death of the last man, and therefore delay not your coming upon us.' Sir George called in the aid of the ships' crews: they made sorties with such gallantry as to prevent Sevajee from plundering the part of the town in which the English factory was situated, and he soon after retired. The nawâb presented Sir George with a dress of honour, and recommended the interests of the Company to Aurungzebe with such effect, that the emperor, by a firmaun, remitted the customs at Surat to all merchants for one year, and granted a perpetual remission of a part of the duties to the English in particular.

Surat continued to be the chief seat of government under the East India Company till 1686, when it was removed to Bombay. In 1687, the conduct of Sir John Child having exasperated Aurungzebe, the factory at Surat was seized, as well as Bombay and other places; but after making submission, they were restored. Surat was fined 150,000 rupees. The city was afterwards partially pillaged by the Mahrattas more than once, and the nawâb was obliged to pay them an annual tribute. In 1800 the nawâb was compelled by the English to sign a treaty, by which he resigned the government, civil and military, with all its emoluments and powers, to the East India Company, who, on their part, agreed to pay him and his heirs one lac of rupees annually, together with one-fifth of the surplus annual revenue, after deducting all charges. Though a state prisoner, the nawâb of Surat, like his master the emperor of Delhi, is still permitted to retain the forms of state and authority; and we believe the Mogul ensign still waves on the walls of the castle of Surat, in company with the English jack. By the treaty of 1803 the Marhattas were compelled to relinquish all their claims on Surat. Surat has suffered severely by fires; a large part of the city was destroyed by one in 1836; but the houses had been, to a considerable extent, rebuilt when Mrs. Postans was there in 1838.

(Heber's *Narrative of a Journey in the Upper Provinces of India in* 1824 *and* 1825; Mrs. Postans's *India in* 1838; Hamilton's *East India Gazetteer;* Milburn's *Oriental Commerce;* Mill's *History of British India*, by H. H. Wilson; Kerr's *Collection of Voyages and Travels*, vols. vi., vii., and viii.)

SURCHARGE. [Taxation.]

SURD. This word has been used to signify an irrational arithmetical or algebraical quantity since the time of the introduction of algebra into Europe; though why any term formed from *surdus* was used in such a sense is not known; perhaps it was the supposed translation of an Arabic term. In the article just cited we have said as much as is necessary on the subject. We will only add that the second volume of Cossali's History of Algebra contains an account of the tenth book of Euclid, with reference to the use made of it by the earlier algebraists.

SURDITES. [Deafness.]

SURE'NA. [Crassus.]

SURETY. A surety is one who undertakes to be answerable for the acts or non-acts of another, who is called his principal. Such undertaking must be in writing, and it may be either by bond or by simple writing. A contract is not binding in law, unless made upon some sufficient consideration; but in the case of a bond this consideration is inferred from the circumstances of deliberation incident to its execution as a deed. When the undertaking is not by bond, it is necessary that the consideration should appear upon the face of the written instrument, or be necessarily implied from the terms of it, and that the instrument should be signed by the party who becomes the surety. The instrument however may consist of several writings, if they are so connected by reference to each other that they can be considered as incorporated. The instrument by which the surety becomes bound, when it has reference to civil matters, is generally called a guarantee, and ordinarily consists of an undertaking to become answerable for the payment of goods furnished to the principal, or for his integrity, skill, attention, and other like matters. In such cases the consideration expressed would probably be the furnishing of the goods to the principal, or his employment by the party guaranteed. In the construction of guarantees the same rule of law prevails as in the case of all written instruments,—that they shall be understood in the sense most unfavourable to the party making them which the words will reasonably bear. The application of the rule is very frequent in cases of guarantee where the question arises whether or not the guarantee is what is called a subsisting guarantee. Thus where the surety undertakes to be answerable to the amount of 100*l.* for goods supplied to his principal, this may mean that he will be answerable for the first 100*l.* worth, and cease to be answerable for any goods supplied afterwards; or, that he will continue to be answerable to the amount of 100*l.* for any indefinite period during which goods may be supplied, although the principal has paid for the first 100*l.* worth. The latter kind of guarantee is called a subsisting guarantee. 'If a party,' as Lord Ellenborough says, in deciding upon a case of this kind, 'means to be surety only for a single dealing, he should take care to say so.' Observations of a similar character may be made as to the application of payments by the principal. If a party who becomes surety for the payment of a particular debt means to insist upon the application of the first money afterwards paid by his principal to the discharge of that debt, he should take care that such intention on his part is evident, either from the words of his undertaking or from the course of dealing between his principal and the guarantee. 'The general rule,' as the same learned judge has stated, is, 'that where nothing is directed as to the application of the money, the party who receives it may apply it.' Thus, if the principal was indebted to the guaranteed before the guarantee was given, or has become indebted to him afterwards for other debts than those for which the surety intended to make himself liable, the guaranteed may, if not restricted by the guarantee or the circumstances of the transaction, apply money paid him by the principal to the discharge of these other debts, and still hold the surety liable for the payment of the debt which he has guaranteed.

The circumstances connected with the relative position of the guaranteed and the principal are considered as embodied in the contract between the guaranteed and the surety, and as forming part of that upon which the undertaking of the latter is founded. If therefore these are substantially varied, so as to increase the risk of the guaranteed, or to destroy or suspend his remedy against the principal, the surety is thereby discharged. Thus, if the guaranteed has, at the time the guarantee is given, a lien upon property of the principal in his hands, which he afterwards parts with; or if he extends the time of credit, or after commencing an action against the principal gives him time, the surety will be released. But the variation of circumstances must be substantial; a change which does not operate so as to increase the risk or lessen the remedy will not have such an effect. Neither can the surety discharge himself by a mere request or caution to the guaranteed to abstain from trusting the principal, or to watch his acts, &c. Nevertheless it is the duty, and perhaps an implied undertaking on the part of the guaranteed, against the consequences of the neglect of which a court of equity might relieve the surety to employ a reasonable degree of prudence and attention in intrusting his goods, or inspecting and checking the accounts of his clerks or servants. In some cases also a court of equity has interfered to compel the guaranteed to take steps to recover the debt due from the principal, where he has been guilty of gross negligence in abstaining from doing so. It is a general rule that the surety is entitled to the benefit of all the securities which the guaranteed has against the principal.

If the guaranteed compounds with the surety, he does not thereby discharge the principal.

In case of the principal becoming bankrupt, the surety may prove for the amount of the debt owing to the guaranteed; or if the debt has been otherwise proved, the surety may receive the dividends towards the amount of his responsibility to the guaranteed.

With respect to the rights of the surety against the principal, Mr. Justice Buller has distinctly laid down the law, 'wherever a person gives a security by way of indemnity for another, and pays the money, the law raises an assumpsit,' that is, implies a promise on the part of the principal to repay to the surety all the money that he has expended on his behalf, and this money may be recovered in an action against the principal for money paid to his use. But in no case is the surety entitled to more than an indemnity from his principal. Thus, if the guaranteed is content with a less sum from the surety, instead of exacting the full amount for which he is liable, the principal will be bound to repay to the surety the less sum only. If the surety has himself taken a bond or other security from the principal, he relinquishes his right to bring an action upon the promise implied in law, and must have recourse to an action upon his security. The court of chancery will interfere to give the surety relief out of any funds of the principal which he cannot reach at common law.

Where more persons than one become sureties for the same principal, they are called co-sureties. If one of these has paid the whole of the debt due from the principal, he may recover in an action of assumpsit from his co-sureties the amounts for which they were respectively liable. A court of equity will also interfere to regulate the proportions partly due from each. And in case any of them are unable to pay from insolvency, &c., it will compel the others to contribute proportionally the amount for which the defaulters were liable. The law is the same as to co-sureties, whether all have been created by the same instrument in writing, or each one by a distinct instrument.

(Fell, *On Guarantees*; *Mayhew* v. *Crickett*, 2 Swanston, 185.)

SURETY OF THE PEACE 'is the acknowledging of a recognizance or bond to the king, taken by a competent judge of record for keeping the peace.' Magistrates have the power to take such recognizances, which are generally done by the party acknowledging (*recognizing*, and hence the term *recognizance*) that he is indebted in a bond to the king to a certain amount, the condition of which bond is, that he or the party for whom he becomes bound shall keep the peace during a term named in the condition. Such recognizance may be obtained by any party from another on application to a magistrate, and stating on oath that he has just cause to fear that such other 'will burn his house, or do him a corporal hurt, as by killing or beating him, or that he will procure others to do him such mischief.' Upon such application being made to the magistrate, it is his duty to summon the party before him and cause him to enter, either alone or with others, into such recognizances as he thinks the case demands. The fear must be of a present or future danger: no recognizances are demandable on the ground of a past offence. Upon the neglect or refusal of the party so summoned to enter into the recognizances demanded, he may be committed to prison by the magistrate for a specified period, unless he sooner complies. If the recognizance is forfeited by a breach of the condition, it may be removed into one of the superior courts and there proceeded upon.

Sureties also may be similarly required for the good behaviour of parties who have been guilty of conduct tending to a breach of the peace, abusing those in the administration of justice, &c.

(Burn's *Justice*, tit. 'Surety of the Peace.')

SURF. [SEA.]

SURFACE. SURFACES, THEORY OF. For the mere definition of surface, see SOLID, &c. We are here to speak of that branch of algebraic geometry which considers the generation and properties of curve surfaces following an assigned law.

If three planes, each at right angles to the other two, be taken as the planes of CO-ORDINATES, the position of any point is determined as soon as its co-ordinates, or distances from the three planes, are given in sign and magnitude. If the co-ordinates of a point be x, y, z, and if between these one equation exists, $\phi(x, y, z) = 0$, any point may be chosen in the plane of x and y, by means of given values of x and y, and the corresponding value or values of z may be found from the equation. The locus of all the points whose position can be ascertained by determining one of the co-ordinates from this equation, the other two being taken at pleasure, is a surface of which $\phi(x, y, z) = 0$ is called the equation, and the modes of proceeding are pointed out in all works on algebraic geometry. The applications of the differential calculus depend on the principles explained in TANGENT: the practical use of the whole method depends mostly on descriptive geometry, whether formally known under that name or not.

Surfaces are distinguished algebraically by the nature and order of their equations. Thus we have surfaces of the first order, in which the equation is of the first degree (this class contains the plane only); surfaces of the second order, which will be classified in the next article; and so on.

Surfaces are also distinguished by their mode of generation, and some of the principal cases are as follows:—

1. *Cylindrical surfaces* are generated by a straight line infinitely produced in both directions, which moves so as always to be parallel to a given line, and to have one of its points on a given curve.

2. *Conical surfaces* are generated by a straight line infinitely produced in both directions, which always passes through a given point or vertex, and has one point in a given curve. The common CYLINDER and CONE would be described in this science as a *right circular cylinder* and a *right circular cone*. The cylindrical surfaces themselves are only an extreme case of the conical ones, being what the latter become when the vertex is removed to an infinite distance.

3. *Surfaces of revolution* are generated by the rotation of a curve about an axis, relatively to which it always retains one position. The common cone and cylinder, the SPHERE, and others of the greatest practical use, are contained in this class.

4. *Tubular surfaces* are generated by a circle of given radius, which moves with its centre on a given curve, and its plane at right angles to the tangent of that curve. When the given curve is a circle, the tubular surface is a common ring.

5. *Ruled surfaces* (the *surfaces réglées* of the French writers) are those which are described by the motion of a straight line, which neither remains parallel to a given line nor always passes through a given point. This includes, among many others, the whole class of *conoidal surfaces*, made by a straight line which moves parallel to a given plane, and always passes through a straight line perpendicular to that place and a given curve. The surface of a spiral staircase, as it would be if there were no steps but only a gradual ascent, is an instance.

6. *Developable surfaces* are those which can be unwrapped on a plane without any doubling of parts over one another, or separation; that is, without being rumpled or torn. The only familiar instances are the cylinder and cone.

SURFACES OF THE SECOND DEGREE. This name is given to all those surfaces of which the equation is of the second degree, or can be made a case of

$$ax^2 + by^2 + cz^2 + 2a'yz + 2b'zx + 2c'xy$$
$$+ 2a''x + 2b''y + 2c''z + f = 0,$$

to which form any equation of the second degree between two variables may be reduced. These surfaces hold the same place among surfaces which is held by curves of the second degree, or conic sections, among curves; and every section made by a plane with any surface of the second degree must be a curve of the second degree. The following article is intended entirely for reference, as the books which treat on the subject hardly ever give the complete tests for the separation of the different cases from each other.

1. The preceding equation may be wholly impossible, or incapable of being satisfied by any values of x, y, and z. This happens when the left-hand side can be resolved into

the sum of any number of squares which cannot vanish simultaneously.

2. It may represent only one single point. In this case the left-hand side can be resolved into the sum of three squares, which vanish simultaneouly for one set of values of x, y, and z.

3. The equation may belong to a single straight line. In this case the left-hand side can be resolved into the sum of two squares.

4. The two last cases have a particular case which is algebraically very distinguishable from the rest, though it can only be geometrically represented, by saying that the point or line is at an infinite distance from the origin.

5. The equation may belong to a single plane. In this case the left-hand side is a perfect square.

6. Or to a pair of planes, either parallel or intersecting. The left-hand side can then be resolved into two different factors of the first degree.

In the preceding cases there is no other surface than can be represented by one or several equations of the first degree. We now come to the cases in which new surfaces, not plane, are generated. But we may first observe that the left-hand side of the equation has a property much resembling a celebrated one of integer numbers. If it be the sum of any number of squares exceeding four, it may be reduced to the sum of four squares at most.

7. The equation may belong to a cone, having for its base any one of the conic sections. But in every case the same cone may be described by a circle only: that is, every cone of the second order is a circular cone, right or oblique. In this case the first side of the equation takes the form $P^2+Q^2-R^2$, or $P^2-Q^2-R^2$, P, Q, and R being expressions of the first degree, of the form $Ax+By+Cz+E$.

8. The equation may belong to a cylinder having for its base any conic section. But the elliptic, parabolic, and hyperbolic cylinders are perfectly distinct. In this case the first side of the equation can be reduced to the form P^2+mQ^2+nQ, P and Q being expressions of the first degree, and m and n constants.

9. The equation may belong to an *ellipsoid*, a *single hyperboloid*, a *double hyperboloid*, an *elliptic paraboloid*, or an *hyperbolic paraboloid*. These five are the distinct surfaces of the second degree, answering to the three distinct curves of the second degree, namely, the ellipsoid to the ellipse, the two hyperboloids to the hyperbola, and the two paraboloids to the parabola. They will presently be further described; in the mean time the forms to which the left-hand side of the equation may be reduced in these several cases are—

Ellipsoid	$P^2+Q^2+R^2-m^2$.
Single Hyperboloid	$P^2+Q^2-R^2-m^2$.
Double Hyperboloid	$P^2-Q^2-R^2-m^2$.
Elliptic Paraboloid	P^2+Q^2+mR.
Hyperbolic Paraboloid	P^2-Q^2+mR.

The conditions under which the several cases are produced are exhibited in the following table. Let

$$V_1=a+b+c$$
$$V_2=bc+ca+ab-a'^2-b'^2-c'^2$$
$$V_3=abc+2a'b'c'-aa'^2-bb'^2-cc'^2$$
$$V_4=(bc-a'^2)a''^2+(ca-b'^2)b''^2+(ab-c'^2)c''^2$$
$$+2(b'c'-aa')b''c''+2(c'a'-bb')c''a''+2(a'b'-cc')a''b'$$

$$W=-\frac{V_4}{V_3}+f.$$

When $V_3=0$, V_4 is a perfect square: if V_4 also $=0$, the three expressions

$$\frac{ba''^2-2c'a''b''+ab''^2}{ab-c'^2},\ \frac{ac''^2-2b'c''a''+ca''^2}{ca-b'^2},$$
$$\frac{cb''^2-2a'b''c''+bc''^2}{bc-a'^2}$$

are all equal. Let either of them, with its sign changed, and increased by f, be called W′. Again, when any three of the six quantities,

$$bc-a'^2,\quad ca-b'^2,\quad ab-c'^2$$
$$b'c'-aa',\ c'a'-bb',\ a'b'-cc'$$

vanish, the other three also vanish. Let these vanish, and also let a'', b'', c'' be in the proportion of a, c', b', or of c', b, a', or of b', a', c. When this happens, the three following,

$$\frac{a''^2}{a},\ \frac{b''^2}{b},\ \frac{c''^2}{c}$$

are equal: let either, with its sign changed, and increased by f, be called W″. The table is then as follows, in which p means either of the signs + or −, and n means the other; and a supposition put in parentheses means that it is a necessary consequence of what precedes, or is not independent.

W	V_3	W′	V_2	W″	V_1	Surface.
p	p		+		p	Impossible.
p	n		+		n	Ellipsoid.
p	p		+		n	Single Hyperboloid.
p	p		−			do. do.
p	n		+		p	Double Hyperboloid.
p	n		−			do. do.
∞	(0)		+			Elliptic Paraboloid.
∞	(0)		−			Hyperbolic Paraboloid.
0	p		+		p	Point.
0	p		+		n	Cone.
0	p		−			do.
$\frac{0}{0}$	(0)	p	+		p	Impossible.
		p	+		n	Elliptic Cylinder.
			−			Hyperbolic Cylinder.
		∞	(0)			Parabolic Cylinder.
		0	+			Straight Line.
		0	−			Intersecting Planes.
		$\frac{0}{0}$	(0)	p	p	Impossible.
				p	n	Parallel Planes.
				0		Single Plane.
				∞		

For example, it is the condition of an ellipsoid that W and V_3 should be finite with different signs, that V_2 should be positive, and V_1 of the same sign as V_3: it is the condition of intersecting planes that W should have the form $0 \div 0$, or that V_4 and V_3 should both vanish; that W′ should also vanish; and that V_2 should be negative. It is the condition of a single hyperboloid, if V_2 be positive, that W and V_3 should both differ in sign from V_1: but if V_2 be negative, it is enough that W and V_3 should have the same sign. All that precedes is equally true, whether the co-ordinates be oblique or rectangular; but the following is only true for rectangular co-ordinates: if the surface be a surface of revolution, it is necessary that

$$\frac{b'c'-aa'}{a'}=\frac{c'a'-bb'}{b'}=\frac{a'b'-cc'}{c'}.$$

The forms of the ellipsoid and the two hyperboloids may be best conceived by means of the particular cases in which they are surfaces of revolution. Let an ellipse revolve about one of its axes, and let all the circular sections be flattened into ellipses: the result will be an ellipsoid, derived from its particular case, the spheroid. Let an hyperbola revolve about its minor axis; the two branches will generate only one branch of a surface: let the circular sections be flattened into ellipses, and the result is the single hyperboloid. Let the hyperbola revolve about its major axis: the two branches will generate two branches of a surface; and if the circular sections be flattened into ellipses, the result is the double hyperboloid. For the elliptic paraboloid, let a parabola revolve about its principal axis, and let the circular sections become ellipses. The hyperbolic paraboloid has no surface of revolution among its cases, but its form may be conceived as follows:—Let two parabolas have a common vertex, and let their planes be at right angles to one another, being turned contrary ways. Let the one parabola then move over the other, always continuing parallel to its first position, and having its vertex constantly on the other: its arc will then trace out an hyperbolic paraboloid.

The ellipsoid and the two hyperboloids have centres, but neither of the paraboloids has one. The surfaces which have centres possess an infinite number of triple systems of diameters having properties corresponding to those of the conjugate diameters of an ellipse and hyperbola. These we shall not enter further into, but shall proceed to point out how to determine the position of the centre and principal diameters or axes (that is, the system of conjugate diameters, each of which is at right angles to the other two) in either of the surfaces having a centre. Resuming the original equation, and the co-ordinates being supposed rectangular, the co-ordinates of the centre, X, Y, and Z, are thus determined. They are fractions whose denominator is $-V_3$, and whose numerators are

$$(bc-a'^2)a''+(a'b'-cc')b''+(c'a'-bb')c''$$
$$(ca-b'^2)b''+(b'c'-aa')c''+(a'b'-cc')a''$$
$$(ab-c'^2)c''+(c'a'-bb')a''+(b'c'-bb')b'';$$

and if the origin be removed to the centre, the axes retaining their original directions, the equation of the surface becomes

$$ax^2+by^2+cz^2+2a'yz+2b'zx+2c'xy+W=0,$$

where W is the expression already signified by that letter, and will be found to be also $Xa''+Yb''+Zc''+f$.

Let the three principal axes now make angles with the axes of x, y, and z, as follows:—the first, angles whose cosines are α, β, γ; the second, angles whose cosines are α', β', γ'; the third, angles whose cosines are α'', β'', γ''. The equation

$$v^3-V_1v^2+V_2v-V_3=0$$

has always three real roots; let them be A, A′, A″. Then the directions of the principal axes are to be determined from

$$\alpha^2=\frac{bc-a'^2-(b+c)A+A^2}{(A-A')(A-A'')}$$
$$\beta^2=\frac{ca-b'^2-(c+a)A+A^2}{(A-A')(A-A'')}$$
$$\gamma^2=\frac{ab-c'^2-(a+b)A+A^2}{(A-A')(A-A'')}.$$

To find α'^2, &c., interchange A and A′ in the above; and to find α''^2, &c., interchange A and A″. The principal axes being thus determined, the equation to the surface, referred to the principal axes, is

$$Ax^2+A'y^2+A''z^2+W=0,$$

a form which is fully considered in all elementary works on the subject, and from which the principal properties are derived. (*Algebraic Geometry*, in the 'Library of Useful Knowledge.')

For the proofs of the preceding assertions, and their extension to oblique co-ordinates, see a paper 'On the General Equation of Surfaces of the Second Degree,' in the Cambridge Philosophical Transactions, vol. v., part 1. Under the form of considering the surface of the second degree, we have in fact been treating the general properties of the equation of the second degree, with three variables, and have solved various other problems of geometry and mechanics. The principles applied in this solution have been generalized in a paper on 'Linear Transformations,' by Mr. Boole. (*Cambr. Math. Journ.*, vol. iii., p. 1.)

SURFACE OF THE EARTH. Geology, by teaching us to look upon the form and distribution of land and sea, the features of hills and valleys, and the various deposits of peat, silt, gravel, &c., as effects of physical agencies, some of which are no longer in operation upon those areas where once they predominated, confers upon the surface of the earth an interest much greater than that which belongs merely to pictorial combinations, or even to agricultural utility and commercial adaptation. Uniformity, inequality, height, depth, and area, every the least peculiarity of form, whatever is remarkable in any part of the surface of the land or bed of the sea—these are effects of causes which require to be traced out before the problem of the physical history of the globe can be considered as resolved.

Superficial Deposits.—If the stratified and unstratified rocks which compose the skeleton of the earth were laid bare to our view, the aspect of the globe would be far more rugged than it is now. The valleys would in many cases lose their soft and easy curvatures and accordant slopes, in angular fractures and irregular chasms; the mountains and hills would lose those sloping buttress-like banks, composed of fallen materials, which connect the broken ridges above with the level expanse below; a sterner aspect would belong to the now sinuous lines of sea-coast; and an almost general barrenness would overspread the inland surface.

The soil, gravel, clay, peat, and other substances, which by their accumulation mask the features of the interior rocks, constitute a peculiar class of phenomena which have been much, and yet not sufficiently, studied by geologists. It is certain that without a more exact appreciation of the causes which have permitted the aggregation of the 'superficial deposits' already named, our analysis of the processes whereby the earth has been made fit for the residence of man, and adapted to its present uses, must be very imperfect.

Soil is often supposed to be merely the disintegrated parts of the subjacent rocks, and this is sometimes really the case; trap rocks, for example, of which the felspar and the hornblende become decomposed by the atmosphere, yield a soil often remarkable for fertility, and uncontaminated with foreign ingredients. But the soils which cover clays and limestones and sandstones are seldom of this simple origin. The basis of these soils may be generally derived from the subjacent strata, but they usually contain foreign ingredients. The soil on the chalk and limestone hills of England is often sandy, sandstones are covered by loam, and clays overspread with pebbles. The effect of this admixture of foreign substances with the disintegrated parts of the native rock is usually favourable to fertility.

We may often understand the cause of these admixtures by considering the effect of rains and currents of water on the sloping surface of the earth. These effects arrive at a maximum in particular vales and plains, into which many streams enter after flowing over strata of different kinds. In such vales the soil is in fact a mixture of calcareous, argillaceous, and arenaceous parts, and its indigenous plants are correspondingly varied, and include many which are not found growing together on any one of the soils which are here mixed together.

To watery agency, acting under the actual circumstances of physical geography, we may also ascribe many even extensive accumulations of gravel and sand which lie along the sides of valleys and in hollows of hills, or on the slopes of mountains; and it requires sometimes only the postulate, that in particular valleys inundations have formerly reached higher levels than at present, to apply the same explanation to terraces of gravel and sand now considerably above the actual flood-mark, but sloping parallel to the general inclination of the valley.

The beds of old lakes, often consisting of layers of shelly marl, with bones of existing or extinct quadrupeds, the surfaces of silt which lie along the actual and antient æstuaries of rivers, and often conceal buried forests and subterranean peat, present no difficulty as to their origin. For the processes by which peat grows and trees are buried, and marshy land is saved from the sea, and lakes are filled up, are at this day in action. To all such peat or turf moors, subterranean forests, marsh and fen land, drained lake-beds, and sand and gravel, the title of *alluvial deposits* is very commonly given. Generally, they require no supposition of extensive changes of physical geography produced by violent disturbances of nature, but seem to be clearly and perfectly explicable by causes still in action, though perhaps not in the same situations on the earth's surface. But there are other gravels, sands, and clays, to which this explanation cannot be applied without calling in aid great changes of physical geography, or physical processes not seen in daily operation: such as extensive displacement and change of level of land and sea; unexampled floods of water; surprising alterations of climate, or movement of glaciers in situations where now the snow and ice of the coldest winter melt with the first breath of spring. These phenomena were classed under the title of *diluvial deposits*, at a time when their origin was very generally ascribed to violent floods of water, and the title is still retained even by geologists who do not admit this hypothesis.

These diluvial deposits are commonly admitted or assumed to be of older date than those called alluvial, and, taken in a collective sense, they are so, but this is the least important circumstance characteristic of their history. The conditions of their accumulations are remarkable.

1. It is often seen that thick deposits of clay, sand, and pebbles, or large fragments of rock, lie on the very summits of hills (as abundantly on the hills which adjoin the valley of the Thames).

2. Fragments of rocks quite unlike those of the vicinity lie in valleys, on hills (as on the Salève near Geneva), and even on islands (as on Staffa).

3. These fragments are found solitary, or buried in clay, sand, or gravel, and sometimes in enormous abundance, as in Huntingdonshire, near Birmingham, in Holderness, and other parts; and they are such that no stones of like nature occur anywhere in the natural drainage of the country

where the gravel is accumulated, nor within 20, 50, or even 100 miles of the spot.

4. The fragments (often called boulders) appear thus in several cases to have been transported from particular parts of the country, over elevated ground, across the natural valleys and ranges of hills, but yet are, in some cases, distributed in a manner which manifests a decided dependence on some of the greater features of physical geography. Thus the abundantly spread detritus from the Cumberland mountains crosses the island to Tynemouth, and reaches the coast of Yorkshire, but does not cross the Pennine chain of mountains, except at one point (Stainmoor), though it spreads along the western side of it as far south as Manchester and the plains of Cheshire and Staffordshire. In like manner the detritus from the Western Alps has been carried on to the Jura, and lies in a strange manner in all parts of the hollow of the Lake of Geneva, and on the insulated Salève Mountains; yet it has been observed that the lines followed by the boulders are those of the great valleys, so that each great valley has been the direction in which were carried the blocks from the head of that valley.

5. It is observed that often the largest blocks contained in a mass of diluvial detritus lie at the top, resting on the smaller gravel and sand; and that below the whole mass the hard rocks are scratched by parallel distinct small grooves or striæ, marks of the dragging movement to which the stones were subject in their passage.

6. Though in some cases successive deposition can be traced in the parts of a diluvial mass, it is very often seen that the materials are entirely unarranged, mere heaps of stones, and sand or mud; the stones being often indiscriminately stuck in clay, large and small, heavy and light, absolutely without any stratification, such as long suspension in water must certainly have produced.

7. Finally, amidst such confused masses, bones of land quadrupeds, mostly or entirely of extinct species, and even of extinct genera, occur, and locally even in abundance. These are however more common in laminated lacustrine deposits resting upon the diluvial masses, or perhaps covered by them.

It has been thought possible to explain these characteristic phenomena by many local inundations, or one general and overwhelming flood, capable of overcoming many of the lesser inequalities of surface-level, but modified in its course by the larger ranges of mountains and valleys. And as in the northern zones of the world (which have been much investigated in this respect) there is a very frequently observed direction of the boulders to the south or south-east, it has been proposed for consideration whether some great change of the level of land and sea in the circumpolar regions might account for what seems a general fact. But further, as the most abundant deposits of this nature have been drifted from particular chains of mountains, as the Cumbrian group in England, the primary mountains of Norway, the Alps, &c., all which districts have undergone elevation *at some time*, it has been thought that their upward movement may have been the cause of the displacement and transport of the blocks. (Buckland, *Reliquiæ Diluvianæ*; Elie de Beaumont, *Sur les Revolutions du Globe*.)

It has however been proposed to account for the distribution of the boulders by a more gradual action of the waters of the sea. If the region of Cumbrian rocks, for example, and a very large portion of the north of England, were supposed to be raised from the sea, by a continual or intermitting movement, so as to bring successively under the action of the breakers the whole country to the east and south-east of the area now occupied by the Cumberland mountains, this would allow of a continual drifting of the boulders to the east and south, by the continual tendency of the tides and currents of the sea. (Phillips, in *Treatise on Geology, &c.*; Whewell, in Murchison's *Silurian System*.) Floating ice has been represented as adequate to carry off from the shore where it was formed masses of mud and fragments of rocks, and, by melting or turning over, to spread them on the bed of the sea. This sea-bed raised would show the accumulations from such icebergs, often in narrow bands or insulated patches, such as really occur, and have been long celebrated, among the heaps of Norwegian detritus which lie on the sandy plains of North Germany. (Lyell, *Principles of Geology*; Murchison, *Silurian System*.)

Finally, ice in another form has been appealed to for the explanation of diluvial phenomena. The formation of glaciers in mountain valleys is such as to permit of their forward movement down a slope, and their carrying with them in their progress fragments of rocks and heaps of gravel and mud which by any cause fall upon their surface. These heaps of 'moraine' accumulate along the sides and at the lower termination of the glacier, and the arrangement, or rather confused aggregation, of the materials in them resembles very much the diluvial masses. The surface of the rocks below a glacier is scratched, as we have before stated to happen in places where boulders are noticed; and as in the Alps it is certain that glaciers have formerly been extended much farther from the mountain-summits than now they are, it has been conjectured that antiently, in the times coincident with or preceding the diluvial period, they were very much more extended, so as even to have reached from the Alps to the Jura, from the mountains of Norway to those of Bohemia, and from Shap Fells in Westmoreland to the mouth of the Humber. Upon the subsequent contraction of these glaciers, the moraines they had left would experience some changes by the action of water (melted ice), which might then run in lines impossible for watery currents after the ice was fully removed. (Agassiz, *Etudes sur les Glaciers*.)

We do not propose to investigate any of these hypotheses. Geologists have been remarkable for eagerly adopting and as easily abandoning most of them; and others might have been added merely as beacons to be avoided. It may be proper however to point out three things which may be useful to remember in further prosecuting this subject.

1. It must be determined by evidence whether the accumulation to be explained happened on the land at its present level, or on the bed of the sea.

2. It must be determined by evidence what was the probable character of the climate in the countries where diluvial accumulations excite attention.

3. In proposing a general cause, such for example as the movement of glaciers, it must be shewn to be adequate to satisfy all the minuter details of the phenomena, and not inconsistent with general limiting conditions established by extensive induction from facts observed in the earth itself, or admitted as parts of general cosmical theory. [GEOLOGY; REFRIGERATION; SUBMARINE FORESTS.]

The determination of the cause of the diluvial accumulations is of the highest importance in geological theory. It is impossible to doubt that to the same cause must be ascribed many considerable modifications of the *preexistent surface* of the land. If, abstracting our attention from the accumulated deposits which conceal the stratified and other rocky masses in the crust of the earth, we look at the *actual form* of its surface, there appears little that is even difficult of explanation by the application of known and real causes. The relative areas of seas and land; the peculiarities of outline of continents and islands; the directions of mountain-ranges, and remarkable vales and plains; the individual features of hills and valleys; the degree in which the land is wasted in some quarters and augmented in others; and the rate of change which may take place in these respects;—all this may be satisfactorily referred to subterranean and submarine disturbances of different periods, to the effects of the sea upon the land when the land was not at its present level above the water, and to the operation of the atmosphere, rains, rivers, and inundations.

From this large field of research we shall select for brief illustration the outlines of land and sea, the directions of high and low ground, and the individual features of hills and valleys. The few examples needed will be drawn from the British Isles, but the explanations are of general application.

Much of the irregularity of outline, on a large scale, of the British Islands depends on the *form* in which the antient bed of the sea was elevated into dry land. Thus the line of the Hebrides, the prominent parts of Caithness, of Aberdeenshire, and of Argyleshire, are on axes of upward movement of the primary strata; while the Great Caledonian Valley, from Fort William to Inverness, and the great basin of the Forth and Clyde, are in axes of depression of the strata. This latter hollow is margined on the south by the great axis of elevation of the Galloway and Lammermuir hills, reappearing beyond the Irish Channel south of Belfast, as the Argyleshire chain is resumed in Donegal. The Isle of Man, the promontory of Lleyn in Caernarvonshire, the east and west ridges and hollows of the strata which reach the sea in South Wales and North Devon, give to Pembrokeshire, Glamorganshire, and North Devon remarkable and detailed alternations of promontory and bay. The Isle of Wight is formed on an axis of elevation from the Needles to Culver Cliff; while north of it are the axis of depression of the Solent, the axis of elevation of the wealds of Sussex, and the axis of depression of the æstuary of the Thames.

Inland the same ridges and hollows, and others of as great importance, produce continuous chains of hills—the North-western Highlands, the Grampians, the Lammermuir range of hills, the Wicklow mountains, the Snowdon, the Berwyn, and Malvern hills, and multitudes of other narrow tracts of elevated land. Great *faults*, elevating or depressing one portion of a natural district, leave marks of inequality on the surface. Thus the great Pennine faults, ranging from Newcastle to Brampton, and thence to Kirby Lonsdale and Settle, occasion differences of level in the ground of 1000 and 2000 feet for a length of 100 miles.

In all cases, and in every country, it appears that, notwithstanding the operation of later agencies, the main features of the surface of the land are due to the positions in which subterranean movements left the displaced masses of rocks. But the operation of subsequent agencies is distinctly traceable in modifications of these features on the sea-coast, and in the interior of every country.

The surface of the land has been *wasted*, and as the various stony and earthy masses which come to the surface have unequal compactness, and are unequally capable of resisting the chemical and mechanical agencies which originate in the varying heat and moisture of the atmosphere, we find in consequence a multitude of irregularities, both on a large and small scale, directly related to the properties of the rocks. On the sea-coast some parts are known to be wasted (as the coasts of Sheppey, Dunwich, and Bridlington) even rapidly, one or several yards annually on the average; others seem almost unchanged by a thousand years of storm and tempest, as the 'Worm's Head;' and some considerable tracts of new land have been added to the shores of Lincolnshire, along the banks of the Thames, and by the side of the Severn.

The line of coast from the Tyne to the Humber is instructive in this respect. The prominences on the Durham coast, ending with Hartlepool, are guarded by magnesian limestone, and the æstuary of the Tees is excavated in red marl and lias clays. The peak near Robin Hood's Bay, Scarborough Castle Hill, Filey Brig, and Flamborough Head are all promontories of hard rocks; but Robin Hood's Bay, Scarborough Bay, Filey Bay, and Bridlington Bay are all excavated and wasted in clays of the liassic, oolitic, and diluvial periods. The interior of the country shows similar effects on a grander scale. The great vales and plains of England, in parts the least influenced by subterranean disturbances, are by no means the excavated paths of rivers, nor are the great ranges of hills the separating summits between such rivers. The plains and vales are lines of soft and perishable strata, and the crests which divide these vales are ranges of harder rocks. A transverse section of the English strata shows always, both on a large and small scale, this important fact (see *Fig.* 1), and every well-shaded topographical map, coloured geologically, demonstrates the extent of its application in explaining the irregularity of surface. The chalk hills, oolitic hills, &c. alternating with vales of clay, in all the southern and eastern parts of England, give to those parts characters far more important than the undulations connected with river channels.

Fig. 1.

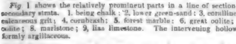


Fig 1 shows the relatively prominent parts in a line of section across the secondary strata. 1. being chalk; 2. lower green-sand; 3. coralline oolite and calcareous grit; 4. cornbrash; 5. forest marble; 6. great oolite; 7. inferior oolite; 8. marlstone; 9. lias limestone. The intervening hollows are uniformly argillaceous.

Similarly, hills and valleys, in which rocks of unequal power of resisting watery action appear, show the force and continuity of this action by the prominence of the hard rocks and the excavated surfaces of the softer masses. Thus, in *Fig.* 2, we see on the breast and edges of a hill composed of limestones, sandstones, and shales, the especial prominence of the limestones; and where these cross a valley, each limestone edge is the place of a waterfall. By studying in such valleys the manner in which the actual stream wastes the rocks, we can easily assure ourselves of the truth of the general explanation offered above. In *Fig.* 3 is a section of a waterfall, showing the edge of limestone (*a*), over which the water falls, and under it a bed of sandstone (*b*) little wasted, but at the bottom a body of shale which has perished by the dampness and spray, and is excavated in a remarkable manner.

Fig. 2.

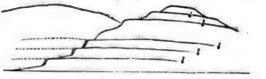


Fig. 2. Aspect of a mountain consisting of carboniferous limestone, shale, and sandstone; the limestone bands (marked *l*) project remarkably, and, where they cross a valley, make waterfalls.

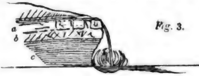


Fig. 3.

Fig. 3. The side view of a waterfall, where the stream falls free of the rock and causes excavation in the subjacent shales.

Just such an action is observable on similar cliffs by the sea, and in each case the same effect follows: the falling of the hard rock at top from want of support below. Thus the situation of a waterfall is daily displaced, and is moving up the stream—as the Falls of Niagara and Hardrow Force are known to have done. (Lyell, *Principles of Geology*.) Into all these effects of waste on the earth's surface rain enters for something important. Few surfaces of rock are altogether exempt from chemical changes dependent on atmospheric variations; all are more or less liable to perish with rain, frost, and watery movements; and thus the individual features of hills and valleys, the ranges of high and low ground, and the outlines of land and sea, appear to be effects impressed by subterranean movements and fractures of the earth's crust, modified by the action of the sea on materials of unequal resisting power, while they were below, and while they were rising through its waters, and by the subsequent mechanical agencies of rivers, rains, and chemical forces excited by atmospheric variations. [GEOLOGY.]

SURGEONS, COLLEGE OF. The present College of Surgeons of London had its origin in the Company of Barber-Surgeons, which was incorporated by royal charter in the first year of Edward IV. The connection between the practice of barbers and that of surgeons commenced in the custom of employing the former to assist in the use of baths, in the application of ointments, and in various other surgical operations performed by the monks and Jews, who, from the tenth to the twelfth centuries, were almost the only practitioners of the healing art. In 1163 the Council of Tours having prohibited the clergy from undertaking any bloody operation, the practice of surgery fell into the hands of the barbers and the smiths, of whom the former soon became by far the more important class.

By the charter of 1 Edward IV., the barbers practising surgery in London, who had before associated themselves in a company, were legally incorporated as the Company of the Barbers in London, and received authority over all others practising the same arts in and about the metropolis. Their authority extended to the right of examining all instruments and remedies employed, and of bringing actions against whoever practised illegally and ignorantly; and none were allowed to practise who had not been previously admitted and judged competent by the masters of the company.

This charter was several times confirmed by succeeding kings, but in spite of it many persons practised surgery independently of the company, and at length associated themselves as members of a separate body, and called themselves the surgeons of London. In the 3rd year of Henry VIII. it was enacted 'that no person within the city of London, or within seven miles of the same, should take upon him to exercise or occupy as a physician or surgeon, except he be first examined, approved, and admitted by the bishop of London or by the dean of St. Paul's for the time being calling to him four doctors of physic, and for surgery other expert persons in that faculty.' All who under this act obtained licence to practise were of course equally qualified, whether members of the company of barbers or not; and in the 32nd year of Henry VIII. the members of the latter company, and those who had incorporated themselves as the company of surgeons, were united in one company 'by the name of masters or governors of the mystery and commonalty of barbers and surgeons of London.'

By this act the united body were granted all the privileges of the Barbers' Company. A charter granted by James I. gave the surgeons of the company an exclusive right of practising within three miles of London; and another, granted by Charles I., proposed to exclude every person from practising surgery in or within seven miles of London, unless after an examination by the examiners of the company. The act of the third year of Henry VIII. however was not repealed, and the members of the company were obliged to obtain the testimonials of the ordinaries before they could lawfully practise either within the precincts of London or in the other dioceses of the kingdom

In the 18th year of George II. an act was passed by which the union of the barbers and surgeons was dissolved, and the surgeons were constituted a separate company, having by this time attained to be practitioners of a scientific art, which placed them far in advance of their former compeers. By this act the company of surgeons was granted all the privileges which the previous united company had enjoyed by virtue of 32 Henry VIII., and the letters-patent of Charles I., &c. It therefore virtually repealed the ecclesiastical power of licensing surgeons, and conferred on the members of the company the right of exclusive practice within London and Westminster and seven miles around, and the privilege of practising in every part of the kingdom. But the corporation thus instituted became dissolved or suspended (Willcock, *On the Laws of the Medical Profession*) by the death of the master on the day of election, and their consequent incapacity of electing a successor. Its affairs however were as regularly carried on as if its constitution had not been affected; and in the 40th year of George III. a charter was granted by which it was confirmed in all the privileges which had been conferred upon it by the act of George II.

By this charter the title of the Company was altered from that of the masters, governors, and commonalty of the Art and Science of Surgeons to that of the Royal College of Surgeons in London, which it now bears. It is governed by a council or court of assistants, consisting of twenty-one members, of whom ten compose the court of examiners. Of these ten one is annually elected president, or principal master, and two are annually chosen vice-presidents or governors. By the bye-laws which the council were empowered by the charter to make, the members of the council are to be chosen for life from those members of the College whose practice is confined to surgery, and are to be elected by ballot at a meeting of the council. The rule generally followed, though not necessarily to be observed, is to elect in order of seniority those of the class of members just mentioned who possess a considerable professional reputation and reside in London. The examiners are generally chosen in order of seniority from the members of the council: the presidents and vice-presidents are chosen in rotation from the court of examiners, the president for the current year having been the senior vice-president during the past year.

The members of the College are admitted by diploma after examination before the court of examiners, and their diploma confers upon them the right of practising surgery in any part of the British dominions.

The council of the College have at various times required certain qualifications of age, education, &c. from candidates for examination. The regulations last issued (October, 1841) require candidates—1st, to be not less than twenty-one years old; 2nd, to have been engaged in the acquirement of professional knowledge during not less than four years, six months of which shall have been occupied in the study of practical pharmacy, twelve months by attendance on the practice of physic, and three years on the practice of surgery at a recognised hospital or hospitals in the United Kingdom. three months vacation being allowed in each year; and, 3rd, to have studied anatomy and physiology by attendance on lectures and demonstrations, and by dissections, during three anatomical seasons (each continuing from October to April inclusive), and to have attended two courses of not less than seventy lectures each in surgery, and one course of seventy lectures on each of the following subjects, viz. the practice of physic, materia medica, chemistry, and midwifery with practical instruction. These rules however apply only to candidates who have not previously obtained any medical or surgical diploma. Members and licentiates in surgery of any legally constituted College of Surgeons in the United Kingdom, and graduates in surgery of any university requiring residence to obtain degrees, are admitted for examination on producing their diploma, licence, or degree, together with proofs of being not less than twenty-one years of age, and of having been occupied at least four years in the acquirement of professional knowledge. Graduates in medicine of any legally constituted college or university requiring residence to obtain degrees are admitted for examination on producing, together with their diploma, proof of having completed the anatomical and surgical education required by the foregoing resolutions.

The examinations are conducted *vivâ voce*, or, if the candidate desire it, in writing. The questions are almost exclusively anatomical and surgical; and the examination of each candidate occupies about an hour and a half, during which time he is usually questioned by four of the examiners in succession.

The advantages conferred by the diploma of the College of Surgeons are practically little more than honorary. For although its charter, confirming the privileges given to its members by previous acts and charters, renders it illegal for any one but a member of the College to practise surgery in London or Westminster, or within seven miles thereof, and illegal for any one but a member of the College, or one licensed by the ordinary or vicar-general of his diocese, to practise surgery in any other part of the kingdom, yet the College has never prosecuted any one who has practised without possessing either of these titles. The only real privileges of the members of the College therefore are, that their diploma qualifies them for examination before the army, and navy, and East India Company's medical boards; that they have access to the library, the museum, and the lectures at the College; and that in the majority of cases they alone are eligible to hold surgical appointments in public and charitable institutions.

Nevertheless the diploma of the College of Surgeons is regarded as essential to the respectability of all those medical practitioners in England who do not practise as physicians. The present number of members is rather more than 12,000, and about 600 diplomas are granted annually.

According to the last financial statement (June, 1841), the receipts of the College for the previous year were as follows:—

	£	s.	d.
Court of examiners; fees for diplomas, at 20 guineas each, exclusive of the cost of stamps . . .	12,761	14	0
Rent	37	10	0
Fees on admission to council and court of examiners (20 guineas each) .	105	0	0
Fee on certificate of diploma . .	5	5	0
Incidental, sale of lists, catalogues, &c.	39	13	0
Dividends on investments in government securities, &c. . . .	1,299	4	4
	£14,158	6	4

And the disbursements were as follows:—

	£	s.	d.
College department, including council, court of examiners, auditors, diploma-stamps, collegiate prize, salaries, &c.	6,357	12	7
Museum department, including catalogues, specimens, spirit, salaries, &c.	2,823	5	11
Library department, including the purchase and binding of books, salaries, &c.	778	0	0
Miscellaneous expenses, taxes, rent, &c	434	6	3
Studentships in anatomy .	192	7	7
Repairs and alterations . . .	238	19	11
Hunterian oration, lectures, Jacksonian prize, &c.	99	17	0
	£10,924	9	3

The museum of the College consists of the collection made by John Hunter [Hunter, John], which was given in trust by government, who purchased it for 15,000*l*., and of numerous additions made to it by donations of members and others, and by purchase. The part of it which illustrates physiology is probably the most valuable collection of the kind in Europe. It is open to the members, to the trustees of the Hunterian collection, and to visitors introduced by them on the four first ordinary days in each week; also, in compliance with the deed of trust, to all fellows and licentiates of the Royal College of Physicians in London, to peers and members of parliament, to the great officers of state, and of the royal household and their immediate deputies, to all the dignitaries of the church and of the law, to all general and flag officers, to the members of all the learned and scientific bodies in the United Kingdom, to the members of all the public boards, and to persons introduced personally by them respectively.

One student in anatomy is usually appointed annually, at a salary of 100*l*. per annum. They are chosen after examination by the museum committee. Candidates must be members of the College under twenty-six years of age. Their office is to assist the conservators of the museum in the preparation and dissection of specimens, and in other parts of their duties. At the end of three years' service they are eligible to assistant-surgeoncies in the army, navy, or East India Company's service; one such appointment every third year in each of the three services having been placed at the disposal of the president and council of the College.

Lectures on anatomy, for which 510*l*. were left to the company of barber surgeons by Edward Arris, and 16*l*. per annum by John Gale, are delivered annually by one of the members of the council or some other member selected by them. Twenty-four museum lectures are also, in compliance with the deed of trust, annually delivered by the Hunterian professor, the subjects of which must be illustrated by preparations from the Hunterian collection, and from the other contents of the museum. And an oration in commemoration of John Hunter, or of others who have been distinguished in medical science, is delivered annually on the 14th of February, the anniversary of Hunter's birth.

Abstracts of the several acts and charters relating to the College of Surgeons may be found in Willcock 'On the Laws relating to the Medical Profession,' London, 1830, 8vo., and in Paris and Fonblanque's 'Medical Jurisprudence,' vol. iii. The bye-laws, the list of members, the catalogues of the museum and library, &c., are published by the college.

In the article **Anatomy** some account is given of the manner in which the study of that science was at that time pursued. The dissection of the human body has since been made the subject of an act of parliament (William IV., 2, 3, c. 75), of which an abstract may be very appropriately placed here.

By this act, which is intituled 'An Act for regulating Schools of Anatomy,' it is enacted that the home secretary of state in Great Britain, and the chief secretary for Ireland, may grant licences to practise anatomy in Great Britain and Ireland respectively to any person lawfully qualified to practise medicine or surgery in any part of the United Kingdom, or to any teacher of anatomy, medicine, or surgery, or to any student attending any school of anatomy (sec. i.). The secretary of state or chief secretary, as the case may be, is to appoint not less than three inspectors of places where anatomy is carried on, who are to continue in office for one year, and may be re-appointed or removed by the secretary (sec. ii.), and whose districts of superintendence are also to be determined by the secretary (sec. iii.).

The inspectors are to make quarterly returns to the secretary of state of all the bodies dissected in their respective districts (sec. iv.), and to inspect, at any time, any place in which anatomy is practised within the same district (sec. v.).

Any executor or other party having lawful possession of any dead body, with which he has not been intrusted for the purpose only of interment, may permit that body to be anatomically examined (*i.e.* dissected), unless the deceased have been known to express, either in writing at any time, or verbally to two witnesses during his last illness, a desire to the contrary, or unless any known relative of the deceased shall require the body to be buried without such examination (sec. vii). If any person, either by writing at any time, or verbally as aforesaid during his last illness, shall direct his body to be examined after death, or nominate any person licensed under this act to make such examination, and if before the burial of the body such direction be made known to the party having lawful possession of it, he shall direct the examination to be made by the person nominated, unless the deceased person's nearest known relative, or any one or more of such person's nearest known relatives, being of kin in the same degree, shall require the body to be interred without such examination.

No body may be removed for anatomical examination from the place where the person died unless forty-eight hours have elapsed from the time of death, nor until after twenty-four hours' notice given after death to the inspector; or if an inspector be not appointed, to some physician, surgeon, or apothecary residing near the place of death—nor without a certificate stating the cause of the person's death signed by his medical attendant—or if he had no such attendant, by one called in after death to view the body, but who shall not be concerned in examining the body after removal: such certificate to be delivered with the body to the party receiving the same for anatomical examination (sec. ix.).

Any person licensed to practice anatomy may, under these regulations, receive or possess any body for anatomical examination (sec. x.). On receiving it he must also receive with it the certificate as aforesaid, and this he must, within twenty-four hours after the removal of the body, transmit to the inspector, together with a return stating at what day and hour and from whom the body was received, the date and place of death, the sex, and (if known) the christian and surname, age, and last place of abode; and he must enter the same, with a copy of the certificate, in a book kept by him for that purpose, and to be produced whenever required by the inspector (sec. xi.).

No party may receive a body at any place for anatomical examination unless he, or the owner or occupier of that place, or some party licensed under this act to examine bodies, have given at least one week's notice to the secretary of state or the chief secretary, as the case may be, of the place where it is intended to practise anatomy (sec. xii.). Bodies must be removed in decent coffins or shells, and persons receiving them must make provision for their decent burial after examination (sec. xiii.).

No licensed person can be prosecuted for receiving or having in his possession any body which he has received according to the provisions of this act (sec. xiv.). The bodies of murderers are not to be dissected after execution, but shall be either hung in chains or buried within the precincts of the prison, as the court before which they were tried shall order.

Any person offending againt this act is deemed guilty of a misdemeanor, and on conviction may be imprisoned for any time not exceeding three months, or be fined not more than fifty pounds, at the discretion of the court before which he is tried.

SURHYA SIDDHANTA. We had intended, under the title of this Hindu work, to have given some account of the astronomy of that nation, but we find the question so mixed up with that of their other science, that we prefer to consider it all together under the head Viga Ganita.

SURIANA'CEÆ, a small natural order of plants formed by Lindley, and placed in the Gynobasic group of Polypetalous Exogens. The calyx is 5-parted, slightly imbricated; petals 5, equal; stamens indefinite, hypogynous, with round anthers, bursting internally with 2 longitudinal fissures; carpels 5, surrounding a small gynobase, with style arising from their base; fruit woody; seed solitary, exalbuminous The species are woody plants, with alternate leaves without stipules, capitate jointed hairs, and racemose flowers. These plants are closely allied to Coriariaceæ and Geraniaceæ. They are found in the warmer parts of the world, South America, the Canaries, the South of Europe, New Caledonia, New Holland, and India. Lindley refers to this order Heterodendron and Cneorum, but they are doubtful occupants of this position; Suriana being the only other genus. This genus was named after Joseph Donat Surian, who was a physician and botanist of Marseille, and was the companion of Plumier in his travels in South America.

SURINAM. [Guiana, Dutch.]

SURNAME. [Name.]

SU'RNIA. [Strigidæ.]

SURPLICE, the white dress worn by the clergy in their acts of ministration, from the Latin *superpelliceum*.

Palmer says it is by no means improbable that the surplice was, in very antient times, not different from the albe; in fact it only varies from that garment even now in having wider sleeves. The inferior clergy were accustomed to wear the albe at divine service, as we find by the council of Narbonne (A.D. 589), which forbade them to take it off until the Liturgy was ended. Probably in after-ages it was thought advisable to make a distinction between the dresses which the superior and the inferior orders of clergy wore at the Liturgy, and then a difference was made in the sleeves; and from about the twelfth century the name of surplice was introduced. During the middle ages, bishops very frequently wore the surplice with a cope, and above the rochette. (Bona, *Rerum Liturg.*, lib. i., cap. 24, sect. 20; Wheatley's *Illustr. of the Book of Com. Pr.*, 8vo., Oxf., 1810, pp. 100, 101; Palmer's *Orig. Liturgicæ*, vol. ii., pp. 319, 320.)

SURRENDER. '*Sursum redditio* properly is a yielding up of an estate for life or years to him that hath an immediate estate in reversion or remainder, wherein the estate for life or years may drown by mutual agreement between them.' (Co. Litt., 337 b.) A surrender and a release both have the effect of uniting the particular estate with that in reversion or remainder; but they differ in this, that whereas a release generally operates by the greater estate descending on the less, a surrender is the falling of the less estate into the greater.

Coke mentions three kinds of surrenders: 1. A surrender at common law, which is the surrender properly so called: 2. A surrender by custom of copyhold lands or customary estates; and, 3. A surrender improperly taken, as of a deed, a patent, of a rent newly created, and of a fee-simple to the king. (Co. Litt., 338 a.)

1. The surrender at common law is of two sorts: 1. A surrender in deed or by words in writing, expressing the intention of the owner of the particular estate to yield it up to him in reversion or remainder; and, 2. A surrender in law, which is wrought by operation of law, and not actual; as if a lessee for life or years takes a new lease of the same land during the continuance of his term, this will be a surrender in law of the prior lease. (Co. Litt., 338 a.)

The requisites of a good surrender in deed are the following:—The surrenderor and surrenderee must be respectively persons capable in law of making and receiving the surrender; the surrenderor must have an estate in possession of the things surrendered, and not a mere future right; the surrender must be made to the owner of the next estate in reversion or remainder; the surrenderee must have a higher or greater estate in the thing surrendered than the surrenderor, so that the latter may be capable of merging in the former; the estate of the surrenderor must be in his own right, and not in that of another; and lastly, there must be a privity of estate between the surrenderor and the surrenderee. (Co. Litt., *ubi sup.*; Viner, *Abr.*, 'Surrender.') Though, by the Statute of Frauds, a surrender must now be in writing, it does not require the solemnity of a deed (unless the tenement lie in grant), nor of livery of seisin. (Co. Litt., *ubi sup.*; Touchstone, 307.)

A surrender in law may sometimes take place when a surrender in deed could not be made; as in the case where a man makes a lease for years to commence at a future day. This future interest, or *interesse termini*, cannot be surrendered by deed, because there is no reversion in which it can merge; but if the lessee, before the commencement of the term, take a new lease, it is a good surrender in law of the first. (5 *Rep.*, 11; Co. Litt., 218 b.) The surrender in law takes place in every case where a lessee accepts from the reversioner a new lease for any term whatsoever, to commence at any time before the expiration of the old one, so that if a lessee for life were to accept a term for years, there would be a surrender in law of his lease for life. In such a case it cannot properly be said that the previous term is merged in the reversion, unless the new lease commence immediately; but the implied surrender results from the supposed inconsistency of retaining the former estate, and accepting another in part concurrent with it.

A surrender may be either absolute or conditional. A grant of the immediate reversion by a lessor to his lessee, though it be only conditional, causes an irrecoverable merger of the term; but if a surrender has been made upon condition, an entry for condition broken may revest the particular estate. (Co. Litt., 218 b.)

The surrender of terms of years will sometimes be presumed from length of time alone; and many cases have arisen upon the question, after what periods mortgage terms which have been satisfied, and terms which have been assigned to trustees to attend the inheritance and have not been subsequently dealt with, will be presumed to have been surrendered. A full discussion of the cases on this subject will be found in Sugden on 'Vendors and Purchasers of Estates' (vol. iii., 25 to 67, 10th ed.), the general result of which may be stated to be, that where a term has never been assigned to attend the inheritance, the surrender of it may be presumed from the mere length of time elapsed without notice of or dealing with the term, and the question is one which may properly be left to a jury; but when a term has once been assigned to attend the inheritance, presumption of surrender ought not to be admitted unless there has been an enjoyment inconsistent with the co-existence of the term, or some act has been done in order to disavow the tenure under the termor, and to bar it as a continuing interest. [COPYHOLD; MERGER; RELEASE.]

2. As to surrender of copyholds, see COPYHOLD.

3. A surrender may be made of letters-patent and offices to the king, to the intent that he may make a fresh grant of the same right; and a grant of the second patent for years to the same person, for the same thing, causes a surrender in law of the first. (10 *Rep.*, 66.)

SURREY, an inland county of England, bounded on the north by Middlesex, from which it is separated throughout by the river Thames, on the east by Kent, on the south by Sussex, on the west by Hampshire, and on the north-west by Berkshire. The form of the county approximates to an oblong quadrangle, of which the eastern and southern sides are tolerably regular, but the northern and western sides less so. The length of the quadrangle from east to west, from the Kentish border near Westerham (in Kent) to the Hampshire border near Farnham, is 39 miles; the breadth from north to south, from the bank of the Thames at Blackfriars bridge, London, to the Sussex border near Crawley (in Sussex), is 25 miles. The area of the county is estimated at 759 square miles. The population at the different enumerations of the present century was as follows:—1801, 269,043; 1811, 323,851, increase 20 per cent.; 1821, 398,658, increase 23 per cent.; 1831, 486,334, increase 22 per cent.; 1841, 582,613, increase 19·7 per cent. It is in size the thirtieth of the English counties, being a little smaller than Westmoreland, and a little larger than Oxfordshire. Taking the census of 1831, there were 641 inhabitants to a square mile. It was in amount of population the fifth English county, being next below Devonshire, and next above Kent; and in density of population it was the third, being exceeded only by Middlesex and Lancashire. Croydon, Guildford, and Kingston are the county-towns. Croydon is about 10 or 10½ miles south of the General Post-office by the coach-road, and 10 miles by Croydon railway; Guildford is 30¼ miles by coach-road south-west of the Post-office, or 33 miles by the London and South-Western railway to Woking Common, and from thence by coach-road; Kingston is 13 miles south-west of the Post-office by coach-road, and about the same distance by the London and South-Western railway. Guildford and Kingston are both on the Portsmouth road.

Surface and Geological Character.—The part of the county which lies north of a line drawn from the Kentish border near Beckenham, leaving Croydon a little to the south, and passing by Carshalton, Epsom, Ashtead, and Leatherhead, and from thence to the Hampshire border near Ash, leaving Guildford a little to the south, may be regarded as belonging, with some exceptions which we shall notice, to the London clay formation. The district occupied by this formation is comparatively low. It forms however the line of hills extending on the south side of London, from New Cross near Deptford, by Nunhead, Peckham, Denmark Hill, Herne Hill, Brixton Hill, Clapham Rise, and Battersea Rise, Wimbledon Common, and Richmond Hill. It also forms the hills running southward along the Kentish border from New Cross by Forest Hill, Sydenham, Penge Common, and Norwood. None of these are of much elevation, though some of them command extensive and beautiful prospects. The hills about Norwood are 389 feet above the level of the sea. Brick-earth is obtained in the London clay district near Kingston.

North of the hills which extend from New Cross to Battersea the London clay is covered by alluvium; and it is probable that the greater part of this flat was, antecedently to the Roman period, overflowed by the river at every high tide, and formed an extensive marsh, which was gained from the river by embankment. Along the bank of the river too, between Putney and Richmond, the London clay is covered by alluvium.

The range of high and mostly waste grounds, Esher Common, Cobham Common, St. George's Hill (between Cobham and Weybridge), Woking Heath, Pirbright Common, Romping Downs, and Ash Common, which occur in the north-west part of the county, and which extend with slight interruption from the neighbourhood of Kingston to the Hampshire border,—the range of St. Ann's Hill (240 feet), Shrubs Hill, and the other hills west of Chertsey and Bagshot Heath, extending from near the Thames to the Berkshire border,—and the high ground of Chobham Ridges between these two ranges, are all formed of the siliceous sand and sandstone belonging to the upper marine formation, which here covers the London clay. The highest elevation does not exceed 463 feet. This formation presents a poor, hungry, unimproveable sand; and hence extensive wastes are allowed to remain, notwithstanding the proximity of the metropolis and the consequent impulse to cultivation.

South of the boundary-line of the London clay the plastic clay crops out, and occupies a long narrow district extending across the county from the Kentish to the Hampshire border, bounded on the south by a line drawn near Addington, Sanderstead, Banstead, Headly, Bookham, Horsley, and Guildford, and from thence to the Hampshire border. The breadth of the plastic clay district on the Kentish border is four or five miles, but it becomes narrower towards the west, and on the Hampshire border is probably not more than half a mile in breadth. The hills near Addington and Croydon, Banstead Downs (576 feet), and Epsom, Ashtead, and Leatherhead commons are on the plastic clay, which here covers the chalk with a thin bed; the chalk is quarried beneath it on Banstead Downs. Beds of fine clay of the plastic clay formation are wrought near Ewell, and red clay near Guildford. South of the plastic clay the chalk range of the North Downs rises. These downs extend from Kent across the county into Hampshire, interrupted only by the depressions through which the rivers Mole and Wey pass, and by a depression near Farnham. The southern escarpment may be traced running just to the north of Titsey, Godstone, Merstham, Gatton, Reigate, Betchworth, Dorking, Wotton, Albury, Shalford, Puttenham, and Farnham. Guildford is in the line of the downs in the depression through which the Wey passes. The breadth of the chalk district is greater on the eastern side of the county, and the downs there attain their greatest elevation. Botley Hill (880 feet), above Titsey, is the highest point. The breadth of the chalk district here is about four miles. Box Hill, near Dorking, overlooks the depression through which the Mole passes, and is, from the picturesque scenery which it presents, a favourite place of resort for the inhabitants of the metropolis. Between Dorking and Guildford the range of the downs gradually narrows; and between Guildford and Farnham it forms a remarkable narrow unbroken ridge, above six miles long and about half a mile broad, called the Hog's Back. The downs rise again beyond Farnham just on the border of Hampshire, into which they extend. The thickness of the chalk formation at Denbigh, north-west of Dorking, is 440 feet. The dip of the strata east of Guildford rarely if ever exceeds 15°: in the ridge of the Hog's Back it is 45°. The chalk is dug in different places and is burnt for lime.

From beneath the south escarpment of the North Downs the chalk marl and green-sand formations crop out. They occupy the valley which extends at the foot of that escarpment all through the county, and which valley east of Reigate is called Holmesdale; but as the formations extend southward from the chalk they rise into hills, extending south of Limpsfield and Godstone by Bletchingley, Nutfield, Red Hill, Park Hill, south of Reigate; and from thence south-west by Holmwood Common, Leith Hill (993 feet, the highest point in the county, and indeed in this part of England), Hurtwood Common, on which are Holmbury and Coneyhurst hills, Hascombe and Hambledon, to Hind Head Common (923 feet) on the Hampshire border. This range of hills presents a bold escarpment towards the valley on the south, and is broken by two considerable depressions, one near Reigate, by which the Mole passes through, and another between Hurtwood Common and Hascombe, through which a feeder of the Wey passes; and by some minor interruptions. Beds of chert occur in the chalk marl near Reigate, and fire-stone is dug in the same formation at Merstham. Flint and chalcedony occur commonly in the green-sand: in which also fullers'-earth beds occur at Nutfield, and crystallized sulphate of barytes of a yellow colour. The high grounds of these formations are almost entirely waste. On Hind Head Common occurs that remarkable hollow, the Devil's Punch-bowl, round which the Portsmouth road winds for nearly a mile.

The rest of the county, comprehending the whole of the southern border, except a very small part west of Haslemere, is occupied by the Weald clay and iron-sand formations. The latter only just appears at the south-eastern corner of the county, and will scarcely require notice. The Weald clay occupies the broad valley at the foot of the green-sand hills, and in some places forms the lower part of the south side of the hills. Brick-earth is dug in this part of the county, between Red Hill and Horley. Jet is said to have been wrought in the iron-sand formation in this county and in Sussex.

The green-sand hills and the part of the county south of them are included in the Weald district of Kent, Surrey, and Sussex.

Hydrography and Communications.—The county is included in the basin of the Thames, except three very small portions; two south of the green sand hills, which are drained by streams flowing into the Arun, and a third in the south-east corner of the county, which belongs to the basin of the Medway. The Thames, which forms the northern boundary, is navigable throughout for small craft, and up to London Bridge for sea-borne vessels. Those of its tributaries which belong to Surrey are the Bourn brook, the Wey, the Mole, the Hog's Mill river, the stream which joins the Thames above Putney, and the Wandle.

The Bourn brook rises near Bagshot, and flows by Chobham and Addlestone into the Thames below Chertsey, sending off one branch into the Wey; it receives a stream from Virginia Water in Windsor Great Park: its whole length is about 14 or 15 miles.

The Wey rises near Alton in Hampshire, and flows north-east nine or ten miles to the border of Surrey, which it enters not far from Farnham. From the border of the county it flows first north-east and then south-east by Farnham, six miles to Tilford, where it receives, on the right bank, a considerable stream from Woolmer Forest in Hampshire, and runs eastward seven miles to Godalming, where it becomes navigable. From Godalming it flows four miles north by east to Guildford, receiving by the way on the right bank two considerable streams, one of which rises on the south side of Hurtwood Common, and has a circuitous course of 15 miles, chiefly through the Weald clay valley, passing northward by a depression in the green-sand hills; the other rises on the north side of Leith Hill, and flows first northward and then westward 11 miles through the valley between the North Downs and the green-sand hills. From Guildford the Wey flows in a winding channel north by west by Woking, about 14 miles, into the Thames at Weybridge. At Pirford, below Woking, it receives on the left bank a stream 12 miles long, which rises on the northern slope of the Hog's Back, and at Weybridge one nine miles long, which rises on the northern slope of the North Downs between Leatherhead and Guildford. The whole length of the Wey is about 41 miles, for about 18 of which it is navigable.

The Mole rises in the northern part of the county of Sussex. The principal source is near Hand Cross on the Brighton road, and it flows northward about five miles to the border of Surrey, which it enters near Horley, and then flows still northward past Horley, five miles to Kennerley Bridge, two miles south of Reigate. Just above Kennerley Bridge it turns north by west, and flows six miles to Dorking through the valley between the North Downs and the green-sand hills. From Dorking the Mole winds northward through one of the most picturesque and beautiful parts of the country to Leatherhead, five miles following the channel of the river; and from Leatherhead it runs north-west five miles to Cobham, and there bending so as to form three sides of a small quadrangle, flows northward or rather north-north-east into the Thames at East Moulsey, opposite Hampton Court. Its whole course may be estimated at 42 miles. It is not navigable in any part. In penetrating through the chalk range of the North Downs at the foot of Box Hill near Dorking, the Mole is subject to be occasionally absorbed by the spongy and porous soil through which it flows. There are probably caverns and hollows which communicate with the bed of the river, and which in ordinary seasons are filled with water; but when in time of drought the water which they contain is absorbed, the river is drawn off into them so as to leave the channel dry at Burford Bridge under Box Hill, and for some distance below it, except here and there a standing pool. At Thorncroft Bridge, near Leatherhead, the stream rises again, and below that point suffers no interruption. From the occasional occurrence of this phenomenon, the accounts of which have been much exaggerated, the river is supposed to have obtained the name of Mole; its more ancient name, at least in the upper part of its course, appears to have been Emlay. The name Mole is however as old as the Anglo-Saxon period, for Moleshams (or Moulsey), which is evidently derived from it, is mentioned in 'Domesday.'

The Hog's Mill river rises in a copious spring in the village of Ewell, and flows north-west seven miles into the Thames at Kingston. It is not navigable, but turns several mills. The stream which joins the Thames near Putney rises at the foot of Banstead Downs near Cheam, and flows northward by Combe Wood, Richmond Park, East Sheen, and Barnes, where it turns east and joins the Thames half a mile above Putney Bridge: its length is almost 10 miles: it is not navigable. The Wandle rises near Croydon, flows three miles west to Carshalton, then turns and flows eight miles north-north-west by Mitcham, Merton, Garret, and Wandsworth, into the Thames: its course is only 11 miles, and it is not navigable, but few rivers are made more useful for supplying mills of all kinds.

The principal roads in the county are those which lead from the metropolis to the south-east, south, and south-west. The Dover road, as far as New Cross, near Deptford, is in this county. The Brighton road runs south from Southwark through Kennington, Brixton, Streatham, Croydon, and Merstham. Here it divides, one branch running through Reigate, the other running over Red Hill and through Horley. The two branches re-unite near Horley, and run across Lowfield Heath to Crawley in Sussex. The old Reigate and Brighton road appears to have passed, not through Brixton, Streatham, and Croydon, but through Clapham, Tooting, Mitcham, and Sutton, and over Banstead Downs. The Lewes and Eastbourn road branches from the Brighton road to the left a little beyond Croydon, and passes through Godstone. The Horsham and Worthing road branches from the Brighton road to the right at Kennington, and passes through Clapham, Tooting, Merton, Mordon, Ewell, Epsom, Leatherhead, and Dorking. The most frequented Portsmouth road leaves the metropolis at Hyde Park Corner, and enters the county over Putney Bridge, but formerly the more frequented road was through Southwark, Newington, and Wandsworth. The two roads unite beyond Putney, and run south-west by Kingston, Esher, Cobham, Ripley, Guildford, Godalming, and Mousehill. The Winchester and Southampton road branches from this to the right at Guildford, and runs west along the Hog's Back to Farnham. The Chichester road branches from the Portsmouth road to the left near Mousehill, and runs by Haslemere. The Salisbury and Exeter road enters the county across the Thames at Staines, and runs just within the north-western border and parallel to it through Egham and Bagshot.

A road branches from the Salisbury road on the left, and runs to Farnham, which is about as far distant from the metropolis by this road as by the road through Guildford. A road branches from the Worthing road to the right at Leatherhead, and runs to Guildford, which is about two miles farther by this road than by the road through Kingston. There are cross-roads from Kingston to Ewell; from Ewell by Cheam, Sutton, Carshalton, and Beddington, to Croydon; and from Guildford by Albury, Wotton, Dorking, Reigate, Nutfield, Bletchingley, Godstone, and Limpsfield to Westerham, Sevenoaks, and Maidstone in Kent.

The canals are the Grand Surrey Canal, the Wey and Arun Canal, and the Basingstoke Canal. The Grand Surrey Canal is cut from the Thames at Rotherhithe, about a mile and a half to the neighbourhood of Deptford, in Kent, and then turning west is carried two miles and a half farther to Camberwell. There is an extensive basin in the part of the canal near the Thames. The first act for making this canal was obtained A.D. 1801, and it was originally intended to carry it eight miles farther to Mitcham Its length is four miles, almost entirely in this county. The Wey and Arun Canal, sometimes called the Surrey and Sussex Canal, commences in the river Wey near Shalford, between Guildford and Godalming, and runs south by east into Sussex, where it joins the Arun navigation near Billinghurst. The first and only act for this canal was obtained A.D. 1813: its length is nearly 18 miles, of which 11 miles are in this county. The Basingstoke Canal commences in the river Wey, about three miles above its junction with the Thames, and runs south-west nearly 12 miles to Frimley, near the border of the county; it then turns south and runs above three miles to near Aldershot, where it enters Hampshire: its whole length is 37 miles, 15 in this county. The Croydon Canal commenced in the Grand Surrey Canal near Deptford, and ran southward 9¼ miles along the border of Kent and Surrey, having the middle part of its course in Kent, and the beginning and end in Surrey, to Croydon. But this canal has been drained, and its line is now occupied by the Croydon railway. It was commenced under an act obtained A.D. 1801.

There are several railways. The Surrey iron railway was made under acts obtained A.D. 1801, 1805, and 1806, and was opened A.D. 1805. It commences at a basin which connects it with the Thames at Wandsworth, and follows the course of the Wandle to Merton, from which place it takes a direct course to Croydon. Its length is about 9 miles, and the cost of construction was about 60,000*l*. There is a double line of rails throughout. The Croydon, Merstham, and Godstone railway commences at the Croydon end of the foregoing, and runs 8¼ miles by the side of the Brighton road to Merstham. The first act was obtained A.D. 1803, and the railway was opened A.D. 1805. The cost of construction was 90,000*l*. It was intended to carry it to Reigate, with a branch to Godstone. This railway had a double line of rails; and, with the foregoing, served to convey the lime and fullers'-earth from the neighbourhood of Merstham to the Thames. This line was not intended for passengers. Horses were the moving-power employed. This railway has been purchased and closed by the Brighton Railway Company.

The London and Greenwich railway has about half its length, which is 3¾ miles, in this county. The first act was obtained A.D. 1833; and the line was opened to Deptford 1836, and throughout A.D. 1838: the capital raised was nearly 1,000,000*l*. It begins on the Surrey side of London Bridge, Southwark, and is carried throughout on a viaduct of about 1000 arches to its terminus not far from Greenwich church. The London and Croydon railway was commenced under an act obtained A.D. 1835, and was opened A.D. 1839. It commences in the London and Greenwich railway about 1¾ miles from London Bridge, and runs 8¾ miles, in great part along the former bed of the Croydon canal, to Croydon: the capital raised was 741,000*l*. The London and Brighton railway commences at the Croydon end of the London and Croydon railway, and runs by Merstham, Red Hill, and Horley to Brighton. This railway was commenced under an act passed A.D. 1837, and is now open throughout its whole length, which is 41½ miles, with a branch to Shoreham: the capital raised was 2,400,000*l*. The London and South-eastern (Dover) railway is to branch from this at Red Hill, and run eastward into Kent. This railway is in progress: the capital raised is 1,850,000*l*. The Greenwich, the Croydon, and the Brighton railways are designed for passengers; and locomotive steam-engines are employed as the moving-power.

The London and South-western (originally called the London and Southampton) railway was commenced under an act obtained A.D. 1834, and was partially opened in 1838, and wholly in 1840. It commences at Nine Elms, on the banks of the Thames, near Lambeth, and runs south-west by Wandsworth, Wimbledon, Kingston, Esher, Walton, Weybridge, and then nearly parallel to the Basingstoke canal, by Woking and Farnborough into Hampshire, where it runs to Basingstoke, Winchester, and Southampton. Its whole length is 76¾ miles, of which more than 30 miles are in this county: the capital raised was 1,860,000*l*. The line is designed for passengers and goods; and locomotive engines are employed. The Gosport Branch railway which runs from this line to Gosport, is wholly in Hampshire.

Agriculture.—The climate of this county is favourable for corn and grass. Along the Thames and the other rivers of the county the air is soft and mild: where the ground rises into barren gravelly hills, or lies on the range of chalk which divides the county in a direction from north-east to south-west, from Croydon to Farnham, it is keener, and the winds are more boisterous. But hardy plants and robust constitutions are rather invigorated by it than otherwise. The soil varies greatly in different districts. The richest is that which lies along the banks of the rivers, consisting chiefly of a deep alluvial loam. On this soil, in the neighbourhood of London, are some of those extremely productive and highly cultivated market-gardens which supply the metropolis with fruit and vegetables. The immense quantity of manure which is annually laid on the land so occupied, and the deep trenching and digging which are repeated at short intervals, have converted the whole surface, to the depth of three feet or more, into a rich black vegetable mould. On this soil are raised the best and earliest culinary vegetables, which so rapidly succeed each other, that five or six different crops are sometimes gathered from the same ground in one year. There is another naturally rich black soil, which appears in small detached portions along the foot of the chalk hills. Although this soil requires great attention in its tillage, owing to its hardening in dry weather and being very soft and muddy when wet, it produces fine crops of wheat. The quantity of this soil however is small. The next in fertility is a hazel loam, with a considerable portion of calcareous earth in its composition, which is found on the northern side of the hills about Cobham, Ripley, Woking, and Horshill: the well-known hop-grounds in the neighbourhood of Farnham are mostly on a similar soil.

The most extensive tract is that of the Weald clay, which is a soil with a smaller mixture of siliceous sand than most clays. This weald extends into Sussex and Kent, and occupies most of the southern parts of the county. Some of it when ploughed rises in continuous strips, and is turned over in solid masses as if it were soap. In its natural state this soil is of little value, and can only be rendered productive by very complete draining, and by correcting the tenacity by chalk or gravel, where they can be found at hand, which however is seldom the case. The Weald is generally low and flat; where it rises into hills the soil is more fertile. In the northern portion of the county extending towards Hampshire is a large tract of sandy loam of various qualities, some of which remains to this day in the state of heath and commons. There are some sandy loams of a better quality between the barren soil known by the name of Bagshot sand and the chalk hills, as about Esher, Dorking, and Reigate: about Godalming it becomes of a very good quality, resting upon a sandstone. The poorer sands rest chiefly upon a yellow ferruginous gravel.

The tops of the chalk hills are either covered with a short pasture, as downs, or, where the soil is deeper over the chalk, it is mostly under the plough.

Surrey is a favourite county for the residence of men of fortune. It possesses many beautiful sites, and the views from some of the hills are very extensive, such as Richmond Hill, St. Ann's, Cooper's Hill, and Leith Hill. The villas within a short distance from London are very numerous, but few of them have more than a small quantity of pasture-land and pleasure-ground attached to them. Within a certain distance from London the larger properties have been mostly subdivided, and their value greatly increased from the competition of purchasers. Where land is held as an investment or inheritance, the rent is low, and the farms are not often let so as to encourage the tenant to lay out any capital. Where the tenure is from year to year, there is no security to the tenant in case of the death or failure of the landlord; and he is only restricted in his mode of cultivation by the custom of the country, than which nothing can be more vague. Two or even three white crops in succession are no infringement of the custom in some places, provided the land has been fallowed and manured. Where leases are granted, the conditions are often absurd and contrary to the principles of all improved husbandry, if they are not even contradictory and impossible. The consequence is that farmers who are of the old school continue a slovenly unprofitable system, by which they get a bare livelihood, and the land remains unimproved, if not deteriorated. There are proprietors, however, who are more alive to their own interest; who assist their tenants in draining, marling, or chalking their land; and who, by granting leases on fair terms, get respectable tenants with sufficient capital to cultivate the land properly. Most of the farms are smaller than is consistent with a wealthy tenantry. Provided a man has a sufficient capital, he can cultivate 500 acres as easily as 200, and can afford to use better and more improved implements. A lower profit per acre will remunerate him; while the small farmer requires all his profits to maintain his family. Till within a few years the poor-rates swallowed up a great portion of the rent; and the tenants, having their labour partly paid from the rates, were not inclined to lessen a burden which fell chiefly on the landlord, who was in consequence obliged to lower the rent. In some parishes the rates fully equalled the rent, and yet the aggregate was not too high for the tenant to pay. Land worth twenty shillings per acre let at ten shillings, the rates making ten shillings more; but the tenant had a profit on the rates by the reduction of wages, and the whole loss fell on the landlord. The removal of this abuse, and the commutation of the tithes, will tend greatly to the benefit of both landlord and tenant, and introduce a better system of cultivation.

The implements of husbandry used in Surrey vary extremely on different farms. Some adhere to the old clumsy Kentish wheel-plough, others adopt the more modern and improved forms. The strong turn-wrest plough, with four or six horses, may be very well adapted to break up rough ground full of stones and roots, although the modern subsoil plough would do this with much less power; but for ploughing land which is already in cultivation a lighter instrument is greatly preferable. A turn-wrest plough might be constructed as light as any swing-plough; and where the subsoil is porous, and the land can be laid flat, no plough does its work better than a good light turn-wrest plough, and as the system of under-draining extends, so will, no doubt, this implement. The skim-coulter, so generally used in ploughing leys, which turns in the surface and buries it, was invented by Ducket, at Esher in this county. On all the light soils swing-ploughs with a skim-coulter are universally used. The mole-plough is used as a substitute for underdraining, chiefly on meadows. Where the subsoil is a tenacious clay of a uniform texture, this instrument is efficacious; but where a variety occurs in the soil, it is only a temporary remedy against excess of moisture. The bore made by the plough is soon choaked, even if the moles do not work in it; and wherever this is the case, a springy spot is formed. On the light soils the seed is generally put in with a drilling-machine; on the heavier it is mostly sown broadcast. Dibbling is not much practised, except in the market-gardens.

On the larger farms threshing-mills are common; but as the farms are mostly small, and the labourers abundant, the flail is the usual instrument of threshing.

The system of fallowing to clean the land, and to 'sweeten' it, as old farmers say, is almost generally adopted on the heavy soils: in fact there is no time in autumn or spring to clean land, which is then usually in a wet state; and the only crop which can be profitably raised in the fallow year is tares to cut up for horses or cattle. On the best soils this may take place on half the land usually fallowed; and if the tares are cut early in summer, or, which is better, fed off with sheep, the land may be got clean and in good order for wheat-sowing by what is called a bastard fallow. It is seldom that the season will allow of cleaning clay-land before spring-sowing. Fallows are therefore occasionally indispensable in such soils. The course of crops differs on the different soils. On all light soils the Norfolk four years' course is generally adopted, with occasional modifications. On the chalk sainfoin is sown with advantage, and broken up after five or six years. On the lands which are too wet for turnips to be fed off, the common course is—fallow, wheat, beans or clover, and oats. The long fallow for barley, which is so common in Essex and Suffolk, is almost unknown in Surrey: barley is seldom sown, except on the better light loams, where the Norfolk course is adopted. On the Weald clay the usual rotation is—fallow, wheat, clover, and oats, which is probably as good as any. Many farmers plant or drill beans on half the land which has borne wheat, and sow the other half with clover. If they give a half-dressing of manure for their beans, this is the best and most profitable course, as the clover then only recurs every eighth year. But this cannot be done without stall-feeding cattle on corn or oil-cake, or fattening pigs on the beans, where manure cannot be purchased; for the produce of the farm is mostly carried to market, and without oil-cake the straw of the wheat and oats would produce an insufficient portion of manure for the land, and that of a very inferior quality. The beans are carefully hoed by hand, where there is any pretension to good farming. Some old-fashioned farmers, especially among the small occupiers, adhere to the old course of fallow, wheat, oats, laying on all the manure they can make on the fallow for the wheat. The appearance of the land will readily show where this is the case, without asking a question; and the poverty of the farmer proves how unprofitable it is to the tenant, as well as the landlord. On the chalk soils, where there is a strong reddish clay, which the chalky subsoil prevents from being wet, turnips are added to the foregoing course, or rather the Norfolk course alternates with it, thus:—fallow well ploughed and stirred and folded with sheep; wheat, beans, oats, turnips dunged, barley, clover, oats or wheat, according to the fertility of the land. Peas are sometimes substituted for the beans, and tares made to precede the oats. There is no great fault to be found with this system, provided attention be paid to have a sufficient quantity of manure, either from sheep fed on the downs and folded at night on the land, or by the stall-feeding of cattle. Without the advantage of the downs to feed the sheep, or grass-land attached to the farm, a proper quantity of manure could not be made. On all the good sandy loams the Norfolk course is universal, with the same variations which are found useful in that county. [Norfolk—*Agriculture.*]

The poor barren sands have been rendered productive in some spots by trenching and judicious planting. Where the iron pan, as it is here called, or the moor-band, which is an almost invariable concomitant of heath, is broken through, trees thrive well; where this is not done, planting is generally a dead loss. In the midst of the most desolate heaths in the county a cottage is sometimes erected by some poor man, with the consent of his parish, or by tacit acquiescence, with a garden in which fruit-trees grow and good vegetables are produced. This has been chiefly effected by deep digging, manuring with scrapings from roads and the ashes of the turf which serves for fuel mixed with the manure of the pig, which is littered with coarse grass or fern from the common. This shows that the soil is not irreclaimable; and it requires only the labour and care which are stimulated by necessity to convert these barren heaths into productive land. They are by no means so unpromising as some of the Dutch and Flemish heaths, which are now in full cultivation. [Barren Land; Flanders—*Agriculture.*]

We have mentioned sainfoin as a plant grown with great advantage on the chalky soils of this county, where it thrives well, and leaves the soil improved by the decomposition of its roots. It is usually sown with barley, as is the practice with clover, with this difference, that the land is ploughed deeper in order to loosen the chalky subsoil, into which the roots of the sainfoin strike to some depth. Some farmers sow trefoil at the same time; but the best farmers do not approve of this. The sainfoin alone will cover all the ground, and give a greater weight of fodder, whether green or made into hay, than the mixture; and the trefoil seems to act as a weed to the sainfoin, and to check its growth. As grass and weeds are great enemies to sainfoin, the land should be quite clean when the barley is sown—as it should at all events—that the sainfoin may choke the weeds and keep possession of the surface. It will bear a long continuance of dry weather without looking sickly, which is owing to the depth to which the roots grow. Sainfoin may also be sown before winter, if the soil is prepared; and in that case it is well to give it the whole surface of the land without any other crop. In the course of its continuance, which may be five or six years or more, the loss of the corn crop will be fully compensated. In order to have a fine sainfoin hay, it should be sown thick, to increase the number of stems without causing them to be too strong and woody, which would be the case if they had much room to grow in. A thick crop also keeps down the weeds. The proper quantity of seed is four or five bushels per acre. When the sainfoin is sown to stand for seed, a different mode of management must be adopted. In this case the plants cannot be too strong, and they should stand in rows a foot apart, and the intervals be hoed, as with beans; but in this case the plant will not be allowed to remain long in the land, and it will be better to cut it young for green food in the succeeding years than to make it into hay.

When sainfoin has been cut several years, it may be invigorated by top-dressing. The liquid manure, which is collected in tanks, and consists of the urine of stalled beasts and the drainings of dunghills, is the most effective recruiter of the soil. In Switzerland, where sainfoin is grown abundantly on the chalky slopes at the foot of the Jura Mountains, the inhabitants carry this liquid in flattened conical tubs slung on their backs, the wide part rising above their head; and distribute it by pouring it over the sides of the tub, right and left, by a peculiar stoop and jerk. One would suppose this to be a very slow and laborious process; but where carts could not well go, owing to the nature of the surface, it is the readiest means of carrying manure, and it is only mentioned here to prove how valuable a top-dressing it is found to be. It is in a very concentrated state, and usually put on in rainy weather, or in the evening, to prevent burning. If a cart-load of rotten dung were well washed in as much water as will fill a large cart, it would be found to have imparted all its richness to the water, and left only insoluble fibres of straw behind. This quantity of liquid manure is as easy of carriage as a cartload of dung, and would invigorate a much greater extent of ground than if the solid manure were carted on and allowed to dissipate, in a great measure, before it is washed in by the rains. This is only anticipating what the rain will do less effectually, and avoiding the disappointment caused by dry weather.

Ashes are likewise a useful top-dressing for sainfoin. Peat and wood ashes are the best, no doubt, but coal-ashes, which may be obtained in larger quantities, have also a very good effect when well sifted from cinders. Gypsum has been used with advantage; but it is not yet known how it acts. In some soils its effects are scarcely perceptible, in others it seems to do wonders. Top-dressing not only produces a greater crop, but keeps the plant in vigour for a longer period when it begins to get thin; and as the expense of cultivation is confined to this top-dressing, the longer the field can be made to produce a good crop before it is broken up again, the greater the profit. To say that sainfoin does not exhaust the soil at all may perhaps not be warranted by theory or practice; but as it draws its nourishment chiefly from the chalky subsoil, and the gramineæ derive theirs mostly from the surface, it is reasonable to conclude that sainfoin exhausts this latter less, in proportion to the produce, than any other of the plants usually cultivated, lucern not excepted; for lucern requires a good friable soil to thrive in, and to enable it to last as many years as the sainfoin.

In making sainfoin hay great attention must be paid to the weather. It has a hollow stem, which in long continuance of wet weather becomes filled with water: in this case the hay can be seldom carried without danger of its becoming musty in the stack and being entirely spoiled. In very dry climates there is no fear on this account; but in our moist climate this is a serious evil. The situations in Surrey where the sainfoin grows best are also most open and exposed to the winds. If the proper time be chosen for making sainfoin into hay, which is when the flower is first beginning to fade, and the swarth be often turned without any tedding or spreading about, and soon made into small cocks, there will be no great danger of the stems being soaked with wet, even by very heavy showers. It must be left till quite free from moisture or sap before it is stacked, or it will become mouldy or heat dangerously, as the water or the sap prevails. Well got up sainfoin hay is nearly equal in value to clover hay, and much more nutritious than the best meadow hay. It is especially good for fast-working horses, as it affects the wind less than clover. Lucern and sainfoin hay are generally considered on a par, when equally well made. But if the most is to be made of the crop of either of these plants, they must be cut green, just as the flower opens, and given to horses and cattle in that state. One of the greatest enemies to the duration of a field of sainfoin is the oat-grass, which insinuates itself and ultimately thins the plants so much as to force the farmer to plough it up. This should be anticipated, and the ground ploughed and cleaned before the weeds have gained the mastery; for in that case it is difficult to eradicate them.

When a field of sainfoin is broken up, it should not be sown again for at least as many years as the sainfoin has lasted, or it will probably fail of giving such a crop as will keep down the weeds. There are some exceptions, at least it is so stated in books, where the land, being thoroughly cleaned by fallowing, sainfoin has been sown again immediately with success. But we would not recommend the practice: it is better to choose another field, and let the sainfoin go the round of the chalky fields in succession: the crops which come after it will be all the better. These remarks may be taken as supplementary to what is said in the article SAINFOIN.

The hop-gardens of Surrey are about Farnham. The greater value of Farnham hops in the market is probably owing partly to the soil in which they grow being peculiarly suited to this plant, and partly to the greater care with which it is cultivated. The greater price obtained for the best Farnham hops is the stimulus to the exertions of the growers. For a detail of the culture and management, see HOPS.

The wealds of Surrey were, till within a comparatively modern date, one continued forest (*Wald*, in German), and were gradually cleared and cultivated, as timber was in request and land was wanted to raise corn, which, within little more than a century, the wealds did not produce in sufficient supply for the inhabitants, although the population was small. At present the woods have been greatly thinned, and the process of grubbing has gone on most rapidly. It has been found that the underwood, with a few trees interspersed, if properly taken care of, is more profitable than an open wood of thriving oaks, which have a slow growth and give a distant return, while the coppice is turned into money every ten, twelve, or fourteen years. Hence the management of underwood has been well attended to. The woods are kept dry on the surface by numerous open drains in the tenacious clay. The shoots have been plashed and laid down to take root where there appears any vacancy, and the woods have been carefully fenced from cattle and other trespassers. The best underwood consists of quick-growing trees, as ash, elder, sallow, and willow. The oak and chesnut are more precarious, although more valuable when in perfection. The coppice, if of any extent, is cut and sold by the proprietor or his agent. When it is included in a lease of a farm, from twelve to sixteen shillings per acre is an average yearly rent. When the lease is for twenty-one years, the farmer is induced to cut the coppice twice, although it does not produce so much as it would at twelve or fourteen years' growth, even allowing for the rent of the surplus years. It is therefore always preferable for the landlord to keep the coppices in hand.

The new plantations which are made are either merely ornamental, near the seats of proprietors, or are on the barren sandy soil, as mentioned before.

In the heaths and poor sands furze is often abundant, and gives some return, when cut and tied in faggots for heating bakers' ovens, and for the use of brick-makers and lime-burners. In some places it has been sown for this purpose, and has produced a good return at a small expense. A gallon of seed is sown per acre after the land has been cleared of heath and ploughed deep. The subsoil must be dry or the furze will not thrive. In the first year it may be mown, and the tops, bruised in a mill, are very good food for horses and cows. It may be cut afterwards every three years and tied up into bundles. An acre will produce from 2000 to 3000 bundles, worth six shillings a hundred delivered. This is a good return from such poor land.

There is no peculiar breed of cattle in Surrey. There is not much good grazing-land, and the beasts that are fatted or kept for milch-cows are of all the breeds which are usually met with. Short-horn and Alderney cows, and crosses between them, are very common in the pastures adjoining gentlemen's seats. There was a small herd of pure Ayrshire cows kept at Esher by the late R. Oswald, Esq., and a cross between these and the Alderney, which were very beautiful, and gave excellent cream and butter. They were sold and dispersed through the neighbourhood, and the breed will probably not be kept pure. Beasts of all breeds are fatted at the distilleries near London. Oxen for draught are very seldom met with, horses being almost universally employed for farm-labour.

There was once a peculiar breed of heath sheep, which had a small fleece of fine wool, and very delicate flesh when fatted. The meat was well known by the name of Bagshot mutton. There is only a small remnant of this breed left, as many of the heaths and commons have been divided, although not cultivated, and the sheep have no longer their former wild and extensive range. The farmers are partial to the South Down sheep, and some prefer crosses between these and the Leicester or the Cotswold, which give a heavier fleece and larger carcass. They also bear folding on the exposed hills. Several farmers about Ewell, Esher and Walton, and towards Guildford, rear house-lambs for the London market. The ewes are invariably of the Dorsetshire breed, which lamb early. They are well fed and closely housed, and the sucking lambs are treated in a manner very similar to calves fattening for the butcher. The great object is to get them fit for the market as early as possible in the season.

The pigs are principally of the Berkshire breed. There was formerly a very large breed at Rudgwick in this county. The hogs, some of which gave carcasses of forty and fifty score when fat, vied with oxen for weight. But these enormous animals took a long time to fatten, consumed a large quantity of food, and the bacon was not so readily disposed of as of the smaller sorts. This is a sufficient reason for their being less valued.

The principal fairs in Surrey are as follows:—

Blechingley, May 19, Nov. 2; Chertsey, first Mond. in Lent, May 14, Aug. 6, Sept. 25; Croydon, July 5, Oct. 2, Dorking, day before Ascension-day; Farnham, Holy Thursd., Midsummer-day, Nov. 13; Egham, May 29; Epsom, July 25; Esher, Sept. 4; Ewell, May 12; Walton-on-Thames, Easter week; Godalming, Feb. 13, July 10; Guildford, May 4, Nov. 22; Haslemere, May 13, Sept. 26; Kingston, Th. in Whitsun week, Aug. 4, Nov. 13; Leatherhead, Oct. 10; Merton, Easter Mond., Whit. Mond.; Reigate, Whit. Mond., Sept. 14, Dec. 9; Ripley, Nov. 11; Wandsworth, Whit. Mond.

Divisions, Towns, &c.—Surrey is divided into fourteen hundreds, as follows:—

Hundred.	Situation.	Area. Acres.	Population 1831.
Blackheath	S.	40,930	8,681
Brixton	N.E.	30,990	337,361
Copthorne	Central	34,730	10,727
Effingham	do.	7,060	1,646
Elmbridge	N.	21,100	8,048
Farnham	S.W.	26,680	8,228
Godalming	S.W.	37,200	10,476
Godley	N.W.	43,730	14,517
Kingston	N.	12,690	17,491
Reigate	S.	45,150	10,719
Tandridge	S.E.	52,380	9,381
Wallington	E.	36,470	24,647
Woking	W. & Central	52,770	15,993
Wotton	S.	32,600	7,754
Militia under training		..	665
Total . .		474,480	486,334

The metropolitan boroughs of Southwark and Lambeth are included in Brixton hundred, and Guildford is included in Woking hundred.

Surrey comprehends the parliamentary boroughs of Southwark, Lambeth, Guildford, and Reigate; the now disfranchised boroughs of Haslemere, Blechingley, and Gatton; the market-towns of Chertsey, Croydon, Dorking, Epsom, Farnham, Godalming, and Kingston; the suburban villages of Rotherhithe, Bermondsey, Newington, Walworth, Camberwell, Peckham, Dulwich, Norwood, Brixton, Kennington, Clapham, Wandsworth, Putney, Battersea, Tooting, and Streatham; and the remoter villages of Mortlake, Barnes, Kew, Richmond, Wimbledon, Merton, Mitcham, Ewell, Carshalton, Beddington, Wallington, Leatherhead, Walton-on-Thames, Esher, and Egham. Southwark is described elsewhere [LONDON; SOUTHWARK], as are some of the other places. [BATTERSEA; BLECHINGLEY; CROYDON; FARNHAM; and LAMBETH.]

Guildford is in Woking hundred, chiefly on the right bank of the Wey, and in that depression of the North Downs through which the river passes; 30½ miles from the General Post-office, London, by Kingston, or 31½ by Leatherhead. The area of the old borough was 210 acres. The present parliamentary and municipal limits, as determined by the Boundary and Municipal Reform acts, comprehend a much larger area. Guildford is mentioned first in the will of Alfred the Great, by whom, as being a royal demesne, it was bequeathed to his nephew Ethelwald, on whose rebellion or death a few years after it reverted to the crown. It was here that Alfred, the son of Ethelred II., was treacherously seized in the reign of Harold I. (A.D. 1036), and here his Norman attendants were massacred to the number of nearly six hundred. In 'Domesday' the town is called Gildeford. It belonged to the king, who had seventy-five messuages or tenements (*hagæ*), from which and other data Manning (*History of Surrey*) conjectures the population to have been about 700. There are the remains of an old castle here of uncertain date, but it is probably later than the Domesday survey, as it is not noticed there. It was taken by Louis of France and the insurgent barons in the reign of John, A.D. 1216. It was alienated from the crown in the time of James I. The ruin stands on an eminence on the south side of the town, and not far from the east bank of the river. There are some remains of the outer walls. The shell of the keep is standing: it is a square tower, about 44 feet square outside, with walls ten feet thick in the lower story. The original entrance was through a stone arch in the west front, so high that it must have been approached by an outside staircase. This opening, which now commonly passes for a window, has a pointed arch, which, as the general character of the keep is Norman, was probably altered at a period subsequent to the erection. There was a circular staircase in one corner, and there were galleries in the walls as at Rochester. The town is on a declivity, and the High-street, which runs down to the bridge over the Wey, is steep. The town is well paved, and lighted with gas; and from the well-built and substantial houses which it contains has a thriving and respectable appearance. St. Mary's church, on a declivity to the south of the High-street, is a curious edifice, chiefly of chalk, very antient, and rudely built. Some parts are of early English, and others of later date. It consists of a nave with two aisles, and a chancel with a chapel on each side, forming an extension of the aisles, and originally communicating with the chancel by arches which are now stopped up. These chapels do not extend the length of the chancel, and are round at the east end. There is a small embattled tower in the centre of the building. Trinity church is near the eastern entrance of the town on the south side of the High-street. It was rebuilt of brick about the middle of the last century, with an embattled tower of the same material 90 feet high. St. Nicholas is on the west side of the Wey. It is an antient structure, rudely built of chalk and flints, with an intermixture of stone; and is of various dates and styles. It has a low embattled western tower entirely of stone, and some good lancet windows. On the north side of High-street, nearly opposite Trinity church, is Abbot's Hospital, or Trinity Hospital (erected and endowed by Archbishop Abbot, a native of Guildford), a building in the Elizabethan style, of imposing appearance, built round a quadrangular court. The gateway tower is square, with octangular turrets at the corner, surmounted with pinnacles. There is a grammar-school, an antient and spacious building. The old town-hall, or guild-hall, is a large building, surmounted by a turret, and having a clock projecting into the street; and there are a new corn-market and court-house of neat and handsome appearance, and a neat theatre. The county house of correction is a brick building, well situated, about a quarter of a mile from the town; and there are extensive barracks on the site of an antient Dominican friary. Half a mile south of the town, on a hill to the left of the Godalming road, are the picturesque ruins of St. Catherine's Chapel. There are meeting-houses for several bodies of Dissenters.

The population of the old borough in 1831 was 3924, of the borough as subsequently extended probably about 4833. There is no important branch of manufacture carried on at Guildford. There are some paper and corn mills, breweries, and an iron-foundry. There are markets on Wednesday and Saturday, the latter a good corn-market. There is a weekly lamb-fair or market on Tuesday, from about Easter to Whitsuntide; and there are two yearly fairs for cattle and horses. There are two banking establishments. The Midsummer quarter-sessions for the county are held here, and the summer assizes alternately with Croydon. The court of election for members of parliament for the western division of the county is also held here.

The town was early incorporated, but the time is unknown: the earliest known charter is of Edward II. Quarter-sessions for the borough are held, and petty sessions as occasion requires. The town has, under the Municipal Reform Act, a commission of the peace, 4 aldermen, and 12 councillors. Guildford has sent two members to parliament ever since 23 Edward I. The number of voters on the register for 1835-6 was 430: for 1839-40, 495.

The livings of Trinity and St. Mary's are rectories, united, of the joint clear yearly value of 171*l.*, with a glebe-house. St. Nicholas's is a rectory, of the clear yearly value of 437*l.*, with a glebe-house. They are all in the rural deanery of Stoke, the archdeaconry of Surrey, and the diocese of Winchester.

There were in the old borough, in 1833, an infant-school with 123 children, 76 boys and 47 girls; the grammar-school with 74 boys, 6 on the foundation; an endowed blue-coat school with 56 boys, 26 of them on the foundation; two national schools, with 64 boys and 76 girls; a Lancasterian school, with 96 girls; and ten other day-schools, with 231 children, viz. 105 boys and 102 girls, and 24 children of sex not stated. There were also two Sunday-schools, with 352 children, viz. 158 boys and 194 girls; besides which 44 boys from one of the national schools attended on Sunday.

Reigate is in the hundred of Reigate, 22 miles from the General Post-office, through Croydon. The borough, which is now co-extensive with the parish, has an area of 5900 acres. This place is called Cherchefelle in 'Domesday,' but acquired the name of Reigate in the following century. It was a royal demesne at the time of 'Domesday,' and was afterwards granted to the earl of Warrenne and Surrey. There was a castle here, of the foundation and history of which little is known except that it was taken from Earl Warrenne by Louis of France and the insurgent barons A.D. 1216. There are no remains of it now, except the earthworks which mark the site. There was also a priory, of which there are no remains: its yearly revenues at the dissolution appear to have been 78*l.* 16*s.* 8*d.* gross, or 68*l.* 16*s.* 8*d.* clear. The town is pleasantly situated in the valley of Holmesdale, at the foot of the southern declivity of the North Downs. It is a small but remarkably neat place, having an unusual proportion of genteel houses in it. It consists of one principal street, running east and west along the valley, and another street branching southward from this. The town is lighted with gas. The site of the castle is on the north side of the town, behind the houses in the High-street: the site of the priory is marked by a modern mansion, so called, at the southern end of the branch street. The church is at the east end of the town: it is built of squared chalk or limestone, probably from the neighbouring quarries, and is chiefly of perpendicular character, with some good windows, and a lofty embattled tower at the west end, of later date than the rest of the church. On the north side of the chancel is a brick vestry, built A.D. 1516, with an apartment over it containing a library for the use of the parish and neighbourhood. In a vault under the chancel Lord Howard of Effingham, afterwards earl of Nottingham, who commanded the English fleet against the Spanish Armada, and several of his family, are buried. There are meeting-houses for Quakers and Independents. There is a small brick market-house with a town-hall over, and a small building adjacent called the 'clock-house,' used for confining the prisoners brought here for trial at the sessions. The town-hall occupies the site of an antient chapel of St. Thomas à Becket; and there are some remains of another chapel, said to have been dedicated to St. Lawrence, now converted into a dwelling-house. There is a good market on Tuesday for corn and provisions, and a monthly cattle-market. There are three yearly fairs. The Easter sessions for the county are held at Reigate. Reigate is a parliamentary, but not a municipal borough. It returned two members from the 23rd Edward I., but the number of members was by the Reform Act reduced to one. The previously narrow limits of the borough were extended by the Boundary Act. The number of voters on the register for 1835-6 was 195; for 1839-40, 198. The living is a vicarage, of the clear yearly value of 418*l.*, with a glebe-house. It is in the rural deanery of Ewell, in the archdeaconry of Surrey, and the diocese of Winchester.

There were in the parish, in 1833, a free grammar-school, with 26 boys; a national school, with 66 boys and 60 girls; fourteen other day-schools, with 278 children, namely, 140 boys and 138 girls; and three Sunday-schools, with 171 children, namely, 30 boys and 141 girls.

Haslemere is in Godalming hundred, twelve miles south of Guildford, on the road to Chichester. The area of the parish is 3330 acres. There is a tradition of the former greatness of this place before it was ruined by the Danes, but the tradition is unsupported, nor is the place noticed in 'Domesday.' A charter granted by Queen Elizabeth in the 38th year of her reign speaks of the antiquity and populousness of the town, but refers to its existing impoverishment from the extinction of its fair and market; in consequence of which the charter contains a grant for a market and two fairs. The town occupies an elevated site, and is very clean; the streets are irregularly laid out, and neither lighted nor paved. The church, or rather parochial chapel, of which Chiddingfold is the mother church, is on the north side of the town, and is an antient structure. The east window has some old painted glass. There is a small square tower at the west end. The Independents have a meeting-house; and on a common adjacent to the town is an almshouse which affords a dwelling to some poor persons, but they receive no allowance, owing to the decay of the market, from the tolls of which their stipend was derived. The population of the parish, in 1831, was 849. The market, which is on Tuesday, is kept up, but is of little importance: there are two yearly cattle-fairs. There was in 1831 a small manufacture of silk-crape which employed sixteen men. Haslemere sent members to parliament 'from time beyond memory,' according to the charter of Elizabeth; but it is questioned if any were actually sent until a few years before that charter was granted. They were regularly returned until the disfranchisement of the borough by the Reform Act. The living is a chapelry, united with the rectory of Chiddingfold; their joint clear yearly value is 522*l.*, with a glebe-house; they are in the rural deanery of Stoke, in the archdeaconry of Surrey, in the diocese of Winchester. There were in the parish, in 1833, a national school, with 60 boys; two other day-schools, with 14 boys and 29 girls; and one Sunday-school, with 40 girls.

Gatton is in Reigate hundred, about two miles north-east of Reigate. The area of the parish is 1140 acres, partly on the North Downs, partly at their southern foot. Some Roman antiquities have been found, and Gale contends for there having been a Roman garrison here, but of this there is no sufficient evidence. Aubrey, in his 'History of Surrey,' has spoken of a castle at Gatton, but without any known evidence from antient writers or any existing trace of its site. Gatton first sent members to parliament 29 Henry VI. (A.D. 1451), and returned two down to the time of its disfranchisement by the Reform Act. The place has entirely lost whatever importance it may have possessed, and is now a scattered village of only 23 houses and 145 inhabitants. Gatton House, the residence of the late Lord Monson, is a handsome residence in an extensive and beautiful park: the parish church, which is in the park, is remarkable for the neatness with which it is fitted up. Until the disfranchisement of the borough by the Reform Act, the proprietor of Gatton House was patron.

Chertsey is in Godley hundred, on the bank of the Thames, 22½ miles from the General Post-office, London, by Brentford, Twickenham, and Shepperton, and 11 miles west of Kingston through Hampton Court and East Moulsey. The area of the parish is 10,020 acres. The name of the place is written by Bede Ceortesei, and in the Saxon Chronicle Ceortes-ege and indicates the situation of the place, in a peninsula, which was perhaps once an island formed by the Thames, the Bourn brook, and the stream from Virginia Water. The town was known in antient times by its mitred Benedictine abbey, founded in the times of the Heptarchy. The yearly revenues of the abbey at the dissolution were 744*l.* 18*s.* 6¾*d.* gross, or 659*l.* 15*s.* 8¾*d.* clear. The body of Henry VI. was for a time deposited in this abbey. The town is irregularly laid out; the principal street runs east and west, the streets are partially paved and lighted with gas, and the houses are for the most part neatly built of brick. There is scarcely a fragment left of the abbey, which stood on the north side of the town, between it and the river, in a very low flat, now forming fertile meadows. The church is in the centre of the town, and is a modern brick building faced with stone, in what is described as the florid Gothic style. The market-house is also a modern building. An old house in the town possesses some interest as having been the residence of the poet Cowley. East of town is Chertsey bridge, a handsome stone-bridge over the Thames, erected in the latter part of the last century. There are several places of worship for Dissenters. There is a building for the Literary and Scientific Society, with theatre, lecture, and reading rooms. The population of the parish, in 1831, was 4795, about one-third agricultural: the population of the town is not given separately. The chief trade of the town is in malt and flour: a considerable quantity of vegetables are raised in the neighbourhood for the supply of London, and a great number of bricks are made. The market is on Wednesday for corn and provisions; it is a considerable market for poultry: there are four yearly fairs. The living is a vicarage, of the clear yearly value of 307*l.*, with a glebe-house, in the rural deanery of Stoke, in the archdeaconry of Surrey, and diocese of Winchester. There were in the parish, in 1833, two national schools, endowed, with 262 children, namely, 157 boys and 105 girls; eleven other day-schools of all kinds, with 196 children, namely, 68 boys and 128 girls; two other day-schools, from which there was no return; and two Sunday-schools, with about 100 children of both sexes.

Near Chertsey, on St. Anne's Hill, is the residence of Charles James Fox, commanding an extensive prospect. There is a tablet in Chertsey church, erected by his widow, with an inscription to his memory.

Dorking is in Wotton hundred, about 24 miles from the General Post-office, London, through Ewell and Epsom. The area of the parish is 10,150 acres. The town is of no historical interest; but is delightfully situated in the valley on the south side of the North Downs, near the river Mole. It is surrounded by gentlemen's residences: Betchworth castle and park on the east, Berry Hill on the south-west, and Churt park on the south-east. The principal street runs from north-east to south-west, the other streets branch from this. The footpaths are paved, and the streets lighted with gas, and the town presents a pleasing appearance: the houses, though antient, are neat and well built. The church is in the centre of the town, and is of ordinary stone and flint, except the upper part of the tower, which is of squared stone or chalk. The church is roofed with the coarse flag-stone quarried near Horsham: it is cruciform, with the tower, which is low, in the centre; and is principally of perpendicular date. It contains the monuments of Abraham Tucker, author of 'The Light of Nature Pursued,' and of Jeremiah Markland, the classical scholar and critic. There is a town-hall in the middle of the High Street; and there are meeting-houses for Independents and Quakers. The population of the parish, in 1831, was 4711, about one-third agricultural: the population of the town itself was not distinguished. The chief trade is in flour and lime; and a great quantity of poultry of a peculiar breed, supposed to have been brought over by the Romans, and known by having five claws to each foot, is reared in the neighbourhood for the supply of the metropolis. The market, which is well supplied, is on Thursday, and there is one yearly fair. The living is a vicarage, of the clear yearly value of 411*l.*, in the rural deanery of Stoke, in the archdeaconry of Surrey, and the diocese of Winchester. There were in the parish, in 1833, an infant-school with 147 children, 99 boys and 48 girls; two national schools, held also on Sundays, with 138 children, 70 boys and 68 girls; a day and Sunday school with 16 girls, connected with Dissenters; and seven other day-schools, with 155 children, namely, 55 boys and 100 girls. Dorking is situated on or near the Roman road Stone Street, and it has been said that in digging graves in the churchyard the grave-diggers have occasionally come to the road-way, but this appears to want confirmation.

Epsom is about 15 miles from the General Post-office, London, on the Worthing road. The area of the parish, which is in Copthorne hundred, is 3970 acres: the population, in 1831, was 3231. The town is irregularly laid out, but has a number of good houses. The church is a modern building, and there are two Independent chapels. The market, which had been discontinued, has been lately revived: it is held on Wednesday. There is a considerable cattle and wool fair. Some brick-making, brewing, and malting is carried on, and there are some nursery-grounds. Epsom has mineral springs, now less resorted to than formerly; and in the week preceding Whitsun-week horse-races are held on the adjacent downs, and are very numerously attended, chiefly from London. The grand stand on the race-course is a spacious and handsome building. The living of Epsom is a vicarage, of the clear yearly value of 303*l.*, in the rural deanery of Ewell, the archdeaconry of Surrey, and the diocese of Winchester. There were in the parish, in 1833, a national school with 157 children, namely, 100 boys and 57 girls; fifteen other day-schools, with 316 children, namely, 144 boys and 172 girls; and two Sunday-schools, with 114 children, namely, 48 boys and 66 girls.

Godalming is in the hundred of Godalming, about 4 miles south-south-west of Guildford, on the Portsmouth road. The area of the parish is 8470 acres. The manor of Godalming was bequeathed by Alfred the Great to his nephew Ethelwald, and on his revolt, or death (A.D. 905), reverted to the crown, to which it belonged at the time of Domesday Survey, in which it is called Godelminge. The town is of little historical interest. It was in 1724 the scene of a gross imposture by one Mary Toft, a woman who professed to be delivered of 17 young rabbits. The matter excited great attention; and numerous pamphlets, engravings, and squibs were published on the occasion. The town is situated in a valley amid the green-sand hills, on the south bank of the Wey, which is navigable up to the town. The principal street is about three-quarters of a mile long. The suburb of Mead-row and the village of Ferncombe on the north-east are nearly united to the town by intervening buildings. There is a brick bridge over the Wey. The town is paved and lighted: the houses are in general small and of mean appearance. The church lies back from the High Street, not far from the river: it is a cruciform church, having a low tower rising from the intersection, surmounted with an ordinary spire of timber covered with lead. There are some portions of early English architecture, and some curious windows of a later date. In it is a monumental tablet to the memory of the Rev. Owen Manning, the historian of the county, as well as a gravestone in the church-yard, where he was buried. There is a neat modern town-hall, and in the town and neighbourhood are some dissenting places of worship. The population of the parish, in 1831, was 4529. Godalming had formerly a flourishing manufacture of kerseys and other woollen cloths, but this is now decayed; the manufacture of silk and worsted stockings, shirts, drawers, fleecy hosiery, and gloves is still carried on. There are several corn, paper, oil, and fulling mills near the town. Timber, planks, hoops, bark, flour, and paper are sent by the Wey to London. There is a market on Wednesday for corn, and another on Saturday for provisions, and there are two yearly fairs. Godalming was made a corporate town by Queen Elizabeth. The limits of the borough are said to comprehend rather more than the present town, but are not exactly known; the corporation has no jurisdiction, civil or criminal, and no property; and the town was, before the Municipal Reform Act, lighted and watched under a local act unconnected with the corporation, and applicable to a very restricted district not exactly coincident with the borough. A more extended boundary has been recommended for the borough, which under the Municipal Reform Act has four aldermen and twelve councillors, and no commission of the peace. The living is a vicarage, of the clear yearly value of 461*l.*, with a glebe-house, in the rural deanery of Stoke, the archdeaconry of Surrey, and the diocese of Winchester. There were, in 1833, one infant-school with 52 children of both sexes; two national schools, with 207 children, namely, 109 boys and 98 girls; two Lancasterian schools, with 270 children, 140 boys and 130 girls; six other day-schools, with 225 children, namely, 137 boys and 88 girls; and two Sunday-schools, with 184 children, namely, 53 boys and 131 girls.

Kingston is in the hundred of Kingston, 13 miles from the General Post-office, London, on the Portsmouth road. It is on the east or right bank of the Thames, from which circumstance it is sometimes called Kingston-upon-Thames, to distinguish it from other Kingstons. The area of the parish, comprehending the town and the hamlets of Ham-with-Hatch and Hook, is 7300 acres: the total population in 1831 was 7257, namely, the town 5989, Ham-with-Hatch 1079, Hook 189. Many Roman antiquities have been found near the town, and some antiquaries have contended for this being the spot where Cæsar passed the Thames. There is thought to have been a Roman town or settlement a little to the east of the present town. It was a place of note in the Anglo Saxon times: several of the Anglo-Saxon princes were consecrated here. The name is written in the MSS. of the Saxon-Chronicle Cingestune and Cyningestune: in 'Domesday,' where it is enumerated among the 'King's Manors,' it is called Chingestune. The first charter granted to the town was by John (A.D. 1199), and it sent members to parliament in the reigns of Edward II. and Edward III., but not since. Here Sir Thomas Wyat crossed the Thames in his attempt to possess himself of London. Here the Earl of Holland, with the Duke of Buckingham, and his brother Lord Francis Villiers, attempted to revive the Royalists' cause, in 1648, when a skirmish took place with some troops of parliamentary horse sent from Windsor to suppress the rising, in which skirmish the Royalists were defeated and Lord Francis Villiers slain. The town extends about half a mile along the banks of the river, and about a quarter of a mile inland from it. It is irregularly laid out, at the junction of the Hog's Mill river with the Thames: the streets are watched, and lighted with gas, under a local act. The houses are of ordinary appearance. There are houses extending, with little interruption, a considerable distance from the town along the roads to London and to Portsmouth. The church is an antient building, but has undergone from time to time numerous alterations and repairs: it is cruciform, and has an ancient tower rising from the intersection of the nave and transept. There are meeting-houses for different classes of Dissenters. There are a modern county court-house and a county house of correction. The town-hall is of the Elizabethan period; and there is a borough gaol of more modern date, a convenient building, used only for debtors, criminals being sent to the county house of correction. There is a grammar-school held in an antient building formerly a chapel dedicated to St. Mary Magdalen, and there are large national school-rooms for boys and girls, and a school-room for the infant-school. The bridge over the Thames is of stone, with five arches: it was erected a few years since, at an expense of 40,000*l.*, in place of the ancient wooden bridge which previously stood here. The chief business of the town is malting, which is extensively carried on: there is also a considerable coal-trade. There are brick and tile works, and market-gardens round the town, and breweries and oil-mills in it. There is a market on Saturday, for corn, cattle, pigs, and provisions; another market, held on Wednesday, has been discontinued. There are three yearly fairs, but only one of them, a cattle, sheep, and horse fair, held in November, is of any importance. Kingston is near the line of the London and South-Western Railway. The corporation enjoys certain privileges and jurisdiction in the manor of Kingston, which, besides the parish of Kingston, includes the parishes of Petersham and Long Ditton, and other districts: it has also other privileges in the hundreds of Kingston, Elmbridge, Copthorne, and Effingham. Under the Municipal Reform Act there are six aldermen and eighteen councillors. The manor, which is regarded as the borough, is divided into three wards by the same act, and has a commission of the peace. A more restricted boundary has been proposed, yet extended in one direction so as to include Hampton-wick, on the Middlesex side of the bridge. General sessions of the peace are held at Easter and Michaelmas, and petty sessions weekly; besides which the Michaelmas quarter-sessions and the spring assizes for the county are held here, and the county magistrates hold petty sessions weekly. The court of record, which is held weekly, has jurisdiction in the four hundreds mentioned above. The ordinary yearly revenue of the corporation is above 700*l.* The living is a vicarage, united with the vicarage of Richmond, of the joint clear yearly value of 888*l.*, in the rural deanery of Ewell, in the archdeaconry of Surrey, in the diocese of Winchester. There were in the parish, in 1833, one infant-school in the town, with 80 children of both sexes, and another in the hamlet of Ham with 35 children; two day and Sunday national schools, with 340 children, namely, 240 boys and 100 girls; two other day and Sunday schools, endowed, with 80 children, 40 boys and 40 girls; thirty other day-schools, with 605 children, namely, 279 boys and 326 girls: and three Sunday-schools, with 274 children, namely, 126 boys and 148 girls.

Of the villages and parishes which adjoin the metropolis on the south, we first notice Rotherhithe. This parish lies in an angle of the river Thames, at the north-east corner of the county, and has an area of 690 acres. It has one long narrow street winding along the bank of the river, and a number of smaller streets or lanes. A considerable part of the lower road to Deptford is in it. The houses are generally of the poorer sort, and a large part of the inhabitants consists of seamen, watermen, or persons connected with shipping, and with the trades which supply shipping. The church was built early in the last century: it is a plain brick building with stone quoins, with a square tower, surmounted by a stone spire, at the west end. Among the monuments in the churchyard is that of Prince Lee Boo. The population of the parish in 1831 was 12,875. The Grand Surrey Canal and the basins connected with it are wholly in this parish, also the Commercial Docks and ponds, and the East Country Docks. There are several ship-building yards, timber-yards, and other establishments connected with the ship-building business. There are also iron-works, corn-mills, and extensive granaries and warehouses for goods. The Thames Tunnel, now almost completed, has one of its entrances near Rotherhithe church. The living is a rectory, of the clear yearly value of 772*l.* Three new churches or episcopal chapels have been erected, and there are several places of worship for Dissenters. There were in 1833 twenty-eight day-schools of all descriptions, with 852 children, namely, 493 boys and 359 girls; and five Sunday-schools, with 750 children, namely, 338 boys and 412 girls. Among the day-schools were the 'Free Charity and Amicable Society Schools,' with 150 boys and 50 girls; the 'United Society School,' supported by subscription, with 51 boys; and a charity-school with 50 girls, 20 of whom were clothed by the institution.

Bermondsey is on the south bank of the Thames, and lies between Southwark on the west and Rotherhithe on the east. The area of the parish is 620 acres. This parish is noticed in 'Domesday,' where it is called *Bermundeseye:* it had a Cluniac priory, founded by Aylwin Child, a citizen of London, A.D. 1082: the yearly revenues at the dissolution were 548*l.* 2*s.* 3¾*d.* gross, or 474*l.* 14*s.* 4¾*d.* clear. Bermondsey now consists of a number of paved streets and roads with flagged footpaths, lined in some few parts with tolerably good houses, but more commonly by others of an inferior description. The old church is a building of little architectural pretension; but there is a new church (St. James's) of good appearance, and there are some dissenting meeting-houses. The population, in 1831, was 29,741. Near the water-side there are wharfs, and the various trades connected with shipping are carried on; and in that part of the parish which lies back from the river there are many tan-yards. There is a considerable extent of ground occupied by market-gardens. The London and Greenwich Railroad runs through the parish. The living is a rectory, of the clear yearly value of 514*l.*, with a glebe-house: the perpetual curacy of St James's Church, to which the rector presents, is of the clear yearly value of 300*l.* There were, in 1833, ninety-one day-schools of all kinds, including an infant-school with 60 children, namely, 35 boys and 25 girls; the Bermondsey Free-school, supported by endowment, with 80 boys; and six schools supported by subscription, namely, the United Charity-School, with 193 boys, 50 of whom were clothed by the institution; another charity-school with 126 girls; a Lancasterian school with 300 boys; two Catholic schools, with 150 boys and 100 girls; and another school with 20 boys and 32 girls. There were also five Sunday-schools.

Rotherhithe and Bermondsey are, for parliamentary purposes, included in the borough of Southwark.

Newington adjoins the south side of Southwark, and is bounded by Lambeth parish on the west, and on other sides by the parish of Camberwell. Newington is in great part incorporated with the metropolis: it includes several important thoroughfares, as one side of Newington Causeway and of the Brighton road, and both sides of Great Dover Street, the great southern and south-eastern outlets of the metropolis. It includes also the village or hamlet of Walworth, on the Camberwell and Norwood road. The streets generally have flagged footpaths, and are lighted with gas. The principal thoroughfares and some other streets have a number of good houses; but the back streets, for the most part, have houses of an inferior description. The old church is a heavy, ugly building; but the new churches, Trinity Church, Trinity Square, and St. Peter's, Walworth, are of better character. There are several dissenting meeting-houses. The county court-house, where the winter sessions are held, and one of the county prisons, are at Newington. The population of Newington parish, in 1831, was 44,526. The living is a rectory, of the clear yearly value of 1300*l.*, with a glebe-house: it is in the peculiar jurisdiction of the archbishop of Canterbury. There were in the parish, in 1833, one hundred and seventy day-schools of all kinds and ten Sunday-schools. Among the day-schools were, an infant-school, with 140 children, namely, 87 boys and 53 girls; a national school, with 515 children, namely, 330 boys and 185 girls; a Lancasterian school, with 350 boys; the Walworth Charity-School of Industry, with 100 girls; and the York Street Charity-School, with 70 girls.

Camberwell is an extensive parish, extending from the boundaries of Rotherhithe and Bermondsey on the north to Croydon on the south: its area is 4570 acres: the population, in 1831, was 28,231 The village of Camberwell adjoins Walworth on the south, and consists of four principal thoroughfares meeting in an open green, and leading respectively to London by Walworth, to Deptford by Peckham, to Kennington and to Norwood by Denmark and Herne hills. These thoroughfares are lined with good houses, especially in the direction of Denmark and Herne hills, which are lined by a succession of genteel villa residences pleasantly situated. Camberwell old church, an antient building, was destroyed by fire not long since, and has not yet been rebuilt. There is a new church, St. George's, near the Grand Surrey Canal. A chapel on Denmark Hill is in the parish of Lambeth. The living of Camberwell is a vicarage, of the clear yearly value of 1820*l.*, with a glebe-house: the perpetual curacy of St. George's, in the gift of the vicar, is of the clear yearly value of 500*l.*

Peckham is a hamlet of Camberwell, which it adjoins on the east: it consists of the main street on the road from Camberwell to Deptford, and of some others. There are a number of good houses, especially those which have been built round a large common called Peckham Rye. One of the new cemeteries for the metropolis is at Nunhead, near Peckham Rye. Peckham has two episcopal chapels of no architectural pretension, and several dissenting places of worship.

Dulwich lies in a hollow about 2 miles south from the village of Camberwell, and consists of a number of genteel pleasant residences. The only buildings requiring notice are, the College of God's Gift, which has been much improved in appearance during the last few years; and the episcopal chapel, a plain building, at East Dulwich: behind the college is a picture-gallery, containing some fine paintings, chiefly by the old masters. [ALLEYN; BOURGEOIS.]

Norwood is south from Dulwich: it has a number of scattered villa residences; a mineral spring, the Beulah Spa, in a pleasure-ground delightfully laid out; two episcopal churches, one of Grecian, the other of Gothic architecture; and a large public cemetery, with episcopal and dissenting chapels for performing the burial service. Norwood is partly in Lambeth, partly in Croydon parish.

Brixton is a hamlet of Lambeth parish, and contains a number of genteel residences on the Brighton road. There is a new church, St. Matthew's, at the foot of Brixton Hill; an episcopal (formerly dissenting) chapel in North Brixton; and there are several dissenting meeting-houses. On Brixton Hill is a house of correction for the county, and a handsome building for the St. Ann's Society Schools. There are also some almshouses, built and endowed by the late Thomas Bailey, Esq. The perpetual curacy of St. Matthew's is of the clear yearly value of 650*l.*

Kennington adjoins Brixton on the north: it comprehends a tolerably extensive common, on which a handsome new church (St. Mark's) has been erected, and roads leading from this common in various directions: there are a number of good houses round the common and along the main lines of road: in some of the back streets are also some genteel residences. There was formerly a royal palace at Kennington. There are three proprietary episcopal chapels besides St. Mark's Church: there are also some dissenting chapels. South of Kennington, on the Clapham road, is Stockwell, where is a chapel-of-ease. Both Kennington and Stockwell are in Lambeth parish. The clear yearly value of the perpetual curacy of St. Mark's is 700*l.*

Clapham lies south-west of Stockwell, on the road from London to Epsom, Horsham, and Worthing. It is mentioned in 'Domesday,' where it is called Clopeham. The area of the parish is 1070 acres: the population, in 1831 was 9958. Clapham Common, an open space of about 200 acres, partly in this parish and partly in Battersea, is planted with trees, so as to present the appearance of a park, and is surrounded by handsome houses. There are also a number of handsome houses along the road from London to the common. At one corner of the common is the parish church, a plain brick building. There are two episcopal chapels; St. Paul's, on the site of the old parish church, and St. James's, a modern building of Gothic architecture, in what is termed Clapham Park. There are some dissenting places of worship. The living of Clapham is a rectory, of the clear yearly value of 1275*l.*, with a glebe-house. The clear yearly value of the perpetual curacies of St. Paul's and St. James's is 200*l.* and 500*l.* respectively.

Wandsworth is on both sides of the river Wandle at its junction with the Thames. It is about 7 miles from the General Post-office, on the old Portsmouth road. The Lon don and South-Western Railway and the Surrey Iron Railway run through the parish. Wandsworth is called in 'Domesday' Wandesorde and Wendlesorde. The area of the parish is 1820 acres: the population, in 1831, was 6879. The main street is along the Portsmouth road. There are some good mansions, inhabited chiefly by wealthy Londoners. There are manufactures of British matting, bed-sacking, bolting-cloths, wire-blinds, candles, and hats: there are a distillery, vinegar-works, malthouses, breweries, dye-houses, corn and paper mills, an iron-foundry, lime-kilns, coal-wharfs, and calico print-works. The church is a plain modern building; and there are two chapels-of-ease, St. Anne's and Summer's Town chapels; and some dissenting places of worship. There are gas-works, a police-station, a savings-bank; and infant, national, and Lancasterian schools; and a school of industry, besides a number of private schools. In Garrett Lane, between Wandsworth and Tooting, it was customary to hold a mock election on the meeting of every new parliament; but this piece of burlesque has been discontinued for several years: it gave subject and title to one of Foote's dramatic pieces. Several of the French Protestant refugees in the seventeenth century settled at Wandsworth. The living is a vicarage, of the clear yearly value of 840*l.*, with a glebe-house: the perpetual curacy of St. Anne's Chapel is of the clear yearly value of 162*l.*

Putney adjoins Wandsworth on the west, on the road to Richmond, and lies on the bank of the Thames, across which there is a wooden bridge, erected in the early part of the last century, connecting this village with Fulham in Middlesex. The area of the parish is 2280 acres; the population in 1831 was 3811. A bridge of boats was thrown over the river at Putney by Fairfax, in the great civil war, and the army made it their head quarters in 1647. Thomas Cromwell, earl of Essex, and Gibbon the historian, were natives of Putney. The place is of little trade. The church is chiefly of the time of Henry VII., but some parts are older: at the east end of the south aisle is a little chapel, built by West, bishop of Ely, in the time of Henry VIII.: this chapel is adorned with rich tracery. There is a dissenting place of worship. At Roehampton, a hamlet of Putney, near Richmond Park, are some handsome villas. The living of Putney is a perpetual curacy, in the peculiar jurisdiction of the archbishop of Canterbury, of the clear yearly value of 362*l* There are a national and an infant school. Battersea is described elsewhere. [BATTERSEA.]

Tooting lies south-west from Clapham, and south-east from Wandsworth: it comprehends Upper and Lower Tooting. Upper Tooting is a hamlet of Streatham: Lower Tooting, or Tooting Graveney, is a separate parish, whose area is 680 acres; the population in 1831 was 2063. The principal street of Upper Tooting lies along the Horsham and Worthing road: Lower Tooting is partly on, partly to the left of the road. The parish church of Lower Tooting has been rebuilt within the last ten years, and is a handsome building: there is a chapel-of-ease at Upper Tooting, or rather on Balham Hill, close to it; and there are some dissenting places of worship. The living of Lower Tooting is a rectory, of the clear yearly value of 374*l.*, with a glebe-house. There are two national schools, an endowed parochial school, and an infant-school.

Streatham lies south from Brixton, on the Brighton road. Its name is supposed to be derived from its situation on the Roman road from London into Sussex. The area of the parish is 2770 acres: the population in 1831 was 5068. The principal street extends along the Brighton road, and in it are a number of handsome villas. There is a mineral spring at Streatham, the waters of which are regarded as of some virtue in scorbutic complaints. The church was partly rebuilt about ten or twelve years since: there are Independent and Wesleyan meeting-houses. There are an infant-school and a national school in Streatham parish. The living is a rectory, of the clear yearly value of 1136*l.*, with a glebe-house.

Rotherhithe and Bermondsey are included in the parliamentary (but not in the municipal) borough of Southwark: Newington, with Walworth, Camberwell, Peckham, Brixton (partially), Kennington, and Stockwell, are in the parliamentary borough of Lambeth. All the villages described above are in Brixton hundred, and all the parishes are in the rural deanery of Southwark.

Mortlake is in Brixton hundred, on the south bank of the Thames, between Putney and Richmond. The area of the parish is 1910 acres the population in 1831 was 2698. There are a number of handsome residences on the bank of the Thames. Mortlake church is antient, and there is an Independent chapel. Barnes (area of parish, 820 acres; population, in 1831, 1417) adjoins Mortlake on the east, and Kew (area 230 acres; pop. in 1831, 1837), where was a royal palace, now demolished, adjoins it on the west. The gardens of Kew Palace contain a very extensive and complete collection of exotic plants. There is a stone bridge over the Thames at Kew. Kew church was built early in the last century, and has been enlarged since then. There are several market-gardeners in and round these villages, and there are malthouses and a pottery at Mortlake, where also some trade is carried on in corn and coals. Mortlake is a perpetual curacy, in the peculiar jurisdiction of the archbishop of Canterbury, of the clear yearly value of 132*l.* Barnes is a rectory, of the clear yearly value of 375*l.*, with a glebe-house; and Kew a vicarage, united with the chapelry of Petersham, a village between Richmond and Kingston, their joint clear yearly value being 401*l.* Barnes, Kew, and Petersham are in the rural deanery of Ewell, in the archdeaconry of Surrey, and diocese of Winchester.

Richmond is on the south-east bank of the Thames, which here flows to the north-west, 11 miles from the General Post-office, London. The area of the parish (which is in Kingston hundred) is 1230 acres; the population in 1831 was 7243. There was a royal residence here in the time of the Plantagenets. The village was called Sheen before the time of Henry VII., who rebuilt with great magnificence the royal palace, which had been burned down A.D. 1499, and called the place Richmond, from his having borne the title of earl of Richmond before his accession. Richmond Palace was a favourite residence of Queen Elizabeth, who died here A.D. 1603. It was pulled down in part in the middle of the seventeenth century, and still further demolished in the eighteenth. Its site is now occupied by houses built on the crown lands, which have been leased, but some of the offices yet remain. The present park is to the south-east of the village. It was enclosed by Charles I., in whose time it was called 'The New Park:' it is about eight miles round, enclosed by a brick wall, and comprehends 2253 acres; only a small part is in Richmond parish. The Old Park, or the Little Park, which was formed by the union of two previously existing parks, distinguished from each other by the respective epithets of 'great' and 'little,' or sometimes of 'old' and 'new,' is on the north west and north sides of the village; it comprehended, in 1649, 349 acres. It was partly occupied as a grazing-farm in the time of George III., and was partly laid out in gardens, which were enlarged and united with those of Kew. In the gardens stands the observatory built by George III. The lodge which adjoined this park was the occasional residence of George II., his queen Caroline, and George III.: it is now pulled down. There was antiently a Carthusian priory at Richmond. It was restored after the general suppression by Queen Mary I., but existed at Richmond only a year. The members on the second suppression retired to Flanders, where the community still existed till late in the last century.

Richmond is delightfully situated on the side and summit of an eminence on the banks of the Thames, over which there is a handsome stone bridge. Along the brow of the hill is a line of genteel houses, with a terrace in front commanding a prospect of exceeding richness and beauty; and along the banks of the river are some delightful villas and grounds. Richmond is a favourite place of resort in summer for the inhabitants of London, with which there is at that season communication several times a day by steam-boats and omnibuses. The parish church is a neat brick building of modern erection. In the church or churchyard are the tombs of Kean, the tragedian, of Gilbert Wakefield, and of Dr. John Moore, the author of 'Zeluco.' There is also a brass plate with an inscription to the memory of Thomson, the poet, who died at Richmond in 1748. There is a chapel-of-ease, and there are places of worship for Independents, Baptists, Wesleyan Methodists, and Roman Catholics, the latter a very neat structure. Richmond has little other trade than such as is necessary for the supply of the inhabitants and visitors: it has some handsome inns and hotels. There are two or three malthouses and breweries, and some market-gardens and nursery-grounds in the vicinity. There are a literary and scientific institution, a Mechanics' Institution, a dispensary, a savings-bank, an infant and a national school, and several private schools, especially boarding-schools. The living is a vicarage, united with that of Kingston.

Wimbledon is in Brixton hundred, west of Tooting, between the Portsmouth and Worthing roads. The parish comprehends 3700 acres; the population, in 1831, was 2195. Wimbledon park extends northward to the Portsmouth road, and comprehends an area of 1200 acres: it belongs to Earl Spencer. West of the park is Wimbledon Common, nearly as extensive, on which is an antient circular entrenchment. The church is a modern building. There are meeting-houses for Independents and Wesleyan Methodists. Merton is in Brixton hundred, and on the Worthing road: it adjoins Wimbledon on the south. The parish has an area of 1540 acres: the population, in 1831, was 1447. Mitcham is in Wallington hundred, between the Worthing and Brighton roads: the area of the parish is 2670 acres; the population, in 1831, was 4387. Merton had an abbey for the regular canons of St. Augustin, the yearly revenues of which at the dissolution were 1039*l.* 5*s.* 3*d.* gross, or 957*l.* 19*s.* 5½*d.* clear. Merton has some historical interest: its abbey was the place of meeting of the assembly which enacted the 'Provisions of Merton.' [HENRY III.] Part of the outer walls and the east window of the abbey chapel are still standing. Merton church has some Norman and early English portions, mingled with others of later date: Mitcham church has some portions of perpendicular date. The river Wandle flows through these three villages, and contributes to manufacturing operations. There are several establishments for printing calicoes and silks; and there are considerable copper-works; leather-dressing is carried on; and there are several flour, snuff, and drug mills, and two or three malthouses and breweries, and gardens and fields for aromatic and medical herbs. Mitcham is a vicarage; Merton and Wimbledon are perpetual curacies: their respective yearly values are 456*l.*, 93*l.*, and 170*l.*: Mitcham and Merton have glebe-houses: all are in the rural deanery of Ewell.

Ewell is about 13 miles from the General Post-office, on the Worthing road. The parish, which is partly in Copthorne, partly in Reigate hundred, has an area of 2410 acres; the population, in 1831, was 1851. The village is in Copthorne hundred, near the foot of Banstead downs. A little to the east of it, but in Cuddington parish, are the remains of Nonsuch Palace, built with great magnificence by Henry VIII. The streets of Ewell are well paved. The market has been discontinued, but there are two yearly fairs, one of them a very large sheep-fair, and considerable trade is carried on. There are a brick, tile, and pottery work, and several corn and gunpowder mills. The living is a vicarage, united with the perpetual curacy of Kingswood chapel, of the clear yearly value of 277*l.*, in the rural deanery of Ewell.

Along the road that leads by the foot of Banstead downs from Ewell to Croydon are the villages of Cheam, Sutton, Carshalton, Wallington, and Beddington, all in Wallington hundred. Beddington and Carshalton are on the Wandle, and had, in 1831, a joint population of 3348. There are several flour-mills, and there are drug, snuff, flock, paper, and oil mills, a silk and woollen print-work, and a distillery of mint and lavender water. Some leather-dressing is also carried on. Carshalton church has some early English and some decorated English portions. Beddington church is handsome, with a fine tower: it is mostly built of flint and stone, and is of perpendicular character.

Leatherhead is nearly midway between Epsom and Dorking, on the Worthing road. The parish, which is in Copthorne hundred, had, in 1831, a population of 1724. The village has little trade: some malting, brewing, and tanning is carried on. It had formerly a market, now disused. The church is antient and cruciform; the chancel is of decorated character, the north transept perpendicular. There is an Independent chapel.

Walton-on-Thames is in Elmbridge hundred, on the south bank of the Thames, about 4 or 5 miles west of Kingston. The population in 1831 was 2035. It is near the line of the London and South-Eastern Railway. It has a number of handsome villas and mansions, among which are Oatlands, the residence of the late duke of York. There is a church of considerable antiquity, and an Independent chapel. South-east from Walton, on the Portsmouth road, is Esher, near which is Claremont House and park, the residence of the late princess Charlotte of Wales, who died there.

Egham is near the north-western boundary of the county, on the banks of the Thames, on the high road to Salisbury 21 miles from the General Post-office through Hounslow and Staines. The principal street extends for above a mile on the high road, and contains a number of respectable houses. The parish has an area of 7440 acres: the population in 1831 was 4203. There are a parish church, a modern brick building, and a Wesleyan chapel. In the parish, near Virginia Water, above a mile from the town, a new church has been erected. Egham has a good local trade. North of the village, on the bank of the Thames, is Runnymead, where King John signed Magna Charta. The living of Egham is a vicarage, of the clear yearly value of 575*l.*, with a glebe-house.

Divisions for Ecclesiastical, Legal, and Parliamentary Purposes.—The county is wholly in the diocese of Winchester, in which it constitutes the archdeaconry of Surrey. It is divided into three rural deaneries, Ewell, Southwark, and Stoke; antiently there were four, Ewell, Southwark, Guildford, and Croydon; Guildford is now Stoke, and Croydon has been chiefly united to Ewell. Some other alterations have been made, but they are of little moment. The number of ecclesiastical cures of all kinds is as follows:—

Rural Deaneries.	Rectories.	Vicarages.	Perp. Curacies.	Donatives.	Chapelries.	Total Cures.
Ewell .	27	18	14	2	7	68
Southwark	15	3	16	1	19	54
Stoke .	35	15	12	1	8	71
	77	36	42	4	34	193

The county is in the Home circuit, except that for criminal offences the parts of the county nearest to the metropolis are in the district of the Central Criminal Court. The spring assizes for the county are constantly held at Kingston: the summer assizes alternately at Guildford and Croydon. The Epiphany quarter-sessions for the county are held at the sessions-house, Newington; the Spring sessions at Reigate; the Midsummer sessions at Guildford; and the Michaelmas sessions at Kingston.

There are county prisons at Newington (Horsemonger Lane), Brixton, Kingston, Guildford, and Croydon. The prison in Horsemonger Lane, Newington, is of quadrangular form, the airing-yards of the criminal division being enclosed within the building, which consists of three stories above the basement. Part of the building is appropriated to debtors. The construction of the prison is defective, according to the present system of prison discipline; but it is solidly built, and in substantial repair. The number of prisoners confined here in the course of the year is very great. The management is very imperfect. The prison at Brixton is a semi-octagonal building, with the chapel in the middle, in a healthy situation on the rise of Brixton Hill: it is used exclusively as a house of correction. The construction of the prison is defective; but the general management, cleanliness, and order are very creditable. It was in this prison that the first treadmill was erected. The prison at Kingston consists of three or four detached buildings badly constructed and arranged. It is small and insufficient, though the number of prisoners is not great; so that the discipline is necessarily very defective. The prisoners are persons under summary conviction, prisoners intended to be admitted as witnesses on behalf of the crown, and persons remanded for re-examination. Guildford prison is on an eminence near the Wey, within a quarter of a mile of the town: it is solidly built and in good repair, and though of better construction than was usual at the time it was built, is defective when considered in reference to the improvements which have been made in prison discipline. The prison at Croydon is small, having only four cells and a large day-room: it is used as a lock-up house for prisoners charged with felonies or misdemeanors in Croydon parish, for persons committed by the court of requests, and for prisoners brought here for trial when the assizes are held at Croydon. There are, besides these, three prisons in the borough of Southwark, namely, the Queen's Bench and the Marshalsea prisons and the Borough Compter.

Before the Reform Act, fourteen members were returned to the House of Commons from the county of Surrey; two for the county itself, and two each for the boroughs of Southwark, Guildford, Haslemere, Gatton, Blechingley, and Reigate. By the Reform Act Haslemere, Gatton, and Blechingley were altogether disfranchised, and Reigate was reduced to one member: but the county was formed into two divisions, each returning two members, and the borough of Lambeth was created, which returns two members, so that the present number of members sent from Surrey is eleven; two for each division of the county, two each for Southwark, Guildford, and Lambeth, and one for Reigate.

The two divisions of the county are as follows:—East Surrey comprehends the hundreds of Brixton, Kingston, Reigate, Tandridge, and Wallington: the court of election is held at Croydon; and the polling-places are Croydon, Reigate, Camberwell, and Kingston. West Surrey comprehends the hundreds of Blackheath, Copthorne, Effingham, Elmbridge, Farnham, Godalming, Godley, Woking, and Wotton: the court of election is held at Guildford; and the polling-places are Guildford, Dorking, and Chertsey.

The parliamentary constituency in the years 1835-6 and 1839-40 was as follows:—

	1835-6.	1839-40.
East Surrey . . .	5308	..
West Surrey . . .	3681	..
Southwark . . .	5388	5047
Lambeth . . .	7154	6547
Guildford . . .	430	495
Reigate . . .	195	198

The returns for 1839-40 do not include the county of Surrey, for what reason is not stated.

The boundaries of Southwark, Guildford, and Reigate were enlarged by the Boundary Act. The important parishes of Bermondsey, Rotherhithe, and Christchurch, and the Clink liberty in St. Saviour's parish, were added to Southwark: the districts thus added contained, in 1831, a population of about 60,000. The parts added to Guildford contained a population of about 1100: those added to Reigate contained a population of about 3400. The borough of Lambeth comprises the parish of Newington and parts of Camberwell and Lambeth parishes, with a population, in 1831, of nearly 155,000.

History and Antiquities.—At the earliest historical period this county seems to have been, for the most part, included in the territory of the Regni (Ῥῆγνοι, as Ptolemy writes the name), a nation, probably of the Belgic stock, who occupied also the adjacent county of Sussex. Probably some parts of the eastern border were included in the territory of the Cantii, who occupied Kent, and perhaps some parts of the western border may have belonged to the Atrebates, another Belgic nation, who inhabited Berkshire and Hampshire. Manning would identify the Regni with the Segontiaci of Cæsar; but we are not aware of any other reason for this than that Cæsar does not mention the Regni by name, and as he certainly marched through their territories, it is probable that they are mentioned by him under some other. Richard of Cirencester, who calls the Regni *Rhemi*, identifies them with the Bibroci of Cæsar, which is a more probable conjecture than Manning's. In his second expedition Cæsar advanced westward from Cantium, or Kent, through this county to the Thames, which he crossed probably at a ford at Coway Stakes, near Walton-on-Thames, though some fix his passage at or near Kingston. Gale observed traces of a camp, which he supposed to be Roman, about a mile and a half south of the ford at Coway Stakes. Several antient entrenchments are still existing in the county: on Bagshot Heath, about 4 miles beyond Egham, there is a very large one, in form approaching a parallelogram; on St. George's Hill, between Weybridge and Cobham, is another of irregular form, following the shape of the hill on which it stands; on Wimbledon Common is a third, of circular form; near Farnham, partly in this county and partly in Hampshire, is another, popularly called 'Cæsar's Camp,' of irregular form, following the brow of the hill on which it stands; and in Manning's 'Hist. of Surrey,' Roman camps at Anstey, in Milton Manor, near Dorking, at Holmbury Hill, on Hurtwood Common, and at Hascombe, near Godalming, are mentioned. There is a piece of ground on Worms Heath, near Chelshum, between Croydon and Titsey, called 'the camp;' the ground is broken by irregular pits and banks, but no lines can be traced.

Surrey was included in the Roman province of Britannia Prima. No Antonine station is ascertained to have been in it; though Londinium (London) and Pontes (Staines) were close on the border, in Middlesex, and Noviomagus the Νοιόμαγος of Ptolemy, the capital of the Regni, was probably at Holmwood Hill, close on the eastern border, in Kent.

It is probable that several Roman roads crossed this county: the most remarkable and best known is that which ran from Londinium. Its direction does not appear to be ascertained until it reached Woodcote park, near Epsom: it probably passed through Streatham and Wallington near Croydon. Some writers make the road to have passed through Tooting, Merton, and Ewell, nearly in the line of the present road. Beyond Woodcote park it appears to have run over Mickleham downs to Dorking, and from thence by Ockley, beyond which it is known as Stone-Street Causeway, into Sussex. Possibly there was a branch from Dorking westward, in the direction of Guildford and Farnham, into Hampshire.

Another road is supposed to have run into Sussex near East Grinstead. It is supposed to have branched from the road just described near Croydon; but if the opinion be adopted that the road described above ran not by Croydon, but by Ewell, this road must have branched from it much nearer London: in which case it probably ran through Streatham (which appears to have received its name from being on a street or Roman road), and from thence south by Godstone (near which is a place called Stratton, with the traces of an antient fortification), and so into Sussex. Some antiquaries fix Noviomagus at Woodcote near Croydon. It is probable that the Roman road from Londinium to Calleva and Sorbiodunum (Silchester and Old Sarum) crossed the north-western border beyond Staines. Traces of Roman buildings have been found in various places, as at Albury near Guildford, at Guildford, where some Roman bricks have been incorporated in the castle walls, at or near Kingston, and on Walton heath, Walton-on-the-Hill, north-east of Dorking.

It seems most likely that Surrey was, in the earlier period of the Heptarchy, a part of the kingdom of Wessex, not, as is commonly supposed, of Sussex. It was included, as it appears, from the earliest period in the West Saxon diocese of Winchester; and the earliest hostilities which broke out among the Anglo-Saxons, after their settlement in Britain, was the war between Ethelbert of Kent and Cealwin of Wessex, whose territories it is reasonable to suppose were conterminous. Added to this, Wibbandune, where the battle which decided that war was fought, and which is generally supposed to have been Wimbledon in Surrey, was in all probability in the territory of one of the contending parties, and not within the limits of a third and neutral state; and as Ethelbert was the aggressor, it was probably in the territories of Cealwin. In the later period of the Heptarchy it appears however not to have been an integral part of the territory immediately governed by the West-Saxon kings, but to have constituted a detached principality governed by a sub-regulus or dependent king. Whether this was the case from the first settlement of the Saxons is not clear: but if a judgment may be formed from its name, 'Suth rige,' 'the southern kingdom,' which is descriptive of its situation relative not to Wessex, nor to Sussex, but rather to Middlesex and the other Mercian territories, it was perhaps detached from Wessex by the Mercian kings as they rose to supremacy, and by them formed into a separate state. Thus much is certain, that in the middle part of the seventh century it was governed by Frithewald as sub-king, under the supremacy, not of the king of Wessex, but of Wulfhere of Mercia, who also conquered the Isle of Wight, and obtained the supremacy over Sussex. From this time Surrey appears to have depended on Wessex or Mercia, as the power of one or the other preponderated. In A.D. 785, Cynewulf, king of Wessex, was killed at Merantune, probably Merton, where he was visiting a lady, by Cyneheard his kinsman, a dependent prince whom he had wished to deprive of his principality, which, from the scene of this catastrophe, was probably Surrey. Cyneheard was slain next day, with his adherents, by the West Saxon nobles. At this time then Surrey appears to have been dependent on Wessex; but it must soon after have been detached from it, for the inhabitants are said willingly to have submitted to Egbert (A.D. 823), from whose government they had been for some years withheld. From the manner in which the transaction is recorded, it seems likely that Surrey and Sussex had been added, probably by Cenwulf of Mercia, to the kingdom of Kent, which was itself a dependency of Mercia, and which the Mercian kings would naturally desire to strengthen at the expense of Wessex. After the supremacy of Wessex had been finally established by Egbert, Kent, in this enlarged extent, continued to exist as a separate but dependent kingdom.

On the death of Egbert (A.D. 837) his son Ethelwulf succeeded him as king of Wessex, and Athelstan, son of Ethelwulf, as sub-king of Kent. By one or both of these princes the Danes were defeated with great slaughter (A.D. 851) at Aclea or Ockley in Surrey. In 853 the men of Surrey assisted in defeating the Danes in the Isle of Thanet; but lost their Ealdorman, or governor, Huda, or Wada, who was slain in the action. The history of the subsequent period is obscure. On the death of Athelstan it appears that Ethelbert, third son of Ethelwulf, succeeded as sub-king of Kent; but when Ethelwulf was dethroned from Wessex by his second son Ethelbald, he took the title of king of Kent, with a nominal supremacy over Ethelbald. Whether Ethelbert resigned the government of Kent to his father Ethelwulf, or shared it with him, or whether Ethelwulf had no more than a nominal power anywhere, is not clear. On the death of Ethelwulf (A.D. 856 or 857) Ethelbert reigned in Kent; and on the death of Ethelbald (A.D. 861) Ethelbert succeeded both to Kent and Wessex, which for several reigns remained under the same king. In all these arrangements Surrey seems to have formed part of the kingdom of Kent.

In the war of Ethelred or Ethered I., with the Danes, the king and his brother Alfred were defeated at Mere-tune, probably Merton in Surrey (A.D. 871), and Ethelred received a wound, of which he died soon after. In the struggle of Alfred with the Danish chieftain Hasten or Hastings, the Danes were beaten by the king's army at Farnham (A.D. 894). It is possibly to some period of the struggle between the Anglo-Saxons and the Danes that we may refer the couplet quoted by Camden:—

'The vale of Holmsdall
Never wonne, ne never shall.'

Holmesdale is the valley under the southern side of the North Downs, between them and the green-sand hills.

Some of the Anglo-Saxon kings were consecrated at Kingston; Athelstan, A.D. 925, and Ethelred II., A.D. 979. In A.D. 1042, the Anglo-Danish king Hardhacnute, or Hardicanute, died through excessive drinking at Lambeth.

It was a little before this time that Alfred, son of Ethelred II., was seized at Guildford, his eyes put out, and his followers massacred.

After the Conquest, William, Earl Warrenne, a follower and son-in-law of William the Conqueror, received the grant of many lordships in Surrey, and was by William Rufus, soon after his accession (A.D. 1087 or 8), made earl of Surrey. On the extinction of the male line, in the person of his grandson (A.D. 1148), the earldom passed to William of Blois, son of King Stephen, and to Hamelin Plantagenet, natural brother of Henry II., who successively married the heiress of the House of Warrenne, and in the family of the latter, in the male line, it continued till A.D. 1347. From this line the earldom of Surrey passed to the families of Fitz-alan (A.D. 1347), Holland (A.D. 1397), Fitz-alan again (A.D. 1400), then, after a period in which it was dormant, to the families of Mowbray (A.D. 1451), Plantagenet (A.D. 1476-7), and Howard (about 1483-4), in which last family it has remained ever since. It is the second title of the duke of Norfolk, and is given by courtesy to his eldest son.

In A.D. 1215, the Great Charter and the Charter of the Forests (Magna Charta and Charta de Foresta) were signed by John at Runnymead, near Egham, on the border of this county. By Henry III. the whole county, which had been gradually afforested by his grandfather Henry II. as a part of Windsor Forest, was, with the exception of Guildford park, disafforested. Edward I. attempted, but without success, to extend Windsor Forest again into the county. The attempt was renewed as late as the time of Charles I., but again came to nothing.

In the civil war of John, Guildford and Farnham castles were taken by Louis of France and the insurgent barons. In the civil war of Henry III., a body of royal troops, retiring from Tunbridge to Bristol, after the battle of Lewes, A.D. 1264, took Blechingley castle, and routed a body of Londoners at Croydon. In the reign of Richard II. (A.D. 1294), his queen, Ann of Bohemia, died at Shene, now Richmond. In the rebellion of Sir Thomas Wyatt (A.D. 1554), he took possession of Southwark, and marching to Kingston, forced a passage over the Thames into Middlesex, though the bridge at Kingston had been broken down. Queen Elizabeth died at Richmond (A.D. 1603). Just before the civil war of Charles I., Lord Digby and some other Royalists, going to Kingston, gave occasion to the House of Commons, who regarded the visit as of a warlike character, to pass some strong resolutions, and was one of the circumstances which led to Lord Digby's impeachment. In the war itself the county was devoted to the parliamentary cause. After the battle of Edge Hill, and the advance of the Royalists toward London, part of the earl of Essex's army was posted at Kingston (A.D. 1642). Farnham castle, which was held by the Royalists, was taken not long after by the Parliamentarians. In the year 1647 the army, which was at variance with the Parliament, was partly quartered in this county. St. George's Fields, near Southwark, were the scene of the riots occasioned by the struggle of Wilkes against the government (A.D. 1768), and in the same place the Protestant Association under Lord George Gordon assembled (A.D. 1780).

Surrey had at different periods before the Reformation about thirty religious houses of all kinds. Of these the most eminent were the abbeys of Bermondsey (Cluniac), Chertsey (Benedictine), Merton (for regular canons of St. Augustin), and Waverley (Cistercian); and the priories of St. Mary Overy, Southwark, and Newark, in the parish of Send near Guildford, for regular canons of St. Augustin; and Shene, now Richmond, for Carthusians. The remains of Merton abbey have been noticed. Of Bermondsey and Chertsey abbeys, and of Shene priory, scarcely a fragment is left. The priory church of St. Mary Overy is noticed elsewhere. [SOUTHWARK.] There are some remains of Waverley abbey, near Farnham, overgrown with ivy, and extending in detached fragments over a surface of three or four acres: they comprehend some remains of the church, refectory, dormitory, and cloisters. There are some remains of the church of Newark priory. Many of the parish churches in the county are of great antiquity. The early English style, which was in use in the reigns of Richard I., John, Henry III., and Edward I., is prevalent.

(Manning's *History of Surrey*; *Beauties of England and Wales*; Conybeare and Phillips's *Outlines of the Geology of England and Wales*; Greenough's *Geological Map of England and Wales*; Priestley's *Navigable Rivers and Canals*; Rickman's *Gothic Architecture*; Lysons's *Environs of London*; Richard of Cirencester; *Ordnance Map*, and *Map of Antient Britain*, by the Society for the Diffusion of Useful Knowledge; Palgrave's *Rise and Progress of the English Commonwealth*; Ingram's *Saxon Chronicle*; *Parliamentary Papers*.)

STATISTICS.

Population and Occupations.—The population of the county is agricultural, except in so far as the borough of Southwark and the hundred of East Brixton form an important portion of the metropolis. Out of 44,139 males aged 20 and upwards employed in retail trade or in handicrafts in 1831, only about a fourth were resident in the parts of the county beyond the limits of the borough and hundred above mentioned, the number in the borough being 10,197, in the hundred 21,258; and in all other parts, comprising about fourteen out of fifteen parts of the whole area of the county, the number was 12,684. 'In the villages between Croydon and Wandsworth the river Wandle is applied in aid of calico bleaching and printing at Wallington, Mitcham, and Merton; to copper-works in the parish of Wimbledon, and to dyeing at Wandsworth. Besides these (collectively not including more than 100 men) 75 potters and weavers find employment at Battersea; at Farnham is a small manufactory of floor-cloth; at Haslemere of silk crape, and Godalming, one of the earliest stations of the stocking-weaving machinery, retains a portion of that manufacture.' (*Census*, 1831.) At the same period, of males aged 20 and upwards, there were 1873 occupiers of land employing labourers; 727 occupiers not employing labourers; and 16,761 were agricultural labourers. The remainder of the male population aged 20 and upwards was thus distributed:—employed in manufactures, 2065; in retail trades and handicrafts, 44,139; capitalists, bankers, and members of the professions, 14,235; non-agricultural labourers, 24,878; domestic servants, 4131; other males aged 20 and upwards, 10,756. The number of male servants under 20 was 2101; and there were 24,540 female servants.

The population of the county at the following periods was as under:—

	Males.	Females.	Total.	Increase per Cent.
1801	127,138	141,905	269,043	
1811	151,811	172,042	323,851	20·3
1821	189,471	208,787	398,658	239
1831	230,860	255,474	486,334	21·9
1841	278,186	304,427	582,613	19·7

The population increased 313,570 from 1801 to 1841, being 116 per cent.; the increase for England during the same period being 79·9 per cent. The details of the census of 1841 are not yet fully published, but the number of inhabited houses was 95,375; uninhabited 3948; and 1210 were building.

The population, &c. of each hundred and borough, according to the census of 1831, was as follows:—

HUNDREDS, BOROUGHS, &c.	HOUSES.				OCCUPATIONS.			PERSONS.			
	Inhabited.	Families.	Building.	Uninhabited.	Families chiefly employed in agriculture.	Families chiefly employed in trade, manufactures, and handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of persons.	Males twenty years of age.
Blackheath	1,504	1,678	10	41	1,042	432	204	4,523	4,158	8,681	2,247
Brixton	40,880	57,092	777	4,003	2,585	28,267	26,240	112,058	133,802	245,860	58,438
Copthorne	1,850	2,094	8	65	861	630	603	5,384	5,343	10,727	2,881
Effingham	242	315	0	7	190	72	53	861	785	1,646	449
Elmbridge	1,518	1,649	13	75	624	443	582	3,903	4,145	8,048	2,026
Farnham	1,472	1,634	5	29	924	458	252	4,032	4,196	8,228	1,945
Godalming	1,843	2,147	4	41	1,052	746	349	5,259	5,217	10,476	2,636
Godley	2,693	2,963	26	111	1,352	809	802	7,252	7,265	14,517	3,588
Kingston	2,999	3,812	14	144	619	1,593	1,600	8,195	9,296	17,491	4,474
Reigate	1,713	1,997	3	52	1,160	541	296	5,435	5,284	10,719	2,881
Tandridge	1,585	1,782	3	38	1,171	371	240	4,938	4,443	9,381	2,463
Wallington	4,350	4,902	65	345	985	2,856	1,061	12,120	12,527	24,647	6,219
Woking	2,110	2,452	10	56	1,405	597	450	6,048	6,021	12,069	3,209
Wotton	1,251	1,465	9	36	595	494	376	3,908	3,846	7,754	1,918
Guildford (Borough)	630	760	8	17	35	464	261	1,961	1,963	3,924	963
Southwark do.	13,430	22,335	118	1,042	47	10,843	11,455	44,318	47,183	91,501	23,208
Militia								665			
Totals	80,070	109,077	1073	6,102	14,647	49,616	44,814	230,860	255,474	486,334	119,565

County Expenses, Crime, &c.—Sums expended for the relief of the poor: 1748-49-50 (annual average), 26,598*l.*; 1776, 49,744*l.*; 1783-84-85 (average), 66,156*l.* The sum expended in

1801	was 133,874*l.*,	being	9*s.*	11*d.*	for each inhabitant.
1811	.. 217,757	„	13	5	„
1821	.. 242,921	„	12	2	„
1831	.. 265,389	„	10	10	„
1841	.. 199,477	„	6	10	„

In each of the following years ending 25th March, the expenditure was as under:—

1835.	1836.	1837.	1838.	1839.	1840.
£225,120	£187,896	£151,959	£154,937	£164,227	£169,952

The expenditure for the year ending 25th March, 1834, was 261,501*l.* The saving effected between that year and 1840 amounted to 132,794*l.*, or 39 per cent.: namely, under the head of relief and maintenance, 91,549*l.*, or 35 per cent.; in suits of law, &c., 5151*l.*, or 58 per cent.: and in miscellaneous expenses, 36,094*l.*, or 51 per cent. The number of poor-law unions is 18, comprising 143 parishes and a population of 427,829, according to the census of 1831: there are 7 parishes with a population of 54,324, which are not in any union. The number of paupers relieved during the quarter ending Lady-day, 1840, was 32,946 (9705 in-door, and 23,241 out-door), being 8 per cent. of the population, the proportion for England being 8·6 per cent. The illegitimate births in 1830 were 309, or 1 in 40; in England 1 in 20. The numbers affiliated in 1834-5 were 263; and in 1835-6, 158. Bastard children chargeable on the poors'-rate in 1835-6, 2082, or 1 in 234 of the whole population:—in England 1 in 215. Lunatics and idiots chargeable on the same fund in 1836, 504, or 1 in 965;—in England 1 in 1033. Proportion per cent. of persons married (in the extra-metropolitan districts) under 21 years of age, in 1840, 8·5;—in England and Wales, 9·6 for the two sexes.

The annual value of real property assessed to the property-tax in 1815, was 1,579,172*l.*; and of property assessed to occupiers, 439,322*l.* the profits of trade, &c. were assessed at 1,583,080*l.* The sum raised for poor-rate, county-rate, and other local purposes, for the year ending 25th March, 1833, was 378,151*l.*, levied as follows:—

On land	£108,447
Dwelling-houses	240,389
Mills, factories, &c.	27,187
Manorial profits, navigation, &c.	2,127
Total	£378,151

The amount expended was—

For the relief of the poor	£278,375
In suits of law, removal of paupers, &c.	8,667
For other purposes	98,403
Total money expended	£385,445

The county expenditure in 1834, exclusive of that for the relief of the poor, was 25,872*l.* disbursed as follows:—

Bridges, building, repairs, &c.	£738
Gaols, houses of correction, and maintaining prisoners	11,663
Shire-hall and courts of justice, building, repairs, &c.	188
Lunatic asylum	194
Prosecutions	3,102
Clerk of the peace	877
Conveyance of prisoners before trial	1,134
Vagrants, apprehending and conveying	110
Coroner	461
Payment of principal and interest of debt	5,000
Miscellaneous	2,400
Total	£25,872

The county-rate levied at different periods, and the principal disbursements, are shown in the following table:—

	1801.	1811.	1821.	1831.	1838.
	£	£	£	£	£
Income	13,702	9,589	21,116	29,669	17,018
Expenditure:—					
Bridges	24,	658	959	719	737
Gaols	3,723	301	8,874	3,599	656
Prisoners' maintenance	3,082	1,984	6,490	12,489	10,641
Prosecutions	434	338	9,835	3,046	2,541
Constables and vagrants	211	181	811	241	113

The length of streets and highways, and the expenditure thereon, were as under in 1839:—

		Miles.
Streets and roads repaired under local acts		96
Turnpike roads		289
All other highways		1,429
		1,814
Amount of rates levied . . .		£34,432
Expended in repairs of highways	£34,825	
Law and other expenses .	293	
Total expenditure		34,619

The number of turnpike trusts in 1839 was 21; income from tolls, 60,283*l.*; from parish compositions, in lieu of statute duty, 105*l.*; and the total income was 61,000*l.*, the total expenditure for the same year being 63,578*l.* The assets, including arrears of income, amounted to 7,392*l.*; the debts to 202,840*l.* In 1836 the debt was equal to 2·9 years of the annual income;—the proportion for England being 4½ years; the proportion of unpaid interest to the total debt was 17 per cent., the average for England being 12 per cent.

In 1839 the church-rates amounted to 16,526*l.*; and 4,141*l.* applicable to the same objects was derived from other sources. In 1832 the sum derived from 'other sources' included 898*l.* from estates and rent charges. The sum expended for the purposes of the Establishment amounted to 19,772*l.* in 1839, out of which 6,812*l.* was expended on repairs of churches.

Crime.—Number of persons charged with criminal offences in the septennial periods ending 1819, 1826, 1833, and 1840:—

	1813-19.	1820-26.	1827-33.	1834-40.
Total . .	2,829	3,925	5,293	6,892
Annual average .	404	560	756	984

The numbers committed, convicted, and acquitted in each year from 1834 to 1840 were as under:—

	1834.	1835.	1836.	1837.	1838.	1839.	1840.
Committed	1,049	1,007	984	950	898	1,016	988
Acquitted	318	332	314	305	232	273	266
Convicted	731	675	670	645	666	743	722

In 1834 the proportion of persons committed, to the total population of the county, was 1 in 464; and in 1840, allowing for the increase of population, 1 in about 492: showing a decrease, which may be partly attributed to the most populous parts of the county being comprised within the limits of the metropolitan police, over which also the jurisdiction of the Central Criminal Court extends.

Of 988 criminal offenders tried at the assizes and sessions in 1840, there were 67 charged with offences against the person; 45 with offences against property committed with violence; 824 (including 585 cases of simple larceny) with offences against property committed without violence; 6 with malicious offences against property; 27 for forgery and uttering base coin; and 19 for various misdemeanors. About eighty-three per cent. of the offences were those against property committed without violence; and about fifty-nine per cent. were cases of petty larceny. Sentence of death was not recorded in a single case. Of 722 offenders convicted, 11 were transported for life; 25 for periods varying from 10 to 15 years; 40 from 7 to 10 years; 94 for 7 years—making in all 170 offenders transported; 3 were imprisoned for a term exceeding 12 months; 69 for above 6 months; and 449 for 6 months and under; and 31 were whipped, fined, or discharged on sureties. The acquittals were 265 in number; in 4 cases there was no prosecution; in 76 no bill was found; and 185 persons were found not guilty on trial. Of the total number committed, 750 were males and 238 females: 227 males and 93 females could neither read nor write; 388 males and 132 females could read, or read and write imperfectly; 125 males and 12 females could read and write well; 5 had received superior instruction; and the state of instruction of 5 males and 1 female was not ascertained. On an average of several years the proportion of uninstructed criminals in the county was 86·1 per cent.; those instructed 13·9 per cent.;—the average of the former for England and Wales being 89·3 per cent.

Savings Banks.—There are 20 of these institutions; and the number of depositors and amount of deposits on the 20th of November in each of the following years was as under:—

	1833.	1836	1837.	1838.	1839.	1840.
No. of depositors	15,130	18,613	19,804	21,706	23,316	24,643
Am. of deposits	£395,313	£480,265	£498,177	£544,528	£574,143	£596,634

The distribution of the sums invested in 1830, 1834, and 1839, on the 20th of November in each year, was as under:—

	1830.		1834.		1839.	
	Depositors.	Deposits.	Depositors.	Deposits.	Depositors.	Deposits.
Not exceeding £20	7,731	£ 52,021	9,730	£ 62,706	14,531	£38,849
„ 50	3,328	101,409	3,836	120,222	5,389	163,054
„ 100	1,474	100,742	1,639	113,552	2,237	154,728
„ 150	535	62,838	652	65,604	721	96,997
„ 200	230	38,993	245	41,747	378	65,350
Above . . 200	101	23,964	74	19,543	60	15,170
	13,399	380,960	16,136	423,434	23,316	574,143

The deposits of 160 friendly societies, not reckoned above, amounted, in 1840, to 21,027*l.*; and 11,437*l.* were invested by 161 charitable institutions.

The state of the elective franchise in 1839-40 is shown in the following table:—

	E. div.	W. div.	Total.
Freeholders of every class . .	4,073	2,429	6,502
Copyholders and customary tenants	291	475	766
Leaseholders for life or for a term	572	88	660
50*l.* tenants at will . . .	1,067	593	1,660
Trustees and mortgagees .	43	10	53
Qualified by offices . . .	32	52	84
Joint and duplicate qualifications	68	34	102
	6,146	3,681	9,827

Education.—Summary of the Returns made to Parliament in 1833:—

	Schools.	Scholars.	Total.
Infant-schools . . .	114		
Number of children at such schools; ages from 2 to 7 years:—			
Males . .		1,390	
Females . .		1,310	
Sex not specified .		1,584	
			4,284
Daily-schools . .	1,093		
Number of children at such schools; ages from 4 to 14 years:—			
Males . .		21,970	
Females . .		16,334	
Sex not specified .		3,324	
			41,631
Schools . .	1,207		
Total of children under daily instruction			45,915
Sunday-schools . .	244		
Number of children at such schools; ages from 4 to 15 years:—			
Males . .		9,912	
Females . .		10,224	
Sex not specified .		2,400	
			22,536

The Schools established by Dissenters, included in the above table, are—

		Scholars.
Infant-schools . . .	2, containing	218
Daily-schools . . .	20 .	1,928
Sunday-schools . . .	63 .	9,208

The schools established since 1818 are—

Infant and other daily schools .	811, containing	28,517
Sunday-schools . .	173 .	13,936

Lending libraries were attached to 64 schools in 1833.

Maintenance of Schools.

Description of Schools.	By endowment.		By subscription.		By payments from scholars.		Subscrip. and payment from scholars	
	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.
Infant Schools	..	..	9	563	69	953	36	2,763
Daily Schools	66	6195	93	8,785	833	19,912	101	6,739
Sunday Schools	10	705	206	20,078	..	..	28	1,753
Total...	76	6900	306	29,431	902	20,865	165	11,255

The income of endowed schools is 5547*l.*, and a sum of 1049*l.* is applicable for educational purposes in schools not endowed. (*Charity Reports.*)

Only two Sunday-schools were returned from places where no other schools existed. Sixty-one schools, attended by 5385 children, were both Sunday and daily schools. Taking the numbers returned under daily instruction (45,915), and those attending Sunday-schools (22,536), the total number of children is 68,451, which scarcely exceeds one-half of the total number of children between the ages of 2 and 15. The number of boarding-schools was 182.

SURREY, EARL OF. [Howard.]

SURROGATE is, according to Cowell's 'Interpreter,' 'one that is substituted or appointed in the room of another, most commonly of a bishop or a bishop's chancellor.'

The qualifications required in persons appointed as surrogates are defined and enforced by the canons of 1603. The 128th canon declares that no chancellor, commissary, archdeacon, official, or any person using ecclesiastical jurisdiction, shall substitute any person to keep any court for them except he be a grave minister and a graduate or a licensed preacher and beneficed, or a batchelor of law or a master of arts, well qualified from his religion and learning, upon pain of suspension from execution of their offices during three months for each offence. And the person undertaking the office without being so qualified is declared subject to the same censure. (Gibs., *Cod.*, tit. xliii., c. 3.)

Surrogates being delegated officers, their jurisdiction of course depends upon that of the person for whom they act. The principal duty however of ecclesiastical surrogates may be stated to consist of granting probates to wills, letters of administration to the effects of intestates, and marriage licences. The proper performance of these duties is guarded by particular enactments. By the 92nd of the Canons of 1603, surrogates of inferior courts allowing persons to be vexatiously proceeded against in their courts, respecting the probate of wills which ought to be proved in another court, are to be suspended, and to pay the aggrieved party all expenses incurred through such proceedings. By the 93rd canon, any surrogate of the Prerogative Court vexatiously citing a person into his court on the same pretext is to pay the party so cited his costs, upon pain of suspension. (Gibs., *Cod.*, tit. xxiv., c. 4.) By the 26 Geo. II., c. 33, § 7, every surrogate deputed by any ecclesiastical judge who has power to grant licences of marriage is required, before granting any such licence, to take an oath before such judge and to give a bond of 100*l.* to the bishop of the diocese for the faithful execution of his office.

Surrogates are also persons appointed to execute the offices of judges in the courts of Vice-Admiralty in the Colonies, in the place of the regular judges of those courts. The acts of such surrogates have, by the 56th Geo. III., c. 82, the same effect and character as the acts of the regular judges.

SURVEYING is the art of determining the form and dimensions of tracts of ground, the plans of towns and single houses, the courses of roads and rivers, with the boundaries of estates, fields, &c. A survey is accompanied by a representation on paper of all the above-mentioned objects, and frequently by a delineation of the slopes of the hills, as the whole would appear if projected on a horizontal plane. When canals or railways are to be executed, a survey of the ground is combined with the operations of levelling, in order to obtain, besides a horizontal plan, the forms of vertical sections of the ground along the proposed lines, and thus to ascertain the quantities of earth to be removed.

In maritime surveying, the forms of coasts and harbours, the entrances of rivers, with the positions of islands, rocks, and shoals, are to be determined; also the soundings or depths of water in as many different places as possible [Soundings.]

Military surveying consists chiefly in representing on paper the features of a country, such as the roads, rivers, hills, and marshes, in order to ascertain the positions which may be occupied as fields of battle or as quarters; and the facilities which the country may afford for the march of troops or the passage of artillery and stores.

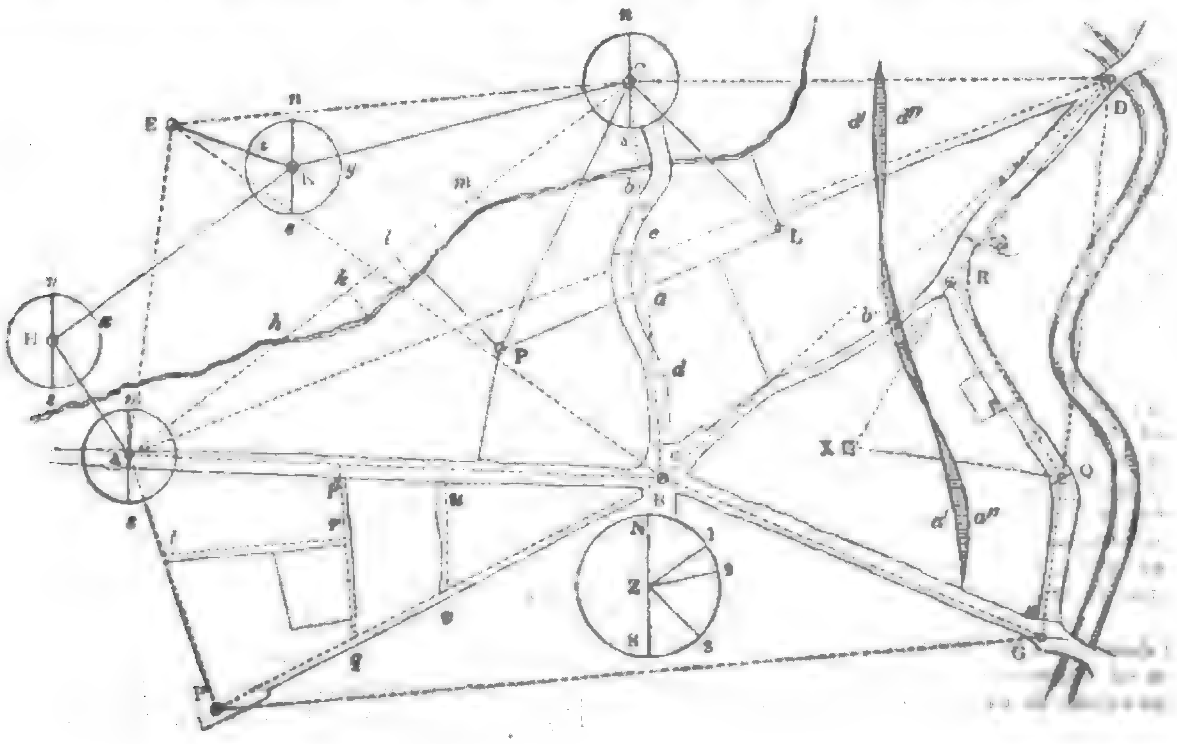
For trigonometrical surveying, see Trigonometry.

Since the measurement of the distance between two objects by means of a rod or chain is very laborious and inaccurate when that distance is considerable, particularly if the ground has many equalities of level, and is much intersected by walls, hedges, and streams of water, it will seldom be possible to execute even an ordinary survey by such means alone, and instruments for taking angles must be employed, together with the chain, in every operation of importance.

If within the tract to be surveyed there should be a road about half a mile in extent, and nearly straight and level, so that a line may be accurately measured upon it by the chain, and that from its extremities several remarkable objects, as churches or mills, may be seen, it will be convenient to use such measured line as a base, and with a theodolite to observe the angles contained between the base and the lines joining its extremities to the different objects. The three angles of each triangle formed by such lines should if possible be observed, in order that by the agreement of their sum with 180° the accuracy of the angular measurements may be tested; and then the lengths of the sides of the triangles may be determined by the rules of plane trigonometry.

Let AB represent a base so measured in a road; and let C, D, E, F be four remarkable objects within or near the boundaries of the tract to be surveyed; the distances AC, AD, &c., BD, BC, &c. will be those which should be determined by computation. These lines may then serve as bases, and if from their extremities be taken the angles contained between them and lines supposed to connect them with any other objects, as houses or remarkable trees, the positions and distances of these objects may be determined by computation as before. Thus BC or BD will serve as a base by which the position of G may be computed.

It will obviously be advantageous if lines supposed to



connect the objects lie nearly parallel to the directions of roads, lanes, streams, or hedges, on account of the facility which will thereby be afforded for laying down such roads, &c. on the plan. In order that it may be possible to place the theodolite at the angular points of the triangles, those points should not be precisely in the churches, mills, or other objects whose positions are to be determined, but should be indicated by poles set up near those objects, on spots of ground in such situations that each may be visible from the two others which with it constitute the intended triangle. The place of the building may be ascertained by its bearing and distance from the pole in its vicinity. After as many stations as may be thought fit have been determined in the manner just described, and the lengths of the lines (that is, the sides of the triangles) connecting them have been computed, the survey may be completed by actual admeasurements with the chain, in each triangle separately.

Poles having been set up at the angular points of every triangle, the surveyor and his assistant set out from any one of these points, as B, and proceeding across the ground, measure the whole length of any one line, as BC, leaving pickets in the ground in the direction of the line at or near every place where it crosses a hedge, as at *a*, a stream, as at *b*, a road, or any other object which is to be introduced in the plan. Should it happen that the line BC, or any part of it, coincides with the direction of a road, offsets, as they are called, are measured perpendicularly to the line, on one or both sides of it, in order to express the distance from the line to the sides of the road, or to the hedges or walls along those sides; these offsets (which are shown at *c*, *d*, and *e*) should be measured at the end of every chain's length, and particularly at every point in the station line opposite to which there is a remarkable object, as a house, a gate, or merely a bend in the direction of the road. Thus, when the work is laid down on paper, the precise form and breadth of the road will be expressed.

In like manner the other side, AC, of the triangle, is to be measured with the chain; pickets are to be left in the ground at or near every place where a stream, as at *h*, a road, or a hedge crosses the side of the triangle; and offsets, as at *k*, *l*, *m*, are to be measured from the station-line to and across such boundaries as may be nearly parallel to any part of its direction. The like process is to be followed on each side of every triangle: the measured lengths of the sides of each triangle should then be compared with the computed lengths; and if the difference is not considerable, the work may be considered as having been performed with sufficient accuracy; otherwise the operations must be repeated, in order that the source of the error may be detected.

To carry on the work in the interior of any triangle, as ABF, the surveyor, where it is possible, measures with the chain the direct distance from the pickets in one side of the triangle to the pickets in another side, as *uv*, *pq*; and since these pickets are supposed to have been placed near the intersections of boundary-lines (roads, streams, or hedges) with the sides of the triangle, the lines last measured will, at least in part of their length, coincide with or be parallel to some of the boundaries in the interior of the triangle; and the precise figures of such boundaries will be determined as before by offsets from the measured line to all the principal bends. The length of each of these secondary station lines may be obtained by trigonometry, since the line is the base of a secondary triangle of which the two sides are known, being measured parts of two sides of the principal triangle, and the angle included between those sides has been found by the theodolite; therefore the measured length of this line, on being compared with the computed length, will afford an additional test of the accuracy of the work.

In measuring these secondary lines within each principal triangle, pickets must, as before, be left in the ground in the direction of the line, at or near places, as at *r*, where hedges, walls, &c. cross the line; and from one of these pickets, *r*, to another, as *t*, lines are afterwards to be measured (these being as much as possible in or near the direction of other boundaries), till at length the whole interior of each principal triangle will have been divided into several secondary triangles, all the sides of which have been measured. These sides, by means of the offsets which have been measured from them, determine the figures of all the natural and artificial boundaries within the tract of ground.

The situations of the buildings are also determined by offsets from the station-lines nearest to them: the ground-plans of the more considerable edifices, as churches and mansions, are measured, and the directions of their fronts with respect to the meridian are ascertained by a compass or otherwise.

When rivers or roads have many abrupt and deep bends, the determination of their forms by means of offsets from the station-lines may become impracticable; and then a separate survey of such details must be made by means of the compass, the circumferentor, or the theodolite. [THEODOLITE.] The same means must be employed for the survey of a sea-coast, when the operation is to be performed on land; and it may often be advantageous to determine in like manner the forms of the hedges, walls, &c. in the interior of the tract which is to be surveyed. Ground covered with wood must be surveyed by going quite round it; poles being set up at remarkable bends on the contour, the distances between them are measured with the chain, and the bearings of the several lines from the meridian are observed with the theodolite.

In order to explain the process of surveying with the theodolite by the method which is commonly called that of the 'back-angle,' and which is now almost constantly adopted, let it be required to determine the outline HKCLBA, which may represent the contour of a wood, or of which part may coincide with the course of a road or river. The instrument may be set up at H, which may be supposed to be the first station; and let the line *ns* at each of the stations H, K, C, &c. represent the position of the needle or of the magnetic meridian at the station: also let the instrument be adjusted so that the zero point of the horizontal limb may be under the point *n* (the north point of the needle), or the zero of the degrees in the compass-box may be in coincidence with *n*; and let K be the second station. Turn the upper horizontal plate with the telescope till the object-glass of the latter is directed to K, and make the intersection of the wires appear to coincide with the object at that station: then the index of the vernier will be at some graduation on the lower horizontal plate, as at *x*, and the angle *n*HK is that which is observed: suppose it to be 54°, reckoning from the north towards the east, which angle is usually represented by N. 54° E. [N. B. Previously to directing the object-glass to K, it might have been directed to any other visible objects, as F or D, whose positions it might be required to determine by means of their bearings from the meridian line.]

Let the theodolite be now removed to K, a staff being planted in the ground at H: turn the whole instrument round on its vertical axis (the index of the vernier remaining at the graduation N. 54° E) till the object-glass of the telescope is directed to H, and the intersection of the wires appears to coincide with the staff there. Then, if the former angle were correctly taken, and no movement of the horizontal plates on one another have taken place, the south point *s* of the needle will lie over the zero of the graduations on the lower plate, or will coincide with the zero of the degrees in the compass-box; and this circumstance will be a proof of the accuracy of the work, all the meridian lines *ns*, *ns*, being supposed to be parallel to one another.

Now turn the upper horizontal plate with the telescope, till the object-glass of the latter is directed to C, and the intersection of the wires appears to coincide with the object there: the telescope in moving from the position KH to the position KC having passed over and beyond *s*; and the index of the vernier being supposed to be at *y*, the number of the graduation, these being read from *s* in the direction *sny*, will be greater than 180: let it be 256 (or 180°+76°); in that case the observed angle is N. 76° E., and it expresses the bearing of the line KC from the meridian *n*K*s*, or from the meridian *n*H*s*. If the telescope in moving from KH should be directed to an object at E, then, the index of the vernier being supposed to be at *z*, the number of the graduation will be less than 180: let it be 110 (or 180° − 70°); in that case the observed angle is N. 70° W., and it expresses the bearing of the line KE from the meridian *n*K*s* or *n*H*s*.

Let the theodolite be removed to C, a staff being left at K, and turn the whole instrument, the index of the vernier remaining at N. 76° E., till the object-glass of the telescope is directed to K, and the intersection of the wires appears to coincide with the staff there; then the point *n* of the needle should lie over the zero of the graduations. Now turn the upper horizontal plate till the object-glass of the telescope is directed to L, and the intersection of the wires appears to coincide with the object there: then the telescope, in turning from the position CK to CL, passing over and beyond *s*, the number of the graduation coincident with the index of the vernier will (reckoning from zero at *n*) be less than 180; let it be 133°: in that case the observed angle is N. 133° E., or S. 47° E., and it expresses the bearing of the line CL from the meridian *n*C*s* or *n*H*s*. If the telescope should not pass beyond *s*, and should be in the position CP, for example, the number of the graduation, reckoned from *n*, will be greater than 180; let it be 206, or 180°+26°: in that case the observed angle is S. 26° W., or N. 206° E., or N. 154° W., and it expresses the bearing of the line CP from *n*C*s* or *n*H*s*. In this manner the process of the survey is continued to the end of the road, or till, having passed completely round the wood, the instrument returns to H, from whence it set out.

As, from local attractions or other causes, the polarity of the needle may not be constant, it is scarcely to be expected that the needle should, when the telescope is directed back to a preceding station, be exactly coincident with the north and south line in the compass-box; yet a near approach to such coincidence will serve to detect the existence of considerable errors in the observed angles; and a complete verification of the whole series of operations will be obtained, should the observed bearing of H from the meridian line *n*A*s* at the last station A, that is, the angle *n*AH, be found to agree with the observed bearing of A from the meridian line *n*H*s* at the first station H. When this agreement takes place the work is said to close accurately.

The survey of a road or an enclosure, by following the course of the former, or the contour of the latter, may be performed by simply observing with a surveying-compass or a circumferentor the bearings of the several station-lines from the magnetic meridian, and measuring their lengths; and one of these instruments is generally employed when great accuracy is not required.

The plane table, which is also occasionally employed for surveying ground, is a square board fitted upon a tripod-stand and furnished with a compass, and with an *alidade*, or ruler carrying 'sights' at the extremities. Drawing-paper is made fast to the board or table, and the instrument being set up at any part of the ground which may be thought convenient, a point is marked on the paper to represent the place. The alidade is next turned about that point, so that the line of the sights may be directed to any remarkable objects whose situations are to be determined, and lines are drawn by the edge of the ruler in its several positions; then the distance from the instrument to some one of those objects being measured, and laid down on its line of direction by a convenient scale, the place of that object on the paper is obtained. The table is then removed to that object, and fixed by the needle in the compass-box, so that its edges may be parallel to their former positions; that is, till the alidade placed on the line joining the places of the two objects on the paper is in a direction tending to the former place of the instrument. In this position, the alidade being turned about the point which represents the actual place of the instrument on the ground, lines are drawn as before along the edge of the ruler, towards the several objects which had been observed at the preceding station: the intersections of these lines with the others will determine the places of the objects on the paper.

The length of every line which is to be measured must be obtained in a direction parallel to the horizon between its extremities; and the determination of this length is generally a work of considerable difficulty on account of the inequalities of the ground.

Where great precision is required, it would be proper that the direction of the line to be measured should be indicated by pickets previously planted at intervals along it; a cord may be stretched tight between the two first pickets, and the measurement may be performed by means of a graduated deal-rod 15 or 20 feet in length, which should be applied successively to the cord, the place of each extremity of the rod being marked by a pin pressed into the cord. But when the ground is nearly level, a measuring-chain [CHAIN] is laid upon the ground itself in the direction of the line to be measured, the leading man pressing into the ground, at the end of each chain's length, an iron-pin, which being taken up by the person who follows, the number of pins so taken up serves to show the number of chains in the length of the line measured. In ascending or descending any gentle elevation of the ground, the chain should be held up at the lower end till it is in a horizontal position, as nearly as the chain-holder can estimate it; and a plummet being suspended from that extremity so as to touch the ground vertically under it, the measurement thus obtained is in general sufficiently near the required horizontal length of the line. When the slope of the ground is too great to admit of this simple method being put in practice, the chain must be stretched on the ground, and then the angle at which it is inclined to the horizon being found by some instrument (a small spirit-level furnished with a graduated arc), the horizontal value of the chain's length must be computed. And if, at the same time, the vertical height of one end of the chain above the other be also computed, there will be afforded sufficient data for determining on paper the form of a vertical section of the ground in the direction of the measured line.

Where the rise or fall of the ground is considerable, the operation will be most conveniently and accurately performed by the use of a theodolite; for this purpose pickets should be set up in the ground, in the direction of the line to be measured, at every place where a change occurs in the inclination of the ground to the horizon, and marks made on them at heights above the ground equal to that of the telescope belonging to the theodolite; then, while the chainmen are employed in measuring the length of the line on the ground, the surveyor takes the angular elevations or depressions of the marks on the pickets, with respect to the horizon. From the data thus obtained the horizontal distances between points of ground, and the positions of the points above or below any assumed horizontal plane, can be computed. In order to save the trouble of making trigonometrical computations, the vertical arch of the theodolite usually carries two series of graduations, from which, by inspection, when the telescope is directed to an object, the portion of the measured line which should be subtracted from it in order to reduce it to the corresponding horizontal length may be found; and also the portion of that horizontal length to which the vertical height or depression is equal.

This method may be conveniently put in practice when it is required to exhibit sections of the ground, for the purpose of guiding the civil engineer in the choice of a line for a road or canal; the great accuracy with which the section might be determined by a spirit-level not being requisite. It is now the practice to represent on a plan of the ground a vertical section in the direction of a proposed line of road, for the purpose of showing the depths to which the excavations are to be carried, and the heights to which the embankments are to be raised; a strong line, as a', b', d', representing the surface of the proposed road: on one side of this line, as at a'', d'', are shown the profiles of the requisite excavation; and on the other side, as at b'', are shown the profiles of the embankments: both the heights and depths being determined with relation to the surface of the road. This method was first proposed by Mr. Macneil.

The principal and secondary station-lines constitute a triangulation on the plan of the ground; and when the lengths of these lines have been ascertained by admeasurement, the superfices of the whole track may be found by the rules of mensuration. The area of each triangle should be calculated separately from the measured lengths of the lines, and the several results added together, if all the triangles lie within the given boundaries of the tract: should any of them lie on the exterior of the boundary, the areas must of course be subtracted. But as the boundaries of the several fields, &c. seldom coincide exactly with the station-lines, offsets must have been measured from every such line to each remarkable bend in the nearest boundary; and between the station-line, the boundary, and every two offsets from the former, there exists a small trapezoid, whose area must be computed separately, and either subtracted from or added to the areas of the triangles formed by the measured station-lines, according as it lies within or on the exterior of these triangles.

The accurate method just described is not always put in practice by surveyors. When the boundaries of a field or tract of ground have numerous small bends, a straight line is sometimes drawn through portions of the boundary in such a manner that the small areas on the exterior of the line shall be equal to those which fall in the interior, this equality being estimated by the eye: the complex figure of the contour line is thus reduced to one more simple; and the area of the field or tract is then computed. For this purpose either the plan is divided into two or more triangles, or by a geometrical construction the whole irregular figure is reduced to one triangle of equal magnitude, and in either case the lengths of the sides are measured by the scale of the plan.

When a road, river, or any boundary-line is surveyed with the theodolite and chain, the successive operations are registered in a book according to a particular form, by which a person without any knowledge of the ground may be enabled with facility to lay the work down on paper. This is called the 'Field-Book,' and the manner of entering in it the series of operations will be best explained by means of an example. Let G, Q, R, D, be the principal bends in the direction of a road, and the stations at which, in succession, the theodolite is placed for the purpose of observing the bearings of the several lines G Q, Q R, and R D, from the magnetic meridian passing through the first station G.

At G let the bearing of the object, or mark set up at Q, be observed; let the line G Q be measured with the chain, and let offsets be measured perpendicularly to that line up to any remarkable points near it. At Q let the bearing of a staff at R be observed; also let the length of Q R, and of several offsets from it at remarkable points towards the right and left hand along that part of the road, be measured. Again at R let the bearing of the staff at D be observed; let also the length of R D, and of various offsets along that line, be measured: and let it be supposed that the like process is continued as far as may be required.

Each page of the field-book is then divided, as below, into three columns by two parallel lines drawn down the page: and beginning at the bottom of the column, the several bearings of objects, the lengths of the station-lines, and the several offsets from those lines are inserted, in order, ascending towards the top of the page, the offsets being placed on the right or left hand of the middle column, conformably to their positions with respect to the station-line to which they belong. And it is on this account that the several entries are made in succession from the bottom upwards. The distances in the middle column between the stations G and Q are reckoned from G; those between Q and R are reckoned from Q, and so on, each number in that column expressing the distance up to the place in the station-line where the offset whose length is given immediately on the right or left hand of the number was taken. When it is required to determine by observed bearings the position of any object, as X, at a distance from the road, those bearings are also inserted in the field-book at the stations, as Q and R, where they were observed, and immediately under the bearing of the next forward station. The mark ⊙ is usually put to signify the word 'station.'

Form of the Field-Book.

	⊙	4, 600	at D, near the bridge.
	30	500	10
45	0	300	
40	10	200	
45	5	100	40 to a tree.
40		0	45 to a gate.
		N. 40° E.	⊙ 4 (D)
House X.		S. 31° W.	
		at ⊙ 3 (R)	
	⊙	3, 500	two roads unite.
	35	400	15
	42	300	10
To a house	30	200	15
	25	100	15
	30	0	25
		N. 30° 20′ W.	⊙ 3 (R)
House X.		N. 82° W.	
		at ⊙ 2 (Q)	
	⊙	2, 350	
	12	300	40
	20	200	32
To hedge by road-side	15	100	30
To a cottage	10	20	50 to side of road.
		0	60 to the river.
		N. 7° E.	
		at ⊙ 1 (G)	near the bridge.

The term 'plotting' is applied to the process of laying down on paper the plan of the ground which has been surveyed. If the survey has been performed by the chain only, the several station-lines constitute the sides of triangles extending over the whole of the ground; the lengths of those sides are determined by admeasurement, and in places where they do not coincide with the roads, hedges, &c., offsets are measured from the sides to the principal bends in those boundaries. In order to 'plot' the survey in this case, a proper scale of graduations, usually representing 'chains' and 'links,' is chosen, and the length of one of the station-lines taken from the scale being laid down on the paper as a base, from the two extremities of it as centres, with distances (taken from the scale) equal to the measured lengths of the two sides, which with the base form the first triangle, arcs are described to intersect one another; this intersection being joined to the extremities of the base by lines, the first triangle is constructed. Each side of this triangle is then used as a base on which another triangle is constructed with lines taken from the scale equal to the measured lengths of the sides, and so on. After the triangulation is thus formed, the offsets are laid down from them. This part of the process is accomplished by setting out with compasses upon each station-line, from one of its extremities, the several distances (taken from the scale) of the points at which the offsets were measured, drawing lines perpendicularly to the station-line at these points, and on them placing, from the scale, the measured lengths of the offsets: lines joining the extremities of these offset lines, either drawn by hand or with a ruler, will represent the lines of roads, the boundaries of fields, and the like. In order to facilitate the operation of laying down the offsets from the station-lines, the surveyor is usually provided with ivory scales graduated to represent chains and links on the edges; by laying an edge of such scale along the station-line, with the zero of the graduations at one end, the several distances of the offset-lines from that extremity can be marked on the line in succession: the scale may then be applied to each offset-line, and the measured extent marked by means of the graduations.

But plotting scales are frequently made with graduations along the edges, and with a short scale, also graduated on an edge, which is disposed at right angles to the length of the principal scale, and is capable of being moved to any part of that scale by having one of its extremities cut so as to slide in a groove formed in the direction of the length of the scale. The perpendicular scale is moved along the principal scale to the graduation which denotes the place of the offset, and the length of the latter is then marked by the graduations on the perpendicular scale. Since the offsets frequently occur on both sides of the station-line, the zero of the graduations on the perpendicular scale may be at some distance from the edge of the principal scale, which is then placed, not in coincidence with the station line, but parallel to it at such a distance that the zero may always be in that line. By this contrivance, which was first proposed by Major Robe, the offsets from the line may be marked, whether they be above or below it, without displacing the principal scale. To find a convenient scale for plotting a survey, the length and breadth of the whole may be computed approximatively in order to ascertain the number of chains in such length or breadth, and then the dimensions of the paper in inches being known, the number of chains in each inch may be formed by proportion. Plans of estates are usually made from scales of 2, 3, or 4 chains in an inch, and the linear dimensions, on a plan made from a scale of 3 chains in an inch, are equal to [illegible] of the actual dimensions on the ground.

In important surveys, where the process consists in measuring a base-line and observing with a theodolite the three angles of every triangle, the base is laid down on the paper from some scale as before; and at each of its extremities all the angles contained between the base-line and visual rays from different objects to that extremity are set out by means of a protractor. The intersections of the several lines from the opposite extremities of the base determine the positions of the objects, and form with the base the first triangles. The sides of these triangles become then the bases of other triangles, and the angles observed at the extremities of their sides must be set out by the protractor. If any of these lines have been measured by the chain on the ground, the construction of the triangles by means of the angles may be verified by measuring the lengths of such lines on the scale by which the base line was laid down. Offsets may also be laid down as already described.

But the practice in ordinary surveys is to observe by the 'back angle,' as before described, the bearings which the different station-lines make with the meridian-line passing through one of the stations, and to measure with the chain the length of each station-line. These bearings and lengths, together with the offsets, are registered in the field-book, and they are generally transferred to the paper in the following manner:—

A line, as N S, is drawn in any convenient part of the paper, generally in a direction parallel to the right and left sides, to represent the magnetic meridian; and any point Z is chosen in it, at which the centre of the protractor is placed. Then the bearings, or angles made with the magnetic meridian by the different station-lines, H K, K C, C L, &c., are set out by the graduations of the protractor about the point so chosen, and lines, as Z 1, Z 2, Z 3, &c., are drawn from this point through the mark made on the paper on setting out each angle. These lines are so numbered in order to indicate the particular station at which each angle was observed. Then if the assumed point Z on the meridian line should be the place of the first station, the first line so drawn is in the direction of the first station-line; but if the assumed point is not the first station, the place of this first station must be chosen on the paper, as at H; and a line drawn through it parallel to Z 1 will be the direction of the first station-line. Its extremity K, found by setting out its length from the plotting scale, will be the place of the second station. Through K a line is to be drawn parallel to Z 2, and this will be the direction of the second station-line, whose length K C must then be set out as before. This process is to be continued till all the station-lines have been laid down; when, if the survey has been carried quite round the boundaries of a tract of ground, the second extremity of the last station-line will, provided the operations have been accurately performed, coincide with H, the place of the first station. From these lines the offsets must be set out as before described.

In order to set out the allotments of land in countries which, like some parts of North America, are covered with wood, the surveyor determines on the ground the position of a boundary-line comprehending an area of a square form, each side of which is six or eight miles in length. One of these spaces, which constitutes a township, is usually divided into squares of one mile on each side; and again, these are divided into squares of half or a quarter of a mile on each side.

The boundary-line of the township is determined by measuring with a chain a base-line six or eight miles in length, generally along one side of a square already marked out for some previous township; and at each extremity of this line carrying out one of equal length perpendicularly to the base. A line joining the farthest extremities of the last lines completes the square. In order to mark out the two sides which are perpendicular to the measured base, a circumferentor, or a large surveying-compass, furnished with plain 'sights,' and mounted on a stand, is used. The bearing of the intended line from the magnetic meridian being ascertained from the position of the base, and the instrument being set up at one extremity of that line, the line of the sights is turned so as to make with the needle of the compass an angle equal to that bearing; then the surveyor, looking in the direction of the sights, observes some remarkable tree, and causes the distance from his station to that tree to be measured, small trees, if such there be between himself and the object, being cut down. Notches are cut in the tree in order that it may be distinguished from the others, and the instrument is removed to the opposite side of the tree. The line of the sights is then turned so as to make the given angle with the needle, and the distance of the station to the next remarkable tree in the line is measured as before. This process is continued to the extremity of the line which is to be set out, and strong stakes are planted at the end of each mile, half mile, and quarter mile on the line. From these stakes the lines of division and subdivision are carried out in a similar manner.

When the allotments are contiguous to a road, or the bank of a river, a narrow front is measured along the road or river, and the boundary-lines are carried out, perpendicularly to the front, as far as may be requisite in order to comprehend between them the intended area.

SURVIVORSHIP. A question of life contingencies is said to be one of survivorship when a benefit depends upon the order of the deaths of individuals in such manner that it shall be necessary to calculate the chance of one individual dying before another in every year of life. This distinctive name depends therefore entirely upon the mathematical character of the problem, and of two questions, which both seem to depend on survivorship in the common sense of the word, one may really do so, in the technical sense, and not the other. Thus, the question of finding the premium of an assurance on the death of A, provided B die first, is one of survivorship: but that of finding the value of an annuity on the life of A, to begin at the death of B, is not.

The *chance of survivorship* is that of one individual, now of a given age, surviving another, also now of a given age. The following table exhibits the chance of the older life surviving the younger, according to the Carlisle Table. Thus the chance that 65 shall survive 25 is ·110; consequently the chance of 25 surviving 65 is 1—·110 or ·890· and it is 890 to 110, or about 8 to 1, that of two persons aged 65 and 25, the elder shall die first.

Elder.	Younger.	Chance of elder surviving younger.
15	5	·400
20	10	·383
25	15	·381
30	20	·375
35	25	·372
40	30	·366
45	35	·360
50	40	·350
55	45	·329
60	50	·315
65	55	·323
70	60	·322
75	65	·303
80	70	·320
85	75	·332
90	80	·329
95	85	·462
25	5	·307
30	10	·283
35	15	·279
40	20	·270
45	25	·263
50	30	·251
55	35	·231
60	40	·212
65	45	·194
70	50	·177
75	55	·177
80	60	·190
85	65	·174
90	70	·191
95	75	·300
35	5	·235
40	10	·207
45	15	·202
50	20	·189
55	25	·174
60	30	·158
65	35	·143
70	40	·126
75	45	·104
80	50	·093
85	55	·094
90	60	·113
95	65	·147
45	5	·177
50	10	·146
55	15	·135
60	20	·119
65	25	·110
70	30	·097
75	35	·081
80	40	·075
85	45	·059
90	50	·052
95	55	·078
55	5	·125
60	10	·091
65	15	·085
70	20	·071
75	25	·061
80	30	·056
85	35	·046
90	40	·044
95	45	·049
65	5	·086
70	10	·054
75	15	·048
80	20	·040
85	25	·034
90	30	·033
95	35	·039
75	5	·057
80	10	·028
85	15	·024
90	20	·012
95	25	·029
85	5	·040
90	10	·017
95	15	·023
95	5	·036

SURVIVORSHIP. [JOINT TENANCY.]

SUS. [MAROCCO.]

SUS. [SUSA.]

SUSA (Σοῦσα), the capital of the country called Susiana and Susis by the Greek geographers. It might almost be considered a part of Persis, as Strabo (p. 727, Casaub.) observes, for it lay between Persis and Babylonia. Susiana comprised part of a mountain region, and it extended also to the coast of the Persian Gulf. The length of the sea-coast from the boundary of the sea-coast of Persis to the mouth of the Tigris was about three thousand stadia. The Choaspes flowed through Susiana, from the mountains of the Uxii, and it entered the Persian Gulf within the limits of the sea-coast of Susiana. Between Susiana and Persis there was a narrow mountain tract, the passes of which were difficult, and were infested by robbers, who even exacted payment of the Persian kings when they passed through the defiles. According to Nearchus the whole coast of Susiana was marshy, and extended westward as far as the mouth of the Euphrates. Besides the Choaspes, there were the rivers Coprates and the Pasitigris, which flowed from the mountains of the Uxii. The Eulaeus is also enumerated among the rivers of Susiana. Such is the substance of Strabo's description of Susiana, which is far from being clear.

The modern Khuzistan, which perhaps comprehends pretty nearly the antient Susiana, lies between 30° and 32° 30′ N. lat., and between 48° and 50° E. long., but it is not intended to say that these parallels and meridians accurately define the limits of the country. From about 31° 30′ N. lat. to 30° the country is flat; north of 31° 30′ it begins to be hilly, and north of 32° the country may be called mountainous. The first great stream, beginning from the west, is the Kerkhah (more usually, but perhaps less correctly, written Kerah), which enters the united streams of the Tigris and Euphrates a little below Kornah, and is identified with the Choaspes. To the east of this river, near 32° N. lat., is the modern Sus. The next stream, to the east, is the Kuran, or Karoon, as it is sometimes written, which joins the Shat-al-Arab by the Hafar cut. This river is formed by two great branches, of which the Dizful, the antient Coprates, is the western, and the Kuran, which flows by Shuster, is the eastern branch. The Dizful and Kuran unite about twenty miles below Shuster; and form the stream antiently called the Pasitigris. The river of Shuster is by some writers identified with the Eulæus, but others consider the Eulæus to be the same as the Choaspes. East of the Kuran is the Jerahi, which likewise flows from the high land, and either enters the Gulf of Persia or is united by a channel with the river of Shuster after its junction with the Dizful river. The Jerahi is supposed, but without any good reason, to be the Hedypnus of Pliny.

In proceeding from Dizful to Sus, and at the distance of 10 miles from Dizful, the great mound of Sus is seen. 'It forms the north-western extremity of a large irregular platform of mounds, which appear to have constituted the fort of the city, while the great tumulus represents the site of the inner citadel: by a rough calculation with the sextant I found the height of the lower platform to be between 80 and 90 feet, and that of the great mound to be 165 feet: the platform, which is square, I estimated to measure two miles and a half. The mound which I paced measured 1100 yards round the base and 850 round the summit. The slope is very steep; so steep indeed as only to admit of ascent by two pathways.' (Major Rawlinson.) Major Rawlinson saw on the mound a slab with a cuneiform inscription of thirty-three lines, three Babylonian sepulchral urns imbedded in the soil, and in another place there was exposed to view, a few feet below the surface, a flooring of brickwork; 'the summit of the mound was thickly strewn with broken pottery, glazed tiles, and kiln-dried bricks. Beyond the elevated platform extend the ruins of the city, probably six or seven miles in circumference: they present the same appearance of irregular mounds, covered with bricks and broken pottery, and here and there the fragment of a shaft is seen projecting through the soil.' (Major Rawlinson.) There is abundance of fine grass about the ruins of Sus and the neighbouring country; and the climate in the middle of March was cool and pleasant. From the summit of the great mound Dizful is distinctly visible, bearing north 38° east. The Kerkhah river is one mile and a half west of the great mound of Sus. A stream called the Abi-shapur rises about 10 miles north of Sus, and flows in a deep narrow channel past the so-called tomb of Daniel, and past the western face of the great mound: it is said to join the Kuran in the neighbourhood of Weis, a considerable distance below the junction of the Dizful river and the river of Shuster. Major Rawlinson could discover no traces of buildings in the interval between the Abi shapur and the Kerkhah. The Abi-shapur is navigable from Sus to its junction with the Kuran, and as its bed is deep and narrow, and nearly on a level with the surface of the plain, it is peculiarly suited for some kinds of navigation. Thus it appears that Sus is really on the east side, not of the Kerkhah (Choaspes), but of a navigable river which flows into the antient Pasitigris, and this circumstance may probably explain some of the confusion that appears in antient writers between the Eulæus and Choaspes. The water of the Abi-shapur is said to be heavy and unwholesome, while that of the Kerkhah is said to be little inferior to that of the Kuran. It thus appears that Sus is the site of an antient city, which it is now generally agreed is the Susa of the Greek writers, once a residence of the kings of Persia. The principal arguments in favour of Sus being the site of Susa, are collected in a paper in the 'London Geographical Journal,' vol. iii., 'On the site of Susa,' by G. Long.

Shuster, which has by some geographers been considered to be the site of Susa, is a comparatively modern city, which was founded by Ardeshir Babegan, or his son Shapur, on the left bank of the Kuran. Shuster is nearly due east of Sus, and the distance is about 55 miles from the road. There are two great bands or dykes at Shuster, constructed for the purpose of furnishing a head or supply of water to the city and the lower country. There are no ruins at Shuster which can be referred to a time prior to the Sassanian dynasty. There is no direct evidence in favour of Shuster being on the site of Susa, which is not equally applicable to Sus, and the direct evidence supplied by the antient writers in favour of Sus, and by the existing ruins, is conclusive in favour of that city, and against Shuster.

There is however a place on the right bank of the Kuran, about 32° N. lat., 50° E. long., which Major Rawlinson calls Susan, which he considers to be the Shushan of Scripture. He admits that the Susa of the Greeks was at Sus, near the Kerkhah or Choaspes. Thus he makes two cities of the name of Susan or Susa. Major Rawlinson did not visit Susan, and his account of the great ruins there is derived from hearsay. If his account of the great ruins at Susan should be confirmed, there can be no doubt of its having been the site of a large city, and the name Susan is a presumption in favour of its being either the Susan of the Scriptures or the Susa of the Greek writers, or both. But if the existence of Sus were unknown, the arguments in favour of Susan representing the Susa of Herodotus or of Strabo would fail, and we should not know where to look for Susa. Susa however is now established at Sus, and the only question is, whether this is not the Shushan of the Scriptures, or if Shustan is another place. Major Rawlinson lays much stress on the identification of the river of Shuster with the Eulaeus, which is apparently the Ulai of the prophet Daniel; and he derives an argument from the fact that Sus is one mile and a half from the Kerkhah, 'but at Susan the river does actually lave the base of the great ruin,' though, as he was not at Susan, it does not appear how he knows this fact. He also considers the expression of Scripture, 'Shushan the palace,' as appearing indicative of a distinction from some other city of the same name. He further derives an argument from Pliny and Ptolemy; but the whole of his discussion of this matter is very unsatisfactory. The only evidence worth noticing is the fact of a large city on the Kuran (if that is really the case) called Susan, (if that fact also is certain). It does not however appear but that this Susan may be a modern city like Shuster. Against this evidence we place the admitted fact of Sus being the Susa of the Greeks and a residence of the Persian kings, and the improbability that there should be two cities of the same name which were royal residences at the same time; and further, that the Susan of the Kuran is not mentioned by that name, at least by the historians of Alexander. The ascertained fact of the Abi-shapur, on which the mound of Sus stands, being a navigable river and joining the Kuran below its junction with the Dizful river, goes a long way towards explaining the confusion between the Eulaeus and Choaspes, which are considered to be the same rivers by most antient writers. The Eulæus may be the Abi-Shapur; and the name Eulæus may have sometimes been given to the Kuran below the junction of the Abi-Shapur. Though much has been done to clear up the geography of Susiana, this matter of the Eulæus and Choaspes still requires further consideration; and the admission of this new Susan into our geographical system must be suspended for the present.

(*London Geographical Journal*, vol. ix., Major Rawlinson's *Notes on a March from Zohâb to Khúzistán*, &c.)

SUSA, a province of the Sardinian territories, on the Italian side of the Alps, which separate it from Savoy on the north, and from France on the west: it is bounded on the south by the province of Pinerolo, and on the east by that of Turin. A great part of the province of Susa lies on the slope of the great Alpine ridge, which here forms the groups of Mont Cenis and Mont Genèvre, the highest summits of which are more than 11,000 feet above the sea. The Dora Ripuaria, which crosses the province in its length from east to west, rises on Mont Genèvre above the village of Cesanna, descends by Oulx and Exilles into the fine valley of Susa, passes by the town of Susa, and at Avigliana enters the plain of Turin, and joins the Po north of Turin, after a course of between sixty and seventy miles. The valley of Susa is fertile, and produces corn, wine, flax, hemp, and mulberries. The highlands produce abundance of chestnuts, and afford good summer pasture. The great road from Turin to Savoy and France over Mont Cenis ascends the valley of Susa as far as the town of Susa, and then turning off to the northward, climbs the side of the mountain till it reaches the elevated plain with the small lake of Mont Cenis, famous for its trout, where is the boundary between Piedmont and Savoy. Lower down to the eastward, in a deep valley or ravine through which the old road formerly passed, is the village of La Novalesa, with an antient and once wealthy monastery, which is often mentioned in the history of the middle ages. In this monastery was found a chronicle, written by the monks, which gave an account of the early marquises of Susa, and of other baronial families of those obscure times: it is known by the name of the Chronicle of La Novalesa. From the town of Susa, following the ascent of the valley to the westward, is the village of Chiomonte or Chaumont, known for its wines, which are equal, if not superior, to those of Burgundy. Higher up is the village of Exilles, with its old fortress built on a rock above the Dora; and still higher is the village of Oulx, from which a carriage-road leads over Mont Genèvre to Briançon in Dauphiné. From Cesanna a mountain-road leads from the valley of the Dora to that of the Clusone, in the province of Pinerolo. Descending the Dora below Susa is the village of Bussolino, on the high road to Turin, in the neighbourhood of which is a quarry of green marble, commonly called Verde di Susa, and which resembles the verde antico of the antients; and lower down is the town of Avigliana, with 3000 inhabitants, in a very fruitful country, with two small lakes well stocked with fish; and farther down is the town and royal residence of Rivoli, which belongs to the province of Turin. Above Avigliana, and near the town of St. Ambrogio, is the small village of Chiusa, in a defile, mentioned in history as a strong position of the Longobards in their wars with the Franks, which Charlemagne was obliged to turn, not being able to force it. The buildings of the Benedictine abbey of S. Michele della Chiusa, once the richest in Piedmont, but long since suppressed, are on a mountain in the neighbourhood. The population of the province of Susa is reckoned at 68,600, distributed among sixty communes.

(Serristori, *Statistica d'Italia;* Denina, *Quadro dell' alta Italia; Calendario Sardo.*)

SUSA, the antient Segusium or Segusio, the head town of the province of Susa, is a bishop's see, and has about 3000 inhabitants. In the cathedral is a monument of Adelaide, marchioness of Susa, from whom the house of Savoy is descended. North of the town is the triumphal arch of white marble raised in honour of Augustus, which is still in pretty good preservation. The frieze is adorned with a basso-rilievo representing a sacrifice. The arch is single, and the opening is 40 feet high and 25 feet wide. It stands across the antient Roman road to Gaul, which was opened by Augustus over Mont Genèvre, and of which the traces are still observable. It forms altogether a striking and characteristic entrance into Italy. The fortress of La Brunetta, cut in the rock by Charles Emmanuel III., king of Sardinia, commanded both the roads of Mont Cenis and Mont Genèvre. It was considered impregnable, but it was destroyed by the French after their invasion of Piedmont in 1796.

The town of Susa is old and ill built, several of the streets are lined with low arcades, and some good houses are seen here and there belonging to the provincial nobility. To a traveller coming from the north the appearance of Susa is striking, for he finds here at once, after having just crossed the Alps, the vegetation, the climate, the architecture, and the manners and features of Italy. The town of Susa has a royal college, a tribunale di prefettura, or provincial judicial court, and some manufactories of leather, gloves, and thread.

(Valéry, *Voyages en Italie; Nouveau Guide du Voyageur en Italie.*)

SUSA'RION (Σουσαρίων), son of Philinus, was a native of the antient village of Tripodiscus, in the territory of Megara. He lived about the time of Solon (about Ol. 50), and the Parian Marbles (*Ep.* 39) call him the inventor of comedy, and seem also to indicate that he gained the prize of comedy then instituted, which consisted of a basket of figs and a jar of wine. But as regards Susarion's invention of comedy the matter is not quite clear. We know indeed that the Megarians were very fond of farcical entertainments, but it is also certain that the invention of real and written comedies belongs to a later time; and there is indeed, as Bentley (*A Dissert. on the Epist. of Phalaris*, p. 144) has shown, no evidence that the four iambic verses of Susarion still extant formed part of a play. It is further probable that he performed his extempore farces upon a waggon, as was customary at the country Dionysia in Attica. The place where he acted his farces was Icarius, a hamlet of Attica, whence some writers call him an Icarian. What is called his invention of comedy must therefore have consisted in introducing into Attica the Doric form of comedy, or he introduced some innovation into these farces, and constructed them on better dramatic principles, which seems to be implied in the statement that he employed a chorus, which had not been the case before. But whatever we may think of his improvements, a considerable time passed from the period in which he acted at Icarius, until comedy experienced real improvement, and was composed on artistic principles.

(Bentley, *A Dissertat. on the Epist. of Phalaris*, p. 144-152; Müller, *Dor.*, iv. 7, § 2; *Hist. of the Lit. of Ant. Greece*, chap. xxvii. § 3.)

SUSIA'NA. [SUSA.]

SUSPENSION is a term used in law when a seignory rent or other profit out of land, by reason of the unity of possession of the seignory, rent, &c., and of the land out of which they issue, are not *in esse* for a time, but may be revived or awaked. It differs from extinguishment, which is when the rent, &c. is gone for ever by reason of the estate in the land being coextensive with that in the rent, &c. (Co. Litt., 313, *a.*)

SUSPENSION, ECCLESIASTICAL, is a mode of censure or secondary punishment inflicted by the church on persons guilty of those minor offences which do not deserve the severer penalties of deprivation or excommunication. 'In the laws of the church,' says Bishop Gibson, 'we read of two sorts of suspension—one relating solely to the clergy, the other extending also to the laity.'

'That which relates solely to the clergy is suspension *ab officio et beneficio* (*i.e.* the duties and income of his office) jointly, or *ab officio* or *beneficio* singly, and may be called a temporary degradation or deprivation, or both.' 'The other, which relates to the laity also, is suspension *ab ingressu ecclesiæ* (*i.e.* from entering the church), or from the hearing of divine service and receiving the holy sacrament, which may therefore be called a *temporary excommunication.*' He also observes that the two sorts of suspension agree in this, that both are inflicted for crimes of an *inferior* nature; that both, in *practice* at least, are temporary; and lastly, both, if unduly performed, are attended with further penalties.' (See Gibs., *Cod.*, tit. xlvi., cap. 3.)

In the Roman Catholic Church various kinds of suspension were inflicted for a great variety of offences. A few may be mentioned to illustrate the nature of this punishment. A bishop might be suspended from wearing the sacred vestments of his order, or from exercising his power of collating, instituting, or presenting to livings, or from the exercise of his jurisdiction, or from his office and benefice, or even from entering the church. These various species of punishment were inflicted for such offences as delaying to consecrate a church after proper application, not punishing concubinary priests, or corrupt and irregular practices in instituting persons to ecclesiastical preferments. The inferior orders of the clergy and other religious persons might be suspended from their office or benefice, or from performing service, or from receiving the sacrament, or from entering the church. The offences so punished were delay or irregularity in the performance of their duties, not wearing a proper dress, violating the rules of their order with respect to eating and drinking, neglecting to receive the sacrament at Easter, or extortion.

Suspension was either imposed by sentence after trial, in which case it must have been preceded by admonition, or was ipso facto upon the perpetration of certain crimes. (Gibs., *Cod.*, *ubi supra.*)

Suspension has been retained as a mode of punishment in the English church. By the 33rd canon of 1603, a bishop ordaining a person who has not a proper title, and refusing to maintain him till he prefer him to some ecclesiastical living, is to be suspended from giving orders during one year: by the 35th canon, a bishop admitting to sacred orders any one not properly qualified is to be suspended from making either deacons or priests during two years; and by the 36th canon, a bishop ordaining any one who has not subscribed in the manner required by that canon is to be suspended from giving orders during twelve months.

It is also declared by the 68th canon that a minister refusing to christen or to bury shall, except under circumstances particularly specified by the canon, be suspended by the bishop of his diocese from his ministry by the space of three months.

Suspension *ipso facto* is also imposed by the 92nd canon upon all ecclesiastical officers who vexatiously cite persons into different courts for the probate of wills.

The above are the principal cases in which suspension still exists as a form of punishment in the church of England. With respect to the laity, Bishop Gibson observes, that 'although this censure is now disused, as being generally thought no punishment by those that deserve it; yet that it is still a legal censure of the church of England, appears not only from many ancient canons and constitutions in this kingdom, which are still in force; but also from an express Act of Parliament, 5 Edw. VI., c. 4, § 1, which provides, that if any person quarrel, chide, or brawl in any church or churchyard, it shall be lawful to the ordinary of the place to suspend every person so offending: that is to say, if he be a layman, *ab ingressu ecclesiæ*, and if he be a clerk, from the ministration of his office, for so long a time as the said ordinary shall by his discretion think meet and convenient, according to the fault. (Gibs., *Cod.*, *ub. sup.*)

There are only two other instances in which the legislature of this country has resorted to suspension as a method of punishment. By the 36 Edw. III., c. 8, which however has been repealed by the 21 Jas. I., c. 28, stipendiary priests taking, without the bishop's dispensation, more than the salaries specified by the act, were suspended of their office.

The other instance occurs in the act passed at the time of the Revolution, prescribing the oaths to be taken to the new government by the 1 W. and M., sess. 1, c. 8, § 7. Every ecclesiastical person neglecting or refusing to take the oath which declared it unlawful to take arms against the king, and the new oaths of allegiance and supremacy, in the manner directed by the act before the 1st of August next following, was declared and adjudged to be suspended from the execution of his office by the space of six months. This assumption of the power of ecclesiastical censure by the laity gave great offence to the high church party. (Hallam, *Const. Hist.*, vol. iii.)

SUSPENSION-BRIDGE, a bridge in which the weight of the roadway, instead of resting upon arches of masonry, or on a rigid frame-work of wood or iron, is supported by the tension of ropes, chains, or rods.

Though it is only within the last twenty or thirty years that suspension-bridges have been constructed to any considerable extent in this country, such structures are by no means of recent origin. Probably the earliest suspension-bridges of which we have any account are those of the Chinese; one of which, the iron chain-bridge of Junnan, or Yunnan, is supposed to have been erected about A.D. 65, in the reign of the emperor Mingus. Ware, who mentions this bridge in his 'Tracts on Vaults and Bridges,' and refers to Kircher's *China Illustrata* and Ogilby's *China* as his authorities, states that the chord-line is of the length of twenty Chinese perches, or 200 cubits. The chain and rope-bridges of India are noticed under BOOTAN, vol. v., p. 169, and the rope-bridges of South America under BRIDGE, vol. v., p. 412. One of the most remarkable of the latter is the bridge of Apurima, which stretches across the cleft of a mountain and a rapid river, at Andaguailas, on the road between Lima and Cuzco. It is described in Frezier's 'Voyage to the South Sea, and along the coasts of Chili and Peru' (p. 184 of the English edition of 1717, and p. 166 of the original French edition of 1716), as about 120 fathoms long and six feet wide. The ropes are formed of bark, and the platform consists of cross pieces of wood interwoven with them. Similar bridges have been described by other writers, the platform being in many cases attached immediately to the sustaining ropes, and therefore assuming the same form, which is that of a catenarian curve. [CATENARY, vol. vi., p. 368.] In some cases additional strength is obtained by adding other ropes, suspended a few feet above the level of the platform; vertical ropes being extended between these and the platform, so as to bear part of its weight. In many of the situations in which rope-bridges are used, high rocky banks afford facilities for fixing the ends of the ropes; but where this is not the case, they are suspended from an elevated framework of timber, or from trees growing on the banks. If the platform of a bridge constructed in this way be attached immediately to the catenarian ropes or chains, it becomes necessary for passengers to rise to the level of the ends of the catenary, either by a flight of steps or by an inclined road. To avoid this inconvenience, and that of the deflection of the roadway, the upper set of ropes or chains must be made sufficiently strong to bear the whole weight of the platform, which may then be suspended from them by vertical ties of various lengths, so as to be nearly or quite horizontal; and the approaches to the platform must be made through or under the framework which supports the ends of the catenaries. Examples of these various forms exist among the suspension-bridges of South America, China, and India, and a few other places; and from these the transition to the more perfect structures of recent times is easy and natural.

Rope-bridges have long been used in military operations in Europe. Sir Howard Douglas, in his 'Essay on the Principles and Construction of Military Bridges' (second edition, 1832), describes several such structures, and states that one was thrown across the Clain, at the siege of Poitiers, in the time of Charles IX. of France. He refers to Davila's 'Historia delle Guerre Civile di Francia', vol. i., p. 264, for particulars. Rope-bridges were also used by Henry, prince of Orange, in 1631, in an enterprise against Ghent and Bruges; in Italy, in the campaigns of 1742; and on several other occasions. One of the most interesting applications of rope-work in the form of a bridge was made in 1812, at the passage of the Tagus by the British army. The object was to provide a passage over Trajan's bridge at Alcantara, one of the arches of which had been destroyed by the French. The gap was near one hundred feet wide, and one hundred and forty feet deep; and over this a net-work of ropes and timber, which had been prepared, was stretched, its extremities being made fast to the remaining masonry of the piers. In connection with this branch of the subject reference may be made to the portable rope-bridges contrived by C. Shakespear, Esq., postmaster-general at Calcutta; a description and model of which were communicated to the Society of Arts in 1824. The details are fully explained and illustrated in the forty-third volume of the Society's 'Transactions.' The supporting ropes are not, in these bridges, suspended in a catenarian curve, but are extended diagonally from the elevated supports or piers to various points of the platform. Temporary suspension-bridges or piers for landing troops, &c. may be supported by ties or rods radiating from vertical masts. Piers or wharfs of this kind are described by Douglas, who mentions one at the Isle of Bourbon, of which an account was given by Mr. C. Noble, in the 'Oriental Repertory,' vol. ii., p. 125.

Drewry states that we have no account of the existence of iron suspension-bridges in Europe before the middle of the last century, and that the earliest appears to have been a small one built across the river Tees, at an elevation of about sixty feet, two miles above Middleton, for foot-passengers only. It was called Winch Bridge, and is described in the third volume of Hutchinson's 'Antiquities of Durham,' which was published in 1794, and in a paper by Robert Stevenson, in the 'Edinburgh Philosophical Journal' for October, 1821. It is, or was (for we do not know whether it is still in existence), about seventy feet long, and rather more than two feet wide. Stevenson, in a plate accompanying his paper, represents the roadway as supported immediately by the chains, which are stretched into a nearly straight line, and are steadied by inclined ties from the banks below. A hand-rail is added on one side for the protection of the passengers, whose footing was far from steady. Stevenson was unable to ascertain precisely the date of the erection of this bridge, but he believed it to be about 1741. The first iron suspension-bridge built in America was that constructed in 1796, by Mr. Finlay, across Jacob's Creek, on the road between Union Town and Greenburgh, the length of which was about seventy feet. Mr. Finlay subsequently, in 1801, obtained a patent for the construction of such bridges, and built several in the United States; one of which, over the Schuylkill, was 306 feet long. His specification describes a bridge supported by two chains, which pass over high towers on the banks, and have their ends brought down to the ground, and firmly secured. The deflection of the chains between the towers is equal to one-seventh of the span or chord-line. The platform or roadway rests upon transverse beams or joists, two of which, in the centre of the bridge, rest upon the chains at the point of their greatest deflection, while all the others are suspended from the main chains by vertical suspending chains. Where the vertical chains are attached to one of the horizontal links of the main chains, the connection is effected by simply passing them through the links, and keying them above; but where the vertical chain is attached to one of the vertical links of the main or catenarian chain, it is effected by means of a fork which embraces the vertical link and is keyed above it. In 1807 a scheme was proposed by M. Belu, a French engineer, for crossing the Rhine, between Wesel and Ruderich, by a bridge about 820 feet long, to be supported by a net-work of wrought-iron chains. In 1814 a still more extensive bridge of similar construction was proposed for crossing the Mersey at Runcorn Gap, so as to form a direct communication between Runcorn in Cheshire and Liverpool. Provis, in his account of the Menai Bridge, states that the plan was suggested by Mr. Dumbell, of Warrington, and that, although no design had then been made, an idea had been thrown out of crossing the river by a web of metallic rings. The promoters of the scheme applied to Telford, who, on account of the great width of the stream, the extensive traffic upon it, and the nature of the bottom, coincided in the plan for a suspension-bridge. He therefore made many experiments on the strength of iron, with a view to determining the proper proportions for such a structure, and prepared a design for a bridge with a central opening of one thousand feet span, and two side openings of five hundred feet each. The deflection of the main chains in the central arch or span was to be fifty feet, and the road itself was to deflect twenty feet, so that the longitudinal bars of the roadway, linked together to form chains, might, by their catenarian position, assist in supporting the weight. The main chains were to be suspended in four parallel lines, so as to divide the platform, which was to be thirty feet wide, into two carriage-ways and a central foot-path. This grand design was subsequently abandoned; but it was useful in paving the way for the subsequent adoption of iron suspension-bridges.

A few suspension-bridges of minor importance were erected in Great Britain between the date of this scheme and the construction of the celebrated Menai Bridge. Drewry mentions one across Gala Water, which was made of thin wires, at a cost of only about 40*l*., although its span was one hundred and eleven feet. It was erected in 1816, by a manufacturer named Lees, of Galashiels. Another wire bridge of about the same length was built in 1817, across the Tweed, at King's Meadows, at an expense of 160*l*. The platform was four feet wide, and was sustained by wires radiating from the tops of two cast-iron columns at each end of the bridge. The columns were cast hollow, and within each of them was placed a vertical bar of wrought iron, two inches and a half square, to which the wires were immediately attached. Several other bridges were built upon this principle; which, according to Navier, a French writer on suspension-bridges, was suggested many years before by M. Poyet. The most important circumstance in the history of suspension-bridges during this period was, however, the introduction, by Captain (now Sir) Samuel Brown, of an improved method of constructing chains for suspending the roadway. Chains of the ordinary form, with short links, are very defective in strength; and several difficulties, among which is the great extent of surface exposed to oxidation, attend the use of cables consisting of small rods or wires. The plan adopted by Captain Brown was to form chains of round or flat bars of iron, several feet long, having either welded eyes or drilled holes at each end, and being connected together by short links and bolt-pins. He made a model of his invention as early as 1813, and had designed and made calculations for bridges still earlier, but he did not obtain his patent until 1817. His specification gives dimensions for a bridge of a thousand feet span, in which the deflection of the main chains should be equal to one twenty-fifth part of the chord line, while it was proposed to make the platform rise in a gentle curve, so that the centre might be twenty-five feet higher than the ends. He devised an ingenious mode of removing a defective bar, by means of a temporary link, as long as three ordinary links, which may be applied to the chain in such a manner as to bear the strain, and consequently to render the removal of the intervening links easy and safe. The first extensive bridge erected upon Captain Brown's plan was the Union Bridge, across the Tweed, near Berwick. It was commenced in 1819, and opened for use in July, 1820. The length of the chord-line, between the points of suspension on the tops of the towers, is four hundred and forty-nine feet, and the deflection is about thirty feet. There are twelve suspending chains, arranged in pairs side by side, and in three tiers, one above the other; each chain being formed of round rods, fifteen feet long and two inches in diameter, with welded eyes, connected together by short coupling-links, the length of which is six inches and three-quarters from centre to centre of the bolt-holes. The bolts for connecting the rods and links are keyed at one end, and are of an oval section, two inches and a half in the longest and two inches in the shortest diameter. The suspension-rods are round, an inch in diameter, and are attached alternately to each of the three tiers of chains, by being dovetailed into a cast-iron saddle placed over the joints. The three tiers of chains are about one foot seven inches apart; and the joints are so arranged that, although in each chain they are fifteen feet apart, they, and the rods suspended from them, are only five feet apart in each set of three double chains. The lower ends of the suspension-rods are forked, to receive longitudinal side-bearers three inches deep and seven-eighths of an inch in thickness, beneath which they are keyed; and upon these longitudinal bearers are laid the transverse wooden joists that immediately sustain the roadway, which rises about two feet in the centre between the suspension-towers. In the towers the distance between the tiers of chains is increased to two feet; and the length of the links is reduced, in order that the chains may lie properly upon rollers mounted to receive them. From these rollers the chains are continued obliquely downwards, and their ends are firmly secured in the abutments of the bridge. In 1821 Captain Brown commenced the Trinity suspension-pier at Newhaven, near Edinburgh, which consists of three spans of two hundred and nine feet each, with fourteen feet deflection. In addition to the catenarian chains and vertical suspension-rods, it has diagonal ties from the piers or towers to points upon the platform; and it has, since the erection of the pier, been deemed advisable to add similar ties beneath the platform, to restrain its motion during violent winds. A peculiarity worthy of notice in this structure is the use of stronger connecting-bolts in those parts of the chains which are near the points of suspension than in the centre of the catenaries, where the strain is less severe.

Probably the design above alluded to for crossing the Mersey, and perhaps also that proposed by Telford for a suspended centering for building an iron bridge at the Menai Strait [SCAFFOLDING, vol. xx., p. 499], led to the determination of the Holyhead Road Commissioners, in 1818, to apply to Telford for his opinion respecting the erection of an iron suspension-bridge at the Menai. The history of this great work, which more than any other has tended to the extensive adoption of such structures, has been given in MENAI BRIDGE, vol. xv., p. 91; and a cut of the bridge is given under BRIDGE, vol. v., p. 413. Telford originally proposed to suspend the platform from sixteen chains, or rather cables, each of which was to consist of thirty-six wrought-iron rods, half an inch square. These small rods were to be packed together in a square form, and then segmental pieces were to be added, so that the whole might form a round cable nearly four inches in diameter, which should be secured by bucklings, bound round with small iron wire, and coated with some protecting substance. This plan, with several other details of the original design, was abandoned, and bar-chains resembling those used in the bridges of Captain Brown, excepting in their rectangular section, were adopted. The ordinary link-bars are three inches and a quarter wide or deep, and one inch thick, and their length, with the connecting-plates, is ten feet; but in the subterraneous tunnels in which the ends of the chains are secured to the rocky shores, the length of the links is reduced to seven feet six inches, and their transverse dimensions are increased to four inches by one inch and a half, so as to diminish the risk of injury by oxidation, which cannot be so readily detected and guarded against as in other parts, owing to the confined situation of the iron-work. The holes for the connecting-bolts were bored by a machine with great care; yet much difficulty was experienced in making them perfectly uniform in distance, since even the small difference in the length of the bars occasioned by changes of temperature became important when they were connected together into chains several hundred feet long. To meet this difficulty each chain was provided with a few adjustable joints, at which, by means of wedges inserted in a slot in the bars, the length might be a little increased or diminished. There are sixteen chains, each of which consists of five lines of bars, connected together at the joints by six coupling-plates. The chains are arranged in four vertical tiers, and form four parallel lines of suspension, the distances between which are regulated by the width of the two carriage-ways and the central foot-path. The chains of the first or uppermost tier are connected with those of the third tier by short vertical rods at the joints, from the lower of which the suspension-rods descend; and the second and fourth chains are connected together in like manner, their joints being intermediate between those of the first and third tiers, so that, although the joints of each chain are ten feet apart, the suspension-rods descend at intervals of only five feet. The suspension-rods are an inch square, and they support transverse cross-bearers, or trussed joists, upon which is laid the platform of fir plank. At the sides of each carriage-way there are longitudinal wheel-guards, or beams of oak, to prevent carriages rolling too much to either side, and thereby injuring the suspension-rods. During the progress of the work, which has been very minutely detailed by Mr. Provis, the resident engineer, every piece of iron was carefully tested, and many plans were tried to prevent the injury of the metal by oxidation. That finally adopted was to clean each piece, after proving its strength, then to heat it until the hand could only just be borne upon it, and while hot to immerse it in linseed oil. After remaining in the oil a few minutes, that the pores might be filled, the bar was taken out and returned to the heating-stove, in which the oil was dried by a moderate heat in three or four hours. The oil was thus converted into a thin coat of hard varnish, which afforded a very complete protection from the atmosphere, although it was very liable to be rubbed off by friction. The whole of the iron-work is protected by painting, which is renewed from time to time, for greater security.

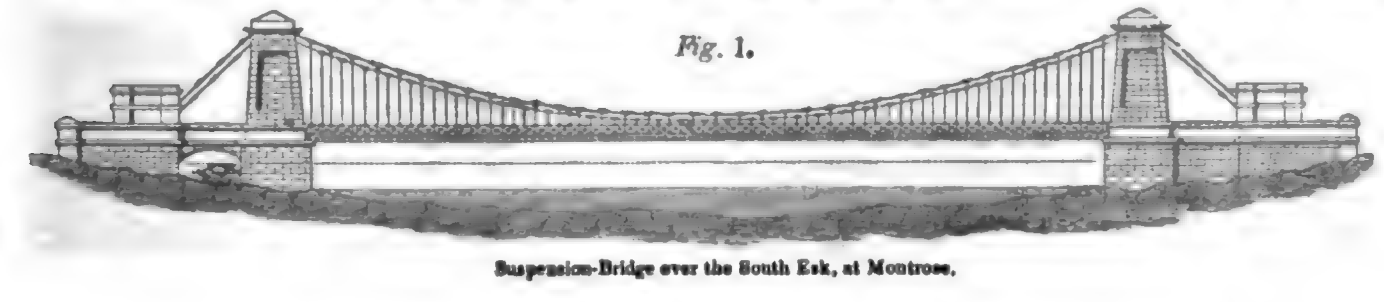
The massive iron castings which are imbedded in the rock to form an abutment for the chains, are bedded upon two or three thicknesses of coarse flannel, saturated with white lead and oil, which, with a few timber wedges, enables them to bear steadily against the rock. The lower ends of the chains, the last or lowest links of which consist of seven instead of five bars, were put together from the abutments, tackle being used to keep them tight, and thereby to prevent their weight from causing them to slide down the inclined tunnels. The portions of chain between the openings of the tunnels and the tops of the piers or towers were built up upon scaffolding; and, to check undulation, they are tied down by rods to the masonry of the end arches (see the cut above referred to), a very little motion being allowed to them on account of changes of temperature. On the tops of the suspension-towers are massive cast-iron saddles to receive the chains; and between these and the cast-iron beds which sustain them are inserted rollers, which allow the saddles to move a little under their immense load, when the chains expand or contract. The operation of raising the portions of chain between the suspension-towers occasioned much anxiety, but was accomplished without great difficulty by joining together several bars from the top of each tower by a hanging scaffold, and elevating the intervening portion of each chain from a raft four hundred feet long and six feet wide, by means of a capstan. In the Conway Bridge, erected by Telford about the same time, the chains were built up, or put together, upon a temporary rope-bridge stretched between the towers.

Before the Menai Bridge was completed, it was found that high winds occasioned considerable vibration, especially in the windward chains. To check this motion transverse braces were applied in such a manner as to tie the several chains together, and to check their individual motion. Each of these braces, of which there are eight in the length of the bridge, consists of cast-iron tubes placed between the chains, with wrought-iron rods passing through them, which are screwed up at the ends. Thus the stiffness of the tubes prevents the chains from coming too near together, while the tension of the rods serves to check any motion in the opposite direction. The tubes which connect the upper and lower tiers of chains are bound together by diagonal braces.

The experience afforded by several violent storms has led to the adoption of some alterations in the details of this magnificent work, the most important of which are the suspension of the trussed beams that support the roadway by only two points, instead of three, as originally constructed, and the insertion of joints in the lower ends of the suspension-rods, just above the platform. By these alterations more play is allowed, and the risk of fracture to the suspending-rods is greatly diminished.

No enumeration of the suspension-bridges erected in this and other countries since the improvements of Captain Brown and the construction of the Menai Bridge can be here attempted. While the Menai Bridge was in progress Captain Brown constructed the suspension-pier at Brighton, which consists of four openings of two hundred and fifty-five feet each, with a deflection of eighteen feet; and Mr. W. Tierney Clark commenced in 1824 the Hammersmith suspension-bridge, the first erected in the vicinity of London. The central opening of the Hammersmith Bridge has a chord-line of four hundred and twenty-two feet, with a deflection of twenty-nine feet six inches; but as the piers are built in the river, and the roadways between them and the shores are suspended from the chains, the total length of roadway supported by the chains is about a hundred and thirty-five feet more than in the Menai Bridge. The width of the bridge is about thirty feet, there being a carriage-way of twenty feet, and two side footpaths of five feet each. There are eight chains, arranged in four double lines, or in two vertical tiers. The chains on each side of the carriage-way consist of six bars each, placed side by side; but the outermost chains, on the outside of the footpaths, consist of three bars each. The bars are eight feet ten inches long between the centres of the bolt-holes, five inches deep, and one inch thick, and the coupling-plates are fifteen inches and a quarter between the bolt-holes, eight inches wide, and one inch thick. The connecting-bolts are two inches and five-eighths in diameter. The suspension-rods are one inch thick, and about five feet apart; and the platform is supported upon double joists of Memel timber, consisting of two pieces twelve inches deep and four inches wide. The lower ends of the rods pass down between the two halves of each joist, and are keyed beneath, upon iron plates or washers. Longitudinal beams are bolted down to the joists on the outside of the footpaths and along each side of the carriage-way, and the platform is stiffened throughout by a strong longitudinal trussing. The ends of the platform, being above the level of the chains, are supported by framework resting upon them, instead of resting upon suspension-rods. This bridge was opened for use in 1827. In 1828 Captain Brown commenced a large suspension-bridge over the South Esk, at Montrose, which is represented in the annexed cut. The chord-line is four hundred and thirty-two feet long, and each chain extends a hundred and fifteen feet

Fig. 1.

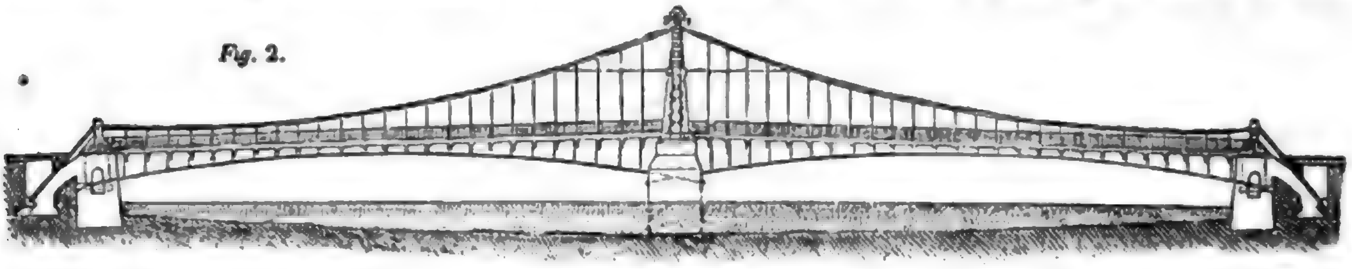


Suspension-Bridge over the South Esk, at Montrose.

from the centre of the tower to the farthest end of the chamber of masonry in which its end is secured. There are two chains on each side of the bridge, one above the other, each consisting of four lines of bars, of the same dimensions as those of the Hammersmith bridge. The total width of the road between the suspension-rods is twenty-six feet. This elegant structure was greatly injured in a storm of wind in October, 1838, and has since been considerably strengthened.

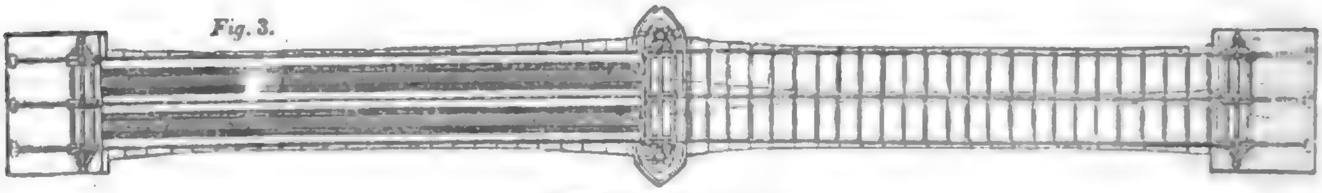
Some suspension-bridges have been erected in which the main-chains, instead of passing over a pier or tower at or near each end of the platform, as in the cut given above, are supported by a single tower in the centre of the bridge, and form what may be called two semi-catenaries. The cut here inserted of a bridge constructed in 1823 by Mr. (now Sir M. I.) Brunel, for the Isle of Bourbon, will illustrate this construction, and also explain the means adopted to enable the bridge to sustain the action of violent winds. The upper figure represents the side elevation of the bridge, showing also the mode of securing the ends of the chains; and the lower gives a ground-plan, with the platform removed from one-half, to show the joists. The bridge consists of two openings of a hundred and twenty-two feet each; and, to resist the strain occasioned by hurricanes, which often blow upwards as well as sideways, a set of chains is added under each half of the bridge, in the form of an inverted catenary; the vertical rods which connect these chains with the platform serving, in ordinary circumstances, to keep the chains in the required form, and, in case of a rush of wind tending to lift the platform, acting as suspension or tension rods to keep it in its proper place. These supplementary chains are not arranged in vertical planes, but in the form shown in the ground-plan, which enables them to offer some resistance to a transverse strain, such as would be produced by a wind blowing at right angles with the side of the bridge. Similar stay-chains are applied to another bridge, consisting of a single catenary, which was erected by the same engineer at the same time and place; and such have been applied successfully to the Brighton chain-pier and some other suspension-bridges. Another peculiarity in these bridges is the circumstance that the chains do not rest upon saddles or rollers in the suspension-towers, but are suspended by links from a strong frame-work of cast-iron, by which means very free motion is allowed to the extent necessary to allow for changes of temperature. This mode of fixing the chains was adopted in the Broughton suspension-bridge, over the Irwell, near Manchester, which was erected in 1827. The above form of suspension-bridge, with a single central tower, has been adopted in the Pont d'Arcole, at Paris, and in a suspension-bridge recently erected over Kenmare Sound, Ireland, of which a description is given in the 'Civil Engineer and Architect's Journal,' vol. i., p. 315.

Fig. 2.



Suspension-bridge in the Isle of Bourbon.

Fig. 3.

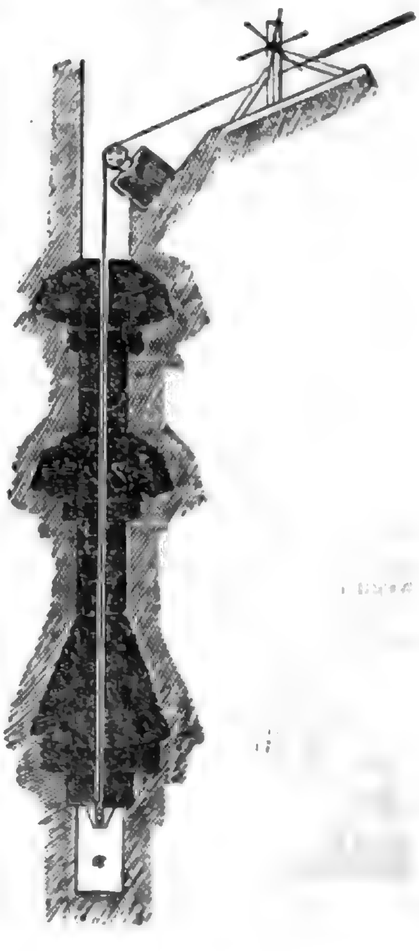


Ground-plan of the above.

Mr. Robert Stevenson, in vol. v. of the 'Edinburgh Philosophical Journal,' proposed to construct suspension-bridges, under some circumstances, without any elevated points of support for the chains, which were to be firmly secured to the abutments of the bridge, and suspended in a catenarian form below the platform, which was to be supported by frame-work built upon, instead of hanging from them. One of the advantages proposed by this arrangement was that the chains might be equally distributed under the width of the platform, whereas in ordinary suspension-bridges they must be so distributed as to leave width between them for carriage-ways. It has been already stated that part of the platform of the Hammersmith bridge is supported above the chains; and Drewry mentions (pp. 95-6) a bridge of one hundred and three feet span on this principle.

Some small bridges of wire have been alluded to already, and Drewry describes several of large dimensions which were erected on the Continent soon after the introduction of suspension-bridges upon an extensive scale in Great Britain. The first large one erected in France was that of Tournon, across the Rhône, between Tain and Tournon, in 1824-5. It consists of two openings of rather more than two hundred and seventy-eight feet each. By far the most important wire-bridge yet built is that over the Sarine, at Fribourg in Switzerland, which was commenced in 1832, and completed in 1834, by M. Challey. It has a span, from pier to pier, of eight hundred and seventy feet, and is one hundred and sixty-seven feet above the level of the river, being much longer and higher than the Menai Bridge. The platform is suspended from four cables, arranged in pairs at the sides of the bridge, with a deflection of fifty-five feet. The wire of which the bridge is composed is about one-twelfth of an inch in diameter, and each cable consists of fifteen bundles of eighty wires each, packed together in a cylindrical form, and bound round at intervals of two or three feet with annealed wire. The wires are not twisted together like

Fig. 4.



the strands of a rope, but each of them extends straight from end to end of the cable. At the suspension-towers the fifteen bundles of wires which compose each cable are flattened out into a broad strap, to give them a more extensive bearing upon the friction-rollers over which they are conducted; and after passing these rollers, they are again united into a cylindrical form until they reach the points of attachment to the rock, which are one hundred and sixty feet from the towers. The ends of the cables are conducted along inclined tunnels excavated in the rock to the depth of forty-five feet from the level of the road at one end of the bridge, and to twice that depth at the other end. In the tunnels the end of each cable is attached to two others, of about half the size, each of which is conducted, over a friction-roller, down a vertical pit or well excavated in the rock to the depth of forty-five feet, in the form represented in *Fig.* 4. The lower end of each small cable is attached to a piece of iron, *a*, which serves as an anchor; and the bevelled recesses of the excavation are filled up with masonry, as indicated by the dark tint in the cut, so arranged as to resist the enormous strain occasioned by the weight of the bridge. As each main cable has two such points of attachment at each end, there are altogether eight of these fastenings at each end of the bridge. The two pairs of cables are suspended at a distance of thirty feet from each other, but the width between the lower ends of the suspension-rods is only twenty-four feet, so that their position is not quite vertical. These rods are small cables, consisting of thirty wires similar to those of which the cables are composed, and having at their upper end a double hook, which rests upon the two cables, as shown at *bb*, *Fig.* 5, which represents one of the suspension-rods or cables as viewed in two different directions; A being its appearance when viewed in a line with the longitudinal direction of the bridge, and B its appearance when looking across the roadway at right angles with the main cables. At the lower end of each vertical suspender is a loop, *a*, which receives the hook of an iron stirrup that embraces the end of one of the transverse beams which support the roadway. There are one hundred and sixty-three pairs of suspending-rods, at intervals of between four and five feet from each other. *Fig.* 6 is a transverse section of the roadway, which is formed of fir planks, supported by the transverse beams, and is stiffened by a strong oak railing, or diagonal truss, running along the sides of the bridge, and by longitudinal beams firmly bolted to the transverse bearers. The bridge was completed at a cost of 24,000*l.*, and was publicly opened on the 19th of October, 1834, on which day upwards of five thousand persons were on it at the same time. A minute description of the work was published in French, from which the particulars of the account in Nos. 279 and 280 of the 'Penny Magazine' are derived. In the former number is given a general view of this remarkable structure, and in the latter are some particulars respecting its construction besides those which are given above.

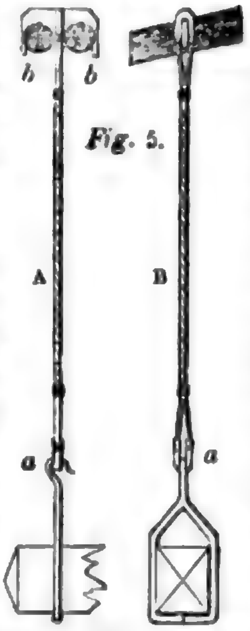
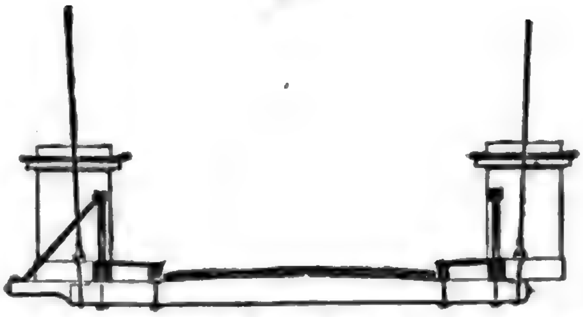


Fig. 5.

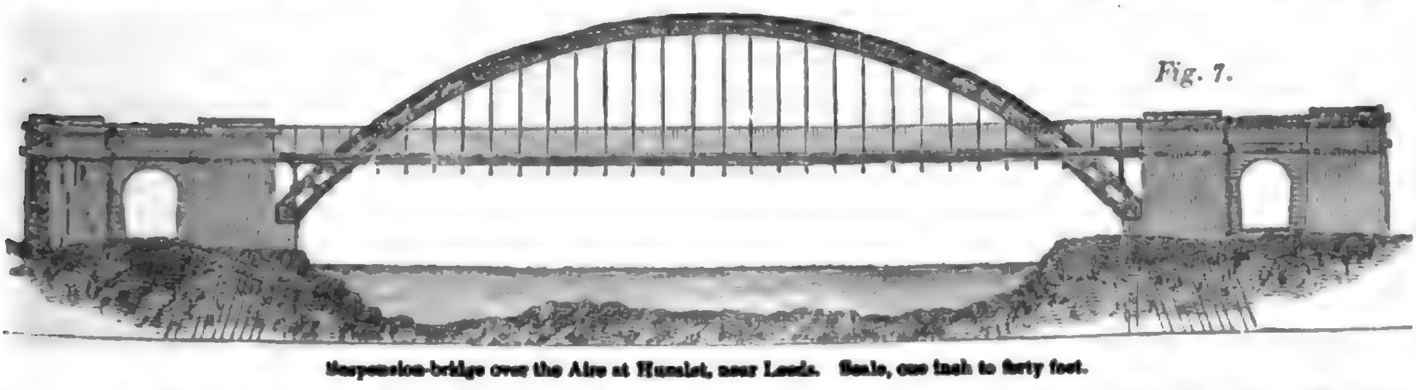
Fig. 6



The use of wire instead of bar-chains in the construction of suspension-bridges is favoured by the simplicity of the apparatus necessary for their erection, and the superior strength, bulk for bulk, of small wires over bars of considerable dimensions. The increased surface exposed to oxidation forms a serious drawback, since, with every precaution, it is difficult entirely to prevent it, or to detect its progress; and another difficulty, which is perhaps of greater importance, arises from the impossibility of adjusting the length of each wire to its position in the cable, so that, when the cable has assumed its proper curvature, each wire may bear its due proportion of strain. Drewry considers the latter difficulty so great, that he observes that, if wire must be used, it would be better to form it into links of from ten to fifteen feet long, and to couple these together with short links either of wire or of iron, uniting them by transverse bolts of large diameter, which, for the sake of lightness, may be made hollow. He describes (p. 117) a bridge of this description at Geneva, in which both the long and short links may be called skeins of wire, bound round into a cylindrical form in the centre, and spread out into broad loops at the ends, where they embrace the hollow bolts. The structure is, in fact, a chain-bridge, of which the chain-bars and linking-plates consist of bundles of wire, instead of solid bars. He says however (p. 153) that, all things considered, 'it may be safely pronounced that bar-chains are better adapted than wires for anything beyond the size of a foot-bridge.' Many small wire-bridges have been constructed on the radiating system before alluded to, but they are necessarily very subject to vibration, and are consequently unsafe. It is impossible to strain the radiating ties or chains perfectly straight, and yet to leave them sufficiently strong to bear the weight of the bridge; and any inequality in the degree of tension of the different ties may, when the platform is made to vibrate by a load passing over it, or by the action of high winds, occasion strains which no practicable strength will enable them to bear. This plan must therefore be considered inapplicable to any but very small bridges, in which the strength is usually so great in proportion to the strain, as to render defects of construction of but little consequence.

Several suspension-bridges of small span have been constructed upon an ingenious plan which combines the advantages of the opposite principles of tension and compression. The first of these, we believe, was the Monk Bridge, across the river Aire at Leeds, which was erected in 1827, by Mr. George Leather of that place. *Fig.* 7 represents another bridge, of rather larger dimensions, built by the same engineer, at Hunslet, near Leeds, a few years later. The platform is supported by vertical suspension-rods, the upper ends of which, instead of being attached to catenarian chains, are supported by rigid arches of cast-iron, which, rising between the carriage-way and the footpaths, are elevated above the level of the platform. In the bridge here represented the cast-iron arcs or ribs are of 152 feet span, and each consists of six pieces fitted together. The suspending-rods are of malleable iron, and they sustain transverse cast-iron beams upon which the roadway is laid. The width of the carriage-way is twenty-four feet, and of the footpaths, which are outside the lines of suspension, seven feet

Fig. 7.



Suspension-bridge over the Aire at Hunslet, near Leeds. Scale, one inch to forty feet.

each. Of other bridges on this principle, which combines an unusual degree of stiffness with some of the valuable properties of the ordinary catenarian construction, reference may be made to that erected for the Birmingham, Bristol, and Thames Junction (now called the West London) Railway Company, at Wormwood or Wormholt Scrubbs, over a diversion of the Paddington canal, at the point where the railway itself passes by a tunnel under the canal. This curious bridge, or rather combination of bridges, is described and represented in the 'Companion to the Almanac' for 1840, p. 249. Timber bridges have been constructed on a similar principle to the above, which may be compared to the kind of truss represented in the article Roof, *Fig.* 18 (vol. xx. p. 146). Drewry mentions one at Eglisau, near Zürich, in Switzerland, consisting of two arches formed of beams 15 feet long, 10 inches broad, and 1 foot deep, with their abutting ends secured by iron straps. The ends of the arches are tied together by horizontal braces, and the weight of the platform is suspended by vertical bars arranged in pairs, which embrace the wooden arch or rib, and are bolted together above it. A similar structure was proposed some years since for crossing the Thames at Hungerford-market, where an iron suspension-bridge for foot passengers is now being erected. Stevenson describes some very extensive bridges of this kind in his 'Sketch of the Civil Engineering of North America.' One, over the Delaware, at Trenton, about thirty miles from Philadelphia, consists of five arches, varying from 160 to 200 feet span; and another, over the Susquehanna, at Colombia, is of twenty-nine arches of 200 feet span.

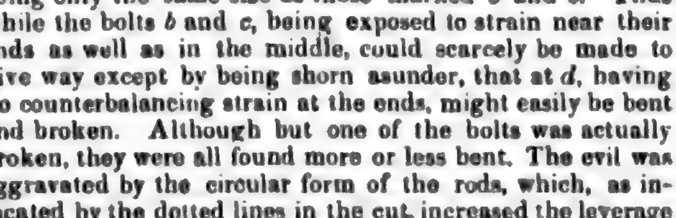
Much attention has been recently excited by the principle of constructing suspension-bridges introduced by Mr. Dredge of Bath, who obtained a patent for his invention in 1836. Without offering any opinion as to the accuracy of his calculations, it may be briefly stated that he professes to effect such great economy of material by a better disposition of the rods and chains, that it has been asserted (*Civil Engineer and Architect's Journal*, vol. iii., p. 193), that the Menai bridge might, on the new plan, be reconstructed for less than the value of the superfluous metal in the present structure. The leading features of his plan are the adaptation of every part of the chain to the precise amount of strain to which it is exposed, by diminishing the number of plates, and consequently the weight and strength of the chains, from the points of suspension to the lowest or central point of the catenary; and the position of the suspending-rods, which, instead of being vertical, are arranged in oblique lines from their points of attachment to the main chains towards the centre of the catenary. The Victoria bridge, over the Avon, at Bath, which was built on this plan in 1836, contains only twenty-one tons of iron, although it is of 150 feet span. In some experiments tried at the Adelaide Gallery, London, it was found that a small wire-bridge of the ordinary construction, consisting of six ounces and a half of wire, and forming a span of five feet eight inches and a half, broke with the weight of eight persons; while a similar bridge, formed of only six ounces of wire, on Dredge's plan, bore eleven persons, until one of them stamped, when it broke down.

Suspension-bridges are well adapted for many situations in which, from the limited traffic, the expense of ordinary stone bridges would prevent their adoption, and also for places in which, from the great span required, the great elevation, the unfavourable nature of the bottom, or the rapidity of the current to be crossed, the erection of any other kind of bridge would be difficult; but they are not applicable to situations of great and constant traffic, since they are much weaker than arch-bridges, and very liable to injury from the vibration occasioned by what might appear slight forces. It is true that, as urged by some of the advocates of this elegant kind of bridge, the low position of the centre of gravity with relation to the points of support, and the freedom of motion allowed by its flexible structure, enables a suspension-bridge to return to its position of equilibrium after it has been disturbed by any accidental cause; but this circumstance will not always be sufficient to counterbalance its greater liability to disturbance, and the risk of accident from defects of workmanship or of construction. Several accidents having occurred to suspension-bridges through the effect of wind, or the strain occasioned by the passing of a large body of people, whose mere weight might be far from sufficient to account for the failure, engineers have recently devoted much more attention than was formerly deemed necessary to means for checking the undulatory or vibratory motion. Drewry, after observing (p. 27) that in small bridges the mass of materials suspended is usually too small to do much injury if put in motion, says that 'in suspension-bridges of large dimensions, and consequently of great weight, the force that the suspended mass will acquire by being put in motion increases rapidly.' 'Hence,' he proceeds, 'it is an object to make it resist motion, and especially to make every part bear its fair share of strain. It is a common doctrine that lightness is the peculiar excellence of a suspension-bridge; but that is a principle which must be acted upon with discretion, and not taken generally; for a bridge may be, from its size, just so heavy that by being put in motion it will acquire great momentum, and just so light and slight that it will be unable to resist the effects of its own vibration. Therefore, when it becomes necessary to make the chains of a bridge so heavy that vibration would be dangerous, it is advisable boldly to increase their weight, rather than to attempt to diminish it, and to bind and connect the several chains and the roadway firmly together, in order that there may be sufficient *mass and stiffness* in the bridge to *resist* motion, rather than to yield to it readily.' Reversed catenaries, as in the Isle of Bourbon bridges, and lateral guys extending from the platform to fixed points on the shores, may prove very useful in checking motion; but probably the most important measure adopted for this purpose is that of trussing the platform longitudinally by two or more lines of stiff diagonal trusses, which may be made in the form of a handsome railing. This is particularly insisted upon in a paper by Colonel (now General) Pasley, of the Royal Engineers, published in the third volume of the 'Transactions of the Institution of Civil Engineers,' upon the state of the Montrose suspension-bridge, after its injury by the hurricane of October 11th, 1838. He conceives that the injuries to which suspension-bridges are exposed from wind arise chiefly from its action beneath the platform; and, in illustration of his position, observes that in the storm of November, 1836, the roadway of the Brighton chain-pier did not give way until after the side railings were shattered and blown away. He also refers to the Hammersmith bridge, which is trussed throughout, as an illustration of the advantage of the system. It is urged in this paper, that if the platform, which presents a large surface to the wind acting from below, be kept from undulating, 'it can scarcely be supposed that the utmost force of the wind could move the chains at all, having comparatively so very little surface to oppose to it, and which must be held down by the great weight of the roadway, so long as *that* remains at rest.' Mr. Provis agrees with the above writer as to the importance of stiffening the platform, although he conceives the mischievous action of the wind to take place laterally as well as vertically; but, in the Menai bridge, in making repairs after the storm of January 7, 1839, he has preferred obtaining the requisite strength by longitudinal beams, instead of trusses. The Montrose suspension-bridge has been, since the injuries described by Colonel Pasley, strengthened with a system of longitudinal trussing by Mr. Rendel, who read a description of it before the British Association in 1841.

Of the theoretical points involved in the construction of suspension-bridges little will be said. These have been considered at length by Davies Gilbert, Esq., in a paper read before the Royal Society in 1826, and printed in vol. cxvi. of the 'Philosophical Transactions;' and in Drewry's work, referred to at the end of this article. The amount of deflection of the chains between the points of suspension must depend upon circumstances; but Drewry conceives that it is not advisable in a large bridge to make the deflection less than one-fifteenth of the chord-line; and that one-fourteenth or one-thirteenth is a better proportion. Some bridges have a still deeper deflection; and others, for bearing very little weight, have as little as one-twentieth; but this Drewry considers unadvisable, because the great strain thrown upon the chains by drawing them into so flat a curve detracts materially from their effective strength. The angle formed by the descent of the chains upon the land-side of the towers should be either the same as that formed by the commencement of the catenary, or very nearly so, in order that the pressure upon the suspension-towers may be vertical, and may not have any tendency to pull them over in either direction. Douglas observes that there is a slight error on this point in the Menai bridge; the angles formed by the chains with an horizontal line being, on the outward and inward sides of the pillar, 16° 10′ and 18° 3′ respectively. 'From this inequality,' he says, 'a horizontal force arises, tending to draw the pillars outwards; and though this force be very small compared with the pressure on the pillar, yet acting constantly at the end of a lever of such length as the height of the pillar (nearly 200 feet), it may produce injurious effects.' 'This therefore,' he proceeds, 'is an error in principle, which should have been avoided, and which ought not to exist in any such constructions' (p. 349). This error appears to be a very common one, and is in some cases considerable in extent; but the most common error is that of making the chains deflect too suddenly on the land-side of the piers, so that the strain tends to throw them into the water.

The method of securing the chains to the abutments is of the greatest importance. Where the abutments are of rock, excavations may be readily formed of a suitable shape, and the required security is easily attainable; but when the abutments are of masonry, Douglas recommends that the whole should be so cramped together that the strain may be borne by the whole mass, and not merely by the wedge-shaped portion upon which it more immediately acts. In all cases the lower part of the chains, and the fastenings by which they are secured, should be left accessible for examination. We may here allude to a singular blunder committed in the abutment-fastenings of the Broughton suspension-bridge at Manchester, which appears to have been the principal predisposing cause of its fall, although the unusual strain to which it was exposed at the time was the *immediate* cause of the accident. This bridge, of a hundred and forty-four feet and a half span, was built in 1827, and sustained the traffic without apparent injury until 1831, when it broke under the passage of a body of soldiers, about sixty in number, marching over in fours. Two similar parties had passed just before, but as they were not marching in step, their passage produced no injurious vibration. The roadway was suspended by two double chains, formed of round iron bars two inches in diameter, connected together at the joints by three short elliptical links with cross-bolts, as at *a*, *Fig.* 8. The last joint however, by which the chain was connected with cast-iron discs imbedded in the masonry of the piers, consisted of a single link, *e*, equal in substance to the three small links at *a*; the cross-bolt, *d*, of this joint being only the same size as those marked *b* and *c*. Thus while the bolts *b* and *c*, being exposed to strain near their ends as well as in the middle, could scarcely be made to give way except by being shorn asunder, that at *d*, having no counterbalancing strain at the ends, might easily be bent and broken. Although but one of the bolts was actually broken, they were all found more or less bent. The evil was aggravated by the circular form of the rods, which, as indicated by the dotted lines in the cut, increased the leverage of the strain. This accident, the particulars of which are narrated in the fifth volume of the 'Memoirs of the Literary and Philosophical Society of Manchester,' second series, shows how dangerous it is for a body of men to walk in regular step upon a suspension-bridge; for, with all its defects of construction, the Broughton bridge had sustained far greater weights when applied in a less injurious manner.

Fig. 8.



Experiments were made some years since by Telford and Captain Brown, to determine the strength which may be safely allowed per square inch for the bars of an iron suspension-bridge. The mean of the results obtained by these engineers is about twenty-seven tons to the square inch, which is commonly taken as the standard for the ultimate or breaking strength of cohesion of good malleable iron. It will stretch with much less, and nine tons per square inch is considered as the maximum strain which it is advisable to allow permanently upon the chains of a suspension-bridge, although a load equal to twelve or fourteen tons may be safely applied for a short time. In 1827-8 a suspension-bridge of *steel* was erected over the Danube at Vienna, by an engineer named Von Mitis, whose preliminary experiments upon various kinds of steel are recorded by Drewry (p. 20). Von Mitis advocates the use of steel in lieu of iron for such structures, but Drewry considers that, if the cost were not a prohibition to its use in this country, its advantages may be questioned, since the greater lightness of a steel suspension-bridge in proportion to its strength would render it more liable to vibration than those of iron. The bridge alluded to at Vienna has a chord-line of three hundred and thirty-four English feet, with a deflection of nearly twenty-one feet and a half, and its vibration is said to be considerable. In a paper read before the Institution of Civil Engineers, on April 14, 1840, by Mr. Andrew Burn, upon a proposed suspension-bridge over the Haslar Lake at Portsmouth, the use of cast-iron instead of wrought-iron as a material for the chains is suggested; the advantages proposed being economy and diminished risk of oxidation. Suspension-bridges have been built with wooden chains, formed of long bars linked together. Ware mentions several such bridges on the continent of Europe; and Drewry (p. 154, &c.) describes some plans for the erection of such structures.

Engineers differ in opinion as to the best arrangement of the material of the main-chains; some using several small chains, arranged in four lines, and in two, three, or four tiers, while others think it better to concentrate the whole strength in two chains only. The latter principle is advocated by Mr. I. K. Brunel, on account of the difficulty of providing for the unequal expansion and contraction of the different chains. When only two lines of chains are used, it is advisable to have them between the carriage-way and the footpaths, which may safely rest upon the projecting ends of the transverse bearers. To avoid any unnecessary weakening of the piers or towers, it is usual to pierce them with arches for the carriage-way only; and in some bridges the inconvenience of making the foot-passengers turn into the carriage-way in passing under them is avoided by supporting footpaths outside the piers by iron consoles or brackets.

(Drewry's *Memoir on Suspension-Bridges*, 1832; Douglas's (Sir Howard) *Essay on the Principles and Construction of Military Bridges*, second edit., 1832; Ware's *Tracts on Vaults and Bridges*, published anonymously, 1822; *Edinb. Philosophical Journal*, vol. v., p. 238; *Penny Magazine*, Nos. 279 and 280; *Companion to the Almanac* for 1833, p. 222; *Memoirs of the Lit. and Phil. Soc. of Manchester*, second series, vol. v., pp. 384 and 545; *Transactions of the Institution of Civil Engineers*, vol. iii., p. 219; &c.)

SUSQUEHANNA. [PENNSYLVANIA.]

SU'SRUTA, one of the earliest and most celebrated of the Hindu writers on medicine, was the son of Viswamitra, and the pupil of Dhanwantari. Nothing is known of the events of his life, and his date is rather uncertain. His medical work is still extant, and has been lately published in two vols. 8vo., Calcutta, 1835. It is unquestionably of some antiquity, but it is not easy to form any conjecture as to its real date, except that it cannot have the prodigious age which Hindu fable assigns it; it is sufficient to know that it is perhaps the oldest work on the subject which the Hindus possess, excepting that of Charaka. The only direct testimony that we have with respect to the dates of Charaka and of Susruta is that of Professor Wilson, who states that, from their being mentioned in the Puranas, the ninth or tenth century is the most modern limit of our conjecture; while the style of the authors, as well as their having become the heroes of fable, indicate a long anterior date. One commentary on the text of Susruta, made by Ubhatta, a Cashmirian, is probably as old as the twelfth or thirteenth century, and his comment, it is believed, was preceded by others. The work is divided into six portions: the *Sutra St'hana*, or Chirurgical Definitions; the *Nidana St'hana*, or Section on Symptoms, or Diagnosis; *Sarira St'hana*, Anatomy; *Chikitsa St'hana*, the internal administration of Medicines; *Kalpa St'hana*, Antidotes; *Uttara St'hana*, or a supplementary section on various local diseases, or affections of the eye, ear, &c. In all these divisions however, surgery, and not general medicine, is the object of the book of Susruta; though, by an arrangement not uncommon with our own writers, he introduces occasionally the treatment of general diseases, and the management of women and children, when discussing those topics to which they bear relation. As this is the only Sanscrit medical work which (as far as the writer is aware) has been published, it will not be out of place here to give some account of the state of medicine among the Hindus, extracted from two notices by Professor Wilson, published originally in the 'Oriental Magazine' (Calcutta, February and March, 1823), from which several passages are inserted by Professor Royle in his 'Essay on the Antiquity of Hindoo Medicine,' 8vo., London, 1837. The instrumental part of medical treatment was, according to the best authorities, of eight kinds—*Chhedana*, cutting or scission; *Bhedana*, division or excision; *Lek'hana*, which means *drawing lines*, appears to be applied to scarification and inoculation; *Vyadhana*, puncturing; *Eshyam*, probing or sounding; *Aharya*, extraction of solid bodies; *Visravana*, extraction of fluids, including venesection; and *Sevana*, or sewing. The mechanical means by which these operations were performed seem to have been sufficiently numerous: of these, the principal are the following—'*Yantras*, properly *machines*, in the present case *instruments;* but to distinguish them from the next class, to which that title more particularly applies, we may call them *implements;* *Sastras*, weapons or instruments; *Kshara*, alkaline solutions or caustics; *Agni*, fire, the actual cautery; *Salaka*, pins or tents; *Sringa*, horns, the horns of animals open at the extremities, and, as well as *alabu*, or gourds, used as our cupping-glasses; the removal of the atmospheric pressure through the first being effected by suction, and in the second by rarifying the air by the application of a lamp. The next subsidiary means are *Jalauka*, or leeches.

'Besides these, we have thread, leaves, bandages, pledgets, heated metallic plates for erubescents, and a variety of astringent or emollient applications.'

The descriptions of the very numerous Hindu intruments not being very minute or precise, Professor Wilson says we can only conjecture what they may have been, from a consideration of the purport of their names, and the objects to which they were applied, in conjunction with the imperfect description given.

'The *sastras*, or cutting instruments, were of metal, and should be always bright, handsome, polished, and sharp, sufficiently so, indeed, to divide a hair longitudinally.

'The means by which the young practitioner is to obtain dexterity in the use of his instruments are of a mixed character; and whilst some are striking specimens of the lame contrivances to which the want of the only effective vehicle of instruction, human dissection, compelled the Hindus to have recourse, others surprise us by their supposed incompatibility with what we have been hitherto disposed to consider as insurmountable prejudices. Thus the different kinds of scission, longitudinal, transverse, inverted, and circular, are directed to be practised on flowers, bulbs, and gourds. Incision, on skins or bladders filled with paste and mire; scarification, on the fresh hides of animals from which the hair has not been removed; puncturing or lancing, on the hollow stalks of plants, or the vessels of dead animals; extraction, on the cavities of the same, or fruits with many large seeds, as the Jack and Bel; sutures, on skin and leather; and ligatures and bandages, on well-made models of the human limbs. The employment of leather, skin, and even of dead carcasses, thus enjoined, proves an exemption from notions of impurity we were little to expect, when adverting to their actual prevalence. Of course, their use implies the absence of any objections to the similar employment of human subjects; and although they are not specified, they may possibly be implicated in the general direction which the author of the 'Susruta' gives, that the teacher shall seek to perfect his pupil by the application of all expedients which he may think calculated to effect his proficiency.

'Of the supplementary articles of Hindu surgery, the first is *Kshara*, alkaline or alkalescent salts. This is obtained by burning different vegetable substances, and boiling the ashes with five or six times their measure of water. In some cases the concentrated solution is used after straining, and is administered internally, as well as applied externally.

'Care is enjoined in their use, and emollient applications are to be applied, if the caustic occasions very great pain. At the same time these and the other substitutes for instrumental agents are only to be had recourse to where it is necessary to humour the weakness of the patient. They are especially found serviceable where the surgeon has to deal with princes and persons of rank, old men, women and children, and individuals of a timid and effeminate character.

'The cautery is applied by hot seeds, combustible substances inflamed, boiling fluids of a gelatinous or mucous consistence, and heated metallic bars, plates, and probes. The application is useful in many cases, as to the temples and forehead, for headaches; to the eyelids, for diseases of the eyes; to the part affected, for indurations in the skin; to the sides, for spleen and liver; and to the abdomen, for mesenteric enlargements. As amongst the Greeks, however, the chief use of the cautery was in the case of hemorrhages, bleeding being stopped by searing the wounded vessels.

'If leeches, when applied, are slow and sluggish, a little blood may be drawn from the part by a lancet, to excite their vivacity; when they fall off, the bleeding may be maintained by the use of the horns and gourds, or the substitutes already mentioned for the cupping-glasses of our own practice.'

The operations are rude, and very imperfectly described. They were evidently bold, and must have been hazardous: their being attempted at all is however most extraordinary, unless their obliteration from the knowledge, not to say the practice, of later times be considered as a still more remarkable circumstance. It would be an inquiry of some interest, to trace the period and causes of the disappearance of surgery from amongst the Hindus—it is evidently of comparatively modern occurrence, as operative and instrumental practice forms so principal a part of those writings which are undeniably most antient; and which, being regarded as the composition of inspired writers, are held of the highest authority.

Besides those sacred writings, there are many valuable professional tracts which correspond with, and are, in fact, commentaries on them. These are said to have been composed by prophets and holy men (Maha Rishis), to whom is generally given a divine origin.

The different nations of India have their respective medical authors. In the peninsula and the south of India, in Tamul; those of the Telingas, in Teloogoo; in Bengal and the northern provinces, the works in use among the Hindus are in Sanscrit; while among the Mohammedan population Persian works and translations from the Arabic are chiefly in use.

The work of Susruta may now easily be procured, as it was one of those ordered to be printed by the Indian government for the use of its native subjects; but the printing of this, as well as of many others, was stopped, when most of them were nearly completed—the first volume and three-fourths of the second of the Susruta having been printed. Fortunately the Asiatic Society of Calcutta, with the spirit and zeal which has ever distinguished it, and with a true knowledge of what was for the benefit of the government itself, undertook, at their own risk, to complete the works.

SUSSEX is a maritime county in England, due south of Greenwich, the meridian of which passes very nearly through the centre of the county. It lies between 50° 43′ and 51° 9′ N. lat., and 0° 49′ east and 0° 58′ west long. It is bounded on the north-east by Kent, from which it is separated in part by the river Rother, in another part by the Teyse or Teise, a feeder of the Medway, and in another part by the Kent Water and other feeders of the Medway; on the west by Hampshire; on the north by Surrey; and on the south and south-east by the British Channel. The extreme length, from Lady-Holt park due east to the Kent Ditch, is 76 miles; its greatest breadth, from Beachy Head to Tunbridge Wells, 27 miles; and the average breadth a little less than 20 miles. The area is 1466 square miles, or 938,240 acres. The gross population in 1841 was 299,770, being an increase of 10 per cent. on the census of 1831, and giving 204 inhabitants to every square mile. In size it is the 14th of the English counties, in population the 18th, and in density of population the 28th. Lewes, the county town, is on the Ouse, 45½ miles from London, nearly in a direct line south, or 49 miles by the road through East Grinstead, Fletching, and Chailey, or 51 miles by the mail-road through East Grinstead and Uckfield.

Surface; Coast; Rivers.—The principal feature in the surface of Sussex is occasioned by the intervention of the high ridges of chalk hills generally known as the Downs. These hills rise from the marsh of Pevensey to the bold promontory of Beachy Head; they then trend westward as far as Shoreham, occupying a surface of about 26 miles in length, and six or seven in breadth, containing 99,840 acres. This tract is properly denominated the South Downs. From Shoreham the Downs gradually recede from the coast and traverse the western part of the county, bearing some points towards the north, and enter Hampshire between West Harting and Stanstead near Petersfield. Their extreme length in Sussex is 53 miles, their greatest breadth 7, and mean breadth 4½ miles. The average height is about 500 feet above the level of the sea; but Ditchelling Beacon is 858 feet, Firle Beacon 820 feet, Chanctonbury Ring 814 feet, Rooks Hill and Bow Hill each 702 feet, and Beachy Head 564 feet above that level. The Downs have a rich covering of a short and delicate turf containing large portions of Thymum serpyllum, and occasional patches of the common furze, the Ulex Europæus, in patches of 30 or 40 acres. The whole district is without trees, except in some declivities where the white thorn is found, and in some of the richer portions at Stanmer and Arundel parks, where thriving plantations of beech and other hardy trees have been recently made. The surface of the Downs is gracefully undulating; the northern escarpment is precipitous, whilst the southern declines gently, and westward of Brighton gradually blends with the low land of the coast.

The maritime district lies between the Downs and the sea, and extends from Brighton westward to Emsworth, a distance of 36 miles. At first it is narrowed to a point, but gradually extends to the breadth of a mile between Brighton and Shoreham; towards Arundel it widens to three miles; and finally, as it approaches Hampshire, it becomes in many places seven miles wide. This district is of remarkable fertility. Here, in Saxon times, many salt-pans for procuring salt from sea-water by evaporation existed; their mention in 'Domesday' is frequent: one only, at Appledram, near Chichester, remains.

The centre of the county is occupied by a woodland tract, which extends from the Downs, to which it runs parallel, to the Surrey hills, denominated the Weald (Saxon *weald*, a forest). The Weald was once an immense forest, called by the Britons Coit Andred, and by the Saxons Andredes-weald, which was inhabited only by hogs and deer, but has been gradually cleared and brought into cultivation. According to the Saxon Chronicle, this wood was 'in length, east and west, 120 miles, or longer, and 30 miles broad.' This district within the county now contains about 425,000 acres, disposed in a line of country varying from five to ten miles in breadth, and from 30 to 40 in length.

The Forest Ridge is that portion of the county which, gradually uniting with the Weald, forms the north-eastern division. It stretches from Fairlight Down on the south by Crowborough to St. Leonard's Forest, and thence westward, terminating in an angle formed by the sand-hills of Petworth on one side, and by Blackdown and Leith hills in Surrey on the other. In this district are two great forests, St. Leonard's Forest, containing 10,000 acres, and Ashdowne Forest, containing about 18,000. Pine, fir, beach, and birch all grow well, and portions of the two forests have been planted with success. The whole ridge is the most romantic part of Sussex. It is broken into hill and dale, and is very elevated. Crowborough Beacon, the highest and most central eminence, is 804 feet above the level of the sea; Brightling Hill, 646 feet; and Fairlight Down, 599 feet.

The marsh-land extends across the eastern division of the county from Eastbourne into Kent, with the exception of five miles taken up by the Forest Ridge of Fairlight and the Hastings hills. Marshy tracts also exist on the borders of all the rivers.

The coast at the extreme east of the county is formed of the low marsh-land, which is a continuation of the low land of Romney Marsh. At Pett the Forest Ridge breaks in for five miles, taking in Fairlight, Hastings, and Bexhill. The low marsh-land of Pevensey, forming Pevensey Bay, extends from Bexhill to the Downs a short distance to the east of the well-known and bold promontory of Beachy Head. The high chalk cliffs of the Downs extend thence as far as Brighton, a distance of 19 or 20 miles coastways, when the low land of the maritime district intervenes and forms the coast line into Hampshire. Pevensey Bay and Seaford Bay form good roadsteads for vessels with north or north-east winds, and the latter is much frequented by vessels for water. A lighthouse of the first class was erected in 1828 on the summit of the second cliff to the westward of Beachy Head, 285 feet above the level of the sea, as a beacon for ships, which were often driven on shore in storms from the south-west, and caverns have been cut in the cliffs between the head and Cuckmere Haven to afford places of refuge to such mariners as may be wrecked on this dangerous coast. The lowest part of the coast from Seaford to the Kentish boundary is protected by single round towers, called Martello towers. They commence near Hythe in Kent, and are continued, except where the coast is of easy defence, in consequence of the cliffs or the military canal, to Seaford, where the last tower is numbered 74. They are built on the beach at intervals of about a quarter of a mile between each. They are about 32 feet in height, and were surmounted by swivel guns. The period of their erection was at the time of the threatened invasion of England by Napoleon. At the same time a portion of this low district, from Cliffe End, near Pett, in Sussex, to Shorne Cliffe, in Kent, a distance of 23 miles, was protected by a canal called the Royal Military Canal. It runs parallel to the sea. The breadth is about 60 feet, and the depth 9 feet: it has a raised bank, or redan, on the northern side, to shelter the soldiery and enable them to oppose the enemy with greater advantage. Its line is very little above the level of the sea.

The principal rivers are the Ouse, the Rother, the Adur, the Arun, the Cuckmere, and the Lavant.

The Ouse begins at Rylands, a few miles north of the village of Lindfield, at the junction of two streams, one of which issues from Bantrudge farm in the forest of St. Leonard, and the other from Selsfield on the borders of the forest at Worth. After the confluence of the two streams, the river flows near Lindfield, and, pursuing a tortuous course to the south-east, half encircles Sheffield Park; then proceeding more directly south, the stream runs by Isfield, Barcombe, and Hamsey to the Lewes levels, which it enters to the north of the town. After separating the Cliffe from the town of Lewes, it proceeds through the levels, divides the South Downs, and having received several small tributary streams, discharges itself into the British Channel at the new mouth of Newhaven, forming what is called Newhaven Harbour: the former outlet at Seaford is closed. [SEAFORD.] The river is navigable for large barges for 12 miles from its mouth without the aid of locks, and with them as far as Lindfield. The waters are used for paper-mills at Lewes and Isfield, and for a large corn-mill at Barcombe.

The river Rother rises near Argus Hill, in the parish of Rotherfield, close under the Forest Ridge. Thence it runs to Mayfield, receiving at Bevilham a large brook that runs from Wadhurst: it then flows in a south-easterly direction towards Kent, passing Etchingham, and receiving a stream that comes from Burwash, it next proceeds to Bodiam. It first touches Kent at Wigsell, in the parish of Salehurst, at the junction of a small stream which rises at Flimwell, near Hawkhurst, and separates the two counties. After the junction with this stream, the Rother forms for some distance the border, and proceeding to Newenden and Wittersham, receives in its course several small streams from the Weald of Kent, the arms of which, together with the Rother itself, enclose the river Island of Oxney. After passing this island, it quits the border, and turns suddenly southward across the eastern extremity of the county, sending off a branch at Iden called the Kent Ditch, which parts the two counties, and empties itself into the sea in the parish of Broomhill, a mile and a half eastward of old Rye Harbour. Proceeding from this branch, the Rother flows to the south-east part of the town of Rye. At this spot the Rother receives the waters of the Tillingham, which rises in the parish of Beckley, on the borders of Ewhurst, itself augmented at a short distance above Rye by the Tweed, a small stream that flows from Playden. Below the town of Rye the Rother receives also the waters of the Brede, which rises in Ashburnham Wood, near Battle, and flows through Whatlington, to Sedlescombe and Brede, and thence to the foot of the hill on which New Winchelsea is built. The united stream then expands into an æstuary, forms the harbour of Rye, and empties itself into the sea at the bight of the bay formed by Fairlight Head on the west and Dungeness on the east. [RYE.]

The Rother is navigable as far as the point where it first touches the borders of Kent above Newenden. This river, which was anciently called Limene, formerly flowed by Newenden to Maytham, and then by Smallhythe and Reading to the town of Appledore, whence it continued eastward, and emptied itself into the sea at New Romney in Kent, on the eastern side of Dungeness, and twelve miles eastward of its present exit; but in the great storm of the 1st of October, 1250 (34 Henry III.), which overwhelmed Old Winchelsea, and during the great inundation of the sea, this river forsook its ancient channel and formed the new one to Rye. In the year 893 the Danish fleet of 330 sail, under the command of the pirate Hastinges, assembled near Boulogne, and directed its course to the English shores. Two hundred and fifty vessels entered the river Rother or Limene, which is described in the Saxon Chronicle as 'at the east end of the vast wood which we call Andred. The river lieth out of the Weald. On this river they towed up their ships as far as the Weald, four miles from the mouth outwards, and thereon destroyed a fort whereon sat a few churls, and which was hastily wrought.' It is remarkable that in the year 1822, one of these Danish ships was discovered embedded in ten feet of mud and sand in a field at Northiam, a short distance from the present navigable river, at the west corner of the Isle of Oxney, about two miles from Newenden. The ship was in a perfectly sound and entire state after a lapse of 929 years. Her dimensions were from head to stern sixty-five feet, and her width fourteen feet, with cabin and forecastle; and she appeared to have originally had a whole deck. She was very strongly built, her bill pieces and keel measuring two feet over; her cross-beams, of which there were five, 18 inches by 8, with other timbers in proportion. In her caulking was a species of moss peculiar to the country in which she was built. In the cabin and other parts of the vessel were found a human skull, a pair of goat's horns attached to a part of the cranium, a dirk or poniard, several glazed and ornamental square tiles, some bricks which had formed the fire-hearth, several parts of shoes or sandals, fitting low on the foot, one of which was apparently in an unfinished state, having a last remaining in it, all of them very broad at the toes, two earthen jugs and a stone mug of ancient shape, a piece of board with thirty perforations, probably designed for keeping the lunar months, or some game, with many other antique reliques. The discovery of this vessel affords a singular confirmation of the accuracy of King Alfred's account of the Danish invasions, as described in the Saxon Chronicle.

The Adur has three sources: one branch rises at Toats Farm near Slinfold, whence it flows past Shipley and Knepp Castle to West Grinstead; another rises at Nuthurst, and, running to the west of West Grinstead Park, joins the first stream at Bay Bridge, whence they both flow to a place near Ashurst, where they are augmented by the third stream, which rises at Slaugham close by St. Leonard's Forest, and, pursuing a tortuous course, runs through Twineham and Shermanbury. From Ashurst the river flows in a due southern direction, between Beeding and Bramber, running on the east side of the castle and near the walls, and thence past Botolphs and Coombes to Shoreham Harbour and the sea. [SHOREHAM.] The river is navigable for small craft from Moak Bridge in the parish of Shermanbury, to the mouth; and it is celebrated for its mullet, pike, and eels.

The Arun also rises in St. Leonard's Forest, within the rape of Bramber, and passes into the parish of Slinfold: it then flows due south, and receives at Stopham the waters of a small river called the Western Rother, which rises in Lurgasball parish, and proceeds in a southerly direction to Selham. At Selham the Western Rother is augmented by the waters of another small stream called the Western Arun, described by Harrison as 'a goodlie water, and thereto increased with no small number of excellent and pleasant brookes: it springeth up of two heads, whereof one riseth by west, by the rills which lie towards the rising of the sunne from East Meon, and runneth by Petersfield; another comes from Bunton Wood and joineth with the foregoing at Petersfield and Durford; after which confluence they go together and in one channel still towards the east, taking a rill with them that commeth between Fernhurst and St. Luke's chapel, south-west of Linchmere, and meeting with it east of Lodsworth.' After the junction at Selham the Western Rother takes an easterly direction, passing near Burton Park to Stopham. From Stopham the Arun thus augmented runs in a circuitous course, passes Hardham and Amberley, in which part the stream is celebrated for trout, through the marshes forming the rich vale of Arundel, and flowing through Arundel town enters the sea at Littlehampton. The channel is led in a southerly direction into the sea between two piers composed of piles with an extension of dicker-work. The depth of water at the entrance between the piers is from two to three feet below the ordinary level of low-water in the sea, but a bar extends outside the dicker-work, across the mouth, which rises about two feet above the general surface and is left dry at low-water. The lift of average spring-tides is about sixteen feet, and of neaps eleven feet. The tide flows nearly seventeen miles up the river, but the backwater is of little value, in consequence of the narrowness of the channel and the sluggishness of the stream. The larger vessels which enter usually remain near the river's mouth at Littlehampton, but a vessel of thirteen feet draught can proceed to Arundel bridge, a distance of six miles, the bottom continuing of a uniform level throughout that extent. The lower part of the river is famous for its mullet.

A canal called the Arun and Wye Junction Canal, formed under an Act of 53 Geo. III., connecting the Arun with the river Wye, completes an inland communication by water with London. The Arundel and Portsmouth Canal also enters the Arun at Ford, connecting it with Chichester Harbour; and by an Act obtained by the Earl of Egremont in 1791, a canal following the course of the Rother has made a navigable water-communication from Stopham bridge to the town of Midhurst, with a branch to Haslingbourne, within half a mile of Petworth.

The Cuckmere rises in the Forest Ridge near Heathfield Park, and runs thence in a south-south-west direction through Warbleton to Hellingly, giving motive-power to several water-mills. It then winds round Hempstead farm and the Old Priory of Michelham, to Arlington, whence it proceeds southerly through the valley past Berwick Court and the small town of Alfriston to Exceat, and finally empties itself into the sea at the opening in the South Downs, to the westward of Beachy Head, between the Seaford and Friston hills, about two miles south-east from Seaford. A shingle beach crosses the entrance, and rises several feet above low-water; the interior of the haven is left dry at three-quarters ebb; the channel is very narrow and crooked, but at high-water it is navigable for small barges to Longbridge, about a mile above Alfriston.

The Lavant has its source in Charlton Forest, and runs in a south-west direction through Singleton, Binderton, and the villages to which it gives its name, and after circling the city of Chichester on all sides except the north, falls into the harbour of Chichester, and enters the sea at the extreme south-west corner of the county. The æstuary at the mouth of the river is famous for its lobsters; and the rocks next Selsey Bill are celebrated for cockles.

There are also two smaller rivers which discharge themselves into the sea, the Ashbourne at Pevensey, and the Asten near the spot where William the Conqueror landed. The latter river runs through the battle-field of Hastings.

The Medway also rises in the northern part of the county. Its source is at Turner's Hill, in the parish of Worth, whence it flows in an easterly direction through Forest-row in the parish of East Grinstead, and through Hartfield and Withyham. It reaches the county of Kent between Groombridge and Ashurst, forming the boundary between the two counties for about a mile, and then turns at Ashurst directly into Kent, at a spot about four miles from Tunbridge.

The London and Brighton Railroad, which was opened on the 21st September, 1841, connects the metropolis with the nearest point of the sea-coast. It branches off from the Croydon Railway to the north of that town, and then proceeds in a direction nearly due south, and at a short distance to the east of the old mail-road: it passes through Merstham, where there is a deep cutting and long tunnel to Horley, and enters the county of Sussex in the parish of Crawley, twenty-eight miles from London: from Crawley it goes to Balcombe, where the high Forest Ridge is passed by another tunnel: it crosses the valley of the Ouse by a beautiful viaduct: it enters the chalk ridge through a deep cutting and tunnel at Clayton, whence it is carried through cuttings in the chalk to the north-east of Brighton. The whole distance from London is fifty miles and a half, but seven miles of the Croydon line is used, so that the whole distance of the new line is forty-three miles and a half; the cost of which, including engines and carriages, has been 2,840,000*l.* It has five tunnels, together three miles and a quarter long, the Merstham and the Clayton being each more than a mile in length. The principal shaft of the Clayton tunnel is 270 feet deep; the Merstham cutting is 180 feet deep, and there are many cuttings not less than 80 feet to 125 feet. The undertaking was projected in 1834, by Sir John Rennie, and has been executed under the direction of Mr. Rastrick.

The mail-roads which enter the county of Sussex are four. The road from London to Hastings enters the county at Frant, near Tunbridge, and runs in a southern direction through Robertsbridge and Battle; the road from London to Brighton enters the county in the parish of Ifield, and runs thence through Cuckfield; the road from London to Portsmouth traverses a small portion of the western division of the county near Petersfield; and the road from Dover to Portsmouth, which runs parallel with the sea-shore, enters Sussex near Rye, and proceeds to Winchelsea, Hastings, Battle, Lewes, Brighton, Worthing, Arundel, and Chichester, quitting the county for Hampshire near Havant. There are also many other roads of less importance. A road branches from the Brighton mail-road, and leads through East Grinstead, Maresfield, and Uckfield, to Lewes, Newhaven, and Seaford. Another road leads from Tonbridge, through Hartfield, and joins the Lewes road at Maresfield. The road from London to Worthing enters the county near Horsham, and passes near Steyning and Bramber. There is a road close to the sea-shore from Hastings, through Pevensey and Eastbourne, to Seaford, Newhaven, and Brighton, with a branch from Eastbourne at the foot of the Downs to Lewes.

Climate.—The climate of the southern part of the county, near the sea-coast, is mild, and not subject to many variations of temperature. The mean temperature of the year is 51·10°, more than one degree above the mean temperature of London. The consequence is, that large towns have sprung up to which invalids and others repair for health and relaxation. The climate at Worthing is so mild, that figs are cultivated in great perfection in the neighbourhood, and Hastings possesses many advantages for invalids. The mean temperature of the three winter months at Hastings is 43°, whilst the mean temperature of winter in the adjoining southern counties is generally only 40·35°. The soil of Hastings is a dry sand-rock, which is warm, and as the town is sheltered on the north and east by high hills and the aspect is south, it is favourable for the winter residence of all persons affected with diseases of the lungs; the disadvantage is, that the climate is too relaxing for those who require a dry air without its being keen. At Brighton the air at the east part of the town is generally dry and bracing, but in the valley near the centre of the town and to the west the air is more mild. The downs fronting the south-west are bleak, being exposed to the violent winds from that quarter, which prevail for two-fifths of the year, during which the atmosphere is frequently charged with saline exhalations from the sea. The higher or northern part of the county, particularly the Forest Ridge, is of considerably lower temperature. In the Weald the circulation of air is impeded by the forests and high hedges, and the climate is cold and damp.

Geology.—The greater portion of the southern part of the county is occupied by the chalk formation, which constitutes its most striking geological feature. The general dip or inclination of this, as indeed of all the strata in the county, is to the south-east, with occasional exceptions. The face of the chalk is marked with fissures or wells, and scooped into deep hollows, furrows, and basins, which are more or less filled with tertiary sand and gravel. In many places quarries have been opened and kilns erected for converting the chalk into lime for the use of the agriculturists, who annually consume large quantities. The Sussex chalk varies in colour from pure white to a bluish-grey; the harder varieties were in great request among the Normans for building. The walls of several old castles and religious houses were built with chalk faced with Caen stone or flints. The chalk is regularly stratified. The upper division contains horizontal layers of siliceous nodules with intersecting veins of tabular flint: sulphuret of iron is found in irregular masses and in octahedral crystals. Chalk-marl constitutes the foundation of the chalk hills: its outcrop connects the detached parts of the range and composes a fertile tract of arable land, on which are some of the best farms in the county. Below the marl is a bed of firestone, which is obscurely traced in the eastern part of the county, but to the west forms a terrace of considerable breadth. The galt, the lowest division of the chalk formation, generally contitutes a valley within the central edge of the chalk, and may be traced, with little interruption, from Eastbourne westward along the whole county into Hampshire, forming a stiff soil, but very rich.

Next to the chalk the most important formation is the Wealden. It joins the galt and extends through the centre of the county. It is a series of clays and sands with subordinate beds of limestone-grit and shale: it forms an anticlinal axis of considerable elevation, the direction of which is nearly from east to west. This district is an irregular triangle, the base extending from near Pevensey to Seabrook in Kent, and the apex being situated near Harting Comb in the western part of Sussex. The wealden-clay is a tenacious clay of various shades of blue and brown, containing subordinate beds of limestone and sand with layers of septaria of argillaceous ironstone. It forms the subsoil of all the Wealden district, and separates the Shanklin sand from the central mass of the Hastings beds. It constitutes a low tract from five to seven miles in breadth, and presents no remarkable features on the surface, except that the soil is extremely favourable to the growth of oak, for which the county has been long famous. The Sussex marble occurs in layers in different parts of the district. It is a limestone of bluish-grey mottled with green and ochraceous yellow, and is composed of the remains of fresh-water univalves formed by a calcareous cement into a beautiful compact marble which bears a high polish. It was used by the Romans, and in the early Norman times it was sought after and employed as Purbeck marble is now. It is much used in Canterbury and Chichester cathedrals; in the former the archiepiscopal chair is formed of it. The central group of the Wealden is formed of alternating sands, sandstone, and shale, which have been denominated the Hastings beds. [HASTINGS SANDS.] These beds extend on the east and north-east of the county, from Bexhill to Ham Street near Aldington in Kent, forming a line of irregular cliffs 30 or 40 miles in length, from 4 to 9 miles in width, and from 20 to upwards of 600 feet in height. On their first emergence from beneath the Weald clay these beds consist of sand and friable sandstone, with occasional interspersions of ironstone and a great intermixture of small portions of lignite. Below this are the Tilgate beds, the lowest stratum of which contains large concretional or lenticular masses of a compact calciferous grit or sandstone in three or four layers, each varying in thickness from two to three inches, which was formerly extensively quarried and used for paving and roofing. These beds extend from the western extremity of the Hastings sands at Loxwood to Hastings, and are separated from the next subdivision by blue clay and shale. This subdivision, called the Worth sands, consists of a series of arenaceous strata, some of which form a fine soft building-stone extensively used. The last division of the Wealden is composed of the Ashburnham beds, which occur beneath the Worth stone: they are composed of alternations of sand, friable sandstone, shale, and clay: they are for the most part highly ferruginous, and enclose rich argillaceous iron-ore and large masses of lignite. It was in the Wealden strata, when wood was abundant and charcoal employed in smelting iron, that the chief iron-works of Sussex were situated, the iron-ore being extracted from the iron-stone of the argillaceous beds. Up to the year 1720 Sussex was the principal seat of the iron-manufactory in England; the consumption of fuel was so great, that more than one act was passed for the preservation of the timber, but the wood still decreased, and by degrees the furnaces were disused and the manufacture transferred to districts where coal was abundant. The last furnace, at Ashburnham, was blown out in 1827.

The plastic clay is the foundation of the flat maritime district south of the downs, which extends from near Worthing to Bracklesham Bay, and thence into Hampshire, forming part of the Isle of Wight basin; and is also seen in insulated patches on Castle Hill, Newhaven, and in many other localities.

The London clay, which in some localities includes beds of grey limestone and sandstone, is also found; the clay constitutes the flat maritime district of the south-west part of the county, and the limestone composes groups of rocks on the coast.

The valleys of all the rivers, and the large levels of Lewes, Pevensey, and Brede, the soil of which is extremely fertile, furnish rich marsh pastures almost equal to Romney Marsh, and are formed of alluvial deposits. These levels are from 3 to 7 miles in breadth, and extend 8 or 10 miles in length.

Agriculture.—The rich marsh-lands, of which there are about 30,000 acres in the county, make an excellent pasture-ground, on which many oxen and sheep are reared and fatted for market. There are also about 50,000 acres of down-land, where the soil is thin and very near the chalk, which are unfit for the plough. They are therefore left in down, and produce excellent pasture for the small sheep known as South Down sheep. The natural grasses, when kept cropped by sheep, are sweet; but if the downs are not sufficiently stocked, they are soon overgrown with furze and heather, and the coarse grasses become prevalent. In the lower or marsh-land the proportion is generally one ox to the acre, and sheep are mingled with the oxen. In the Pevensey Level, where there is plenty of water and grass is abundant, there are most cattle; but even here sheep are increasing. In the Brede Level there are more sheep, and only one bullock to every four acres, in order to keep the pasture even. After the hay is cut and carried, the pastures are usually occupied by cattle and sheep. Stall-feeding is also much and successfully practised in Sussex.

Throughout the whole of the Wealden district, upon the sand as well as the clay soils, the land is extremely poor; and of the 903,000 acres cultivated within the county, 425,000 are situated within this district. The clay is cold and stiff, and very difficult of drainage; but it produces fair average crops of wheat. The usual rotation of crops is, wheat, oats, clover or trefoil one or two years, and then a fallow: sometimes peas or tares are substituted for clover. On these lands lime forms a great proportion of the manure; but, from constant use, it has lost much of its beneficial effect. In this district large commons have been recently enclosed and brought into cultivation at considerable expense; and some parts on the edge of the forests have been planted with fir and birch, which have thriven wherever the land was properly trenched and drained. When the Rev. A. Young wrote, he estimated the waste lands at 110,000 acres: the quantity has been since diminished at least one-third.

The arable land on the Downs consists of thin light layers of earth, not exceeding 8 inches in depth, intermixed with flint pebbles, and is very favourable for the growth of barley: wheat is usually sown once in four years, the course being turnips, barley, clover, and wheat, changing the clover for peas or some other crop the eighth year. In some of the hollows the soil is deeper and more loamy, and so dry as to allow of its being ploughed quite flat without any ridges or water-furrows: this is the richest Down-land, and the rotation is wheat, barley, and clover, varying the clover, and substituting turnips, rape, tares, or peas, the sixth year, as the same land will not bear clover frequently. Along the slopes of some of the hills the soil is of a tough tenacious nature, being a mixture of chalk washed down from the hills by the rains and stiff clay, and is very difficult to cultivate. In the spring it is extremely heavy, and retains moisture for a long time; but when dried it becomes so hard, that unless worked at the exact moment, when it is dry on the surface and the clods are still moist, there are no means of reducing it to a proper tilth: when carefully managed and properly manured, it produces good crops of wheat, oats, and beans. The rich arable land in the county is about 120,000 acres.

Like their neighbours in Kent, the Sussex farmers are not ready to adopt improvements in agricultural machinery: they do not like changes in the system of their forefathers, and they adhere with pertinacity to the old turn-wrest plough, drawn with four horses on the lightest soils, and, on all the stiffest, by six, or frequently by eight or ten oxen. [KENT.] Almost every Sussex farmer works oxen as well as horses. They think there is an advantage in the tread of the ox on very light soils; and that on very heavy lands in the summer, where great strength is required to break up the soil a good depth, the steady draft of the ox is superior to the quick working of the horse. Steers or young oxen are generally broken in for the yoke at three years old, and are worked till six or seven, when they are turned off to fatten. The drill has been received with some favour, and is in common use near the Downs. Threshing-machines were becoming general till 1831, when many were destroyed by the labourers during the agricultural riots, and have not been again erected. The Sussex farmers are very much behind other counties in the management of their farms. A large portion of their land is unfavourable for the introduction of the Scottish convertible system; yet much might be learned by a careful examination of the system of culture pursued in the south of Scotland.

Hops are cultivated to a considerable extent in the eastern part of the county: they have been introduced from Kent, and have gradually extended themselves westward. Upwards of 8000 acres are now under cultivation. The produce however is not so much esteemed in the market as that of Kent.

There are still many extensive woods in Sussex, amounting altogether to about 150,000 acres. The produce of bark is not so great as it has been, but the demand for hop-poles causes great attention to be paid to the cultivation of underwood and coppices, which yield a greater annual return from the land than if they were grubbed up.

The county is noted for its breed of oxen and of sheep. The Sussex ox bears a strong resemblance to the Devon: it has a small and well-formed head, the horns pushing forward a little, and then turning upward, thin, tapering, and long, not so as to confound the breeds with the long-horns, and yet in some cases a little approaching to them. The eye of the ox is full, large, and mild, but with some unquietness in the cow: the throat is clean, and the neck long and thin, although the neck and head are both coarser than the Devon. At the shoulder is the main point of difference and principal defect in the Sussex cattle; the whole fore-quarter is thickly covered with flesh, giving too much weight to the coarser and less profitable parts. The fore-legs are more perpendicular than in the Devon, and placed more under the body. The barrel is round and deep; the back straight; the belly and flank are capacious, yet the beast is well ribbed home: the loins are wide, the hip-bone does not rise high, nor is it ragged externally. The tail, which is fine and thin, is set on lower than in the Devon; yet the rump is nearly as straight, and the hind quarters are cleanly made. The colour is a deep chestnut-red, and some of a blood-bay: much deviation from these colours indicates a stain in the breed. This ox holds an intermediate place between the Devon and the Hereford, with all the activity of the first and the strength of the second; with the propensity to fatten, and the beautiful fine-grained flesh of both. Experience shows that it possesses as much of the good qualities of both as can be combined in one frame. The hide is soft and mellow, a coarse hard thick hide being considered a test of an ill-bred or unprofitable beast. The coat is short and sleek. The average weight is about 120 stones, but some have reached 216 stones. The breed of oxen was becoming neglected in the county, when, some three or four years since, Mr. Selmes, of Beckley, thinking that they were entitled to more consideration than they obtained, challenged Earl Spencer to show one hundred head of cattle of any breed, bred by himself, against 100 head of Sussex cattle bred by Mr. Selmes. The challenge was accepted: the prize was awarded to Earl Spencer; but so good was the Sussex stock shown, that the breed has once more come into repute. The Sussex cow is a very inferior animal to the ox: she yields a very small quantity of milk, and is therefore principally kept as a breeder, all the use being made of her for the dairy which circumstances will allow. The cows have also one great fault: their very countenance indicates an unquiet temper, and they are often restless and dissatisfied, prowling about the hedgerows and endeavouring to break pasture. Nearly all the calves are reared, the males for work, and the females for breeding or early fattening. A good cow, after her own calf has been weaned, will suckle another, and sometimes even two others for the butcher; and it is not uncommon for the farmers to procure calves from Smithfield for this purpose.

The Southdown sheep are among the best for all hill countries where the grass is short; and their kindly properties have caused them to penetrate into almost all parts of the country. They have a patience of occasional short keep, and an endurance of hard stocking equal to any other sheep, and an early maturity scarcely inferior to the Leicester, while the flesh is very fine grained and of peculiarly good flavour. It is only within the last 70 years that these sheep have shown so much goodness. They were bad in shape and unkindly feeders when they were first bred by the late Mr. Ellman of Glynde, whose care and attention, without crossing, raised them to their present worth. The South Down sheep are polled, and are black or grey on the head and legs. The characteristics of a well-bred sheep are, that the head is small, the lips thin, and the space between the nose and the eyes narrow; the under-jaw and chap also fine and thin; the ears tolerably wide, and, like the forehead, well covered with wool; the eye is full and bright; the breast wide, deep, and projecting forwards; the belly and back both straight; the carcass round and full; the hind-legs somewhat separated, giving a fulness to the haunches; and the bones fine, yet having no appearance of weakness. The average dead weight is from 8 to 11 stone, yet some have been killed which have reached to 21 stone. The wool is short, close curled, and fine and free from spiry pro jecting fibres; the average weight of the fleece is from 2½ to 3 lbs. The number of these sheep on the downs has been estimated at 270,000 in summer and 220,000 in winter, or about one and a half on an average all the year per acre; but we are inclined to think the estimate too low. On the richer and wet land in West Sussex a heavier sort of sheep, a cross between the Somerset and the Down, is much more used than the pure Down.

The breed of horses is not famous. Great efforts at improvement were made by the late earl of Egremont, in whose stock was the famous Whalebone blood, and who offered an annual prize at Egdean fair for colts bred from his stock. Of late years a horse-fair, at which prizes have been awarded, has been held at Lewes. These efforts have not been attended with much success. The breed is certainly improved, though still far from good.

The largest fairs in Sussex are Horsham, for sheep and lambs on 5th April and 18th July, for horses and cattle on Monday before Whitsuntide and on 27th November, and for Welsh cattle on 17th November; Easthoathby, on 8th April; East Grinstead (cattle), on 21st April and 13th July; Cross-in-Hand (cattle), on 23rd April and 19th November; Crowborough (cattle), on 25th April; Lewes, on 6th May and Whit-Tuesday for cattle, on 20th July for wool, and on 21st September and 2nd October for sheep; Burwash (cattle), on 12th May; Arundel (cattle), on 14th May and on 21st August; Winchelsea (cattle), on 14th May; Battle (cattle), on Whit-Monday and 6th September; Mayfield (cattle), on 30th May and 13th November; Steyning (cattle), on 9th June, 19th September, and 11th October; Hailsham (cattle), on 3rd June; the Dicker (sheep), on 23rd July; Petworth, on Holy Thursday for cattle, and on 20th November for sheep; Chichester on 4th May, 6th August, 11th October, and (sheep) 20th October; Lindfield (sheep), on 5th August; Egdean (horse and cattle), on 4th September; Finden (sheep), on 14th September; Robertsbridge (hops, cattle, and horses), on 25th September; and St. John's Common (sheep), on 4th October.

Divisions, Towns, &c.—Sussex has been for centuries divided into six Rapes, a term peculiar to the county, the derivation of which is not satisfactorily settled. Somner derives it from *rap*, Saxon, a rope; and Junius from *repp* or *ripp*, Islandic, a tract or district. Each rape contains several hundreds and other smaller divisions. The county has also been for many years subdivided for all civil purposes into two divisions, the eastern and the western, the former comprising the rapes of Lewes, Pevensey, and Hastings; and the latter the rapes of Chichester, Arundel, and Bramber; and by the act of 19 Hen. VII., c. 24, particularly referring to this county, it is enacted 'that the county courts shall be holden and kept one time at Chichester and the next time at Lewes, and so to be kept *alternis vicibus* for ever.' After the Norman conquest these rapes were granted to powerful followers of William, each of whom either occupied the old castle within the rape, or built a new feudal abode. Chichester rape alone had no castle for the residence of the lord, though a fortification was erected immediately after the Conquest for the defence of the inhabitants. Chichester rape formed part of the Honor of Arundel, and was granted to the same nobleman, who possessed the castle and rape of Arundel. The rapes are as follows:—

Eastern Division.—I. Lewes rape occupies the centre of the county, and extends from the borders of Surrey on the north, where it is 6 miles broad, to the sea on the south, where it is 13 miles in width. Its eastern boundary is formed by the Ouse, by which it is separated from the rape of Pevensey, and its western by the Adur, which divides it from the rape of Bramber. This rape was granted by the Conqueror to William, Earl de Warren, who married Gundred, daughter of the king, and founded the castle of Lewes and priory of St. Pancras there. With the descendants of Earl de Warren the barony remained till the beginning of the 14th century, and then, in default of male issue, it passed into the family of Fitzalan, earl of Arundel, where it continued till 1439, when, by the death of Thomas Fitzalan, 15th earl of Arundel, without issue, it was divided among his three sisters. It is now vested in the following proportion:—In the Abergavennys one-half, as heirs of the Beauchamps and the Leuthalls; in the Norfolks one-fourth, as heirs of the Mowbrays and Lenthalls; and in the Dorsets one-fourth, which was conveyed to Sir Richard Sackville, 21st April, 1566, but whether as a gift or by purchase is uncertain. The rape comprehends an area of 129,580 acres, and had in 1831 a population of 71,921. When 'Domesday' was compiled it included 10 hundreds and the borough of Lewes. It is now divided into 12 hundreds and the borough, containing 50 parishes. The following are the hundreds:—

1, Barcombe; 2, Buttinghill; 3, Dean; 4, Fishersgate 5, Holmstrow; 6, Lewes borough; 7, Poynings; 8, Preston, 9, Southover borough; 10, Street; 11, Swanborough; 12, Whalesbone; and, 13, Younsmere.

II. Pevensey rape adjoins the rape of Lewes, which forms its western boundary. It extends from the borders of Surrey and Kent on the north to the sea, the greatest width of the county being in this rape, from Frant to Beachy Head, a distance of 27 miles. The width of the rape along the coast is nearly 18 miles, but in other parts the width varies from 20 miles to 8 or 10. It is bounded on the east by the rape of Hastings. Immediately after the Norman conquest the barony of Pevensey, together with the castle, was granted to the earl of Moreton, brother-in-law of the Conqueror, but it was forfeited by his son, after the battle of Tenerchebrai, to king Henry I., who granted it to Gilbert de Acquila, the descendant of a distinguished Norman family, whose grandfather had perished at the battle of Hastings. From this family the barony took the name of the Honor of the Eagle. Richard, son of Gilbert, having joined the rebellion of Robert de Belesme, the honor and barony were once more forfeited, and granted to Henry Fitz-Empress, afterwards Henry II. That king, after his accession to the throne, reinstated Richard de Acquila, and the Honor of the Eagle remained in that family till the time of his grandson, who passed over to Normandy without the king's licence, and the barony was seized by Henry III., by whom it was granted to Gilbert Marshall, earl of Pembroke. The earl however fell into disfavour, and surrendered the barony to the crown. It was then granted (1241) to Peter de Savoy, uncle of queen Eleanor, for his better support; and soon after his death, in 53rd Hen. III., the whole honor was given to Prince Edward and his heirs. It remained in the crown till 44th Edward III., when John of Gaunt, duke of Lancaster, obtained a grant of it in tail general. On the accession of Henry IV., the king, by letters-patent dated 12th February, 1400, granted the office of constable of the castle (an office created by John of Gaunt), together with the honor, to Sir John Pelham and his heirs, in consideration of his valuable services. The office of constable was held by the Pelhams till 4th Henry V., but other constables were afterwards appointed; and in 1600 the honor was once more in the crown, forming part of the duchy of Lancaster. Subsequently it was granted by king William, in 1706, to William Bentinck, duke of Portland, who sold it in 1730 to Spencer Compton, earl of Wilmington; and his granddaughter marrying Lord George Henry Cavendish, afterwards earl of Burlington, carried the castle and honor to that noble family, in whom they still remain. The rape, which is the largest in the county, has an area of 228,930 acres, and had in 1831 a population of 49,776. In the Conqueror's time it was divided into 16 hundreds; but it has now 19 hundreds subdivided into 52 parishes. The following are the hundreds:—

14, Alciston; 15, Bishopstone; 16, Danehill-Horsted; 17, Dill; 18, Eastbourne; 19, East Grinstead, borough; 20, Flexborough; 21, Hartfield; 22, Lindfield Burleigh Arches; 23, Longbridge; 24, Loxfield Camden; 25, Loxfield Dorset; 26, Lowey of Pevensey; 27, Ringmer; 28, Rotherfield; 29, Rushmonden; 30, Shiplake; 31, Totnore; and, 32, Willingdon.

III. Hastings rape forms the eastern portion of the county: it is in the shape of a triangle, the apex of which is part of Broomhill parish, the western side or base being formed by the rape of Pevensey, the south-eastern side by the Channel, and the north-eastern side by the county of Kent. The width at the base is 23 miles, and the extreme length, from the base to the apex, 28 miles. It has a coast-line of 23 miles. The Honor of Hastings was at the Conquest granted by the crown to Robert, second earl of Eu, of a powerful Norman family, who had been the first with whom William consulted after he had conceived the project of the English expedition, and who had distinguished himself alike by the zeal with which he entered into the plan, and by his personal bravery at the battle of Hastings: the castle is supposed to have been built by him. The honor and castle were seized by a stratagem on the death of William, but were soon regranted to

William earl of Eu, son of Robert. In this family it remained till the extinction of the male line on the death of Henry, the sixth earl, in 1194. The barony then passed to his mother Alice, countess of Eu, daughter of William D'Albini, earl of Arundel, whose son by the second marriage with William de Ysenden succeeded her, but in 29th Henry III. the estate was forfeited for his adherence to the king of France. It was subsequently held for a few years by Prince Edward, but in 46th Hen. III. it was granted to Peter of Savoy, from whom, in 53rd Hen. III. it passed by exchange to John, duke of Brittany, and continued in that house till it became extinct in the person of Joan, widow of Ralph, lord Basset. It subsequently passed in the same manner as Pevensey to John of Gaunt and the Pelhams, but in 23 Hen. VI. the lordship of the barony and castle was separated from the rape, and was granted to Sir Thomas Hoo, afterwards created lord Hastings. The rape and castle remained separated till the time of James II., when the barony and castle were repurchased by Sir Thomas Pelham from Henry, third earl of Huntingdon; and in the Pelhams the united honor has continued to the present time. The rape has an area of 154,060 acres; and had, in 1831, a population of 50,239. When 'Domesday' was compiled, it was divided into 13 hundreds: the same number still exists, but the town and port of Hastings, and the antient towns of Rye and Winchelsea, are now separated. The whole rape has 48 parishes. The following are the hundreds:—

33, Baldslow; 34, Battle; 35, Bexhill; 36, Foxearle; 37, Goldspur; 38, Gostrow; 39, Guestling; 40, town and port of Hastings; 41, Hawkesborough; 42, Henhurst; 43, Netherfield; 44, Ninfield; 45, town and port of Rye; 46, Shoyswell; 47, Staple; and, 48, town and parish of Winchelsea.

IV. Chichester rape is situated at the western side of the county, and is bounded on the north by the county of Surrey, on the east by the rape of Arundel, on the south by the British Channel, and on the west by Hampshire. There is an extent of 16 miles of coast, including the headland of Selsey Bill; and from this extreme point to the borders of Surrey the length is 26 miles: the breadth varies from 6 to 10 miles. The barony of Chichester and the rape have followed the same descent as the honor of Arundel, of which they formed a part. It was granted by William to Roger Montgomery, created earl of Arundel and Shrewsbury, a nobleman of extensive possessions in Normandy, who commanded the centre division of the victorious army at the battle of Hastings, and who was nearly related through his mother to the Conqueror. The honor was calculated to contain 84½ knights' fees, or 57,460 acres, and it comprised the city of Chichester and the castle of Arundel. The earl, following the example of the Conqueror, partitioned his property among his sons, and assigned his English honours and possessions to his second son Hugh: from him it passed, in 1098, to his elder brother, Robert, earl of Belesme; but in 1102 it became forfeited to Henry I., in consequence of the earl's revolt. The king settled it on his second wife Adeliza. She subsequently married William de Albini, who, for services rendered Henry II., received a grant of the honor to him and his heirs. It remained in his three lineal descendants; when, on the death of the third without issue in 1243, it passed through the second daughter, Isabel, to John Fitzalan, ninth earl of Arundel and first earl of that house. The Fitzalans continued possessors, except at two short intervals of forfeiture, till 1580, when, on the death of Henry, the twenty-second earl, it became the property of his heiress, Mary, who married Thomas Howard, duke of Norfolk: it has since been forfeited, like other estates of that noble family, but it has been restored, and is now the property of Henry Charles, thirteenth duke of Norfolk and thirty-fourth earl of Arundel. The rape has an area of 145,840 acres; and had, in 1831, a population of 38,929. At the Conquest there were 9 hundreds, besides the city of Chichester: it is now divided into 7 hundreds, one city, and one borough, including 74 parishes. The hundreds are as follows:—

49, Aldwick; 50, Bosham; 51, Box and Stockbridge; 52, city of Chichester; 53, Dumpford; 54, Easebourne; 55, Manhood; 56, borough of Midhurst; and, 57, Westbourne and Singleton.

V. Arundel rape forms the centre of the western division of the county, and is bounded by Surrey on the north, by the rape of Bramber on the east, by the British Channel on the south, and by the rape of Chichester on the west. Its average length from north to south is 20 miles, its width at the sea-coast 15 miles: it is then contracted to nine miles at a distance of seven miles from the sea, but again widens gradually till it has a width of 16 miles on the borders of Surrey. The castle of Arundel was in existence in the Saxon times; and from the Conquest, together with the honor of Arundel, followed the same descent which we have just noticed in Chichester rape. The rape has an area of 132,800 acres, and had in 1831 a population of 31,064. When 'Domesday' was compiled, the rape of Arundel had 8 hundreds, which are now merged in 5 hundreds and one borough, divided into 56 parishes, 21 of which are in the upper and 35 in the lower division. The following are the hundreds:—

58, Borough of Arundel; 59, Avisford; 60, Bury; 61, Poling; 62, Rotherbridge; and, 63, Westeasewrith.

VI. Bramber rape is situated between the rapes of Arundel and Lewes, and extends from Surrey to the English Channel, a length of 22 miles. Along the coast it has a width of eight miles, which is about the average width of the whole rape. The castle was in existence in the Saxon times, and after the conquest it was granted, together with the barony, to William de Braose, in whose family it remained till the death of the tenth of that name, when, his daughter Oliva carried the honor by marriage to John de Mowbray, whose descendant in 1398 was created duke of Norfolk; the male heir of that family also failed at the end of ten descents, and the heiress Margaret, who married Sir Robert Howard, carried the estates to the Howards, and laid the foundation of the subsequent splendour of that family. Their descendant is still owner of the honor, and is thus lord of the three rapes which form the western division of Sussex. The rape has an area of 116,650 acres, and in 1831 it had a population of 30,113. In the Conqueror's time there were 11 hundreds in this rape, and there are the same number now, but the boroughs of Bramber, Horsham, New Shoreham, and Steyning, are now separated: the whole is subdivided into 40 parishes. The hundreds are as follows:—

64, Borough of Bramber; 65, Brightford; 66, Burbeach; 67, East Easewrith; 68, Fishersgate; 69, borough of Horsham; 70, borough of New Shoreham; 71, Patching; 72, Singlecross; 73, Steyning; 74, borough of Steyning; 75, Tarring; 76, Tipnoak; 77, West Grinstead; and, 78, Windham and Ewhurst.

There are parts of the county which have their particular liberties exempt from the jurisdiction of the county magistrates: 1, the city of Chichester; 2, the liberty of the Cinque Ports, which is partly in this county and partly in Kent. The part which is in this county comprises—1, the town and port of Hastings, including the whole of the parishes of All Saints, St. Clements, St. Mary in the Castle, St. Michael, the Holy Trinity, St. Mary Bulverhithe, and St. Leonard's, Winchelsea; and parts of the parishes of St. Mary Magdalen and St. Leonard, and the liberty of the Sluice, in the parish of Bexhill; 2, the dependants of Hastings, viz. Seaford and Pevensey, the latter of which includes the parishes of Pevensey and Westham, and part of the parish of Hailsham; 3, the antient town of Rye, which includes nearly one-half of the parish; and 4, the antient town of Winchelsea, including the whole parish of St. Thomas the Apostle, and parts of the parishes of Pett, Broomhill, and Icklesham. [CINQUE PORTS.] The hundreds of Battle and of Bexhill, in the rape of Hastings, are also franchises, and the inhabitants are exempt from service on juries for the county.

There is only one city in the county, the city of Chichester: one Cinque Port, Hastings; two antient towns added to the Cinque Ports, Rye and Winchelsea; two members of the Cinque Ports, Pevensey and Seaford; the parliamentary boroughs of Arundel, Brighton or Brighthelmstone, Horsham, Lewes, Midhurst, Shoreham or New Shoreham; the antient boroughs of Bramber, East Grinstead, and Steyning; the market-towns of Battle, Cuckfield, Hailsham, and Petworth, and the towns of Bognor, Eastbourne, Mayfield, Newhaven, and Worthing. Of some of these places an account is given elsewhere. [ARUNDEL; BATTLE; BRAMBER; BRIGHTHELMSTONE; CHICHESTER; HASTINGS; LEWES; RYE; SEAFORD; SHOREHAM.] The others are noticed here.

Winchelsea is locally situated in the hundred of Guestling and rape of Hastings, 67 miles from London. According to the editor of 'Magna Britannia,' the name is derived from the Saxon *wincel*, an angle or corner, and *sea*, or *ea*, island: this explanation well suits the situation of Old Winchelsea, which, before the reign of Henry III., was washed by the waters of the Channel on the south and east, and by the Rother on the north. Of its early history little is known, except that it was of some importance in Saxon times, and that, like its neighbour Rye, it was granted by Edward the Confessor to the abbot and monks of Fescamp in Normandy, which grant was confirmed by William I. and Henry I.; but Henry III., in the 31st year of his reign (1247), resumed possession of it for the better defence of his kingdom, exchanging for it other manors in Gloucestershire. The town is not mentioned by name in 'Domesday,' where the possessions of the abbey were entered under the manor of Rameslie; Winchelsea is probably the new borough there noticed. At the Conquest it did not form part of the Cinque Ports, but was added before the reign of John. [Cinque Ports.] In 1067 William landed here from Normandy, and by his sudden arrival defeated the measures taken in England to shake off the Norman yoke: here also Henry II. landed in 1188, on his return from Normandy: hither Simon de Montford repaired after the defeat of his father at Evesham, intending to bring over foreign troops; and hither he was followed by Prince Edward, who, in 1266, stormed and took the town, putting to the sword the chief inhabitants, who had warmly espoused the cause of the barons. Soon after the exchange with the abbey, the old town began to suffer much from the influx of the sea. More than 300 houses were destroyed by the overflow of the sea in 1250. The sea continued its ravages, and had done so much injury, that the inhabitants petitioned Edward I. for a site whereon to build a new town; and the king, in the 8th year of his reign, issued a commission to Ralph of Sandwich, his steward, authorising the purchase of a rising hill or piece of ground containing 150 acres, which was then a rabbit-warren, called Iham, within the parish of Icklesham. The purchase was completed, an arrangement was made with the vicar to pay him 10*l*. in lieu of tithes, and the 'inhabitants of Old Winchelsea took to it by little and little and builded it.' The ground was divided into 40 squares, containing about 2½ acres each, of which 39 may still be traced; and the spacious streets intersected each other at right angles. The new town was walled in by the king, and in six or seven years it was 'metely well finished.' Very soon afterwards the calamity, against which the inhabitants had provided, happened. 'In the year of our Lord 1287, in the even of St. Agath, the virgin, was the towne of Winchelsea drowned, and all the lands between Clivesend (Cliff's End, Pett) and the vocher of Hithe.' The new town continued to increase and flourish; its relative importance may be known from the large proportion of ships furnished to Edward I. Hastings and its members, with the two antient towns, had to furnish the king with 21 ships, and in the apportionment no less than 10 were assigned to Winchelsea, 5 being required from Rye, and only 3 from Hastings. It soon became the place of import for French wines, for which massive crypts were built. The harbour was little injured by the overflow that destroyed the town, and in the time of Henry VI. Winchelsea was one of the principal ports of embarkation for the Continent.

The new settlement did not escape without the ordinary calamities of towns along the southern coast: it was pillaged and partially burnt by the French in 1360, and received much more serious injury from the Spaniards twenty years afterwards. The town was subsequently repaired. Henry VIII. raised for its defence the castle of Camber, the ruins of which are still standing: it consisted of a large round tower, which served as a keep, surrounded by several smaller ones connected by short curtains. The sea, which had been the constant enemy of Winchelsea, began once more to cause its ruin by deserting the new town; the inlet and harbour became choked up with sand and beach, and although Queen Elizabeth, who visited it in one of her progresses in 1573, manifested her sense of its importance by calling it Little London, the trade was soon entirely lost, and Winchelsea fell into decay. It is now little more than a village; the houses round two sides of the principal square and one small square with a few houses alone remain. In the middle of the last century an attempt was made to establish here a manufactory of cambric, for which an act was obtained (4 Geo. III., c. 37), but the attempt failed. A manufactory of Italian crape succeeded, till it was transferred to Norwich. At present there is no manufacture and very little trade: the population, in 1831, was reduced to 772, inhabiting 143 houses. Winchelsea has never received a charter: it is a corporation by prescription, and was not included in the act of 5 & 6 Wm. IV., c. 76. The corporation consists of a mayor and jurats, of whom there ought to be twelve; the style is 'the mayor, jurats, and commonalty of the antient town of Winchelsea.' The mayor and jurats hold courts of session and general gaol delivery, and their jurisdiction extends to capital felonies. This town returned two members to parliament from 42nd Edward III. till the 2nd Wm. IV., c. 45, when Winchelsea found a place in Schedule A, since which it has been added to the electoral district of Rye, and joins in the return of one member. Of the antient glory of Winchelsea few traces remain. Three of the four gateways are still standing, viz. the Landgate on the north-east, the Strandgate on the south, and Newgate to the south-west, but in a very ruinous condition. Of the three churches, St. Giles, St. Leonard's, and St. Thomas the Apostle, a portion of the last alone exists. It was a large cruciform structure, but the nave has long since disappeared; the north and south transepts are in ruins, and the chancel with two aisles is the only part used for public worship. Three lofty Gothic arches of clustered columns, formed partly of Sussex marble polished, separate the aisles; the walls are fretted with arches and columns, and the windows are in the pointed style. In this church are three altar-monuments, of the time of Edward I., of secular warriors in mail armour, with their legs crossed in token that they had assumed the cross and marched to the defence of the Christian faith in Palestine. They resemble the tombs in the Temple church, London, and, like them, have been erroneously supposed to be monuments of the Knights Templars. The Templars were always buried in the habit of their order, and are represented in it on their tombs. This habit was a long white mantle, with a red cross over the left breast; it had a short cape and a hood behind, and fell down to the feet unconfined by any girdle. By the arms on the shield of one knight, it appears to be the tomb of a member of the family of Oxenbridge, and another probably belonged to Gervase Alard, both distinguished families in the town or neighbourhood in the time of the last crusade. Besides the churches, Winchelsea had a convent of Grey Friars, founded by William de Buckingham, of whose edifice the choir with beautiful arches and fine Gothic windows yet stands. Here was also a convent of Black Friars or Dominicans, and a preceptory of St. Anthony: of these all traces are lost. The living is a discharged rectory, within the archdeaconry of Lewes, of the average net value of 278*l*. per annum. Robert de Winchelsea, made archbishop of Canterbury in 1291, and celebrated for his learning, his charity, and his firmness, was a native of Winchelsea.

Pevensey, which gave its name to the rape, and was once formidable for its castle and useful for its harbour, is now an insignificant village with only 49 houses, and had, in 1831, a population of 343. It is 60 miles from London. The Saxon name was Pevensea, and the Norman Peovensels. Its first authentic mention in history is in 792, when it was given, together with Hastings, by Berodaldus, one of the generals of King Offa, to the abbey of St. Denis at Paris In the reign of Edward the Confessor it had only 24 burgesses, and yet the port was of sufficient importance to be ravaged by Earl Godwin and his son Harold in 1043, when many ships were taken: it was at that time one of the chief ports for communication with France and Flanders. In the bay of Pevensey William the Conqueror landed with his army from Normandy prior to the decisive battle of Hastings; and it was this port which Swane, son of Earl Godwin, entered with eight ships on his return to England after his abduction of the abbess of Leominster. In the reign of Henry III. the port was still available, but it soon afterwards fell into decay owing to the withdrawal of the sea: the original outlet is now choked up, and the water drained through the beach by means of a sluice. Pevensey, like other places on the southern coast, has been claimed as the site of the antient British city of Anderida, with little more than conjecture to support the claim. The only object of interest is the castle, of which many interesting remains exist. The outer work contains many Roman bricks, and much of what is called 'herring-bone work,' from which it has been inferred that this was a Roman fortress. No mention is made of its existence in the Saxon times; but, if not erected by the Romans, it was certainly built from the remains of an older fortress. The outer walls, which constitute the most antient part of the fortification, enclose a space of seven acres, and are from 20 to 25 feet high. The moat on the south side is still wide and deep; on the other sides it has been filled up. The entrance is on the west or land side, between two round towers, over a drawbridge. Within the walls is another and much more modern fortification, approaching a pentagonal form, with five nearly circular towers, moated on the north and west. It is entered from the outer court by a drawbridge on the west side between two towers. The principal barbican or watch-tower is not at the entrance, but towards the north-east corner. The walls are nine feet thick, and the towers were two and three stories in height. The castle was of great strength: it withstood the attacks of William Rufus's army for six days, protecting Odo, bishop of Bayeux, who ultimately yielded only for want of provisions; and it afterwards successfully resisted the siege of King Stephen, who personally superintended the attack, but met with so gallant an opposition from Gilbert, earl of Clare, that he was obliged to withdraw his forces, leaving only a small body to blockade it by sea and by land. It once more resisted hostile attacks, when it was fruitlessly assailed, in 1265, by Simon Montford, son of the renowned earl of Leicester. Again, when Sir John Pelham was in Yorkshire, in 1339, assisting Henry, duke of Lancaster, to gain the crown, the castle, left under the command of Lady Jane Pelham, was attacked by large bodies of the yeomen of Kent, Surrey, and Sussex, who favoured the deposed king Richard, and was bravely and successfully defended by Lady Jane. The castle remained as a fortress till the reign of Elizabeth; two antient culverins, one of which bears her initials, are yet preserved: after which its history is not traced till the parliamentary survey of 1675, when the castle was in ruins, and the ground within the walls was cultivated as a garden. Pevensey is a member of the Cinque Port of Hastings [CINQUE PORTS], and the liberty includes the parishes of Pevensey and Westham, and 500 acres in the parish of Hailsham. It never had a charter, but is a corporation by prescription, left untouched by the act 5 and 6 Wm. IV., c. 76. It consists of a bailiff and jurats; the style is 'The bailiff, jurats, and commonalty of the town and liberty of Pevensey.' The bailiff and jurats hold courts of session and general gaol delivery four times a year, and have jurisdiction in capital felonies, which has not been exercised of late years. The inhabitants had formerly an hospital dedicated to St. John, long since lost. Of the church dedicated to St. Nicholas, the patron saint of the sailors, a portion only remains. The benefice is a vicarage, in the archdeaconry of Lewes, and deanery of Pevensey, of the annual net value, as returned in 1835, of 948*l.* There is an endowment of 100*l.* a year for almshouses, and a school for girls held every day in the church, and there is also a day-school for 50 or 60 boys. The famous physician Andrew Borde, better known as 'Merry Andrew,' was born at Pevensey.

Horsham, a parliamentary borough and market-town in the rape of Bramber, is situated on the Forest Ridge, near the borders of the county of Surrey, at a distance of 35¼ miles south-south-west from London. The area of the parish is one of the largest in the county, comprising 8500 acres, exclusive of the portion on which the town itself is built. The name is evidently taken from *hurst*, Saxon, a wood, and *ham*, a town, although some have derived it from Horsa, brother of Hengist, who was killed in 457, and said to have been buried in the vicinity of the town. The town consists of two streets crossing each other at right angles, with an open space in the centre, in which stands the court-house, a handsome stone building, enlarged by the duke of Norfolk in 1799, for the judges of assizes, who held the spring assize here from that period till 1830: the Midsummer quarter-sessions for West Sussex are still held in this hall. In this town also is the county gaol, rebuilt on the plan of Howard in 1775. Each prisoner was to have a separate cell, and the debtors and felons were to be kept separate, with a day-room on each floor, and a chapel and an infirmary. Here was attempted the earliest of the improvements in prison discipline, and here separate confinement was first systematically resorted to with the most beneficial effects. Since the great improvement in the House of Correction at Petworth, there have been few committals to Horsham gaol, and it is now chiefly used for debtors and for persons convicted. A corn-market, well attended, is held on Saturdays. Horsham is a borough by prescription, and returned two members from the 23rd Edw. I. till the passing of 2 Wm. IV., c. 45, when the borough found a place in Schedule B, and has since returned one member. The old right was in the owners of some twenty-five burgage tenements; the whole parish is now included: the number of voters in 1832 did not exceed 257; but the number increased in 1839-40 to 345 occupiers of 10*l.* houses and six burgage tenants. The church, dedicated to St. Mary, is a spacious and elegant building, with a lofty tower surmounted by a spire, in the early English style of architecture. The benefice is a vicarage, in the archdeaconry of Chichester and deanery of Storrington, of the annual net value, in 1835, of 651*l.* The population in 1831 was 5105. There is a school for 60 children of poor people, to be taught reading, writing, and arithmetic, and, at the discretion of the school-wardens, the Latin language, founded by Richard Collier in 1532, with a good school-house and dwellings for a master and usher. There is also a Lancasterian school for 200 boys and 100 girls, and an infant-school supported by voluntary contributions.

Midhurst is a parliamentary borough and market-town in the rape of Chichester. It is pleasantly situated on a gentle eminence, surrounded by loftier hills overlooking the meandering course of the river Rother as it flows towards the Arun: it is 50 miles from London, and on the high-road from Winchester to Petworth, from which place it is distant 6½ miles. Midhurst is supposed to be the Mida of the Romans with the Saxon termination added: at the time of the Conquest it formed part of the barony of Arundel; but in the reign of Henry I., four and a quarter knights' fees were erected by the king in favour of Savaric de Bohun, into the minor lordship of Midhurst, which was held for several generations by that powerful family. After the extinction of the male line of the Bohuns, the lordship was granted by Henry VIII. to Sir Anthony Browne, standard-bearer to that king, whose son was created Viscount Montague. In his descendants the property remained till the death of George Samuel, the eighth Lord Montague, in 1793, when it passed to his sister Elizabeth Mary, who married William Stephen Poyntz; and on his death, in 1840, it became the estate of his two daughters, one of whom married Captain Frederick Spencer, brother of Earl Spencer, and the other the marquis of Exeter. On a mound on the south bank of the Arun are the ruins of the castle long occupied by the Bohuns: the whole vallation, now overgrown with trees, lies within a circumference of 400 yards. Within the walls was a chapel dedicated to St. Anne. There is a corn-market, well attended, held every Thursday, and a town-hall in which the western sessions were formerly held. Midhurst is a borough by prescription, and returned two members to parliament from 4th Edward II. till 1832, when, by the act 2 Wm. IV., c. 45, the number of representatives was reduced to one; and to make up a constituency a widely-extended agricultural district, consisting of seven entire parishes and eleven portions of parishes, was added. The old right was in the holders of burgage tenements, of which there were forty-four, and the borough was memorable from the fact that the site of many tenements was marked by stones in the park wall, the buildings having been long destroyed. In 1768 this borough gave his first seat to Charles James Fox, then only nineteen years of age. The new district only furnished 252 registered electors in 1832, and in 1839-40 there were only 261. The church, dedicated to St. Denis, is a small and plain stone edifice in the later style of English architecture; it stands in the centre of the town. The benefice is a perpetual curacy, in the archdeaconry of Chichester, and the head of the deanery of Midhurst, endowed with 400*l.* private benefaction, and 600*l.* royal bounty: the average net value per annum, in 1835, was 170*l.* There is a free grammar school for 12 boys, founded by Gilbert Hannam in 1672, and a national school, well supported. The population in 1831 was 1478. About one quarter of a mile east of Midhurst stood the stately pile of Cowdray House, the princely seat of the Montagues, built in the reign of Henry VIII., and destroyed by fire in 1793.

East Grinstead, which is the largest parish in the county containing upwards of 15,000 acres, is a market-town situated in the rape of Pevensey, near the borders of Ashdowne Forest, on the high road from London to Lewes, at a distance of 28 miles from London. The town is pleasantly placed on a considerable eminence, but consists only of one principal street, irregularly built. There is a market for corn on Thursdays, and a cattle-market on the last Thursday in the month. When the roads in Sussex were scarcely passable in winter, East Grinstead, as one of the nearest points to the metropolis, was selected for the holding of the Lent assizes, but the practice was discontinued in 1799, and Horsham chosen instead, the gaol being there. East Grinstead is a borough by prescription, and returned two members to parliament from 1st Edw. II. till the passing of the act 2 Wm. IV., c. 45, when it found its place in schedule A. The old right was in the owners of the burgage tenements, of which there were thirty-six. At the east end of the town is a quadrangular stone building, used as a college for twenty-four aged persons of both sexes, who, under the government of a warden and two assistants, have each a separate apartment, and an allowance of 8*l*. a year. The college was founded by Robert, second earl of Dorset, and was erected in 1616. The endowment is 330*l*. a year. Within the walls is held a free grammar-school, founded in 1708 by Robert Payne, at which twenty-five boys are educated. In this parish stand the ruins of Brambletye House, built in the reign of James I. by Sir Henry Compton, from an Italian model; but it soon fell to decay from the neglect of its subsequent owner. In this parish also is Kidbrooke, built for William, forty-second baron of Abergavenny, by Mylne, the architect of Blackfriars-bridge: it was sold in 1805 to the Hon. Charles Abbott, afterwards Lord Colchester. The church, which is a handsome stone edifice, with an embattled tower surmounted by light pinnacles, stands on the east side of the High-street. It is in a pure style of Gothic architecture, and was erected in 1786. The benefice is a vicarage, in the archdeaconry of Lewes, of the annual net value, in 1835, of 340*l*. The population in 1831 was 3364.

Steyning, a borough by prescription, and a market-town, is in the rape of Bramber, 50 miles from London. The town stands at the foot of one of the escarpments of the Downs, about a mile to the westward of the river Adur, and consists of a wide street running in a north-westerly direction, from which branches another running north-east; on the south side of the latter were situated the burgage tenements of the borough of Bramber, so that what appeared to be one small town returned four members to parliament. This town was called by the Saxons Steningham, from *stean*, a stone; and the ancient Roman road of Stane-street passed through the town. At the time of the Conqueror's survey Steyning belonged partly to the abbey of Fescamp, and partly to William de Braose, lord of Bramber. The abbot held the property till the dissolution of alien priories by Henry IV., who granted it to the newly-founded monastery of Sion in Middlesex; but on the dissolution of the greater monasteries the property passed to the Pellatts, and has since come to the Gorings. There is a well-supplied cattle-market held on every alternate Monday, which is a large mart for the sheep bred in West Sussex. Steyning returned two members to parliament in the 4th Edward II., but was joined with Bramber from that time till 31st Henry VI., when it returned its members separately, till disfranchised by the act 2 William IV., c. 45. The church, dedicated to St. Andrew, was originally a cruciform structure: of the original the nave only remains, the rest being a more modern erection. The nave was built in the Saxon times, or at a very early period of the Norman; the interior is magnificently enriched, the whole of the arches, as well as the capitals on the large cylindrical pillars, being profusely ornamented with tiers of mouldings of great variety and beauty. Ethelwulf, the father of Alfred the Great, is said to have been buried in Steyning church. The benefice is a vicarage, in the archdeaconry of Chichester, and deanery of Storrington, of the average net value, in 1835, of 308*l*. A school for boys, to be instructed in the Greek and Latin tongues, and in the principles of the established church, was founded by William Holland in 1614. The population in 1831 was 1416.

Cuckfield is situated in the northern part of the hundred of Buttinghill, in the rape of Lewes, 37 miles from London, on the high road to Brighton. It is a small neat town, with a market on Fridays, granted by charter of James II. The manor formed part of the barony of Lewes, and passed from the Warrens to the Fitzalans; one-half remains, like the barony, in the Abergavennys, and the other, through an alienation to the Coverts, is the property of the Sergisons. The church, dedicated to the Holy Trinity, is a large building in the decorated style of English architecture, with an embattled tower surmounted by a lofty spire. The benefice is a vicarage, in the archdeaconry and deanery of Lewes, of the average net value, in 1835, of 414*l*. The free grammar-school was founded by Edward Fowler in 13th Henry VIII. William Spencer increased the endowments, and Lady Dorothy Shirley built a school-house near the churchyard: the scholars at present on the foundation are very few. The population in 1831 was 2586.

Hailsham is a small town in the hundred of Dil. and rape of Pevensey, 54 miles from London on the high road to Eastbourne. The population in 1831 was only 1645. It has one of the largest markets in Sussex for sheep and cattle, held on every alternate Wednesday, its proximity to the rich pastures of Pevensey Level making it extremely favourable as a mart. The town is built on a gentle acclivity rising from the Levels. At Otham, in this parish, a religious house for monks of the Premonstratensian order was founded by Ralph de Dene and Sibilla his wife, but it was afterwards moved to Bayham. A few traces of the old walls alone mark the site. The church is in the later style of English architecture, with an embattled tower surmounted by light pinnacles. The benefice is a vicarage, in the archdeaconry of Lewes, and deanery of Pevensey.

Petworth is a market-town in the hundred of Rotherbridge and rape of Arundel, 49 miles south-west by south from London, on the high road to Arundel and Chichester. It is situated on an eminence above a small stream near the river Rother, from which it is supplied with water, raised by works erected by the late earl of Egremont. The property originally formed part of the honor of Arundel, but was given by Adeliza, dowager queen of Henry I., to her brother Joceline de Louvaine, from whom it passed to the noble family of the Percys, lords of Petworth, and afterwards earls of Northumberland, and ultimately devolved upon Elizabeth, baroness Percy, only daughter and heiress of Joceline, eleventh earl. She married Charles Seymour, duke of Somerset, and her daughter Catherine carried the estates to the Wyndhams. The mansion of the Percys backs upon the churchyard. In 1309 Henry de Percy had a licence and embattled his house at Petworth; the house was new-fronted by the duke of Somerset, and greatly altered by the late possessor, George O'Brien, earl of Egremont, who adorned its galleries with the rarest specimens of ancient and modern sculpture, and added to the already rich collection of pictures. A market is held on Saturdays. The market-place and court-house is in the centre of the town: it is a neat stone building, erected at the close of the last century by the earl of Egremont, and here are held the Easter and Epiphany sessions for the western division of the county. One of the first results of the philanthropic Act of 1782 for regulating prisons, procured at the instance of Mr. Howard, was the building, in 1785, of the house of correction at Petworth. It was built on two stories, over arcades: there was a cell for each prisoner, and the system of separate confinement was pursued here as successfully as at Horsham till the year 1816, when, in consequence of the increase of prisoners on the termination of the war, the structure of the prison was altered, and the prisoners were employed in the factory. The church, dedicated to St. Mary, was erected about the time of Henry VII., and is a cruciform structure in the decorated style, to which an elegant spire has been added. The benefice is a rectory, in the deanery of Midhurst, and in 1835 the average net income was 856*l*. There are almshouses for 12 aged people, founded in 1624 by Thomas Thompson, but the number has been increased to fourteen, who each receive house-room and an allowance of 20*l*. a-year. There is also a splendid endowment for twelve poor widows, founded in 1746 by Charles, duke of Somerset, and by a liberal interpretation of the terms of the endowment by the late earl of Egremont, between 700*l*. and 800*l*. are annually given in support of forty-eight females, of which twenty-two are in the almshouses There is a school for twenty poor children, founded in 1753 by Richard Taylor, and the earl of Egremont added in 1834 an endowment for twenty-five boys, to be taught gratis on the national system, and for fifteen more on payment of 2*d* a-week; and also in 1833 an endowment for like numbers of girls, on similar conditions. The population in 1831 was 3114.

Bognor is a retired watering-place in the western part of the county: it is locally situated within the parish of Southbersted, in the hundred of Aldwick and rape of Chichester, 67 miles from London. It owes its origin to Sir Richard Hotham, who in 1784 began to erect houses for visitors, and it has been much frequented of late years. The promenade is extensive, and the houses neat. The Bognor rocks, which are only visible at low-water, extend into the sea in a curved direction for two miles. Within the memory of man they formed a line of low cliffs along the coast. The lowest part of the rocks is a dark grey limestone, in some instances passing into sandstone; the upper part is silicious. The population in 1831 was 2190.

Eastbourne is a pleasant bathing-place. It is situated at the foot of the eastern extremity of the Downs, at a distance of 61 miles from London, and about two miles to the eastward of Beachy Head, on the shores of what is known as Pevensey Bay. The antiquity of Eastbourne is beyond a doubt. It was a station of the Romans, and in 1717 a Roman pavement of white and brown tesseræ, 17 feet 4 inches by 11 feet, and a bath, 16 feet long, 5 feet 9 inches broad, and 2 feet 9 inches deep, were discovered. From the existence of these remains and from its situation it was supposed by Dr. Tabor to be the site of the antient town of Anderida Portus, a station founded by the Romans on the southern coast to check the predatory Saxons; and which has been placed by Camden at Newenden in Kent, by Mr. Elliott at Seaford, and by other antiquaries at Pevensey. It was at Anderida that Ella, after having defeated the Britons at Mercreadesburne, massacred every man, woman, and child, and destroyed the town, which, we are told, was never afterwards rebuilt. Towards the close of the last century Eastbourne attracted notice as a watering-place. The bathing is excellent, the water clear and pellucid, and the sands are dry and extensive. At Holywell, near Eastbourne, there are chalybeate springs, where the water does not materially differ from that at Clifton. The ruins of a domiciliary of a brotherhood of Black Friars are still standing. The church is a spacious building, consisting of a nave with side aisles, a large chancel, and lofty antique tower. The living is a vicarage, in the archdeaconry of Lewes, of the annual commuted value of 550*l*. The population in 1831 was 2726. The South Downs abound with that delicate bird the ortolan, or wheat-ear, and large numbers are caught near this town. Beachy Head, which has been before noticed, has been the scene of two unfortunate encounters to the English: one in 1690, between the combined fleets of England and Holland, under Herbert, earl of Torrington, against the French, an engagement from which Lord Torrington was forced to retire; and the other, in 1706, between three line-of-battle ships —the Royal Oak, the Grafton, and the Hampton Court, which were convoying several merchantmen, and a fleet of nine ships and several privateers, under the command of the famous corsair Du Guay Trouin. The Grafton and the Hampton Court were taken, and the third vessel only saved by being run on shore. The official account, hitherto unpublished, of the disastrous retirement of Lord Torrington from the action in 1690, is preserved among the Ellesmere MSS. at Bridgewater House.

Mayfield is situated on high ground, in the rape of Pevensey, and in the hundred of Loxfield-Camden, 44 miles from London. It is now only a small agricultural town, of one street; but the parish is extensive, including 13,500 acres. The town is remarkable for the palace of the archbishops of Canterbury, who had convenient residences provided for them at easy distances within the South Saxon diocese. The erection of the palace at Mayfield, as well as of the former wooden church destroyed by fire in 1389, is ascribed to the famous St. Dunstan; and in that portion of the palace which is now standing are preserved the saint's forge and anvil, and the very traditionary tongs with which this most reverend prelate seized the arch-enemy of mankind. Mayfield was a favourite residence of the archbishops. Provincial synods were held here in 1332 and 1362, and Archbishops Mepham, Stratford, and Islip died here. Of the antient palace the walls and three noble arches in the hall, and some portions of the chambers, one of which bears the date of 1371, are in existence. They are of later date than the time of St. Dunstan. The palace and manor were surrendered by Archbishop Cranmer to Henry VIII., who, in 1545, granted them to Sir Edward North: they were afterwards alienated to the Greshams, and here Sir Thomas Gresham, the prince of merchants, resided in much magnificence, and entertained in one of her progresses Queen Elizabeth. The church built after the destruction of the wooden pile is still dedicated to St. Dunstan: it is a large building with a lofty spire. The living is a vicarage: it was an appendage to the conventual establishment of the Black Canons at South Malling, and is now a peculiar of the Archbishop of Canterbury, and the annual net value, as returned in 1835, was 834*l*. The population of the parish in 1831 was 2738. Thomas May, the historian of the long parliament, was born at the palace at Mayfield, in 1595

Newhaven is a small and neat town, near the centre of the county, and the south-eastern corner of the rape of Lewes, in which it is situated, at a distance of 56 miles from London The antient name of the town was Meeching, but when the channel of the Ouse was diverted from Seaford and made to enter the sea in a straight line southward, the old name was changed. At what period this occurred is not ascertained: it must have been anterior to the time of Elizabeth, for the haven at Seaford was then decayed. The town consists of one main street, with two smaller ones at right angles, built on the western side of the river, and one mile from the sea. The harbour is the sole cause of its importance, and it is much frequented, being by far the best tidal harbour between Portsmouth and the Downs. The harbour has been already described. [Seaford.] The mouth is protected by a battery on the heights near Castle Hill, where there are the remains of an ancient circular fortification large enough to have contained 5000 men. The river is crossed by a drawbridge, erected in 1784. The inhabitants are chiefly occupied in maritime pursuits, and ship-building has been prosecuted with success. There is a custom-house, and large bonding warehouses for corn and wines. The chief imports consist of coals, timber, corn, wine, and spirits, and there is also a good coasting-trade in flour and butter. The exports are very limited, most of the vessels going out in ballast. The church stands on a hill to the west of the town: the nave is modern, but the round eastern wall of the chancel marks its Saxon origin. The benefice is a discharged rectory, in the archdeaconry of Lewes, with an average net income, in 1835, of 186*l*. The population in 1831 was 904.

Worthing is a modern and healthy watering-place, locally situate within the parish of Broadwater, in the hundred of Brightford and rape of Bramber, 56 miles from London. The situation is low and flat, only a few feet above the level of the sea, and it is foggy in winter. The sands extend for some distance, and in the summer there is good bathing. Not many years ago it was an obscure fishing-station, but at the close of the last century, when fashion caused the best points of the southern coast to be resorted to for health and pleasure, this town sprung up, and in consequence of its proximity to the Downs and the richness of the surrounding country, it has continued to increase. An act for paving and lighting was obtained in 1803, and a chapel-of-ease built in 1812. The streets and squares are well built, and the houses convenient, but not large. The esplanade extends for three-quarters of a mile along the shore. In the neighbourhood, and particularly on Lancing Down, Roman remains have been found, and at Cissbury is a fortification or earthwork of an irregular oval form, enclosing an area of nearly 60 acres. Indications of its having been used by the antient Britons have been discovered, and the finding of Roman coins within the rampart proves its occupancy by the Romans. The population of the parish, in 1831, was 4576.

Tarring near Worthing was the birth-place of John Selden.

Divisions for Ecclesiastical and Legal Purposes.—The whole of the county, with the exception of 21 parishes, is within the diocese of Chichester. It is subdivided into two archdeaconries, Chichester and Lewes. The archdeaconry of Chichester has 5 deaneries, Arundel, Boxgrove, Chichester, Midhurst, and Storrington, embracing 133 parishes, all within the western division of the county. The archdeaconry of Lewes forms the eastern part of the county, and has 4 deaneries, viz. Dallington, Hastings, Lewes, and Pevensey, including 144 parishes. There is also the deanery of Battle, exempt from the archdeacon's jurisdiction, and including the parish of Battle. The peculiars of the archbishop of Canterbury are the deaneries of Malling and Pagham, the former having 12 parishes and the latter 8 parishes; and one parish within the archdeaconry and city of Chichester.

Sussex is in the Home circuit. The assizes are now held at Lewes, where there is a house of correction: the county gaol is at Horsham. For subordinate jurisdiction, the county is divided into East Sussex and West Sussex, the former comprehending the rapes of Hastings, Lewes, and Pevensey; and the latter the rapes of Arundel, Bramber, and Chichester. The justices of the peace, though by their commission appointed for the whole county, confine the exercise of their power to their division of it. Separate quarter-sessions are held; for East Sussex at Lewes, and for West Sussex a day or two afterwards, the Epiphany and Easter sessions at Petworth, the Trinity at Horsham, and the Michaelmas at Chichester. There are also eleven petty-sessions held for East Sussex at different places within that division, viz. Battle, Brighton, Burwash, Cuckfield, East Grinstead, Frant, Hailsham, Hastings, Lewes, Rye, and Uckfield; and seven petty-sessions for West Sussex, viz. Arundel, Chichester, Horsham, Midhurst, Petworth, Steyning, and Worthing.

From the 1st Edward I. to 12th Charles I. the counties of Surrey and Sussex were united under one sheriff, but they are now divided.

The same two great divisions of East and West Sussex are, since the county has been divided by the Reform Act, used for parliamentary purposes. East Sussex returns two members: the election takes place at Lewes, and the nine polling-places are Battle, Brighton, Cuckfield, East Grinstead, Hailsham, Hastings, Lewes, Mayfield, and Rye. West Sussex also returns two members: the election takes place at Chichester, and the seven polling-places are, Arundel, Chichester, Horsham, Midhurst, Petworth, Steyning, and Worthing. Two members each are returned by the city of Chichester, the Cinque Port of Hastings, and the boroughs of Brighton, New Shoreham, and Lewes; and one member each for the antient town of Rye, and the boroughs of Arundel, Horsham, and Midhurst. The total number now returned from the whole county is eighteen. Before the Reform Act it was twenty-eight. By that Act Bramber, East Grinstead, Seaford, Steyning, and Winchelsea, returning two members each, were disfranchised, and Arundel, Horsham, Midhurst, and Rye reduced from two members each to one, making a deduction of fourteen members; but the loss was diminished by the division of the county and the creation of the new borough of Brighton.

History and Antiquities.—This county, like the adjoining county of Kent, comprehends that part of England which, from its proximity to the Continent, first attained notice; but its name is derived from the kingdom erected by Ella, after his successful expedition in 477, when he assumed the title of king of the South Saxons, and gave the title of Suth-sex to the district.

The maritime coast of England was inhabited in the time of Cæsar by a rude but warlike people, the Belgæ; that they were numerous in Sussex, and held the district with ample defences and fortifications, is evident from the remains of their works. They had indeed a regular chain of communications along the hills from one end of the county to the other. The principal posts were at the extremity of some point nearly surrounded by water, and often defended on the land side by a vallum and trench. The towns of Arundel, Bramber, Lewes, and Seaford were thus conveniently placed. They had also stations at short distances on all the ground which was not covered with the immense forest or Coitandred constituting the Weald of Sussex. At Storrington, at Sullington, at Ditchelling, at Lewes, at Cissbury above Worthing, and indeed on almost all parts on or near the slopes of the Downs, the remains of antient British earthworks have been traced. The pottery is of the coarsest and rudest kind, being nothing more than the bluish-grey clay of the country moulded by the hand; ornamented by the indentations of the fingers or by oblique strokes or gashes made by some blunt instrument, and then dried in the sun without fire. Perhaps still stronger evidence of the number of the antient Britons may be found in the preservation in the county of many names of places either pure British, as Glynde (*glyn*, a vale), or mixed with the Saxon, as Pen-hurst (*pen*, a head), Cuck-field (*coc*, *princeps*), and Southease (*ise*, a river), and the retention of many words not generally in use elsewhere. Of the eight principal British roads, one only entered Sussex—the Ermyn Street; one branch from London entered this county at Pulborough near Horsham, running to Chichester on the west, and the other branch went through the eastern part of the county by Wadhurst, Mayfield, and the neighbourhood of Beachy Head, or, as conjectured with much reason by Dr. Stukely, through East Grinstead to Isfield, Lewes, Southease, and Newhaven, in all of which places there are antient encampments and British names.

On the first landing of Cæsar in Britain, he does not seem to have set foot in this county; and it was not till nearly a century afterwards, A.D. 47, when Vespasian received his commission to reduce the maritime districts, that Sussex fell under the Roman sway. This being accomplished, he left the government to a British prince, Cogi, afterwards named Cogidubnus, who, if he did not found the city of Regnum, now called Chichester, made it the chief seat of his government, which included Hampshire and Sussex. In his descendants the civil and military government of the southern coasts is said to have remained till the death of Lucius, the legendary founder of Christianity in Britain.

The Romans however being now supreme, three large towns or fortresses sprung up along the coasts of Sussex, Regnum, Mutuantonis, most probably Lewes, and the third Anderida. There were also smaller and intermediate stations for convenience in journeys, or for the purpose of defence. Of the site of Regnum there is no doubt; for in digging the foundation for the present council-chamber at Chichester in 1723, the foundation of a temple was discovered, with an inscription, showing that it was dedicated to Neptune and Minerva by a company of artificers, by authority of Cogidubnus, Claudius being legate in Britain. Other Roman inscriptions have been from time to time brought to light; among them one by Lucullus, who acted as proprætor after Agricola's recall; and many tesseræ and Roman coins have been dug up; and there is on a place called the Broil, on the north side of the city, an extensive earthwork or castramentation, which has every appearance of having been made or materially altered by the Romans.

The fifteenth Iter of Richard of Cirencester proceeds coastwise from Regnum through the eastern part of the county into Kent. The first station mentioned east of Regnum is called Ad-decimum, the name designated its distance from Regnum, and in 1811 the exact spot was fixed at Bignor where there were discovered the foundations of a large villa, with several tessellated pavements for the different rooms, the crypto-porticus, or enclosed gallery for walking, a sudatory, and a bath. Another road from Regnum passed directly northward into Surrey, which it entered near Haslemere: upon this road, at a distance of 12 miles, was the town of Mida, now Midhurst.

From Ad-decimum the Roman road passed eastward to a place named by Ravennas Anderesio, the modern Amberley, along the high land to Chanctonbury, a circular encampment about 7 miles from Worthing, and about 2 furlongs in circumference; thence to Lancing, where Roman remains of a villa have been discovered; and farther on to a spot near Brighton (Aldrington), called Portus Adurni, a place used for the watch along the coast when the Romans were annoyed by the Saxons. From Portus Adurni a Roman road ran in a northern direction past St. John's Common and through Ardingly into Surrey, and so on to London.

The next town of importance mentioned by Ravennas was Mutuantonis, and this town has been only conjecturally placed at Lewes. The situation is in the direct line of road: it is an easy distance between Bignor and Anderida: it was the most convenient place to pass the Ouse, which must have been at that time an æstuary: the name itself has been conjectured to be compounded of *mutatio* or *mansio*, a mansion; and the British word *anton*, a river. No tesseræ have been found, but many Roman coins have been discovered.

From Mutuantonis the road once more took the hills and proceeded to Anderida. Along the whole line the earthworks at Wolstonbury, Ditchelling, Hollingbury, Whitehawk Hill, and Mount Caburn, clearly mark the route.

The situation of Anderida, as we have already seen, has given rise to much doubt and no little controversy. It was placed by Camden at Newenden in Kent, but that position has been long since abandoned by antiquaries. It was another of the fortresses to keep a look out towards the sea; and the 'Notitia,' or Survey of the Western Empire, informs us that it was garrisoned by a company of the Abulci, with their captain. Newenden never was a seaport, or useful for such a purpose. More modern authorities have been divided between Pevensey, Eastbourne, and Seaford. In the two last places the remains of Roman villas have been found, and any one of them would be unobjectionable in point of distance; but the evidence of Richard of Cirencester's map, which places the city on the east side of a river, on the meridian line from London, flowing into the British Channel, and the situation of the earthworks on the Downs, rather favour the claim of Seaford.

After the success of the Saxons, Hengist and Horsa, in Kent, others of their countrymen were induced to seek a settlement in Britain; and, in 477, Ella, a chieftain of repute among the old Saxons, accompanied by his sons Cymen, Wincheling, and Cissa, came over to the coast of Sussex, and landed at a place called Cymenes-ore, supposed to be Chichester, where they defeated the enfeebled Britons, and drove them back to the large wood then occupying the Weald. Year by year the invaders advanced their positions eastward towards the district of Hengist (at Eridge, in the parish of Frant, and on the borders of Kent there are traces of one of the Saxon stations, called Saxonbury Hill), till, in the year 485, the British kings and rulers, uniting their forces, collected a formidable army, placed Aurelius Ambrosius at their head, and advanced against Ella and his sons. The two armies met at a place named Mercreadesburne: there was a desperate encounter; both armies were thinned; the victory was doubtful; but Ella was obliged to retire westward, and send to Germany for reinforcements. In the meantime the British held possession of Anderida, which was a fortress of considerable importance. Ella determined to reduce it; and in the year 491, having been joined from Germany, he made his attack. For a time the Britons held out, and much harassed Ella, but ultimately the town was taken; and in revenge for the loss and defeats he had sustained, Ella put every inhabitant to the sword, and razed the town to the ground. He was now fully in possession of the coast, and proclaimed himself king of the South Saxons. On his death, in 514, his district embraced the present counties of Surrey and Sussex.

Of the three sons of Ella, two were never heard of after the battle of Mercreadesburne, and he was succeeded in his kingdom by his third son Cissa. This kingdom was bounded on the north by the river Thames, on the east by the newly-established kingdom of Hengist in Kent, on the south by the sea, and on the west by the Britons, still in possession of Hants and Berks. The cultivated lands were estimated at 7000 hides. Cissa fixed his seat of government at Chichester: he spent much money in the improvement of his capital; and gave to it the name of Cissan-ceaster, of which the modern name is a corruption. The date of his death is uncertain. Of the next occupiers of the South Saxon throne nothing is known: dates and names are alike in confusion, till the reign of Edelwalch, about the year 648, who was attacked and taken prisoner by Wurpher, king of the Mercians, but released and allowed to resume his government on embracing Christianity. He was among the last to embrace the true faith; but on his restoration he appointed Wilfrid, archbishop of York, who had been banished from the kingdom of Northumberland, to teach the Christian doctrines, and granted to him, in 680, the peninsula of Selsey, where the first cathedral was erected, and which was the head of the see, till it was moved to Chichester after the Conquest. In this reign, A.D. 685, Ceadwalla, prince of the royal blood of Wessex, having attacked and ravaged Kent with great ferocity, extended his attacks into Sussex, and sought to usurp the royal authority. He was at first defeated, and fled into the forest of Anderida: ultimately Edelwalch was killed, Ceadwalla established his supremacy over the South Saxon kingdom, and held it till his abdication, A.D. 686. For two centuries it was under the rule of military despots, called 'eorls,' appointed by the kings of Wessex. At length arose Egbert, a politic and brave prince, who was invited by the unanimous vote of the witan from the court of Charlemagne to take possession of the throne, vacant by the death of Brithric. The kingdom of Wessex had been long extending its power over the other Anglo-Saxon kingdoms; but this prince, having defeated the Mercians, A.D. 823, despatched a force into Kent, under his son Ethelwolf, and Alstan, bishop of Sherburn. The ruling prince, Baldred, fled, and Kent passed from the Mercian supremacy.

From this time Sussex, with Surrey and Kent, and probably a part of Essex, was a subordinate portion of the West Saxon empire. It was commonly the appanage of the eldest son or heir-apparent of the king of Wessex; and when he succeeded to the paramount sovereignty, he usually resigned the subordinate crown to his heir. Thus, on the death of Ethelwolf in 857, Ethelbald, his eldest son, ruled over Wessex, and Ethelbert, the youngest, was the governor of Sussex. On the death of Ethelbald in 860, the two crowns were united in the person of his brother Ethelbert, who died in 865. His successor, Ethelred, died in 871, and the illustrious Alfred ascended the throne.

It was during these three reigns that the Danes or Northmen made frequent predatory excursions into these parts: Kent was the principal scene of their attacks, but Sussex did not escape. In the very last year of Ethelred's reign, he and his brother Alfred, having fought the Danes at Reading, gave them fresh battle 'with all the army on Ashdowne,' at a spot in the parish of Horsted, hence still called Dane Hill, and the Danes were overthrown. The pirate Hastings about the same time possessed himself of the town to which he gave his name; and in 893 a Danish fleet of 330 sail, under his command, assembled at Boulogne, and directed its course to the British shore. Two hundred and fifty vessels entered the Rother, as we have already seen in the description of that river. Nor were the attacks confined to the eastern part of Sussex; a body of the Danes who had settled in East Anglia and Northumberland in the year 900, fitted out a fleet, and after being repulsed in Devonshire, landed at Chichester. Here however they were driven back to their ships with considerable loss. Two large barrows at West Stoke, near Chichester, are said to have been erected over the bodies of these marauding sea-kings.

King Alfred made his residence in Sussex, and built several castles for the protection of the coast. Of the few of these castles whose situation is still known, is Burlough castle, in the parish of Arlington and rape of Pevensey, the foundations of which remain upon an eminence to the eastward of the small town of Alfriston, which is named after Alfred.

In the reign of his grandson Athelstane, there was an enumeration of the places in which mints were established; there were two in Lewes, and one each in Chichester and Hastings. When the Northmen renewed their ravages under Ethelred II., A.D. 980-991, Sussex was ravaged in the retreat from London of Colans, king of Norway, and Sweyn, king of Denmark; and again in 1009 and 1013, when Sweyn assumed the government.

In the time of Edward the Confessor, Sussex with Kent was included in the earldom of the famous Godwin, who had become one of the most potent subjects in the kingdom, and exercised within his earldom vice-regal power. After the confiscations of his estates, he harassed this coast with his fleet from Ireland, entering the ports and levying contributions till he procured the reinstatement of himself and his sons in his honours and estates.

On the death of Edward, and the assumption of the throne by Harold, Sussex became the scene of the memorable contest which gave the English crown to the Norman invader. On the 28th of September, 1066, the fleet collected by William reached the bay of Pevensey, and the Normans landed near the mouth of the little river Asten. The decisive battle of Hastings was fought on the 14th of October following, at a spot about nine miles from the place of landing, on a heath then called Epiton or Hetheland, but which thenceforth assumed the name of Battle. [Battle.] The details of the battle are well known; the victory was for a long time doubtful, but the fate of the day was decided by a well-executed manœuvre of the Normans, who feigned a retreat, in which they were too eagerly followed by the Saxons; and by the panic which seized the troops of Harold, who had been thrown into disorder on learning the deaths of the king himself and of his two brothers Gurth and Leofwine.

In the reign of William Rufus the civil war was brought into Sussex by the retirement of Odo, bishop of Bayeux, to Pevensey, after his loss of the castles of Tunbridge and Horne. In the troubles of the period of Henry III., on the Downs to the westward of the town of Lewes, at a spot near Plumpton Plain, still called Mount Harry, was fought, on the 14th of May, 1264, the battle of Lewes, between the assembled barons headed by Simon de Montford, earl of Leicester, and the king's troops, commanded by the king himself, assisted by his son Edward and his brother Richard. Prince

Edward was induced to follow the Londoners into the low ground; Montford, perceiving the mistake, attacked the remaining part of the king's forces; and when Prince Edward returned from the pursuit of the Londoners, he found to his dismay that the royal army had been put to the rout, and that his father had precipitately retreated to the priory of St. Pancras. After reinforcing the castle, on which the royal standard still waved, the prince marched with the remainder of his followers to join his father. The immediate result of the battle was the Mise of Lewes, and the ultimate issue the assembling of the first parliament of representatives properly so called. Winchelsea was afterwards attacked by Prince Edward in consequence of its occupation by Simon de Montford, son of the earl; and Montford himself made a fruitless attempt to seize Pevensey.

Jack Cade, whose insurrection in the reign of Henry VI. caused some trouble, extended his march into Sussex [Cade], and is reported to have been killed at Cade Street in Heathfield, where a stone monument has been raised to mark the spot.

In the subsequent reigns till Henry VIII., the whole of the Sussex coast was exposed to the incursions of the French, who landed and burnt Brighton, Seaford, Rye, Winchelsea, and other towns. During the civil wars the castles of Amberley, Arundel, and Bodiam, and the city of Chichester were besieged and taken by the parliamentary forces.

Although the whole of the county was parcelled out by the Conqueror among his followers, and subordinate manors were established in almost every parish, it appears certain that the Normans succeeded no better than their predecessors in winning over the common people. There are nearly two hundred words of pure Saxon origin, little known in other parts of the country, which are in constant use among the natives of Sussex; whilst the blue eyes and light hair of the peasantry indicate their Saxon descent.

Of antient castellated edifices not already noticed or referred to, the most remarkable are Amberley, Bodiam, and Herstmonceux, and the castellated mansions of Eridge, Knepp, and Scotney. The castle of Amberley is situated on the east side of the river Arun, at a distance of four miles from Arundel. The bishops of Chichester had a residence here from the early Roman times, but the present castle was built by Bishop Rede, who was consecrated in 1369, and obtained a licence, in 1 Richard II., to fortify his castle. The ground-plan is nearly a parallelogram. It was built after the French manner introduced by Edward III. after the battle of Poitiers. A square tower rose at each corner: the gateway, the grand feature in the external elevation in castles of this period, is still standing: it was flanked by two projecting round towers, which had machicolations or deeply projecting parapets. The south side is defended by a fosse, over which a bridge leads to the gateway. The present dwelling-house consists of the state apartments, built in the upper court by Bishop Sherburn at the commencement of the sixteenth century: in one still called the queen's room there are some curious paintings, the side pannels exhibiting a series of ten female figures, and the ceiling having the portraits of six warriors carved in wood. The castle was taken and dismantled in 1643, by the parliamentary forces under Waller, and since that period it has not formed the residence of the bishops. Bodiam Castle is of the same æra and built after the same French style as Amberley. It stands at a distance of four miles from Robertsbridge, on the river Rother, at the extreme eastern side of the county. It owes its origin, in 1386, to Sir Edward Dalyngrudge, a valiant knight and captain in the French wars of Edward III., who was married to the heiress of the Wardeux, lords of Bodiam. The heiress of the founder carried the castle to the Lewknors, from whom it passed by alienation to the Websters, and then to the Fullers, the present owners, who have taken great pains to prevent its further decay. The site forms a parallelogram or nearly a square, with four round towers at the angles and three square ones between them; the great gateway is flanked by two square towers, and the entrance is defended by a machicolation and portcullis. The fortress is surrounded by a very broad moat, which is supplied with water artificially conducted from the Rother, and assumes the appearance of a small lake. Upon the outside wall, above the gateway, are three escutcheons, after the French manner, bearing the arms of Bodiam, Wardeux, and Dalyngrudge. The interior was fitted up for a baronial residence. In the time of Charles I., Lewknor, the proprietor, was a staunch royalist, and his castle suffered the fate of Amberley, being dismantled by Waller. The castle of Herstmonceux is only of a few years later date. It was built in 1 Henry VI. (1423), by Sir Roger Fiennes, treasurer of the royal household. It stands on the borders of Pevensey Level, a few miles north of that antient castle. It is one of the oldest brick buildings in England, built after the re-introduction of that material, and for four centuries it has stood the brunt of the weather and exposure to the sea vapours without injury. The building is nearly a square, 214 feet from east to west, and 206 feet from north to south. It has an octagon tower at each corner, and another in the centre of the east and west sides. The gateway on the southern side is flanked by lofty octagonal towers 84 feet high, machicolated and embattled; the approach is by a drawbridge over a fosse which surrounds the whole building. It enclosed three courts and a long range of spacious apartments. The Fiennes were afterwards the Lords Dacre of the south. On the failure of male heirs, in the 37th year of the reign of Elizabeth, the house and estates devolved upon Margaret, the wife of Sampson Lennard, and her descendant sold them in 1715 to the Naylors, whence they came to the Rev. Robert Hare, who in 1777 sold the antient tapestry and furniture, pulled down the roof, and wholly dismantled the castle, leaving the walls alone standing. Eridge Castle stands upon a bold eminence in the parish of Frant, on the borders of Kent. From the earliest times the old castle, which was built in the form of a quadrangle, was the residence of the Nevilles, lords Abergavenny, who here entertained Queen Elizabeth for six days The old residence was forsaken from the time of Charles I., till William, the 42nd baron, at the close of the last century, returned to the antient seat. The castle has been since altered. The antient gallery occupies the entire front of the present building, which is an irregular pile, in the castellated style, embattled and flanked with round towers, but without any regard to architectural unity. Knepp Castle is in the parish of Shipley near Horsham: it is a castellated building in the Gothic style, erected within the last half century by Sir Charles Burrell: of the old castle, at a distance of half a mile, only a single wall is standing: it was long the residence of the family of De Braose, lords of Bramber, and was probably of Norman origin, but of its rise and fall nothing is known. Scotney Castle is on the Kent Ditch, in the parish of Lamberhurst: the stream which divides the two counties runs through the centre of the castle. It was built by a family of this name, about the time of Stephen. At each angle was a round machicolated tower, but the southern only remains. The whole was surrounded by a moat.

Of monastic remains the principal are the mitred abbey of Battle [Battle], the abbeys of Bayham and Robertsbridge, and the priory of St. Pancras at Lewes. The Knights Templars had a preceptory at Sedlescombe, near Battle. Bayham abbey is in the parish of Frant: it was one of the first twenty-seven houses for the Premonstratensian Canons established in England. It was at first situated at Otham, in the parish of Hailsham, but moved to Frant, A.D. 1200. The Sackvilles and De Acquilas were large benefactors; and at the suppression of the minor monasteries, 27 Henry VIII., its income was 152*l.* 9*s.* 4½*d.* Of the abbey buildings there are few remains: the walls of the church, covered with ivy, are in existence, and the ruins of the cloisters, chapter-house, and the gate-house are still seen. The priory of St. Pancras at Lewes ranked in wealth and influence next to the abbey of Battle, and like that abbey it was of the Benedictine order. The house was founded in 1078 by the first Earl de Warren and Gundred his wife, daughter of the Conqueror, who was buried here, and whose tomb, discovered at Isfield, has been replaced in the church near the old priory. It was one of the five principal priories subject to the abbey of Cluni, but it had itself six dependent cells: the priors were constantly summoned to parliament from 1265 to 1364, and had large possessions in Sussex, Surrey, Middlesex, Essex, Lincoln, Hertford, and York. When it was surrendered by Robert Crowham, the prior, on 16th November, 1538, the revenues were valued, according to Dugdale, at 920*l.* 4*s.* 6*d.*, and according to Speed, at 1091*l.* 9*s.* 6*d.* The building itself was nearly demolished by order of Cromwell, the vicar general: the walls of the refectory alone are in a good state of preservation, and there are a few walls of the other parts. The high altar cannot be traced. The abbey of Robertsbridge, situated on the river Rother, in the parish of Salehurst and rape of Hastings, was the third of the religious houses in Sussex, the revenues of which exceeded 200*l.* It was founded in 1176, by Alured St. Martin, for monks of the Cistercian order; and at the time of its surrender by Thomas Taylor, on 6th April, 1539, the gross revenue of the house amounted to 272*l.* 9*s.* 8*d.*, and the clear income to 248*l.* 10*s.* 6*d.* The work of destruction has been so perfect, that the crypt with a spider-arched roof, three lofty arches of the chapel in the south wall, an arched entrance at the west end, and the eastern gable, overgrown with ivy, are all that can be seen, though the foundation can be traced for some distance. The ruins have been converted into a farm-house.

The religious edifices in the county are generally mean and small. Those which are exceptions and most worthy of note are the cathedral [CHICHESTER], the churches of Arundel [ARUNDEL], of Rye [RYE], of New Shoreham [NEW SHOREHAM], and of Broadwater. The latter is a cruciform building, with a low square tower in the centre and a round corner turret. The chancel has a groined roof. The arch under the tower next the nave is pointed and enriched with Saxon zigzag ornaments; the arch entering the chancel is semicircular and in the richest style of Norman ornament. The capitals of the lofty columns are surmounted by palm-branches, an ornament introduced by the Crusaders.

(*Ordnance Map*; Mantell's *Geology of the South-East of England*; Dallaway's *Western Sussex*; Horsfield's *History of Sussex and Lewes*; Watson's *History of the Earls of Warren and Surrey*; Tierney's *History of Arundel*; *Excursions in Sussex*; Lee's *History of Lewes*; Stockdale's *Sketch of Hastings, &c.*; Estancelin's *Histoire des Comtes D'Eu*; Hay's *History of Chichester*; Sharon Turner's *History of the Anglo-Saxons*; Cooper's *Glossary of Sussex Provincialisms*; Rickman's *Gothic Architecture*; Burrell *MSS.*; Hayley *MSS.*; *Parliamentary Reports.*)

STATISTICS.

Population.—The inhabitants of Sussex are principally engaged in agriculture; but the large watering-places along the coast afford employment for artisans. Out of 67,077 males, twenty years of age and upwards, living at the enumeration of 1831, only 109 were returned as employed in manufacture or in making manufacturing machinery. Of these, 40 were employed in the town of Brighthelmstone, 13 at Eastbourne, and 5 at the powder-mills at Battle. The proportion of persons employed in agriculture has been diminishing, the actual proportion in three periods being:—

	1811.	1821.	1831.
Families employed in agriculture	54·92	50·31	42·58
Families employed in trade and handicraft	29·86	35·50	33·18
Other classes	15·22	14·19	24·24
	100·	100·	100·

In 1831 Sussex stood twelfth among the agricultural counties in the number of families employed in agriculture.

The population of Sussex at each of the five enumerations made during the present century was:—

	Males.	Females.	Total.	Increase per Cent.
1801	78,797	80,514	159,311	
1811	94,188	95,895	190,083	19·
1821	116,705	116,314	233,019	22·
1831	135,333	137,007	272,340	17·
184.	147,572	152,198	299,770	10·

showing an increase between the first and last periods of 140,459, or 88 per cent., being more than the average increase in the whole of England.

The following table gives a summary of the population of every rape in the county, as found at the census of 1831:—

RAPES, BOROUGHS, &c.	HOUSES.				OCCUPATIONS.			PERSONS.			
	Inhabited.	Families.	Building.	Uninhabited.	Families chiefly employed in agriculture.	Families chiefly employed in trade, manufactures, and handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of persons.	Males twenty years of age.
Arundel	5,207	6,033	41	167	3,211	1,597	1,225	15,800	15,264	31,064	7,808
Bramber	5,073	5,717	54	238	2,803	1,768	1,146	15,277	14,836	30,113	7,568
Chichester	5,161	6,073	31	203	3,376	1,313	1,384	15,631	15,028	30,659	7,855
Hastings	8,046	9,556	72	221	4,411	2,608	2,537	24,905	25,304	50,209	12,050
Lewes	3,686	4,457	82	121	2,608	959	890	12,559	11,740	24,299	6,199
Pevensey	7,566	8,967	40	191	5,705	2,110	1,152	24,997	23,503	48,500	12,009
Chichester (City)	1,514	1,701	10	109	141	1,076	484	3,838	4,432	8,270	1,935
Lewes (Borough)	1,454	1,604	4	62	89	912	603	4,110	4,482	8,592	2,010
Brighthelmstone (Town)	7,798	8,608	280	547	106	5,146	3,356	18,216	22,418	40,634	9,643
Totals	45,505	52,716	620	1,859	22,450	17,489	12,777	135,333	137,007	272,340	67,077

By the census of 1841 the number of houses inhabited was 54,066; uninhabited 3674; building, 253.

County Expenses, Crime, &c.—The amount raised for the relief of the poor and other county purposes in each of the four periods ending March, 1803, 1813, 1821, 1833, and 1840, near the period of each census, was:—

1803	206,225*l.*, being	1*l.*	5*s.*	10*d.*	for each inhabitant.
1813	350,564	„	1	17	10	„ „
1821	276,450	„	1	3	8	„ „
1833	319,547	„	1	3	6	„ „
1840	167,141	„	0	11	2	„ „

These averages are all above the general averages of England and Wales.

The amount expended in actual relief in each of the years ending 25th March, 1834, 1839, and 1840, was as under:—

	£		*s.*	*d.*	
1834	246,626	or	18	1	for each inhabitant.
1839	142,410	..	10	5	„
1840	144,128	..	10	7	„

Being a decrease of 7*s.* 6*d.* a head in 1840 as compared with 1834. There was also a decrease of 76 per cent. in the law charges; and 71 per cent. in money expended for other purposes. In 1834 Sussex was the most paupérised county in England, the rate of money per head of the population expended in relief being higher than in any other county: and it is now exceeded by Wiltshire alone, where the rate of expenditure is 11*s.* 1*d.* per head.

The sums expended in each of the years 1834, 1839, and 1840, were divided as under:—

	1834. £	1839. £	1840. £	Dec. p. cent. in 1840 compared with 1834.
Expended for relief of poor	246,626	142,410	144,128	41·
Suits at law, removals, &c.	7,873	1,269	1,873	76·
For all other purposes (except county-rate and registration)	30,937	13,387	8,932	71·
	£285,436	157,066	154,933	46·
Payments towards county-rate, 1840			10,561	
Payments under registration and parochial assessment act			1,647	
Total parochial rates, &c. expended in 1840			£167,141	

During the year ending 25th March, 1841, the poor law commissioners authorised the sum of 1673*l.* to be raised for the purposes of emigration, which was applied towards the emigration of 95 adult persons above 14 years of age, 29 children between 7 and 14 years of age, and 37 children under the age of 7 years, most of whom went to Sydney.

The whole length of the highways in Sussex is 2368 miles, the expenditure on which in 1839 was 25,053*l.*, or 10*l.* 11*s.* per mile. There are 678 miles, 35 furlongs, and 4 yards of turnpike-roads in the county, under the management of 53 trusts, of which 22 do not exceed 10 miles in length, a like number do not exceed 20 miles, five do not exceed 25 miles, and four do exceed 25 miles. The number of toll-gates and side-bars in 1838 was 243. In 36 of the trusts, the roads in 1838 were in good repair, in 12 they were in tolerable repair, in 4 they were in bad repair, and a portion of one was under indictment. In 43 of the trusts the roads were wholly repaired by the trustees, in 9 partly by the trustees and partly by the parishes; and one, the Horsham and Steyning road, is repaired by the trustees, except a small part near the bridge over the river Adur, between Bramber and Beeding, which, together with the bridge, is repaired by Magdalen College, Oxford. In 49 of the trusts the pecuniary value of the securities has not been diminished, in two it has, in two trusts there is no mortgage debt, but it appears that a great number of trusts will be affected by the Brighton railway. The total amount of mortgage and debts on bond on 31st December, 1838, was 282,593*l.* 17*s.*, of which 8416*l.* 12*s.* 8*d.* consisted of unpaid interest converted into principal; and the total amount of interest paid was, in 1832, 7656*l.* 0*s.* 6*d.*; in 1833, 8794*l.* 1*s.* 9*d.*; in 1834, 8241*l.* 13*s.* 7*d.*; in 1835, 8871*l.* 8*s.* 3*d.*; in 1836, 8586*l.* 0*s.* 5*d.*; in 1837, 9039*l.* 9*s.* 7*d.*; in 1838, 9119*l.* 8*s.* 9*d.*; and in 1839, 8860*l.* 3*s.* 9*d.*

The annual income arising from the tolls and parish compositions in lieu of statute duty was, in 1839, 49,481*l.*, and the annual expenditure in the same year was 46,255*l.* as follows:—

	£	*s.*	*d.*
Manual labour	9904	16	11
Team-labour and carriage of materials	8996	9	2
Materials for surface repairs	3987	14	11
Land purchased	42	0	0
Damage done in obtaining materials	497	8	11
Tradesmen's bills, law charges, &c.	1813	8	6
Salaries of treasurer, clerk, and surveyors	1385	1	5
Improvements	5887	0	4
Interest of debt	8860	3	9
Towards redemption of the debt	1542	10	0
Incidental expenses	634	4	5
Law charges	1575	10	1
Estimated value of statute-duty performed	129	0	0

The county expenditure for the year ending October, 1841, exclusive of that made for the relief of the poor, was, in East Sussex, 14,937*l.* 13*s.* 10*d.*; and in West Sussex, 4,347*l.* 5*s.* 7*d.*; and was disbursed as follows:—

	East Sussex.			West Sussex.		
	£	*s.*	*d.*	£	*s.*	*d.*
Bridges, building, repairs, &c.	301	17	8	133	18	7
Gaols, houses of correction, and maintaining prisoners	4,626	11	2	2,199	16	5
Shire-halls and courts of justice, building, repairing, &c.	337	13	9			
Lunatic asylums	113	13	6			
Prosecutions	3,176	12	11	779	14	8
Clerk of the peace	877	16	1	500	0	0
Conveyance of prisoners before trial	1,034	18	0	239	4	1
Constables, high and special, and police, included in a police rate	3,006	11	2			
Coroners	546	7	9	179	12	0
Treasurer				40	0	0
Militia payments	18	2	1			
Weights and measures	206	3	4	106	3	2
Miscellaneous	531	6	5	168	16	8
	£14,937	13	10	4,347	5	7

The number of persons charged with criminal offences within the county, in each of the three septennial periods ending with 1819, 1826, and 1833, was 922, 1841, and 2348; being an average of 132 annually in the first period, of 263 in the second, and of 335 in the third. The average number for the last 7 years, ending 1840, has been 3141, or a yearly average of 449.

Of the number committed for trial in 1840 there were—

	Males.	Females.	Total.
For offences against the person	31	3	34
For offences against property with violence	37	0	37
For offences against property without violence	373	66	439
For malicious offences against property	4	0	4
For forgery and offences against the currency	11	5	16
For other offences not included in the above	12	1	13
Total	468	75	543

The number of persons against whom bills were not found by the grand-jury and who were acquitted on trial was 157: of the remaining 386 who were convicted, 239 were for simple larceny; 39 larceny by servants; 18 housebreaking; and 13 for common assaults. There was one person sentenced to death who had his sentence commuted to transportation for life. Of the remaining convicts the sentences were—

Transportation for life	15	
" 15 years	2	
" 14 years	13	
" 10 years	15	
" 7 years	34	
		79
Imprisonment for 2 years and above 1	4	
" 1 year and above 6 months	26	
" 6 months and under	269	
		299
Whipped, tried, and discharged		7
		385

The ages of the persons accused were—

	Males.	Females.
Aged 12 years and under	16	..
" 16 years and above 12	48	9
" 21 years and above 16	106	21
" 30 years and above 21	149	23
" 40 years and above 30	79	13
" 50 years and above 40	46	6
" 60 years and above 50	5	3
Age above 60 years	12	..
Age could not be ascertained	3	..

Their state of instruction was as follows:—

	Males.	Females.
Could neither read nor write	148	25
Read or write, and write imperfect	306	47
Read and write well	11	2
Superior instruction	..	..
Instruction could not be ascertained	3	1

The number of electors qualified to vote for the county members in Sussex at the registration of 1841-42 was, for the eastern division 5994, and for the western division 3678; being about 1 in 15 of the whole male population in that year. The numbers registered in 1839-40 were thus divided—

	East Sussex.	West Sussex.
Freeholders	3482	2452
Copyholders	681	357
Leaseholders	59	154
Occupying tenants	977	504
Trustees	29	12
Holders of offices	40	78
Registered for joint qualifications	48	29
Total registered in 1839-40	5316	3122

or an increase in East Sussex of 492 and in West Sussex of 464, over the numbers registered for the years 1835-36.

The number of savings-banks in Sussex is 13. The number of depositors and the amount of their deposits as they stood on 20th of November in each of the last three years were as follows:—

	1838.		1839.		1840.	
	Depositors.	Deposits.	Depositors.	Deposits.	Depositors.	Deposits.
Not exceeding £20	7,234	£45,540	7,067	£46,968	7,789	£49,611
" 50	3,026	94,146	2,967	90,990	3,176	97,909
" 100	1,283	87,745	1,281	67,766	1,342	92,938
" 150	376	44,922	400	47,548	435	51,563
" 200	251	42,296	257	43,117	249	41,836
Above . . 200	32	8,296	35	8,351	30	7,531
	12,202	322,945	12,007	334,739	13,021	341,128
Charitable Institutions	157	8,263	152	9,239	163	9,786
Friendly Societies .	70	8,944	79	9,303	79	10,036
Total . .	12,430	340,152	12,238	343,271	13,263	360,950

Education.—The following summary is taken from the Returns made to the House of Commons, and ordered to be printed 20th March, 1833:—

	Schools.	Scholars	Total.
I. Infant-schools . .	53		
Number of infants at such schools:—			
Males . .		796	
Females . .		771	
Sex not specified .		238	
			1,805
II. Daily-schools . . .	962		
Number of children at such schools:—			
Males . .		14,418	
Females . .		12,464	
Sex not specified .		4,190	
			31,072
Schools . .	1,015		
Total of children under daily instruction . . .			32,877
III. Sunday-schools . .	287		
Number of children at such schools; ages from 4 to 15 years:—			
Males . .		9,496	
Females . .		8,605	
Sex not specified .		3,333	
			21,434

IV. *Maintenance of Schools.*

Description of Schools.	By endowment.		By subscription.		By payments from scholars.		Subscrip. and payment from scholars.	
	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.	Schls.	Scholars.
Infant Schools	2	32	4	432	39	749	8	592
Daily Schools	65	2236	76	4,997	733	16,710	88	7,129
Sunday Schools	15	1068	230	16,953	..	..	42	3,413
Total...	82	3336	310	22,382	772	17,459	138	11,134

V. Religious Distinction:—

Schools established by Dissenters:—

	Schools.	Scholars.	Total.
Infant-schools . .	2	166	
Daily-schools . .	18	1,451	
			1,617
Sunday-schools . .	68		7,044

VI. Schools established since 1818, or, properly speaking, the increase of schools since 1818:—

		Scholars.
Infant and other daily schools	453, containing	17,364
Sunday-schools . .	197 .	15,840

Lending libraries of books are attached to 51 schools in the county of Sussex.

SUTHERLAND is an extensive, compact, and well-defined shire or county in the northern division of Scotland. This county stretches from the German Ocean, along which it has a sea-coast of about 24 miles from Embo to the Ord of Caithness, across the whole breadth of the island to the Atlantic Ocean and the North Sea; having along the Atlantic, or from Inverkirkaig Bay to Cape Wrath, a sea-coast of 62 miles in length (without including the bays and indentations), and along the North Sea from Cape Wrath eastward to Drum Hallastain, a similar sea-coast of 66 miles. On the south Sutherland is divided from the intermingled counties of Ross and Cromarty by the river Portnaculter, or the æstuary of the Oykill (now generally called the Dornoch Frith), which opens into the Moray Frith eastward of the formidable bar of the Gizzen Briggs, by the river Oykill, by an irregular short conventional boundary among barren uplands, and thence by two fresh-water lochs, and the river and bay of Kirkaig, which opens to the Atlantic. On the north-east Sutherland is divided from Caithness, the most northern county of Scotland, by a lofty and unbroken range of hills which extends from the headland of the Ord of Caithness to that of Drum Hallastain.

The well-defined district comprehended within these boundaries contains an area of about 1865 square miles of land and 38 square miles of water, or 1,193,940 acres of land and 24,230 acres of water. The length of this county in straight lines varies from 60 to 42 miles, and the breadth from 54 to 42 miles. It lies between 57° 55′ and 58° 37′ N. lat., and 3° 43′ and 5° 23′ 30″ W. long.; the mountain Ben Klibreck, which is nearly in the centre of the county, being in 58° 14′ 6″ N. lat. and in 4° 24′ 32″ W. long.

There are no islands along the east coast of Sutherland, but there is a number of small islands along the west and north coasts, of which four are inhabited. Oldany, Calva, and the island of Handa, are the largest of these islands on the west coast. Handa is remarkable for the altitude and wild grandeur of its cliffs, in which innumerable sea-fowl hatch their young. Along the north coast, the lofty peaks of the Stack and Skerries islands, belonging to this county, are conspicuous in clear weather at a distance of some miles from the coast. Island Hoan, the Rabbit Islands, Island Roan, and Island Neave, or Holy Island, are situate close to the coast, and form, in some instances, natural breakwaters, and afford protection for shipping.

The name of Sutherland came from the Northmen, who frequently infested the Scottish shores in and before the twelfth century, and made early settlements along the coasts of Caithness. The present county of Sutherland was, with reference to the position of Caithness and Orkney, the *southern land* of these Norwegian and Danish settlers, and hence the origin of the name of Sutherland, which was applied to a large and important territory, known to the Celtic inhabitants of the Highlands, and still exclusively called, in the Gaelic language, Cattey.

Sutherland is a mountainous and pastoral district. The whole of the interior of the county consists of a succession of mountains and ranges of hills, and some extensive moors, broken and separated by several straths and mountain glens, diverging from the principal valleys, which open towards the sea-coasts. Among these mountain-ranges, one of great altitude, which contains several mountains among the highest in Great Britain, separates the west and north coasts of the county from its southern shore and valleys, and runs in a line nearly parallel with the trending of the indented shores of the Atlantic and North seas. The detached and conical mountain of Suilven, in Assynt, forms the characteristic and picturesque southern pillar of this lofty range; while Ben More of Assynt, which attains an elevation of 3431 feet, Ben Leod, Ben Hee, Meal Ryne, Stack, Arkle, Fionaven, and Ben Spinnue, mark with their towering summits the prolongation of this range to within a few miles of the North Sea. The coast near this point trends almost due east from the bold headland of Cape Wrath; and parallel to it, the continuation of the same elevated ridge is traced in the prominent and equally elevated mountains of Ben Hope, Ben Loyal, Ben Stomino, and the two Ben Griams, to within a short distance of the county of Caithness. The alpine character of this extensive range is also preserved in the magnitude of many lakes at the base of the mountains, in the depth and abruptness of the openings and passes, in the expansion of widely-spread mountain sides and formidable mosses and bogs, and in a variety of romantic valleys and rugged glens and hollows. The western and northern districts of the county, thus separated by the mountains of the interior from the southern and eastern parts, are unlike them in appearance and character. Thus, the two parishes of Assynt and Eddrachilles, along the west coast, are remarkable, even in comparison with the wildest districts of the Highlands of Scotland, for the general ruggedness and inequalities of the surface, and for the vast number of rocky eminences and of second-rate lakes which characterise the district. Along the north coast the same description of country continues, but in a more modified form, and softened by an open track of arable land in the parish of Durness,—by the picturesque beauty of Tongue, and its improved domains and old trees,—by the extensive and beautiful valley of Strathnaver, and the more tame, but fertile Strath of Halladale. The sea-coasts of these two districts also present headlands, promontories, and numerous cliffs of the boldest description. In contrast to these striking and distinguishing features of the west and north divisions of the county, the eastern and southern parishes are marked by several extensive and pleasant valleys, by less elevated nills, by rich pasturage, and by valuable tracks of arable land, in a high state of cultivation, in the parishes of Creich, Dornoch, Golspie, Clyne, and Loth; and, with the exception of the headland of the Ord of Caithness, the sea-coast along the eastern shore is flat and sandy.

The height of some of the Sutherland mountains has been accurately determined: the following list contains, besides the ascertained elevations, the computed height of others, which is believed to be tolerably accurate:—

Ben More of Assynt, ascertained to be		3431 feet.
Ben Klibreck,	..	3164
Ben Hope,	..	3061
Fionaven,	..	3015
Ben Hee,	..	2858
Ben Spinnue,	..	2566
Ben Armin,	..	2306
Ben Griam-more,	..	1935
Ben Uarie,	..	1923
Ben Veallich,	..	1838
Ben Horn,	..	1712
Ben Smorale,	..	1667
Ben Lundie,	..	1467
Ben Hutic,	..	1345
Ben Bhraggie,	..	1282
Suilven, computed to be		2700
Ben Loyal,	..	2500
Canisp,	..	2500
Arcle,	..	2500
Stack,	..	2400
Queenag,	..	2200
Ben Leod,	..	2200
Brebag,	..	2000
Meal Rynie,	..	2000
Meal Horn,	..	2000
Fashven,	..	2000
Knock ari-na-Coolanin, computed to be		2000
Ben Stomino,	..	1800
Glasven, Assynt,	..	1800
Ben Dirach,	..	1800
Cranstackie,	..	1800
Ben Garve, Assynt,	..	1700
Meal-na-kra,	..	1600
Craig-na-chie,	..	1600
Bendergmore,	..	1500
Ben Griam-beg,	..	1500
Ben Roy,	..	1400
Ben Duan,	..	1400
Kollieben,	..	1400

This county is abundantly watered by many rivers and their tributary streams, partly flowing from extensive inland lakes, and partly formed by the junction of innumerable mountain-streams. All these rivers have their source, supplies, and auxiliary streams within the county of Sutherland, with the single exception of the subordinate streams of the Eanack and Carron, which flow through the county of Ross before joining the æstuary of the Oykill. The salmon-fishings of the larger rivers are very valuable; but with the exception of the intricate and narrow channel of the Frith of Dornoch and the short æstuary of the Fleet, none of them are sufficiently large to be navigable. The Oykill is the chief river of the county: its source is in Loch Aish, a picturesque lake to the east of Ben More of Assynt. The Oykill forms the boundary between the two counties of Ross and Sutherland, and, after being augmented by the Eanack, Cassley, Shin, and Carron, expands into an æstuary, the antient Portnaculter, but now generally called, at its mouth between Tarbetness and Embo, the Dornoch Frith, and, above the town of Tain, the Kyle of Sutherland. The Kyle, at a narrow point at the village of Bonar, is crossed by a handsome bridge of three arches, one an iron arch of 150 feet span, and the other two stone arches of 50 and 60 feet respectively, erected at an expense of near 14,000*l.* The river Shin, which flows from a lake of the same name, has a course of six miles before it joins the Oykill, and is the most important salmon river in the county: the yearly average take of salmon and grilse at this station is computed to exceed 122,000 lbs. weight. The other important rivers in the county are the Cassley, which joins the Oykill; the Fleet, which opens into a small æstuary, formerly known as Unes, and now as the Little Ferry; and the Brora and Helmsdale, both of which enter the Moray Frith. The river Halladale, the Strathy, the Naver, the Torrisdale, the Hope, and Dionard all flow into the North Sea; and the Inchard, Laxford, Inver, and Kirkaig enter the Atlantic on the west coast.

The interior and western districts of Sutherland are remarkable for the great number of fresh-water lakes, which in general lie at the base of the higher mountains, or occupy the hollow spaces in the rocks and mosses of the rocky western coast. Loch Shin, with the almost connected smaller lake called Loch Griam, is 18 miles in a straight line from its eastern to its western extremity, and forms one, and the largest, of a singular chain of lakes, which, with the exception of a few miles between each of them, extends from near the head of the Dornoch Frith on the east coast to Loch Laxford, a salt-water loch of the Atlantic on the west coast. The other lakes forming this chain are lochs Merkland, More or Rynie, and Stack, all large and deep, and situated amidst very romantic scenery. Loch Assynt, another sheet of water, surrounded by some of the highest and most picturesque mountains of the county, is the largest lake along the west coast; Loch Hope, Loch Maidie, Loch Naver, Loch Loyal, Loch Carr, and Loch Vealloch are conspicuous on the north coast and in the centre of the county; and Loch Badanloch, Loch-na-clar, Loch-nakuen, Loch Truderscaig, Loch-ari-cliny, and Loch-in-ruar are situated in the inland and eastern parish of Kildonau. Loch Brora and several smaller lakes are situated among the high grounds along the east coast.

The rocks of the interior of Sutherland and a considerable portion of the west coast are gneiss. Detached districts, chiefly in the parish of Rogart and on the confines of Caithness, exhibit great masses of granite, and the high hills of Loth are composed of porphyritic granite of different colours, yellow, reddish-brown, and grey. Sienite abounds on the north shore of Loch Shin, and also large rocks of granular marble. The parish of Assynt also contains extensive masses of white marble, and many of the high hills in that district are of quartz. Limestone is the prevailing rock in the parish of Durness, with the exception of the headland of the Parph, which terminates in Cape Wrath, and in which quartz, red-sandstone, and conglomerate prevail. The headland of Stoir in Assynt is also formed of high cliffs of red-sandstone, with pebbles imbedded in it. Along the east coast of the county the high hills of Golspie and its neighbourhood are formed of old conglomerate; and the low parts of the east coast between Golspie and Helmsdale are composed of oolite sandstone of a beautifully white and fine-grained variety, sandstone-flag, limestone, and coal. Veins are very seldom found in the transition or secondary strata of Sutherland: but veins of quartz sometimes occur in the granite and micaceous schist; and veins of calcareous spar and of tremolite are found in the marble near Loch Shin; and in the rocks of Kildonan large veins of a rude kind of porphyry are formed.

The cultivated soils along the east coast are principally formed from the decomposition of sandstone rock, which often approaches in its nature to shale; and the soils of the straths opening along the east coast seem to be derived from the decomposition of transition sandstone and breccias.

Sutherland, in common with the north of Scotland, has a variable climate, but along the sheltered east coast it is very mild and salubrious. The high parts of the interior and the west coast are subject to continued and heavy falls of rain, the injurious effects of which to the human constitution appear however to be counteracted by the purity and invigorating quality of the mountain and sea breezes, and the antiseptic properties of the mosses on which the superabundant rain accumulates. The valleys are in general well sheltered and cheerful: but in July and August they are often oppressively warm and sultry; and this heat along the west and north coasts fills the air with gnats, which in calm weather harass men and cattle so much as to render outdoor work during the heat of the day almost intolerable.

The arable land of Sutherland lies principally close to and along the east coast; and there the most improved system of Scottish husbandry is carefully acted upon. The Dunrobin breed of Highland cattle belong to this county, and are well known, and eagerly purchased in the southern counties. Sheep of the pure Cheviot breed are by far the most important stock, and the staple produce of the Sutherland high grounds. The interior uplands and some of the valleys are divided into extensive sheep-farms, which are well stocked; but which in summer and autumn, and during a portion of the spring season, could support a much greater number of sheep, provided a supply of winter food could be depended upon. The present permanent sheep stock of the county is computed at 170,000 sheep, and these yield about 430,000 lbs. of wool, which is generally purchased by the English manufacturers. On the arable farms the grain raised is limited to barley, oats, and occasionally wheat and rye: the barley of Sutherland is equal in quality to any raised in Scotland, and weighs on an average from 55 to 56 lbs. per bushel; large parcels have been sold of late years that weighed 57½ lbs. Turnips are extensively raised, and chiefly consumed on the field by sheep during the winter season; and potatoes of excellent quality are cultivated for home consumption, and form the chief article of food for the great bulk of the population. The proper rotation of cropping is well understood, and strictly attended to on all large farms, which are laboured under the five-years shift of husbandry, having annually one-fifth part of the land in fallow, turnips, potatoes, or other green crop; one-fifth part in grass one year old; one-fifth part in grass two years old, and not more than two-fifth parts in corn crop.

In most of the valleys, natural woods of birch, alder, and occasionally oak, adorn the steep sides and water edges; but the extensive forests of Scottish pines that, at a remote period, covered the greater part of the interior of this county have long ago totally disappeared. The extent of planted wood of full growth is not great; but, at the date of writing this article, very extensive plantations of fir, larch, and other forest trees have either been completed or are in progress on the estates of the duke and earl of Sutherland, which, in the course of twenty or thirty years, will highly ornament the country, and cover comparatively barren moorland with valuable timber.

Several parts of this county have been celebrated for centuries as deer forests; and there the red deer are still found in great numbers, and of a size and weight not equalled in any other part of Scotland. Roe deer are also common in the woods; and game of all kinds, being protected, is abundant in all parts of the county. The county has no manufactures; but that valuable and national branch of industry, the fisheries, is prosecuted with vigour and success, and promises to continue to add most materially to the prosperity and wealth of the district. The west and north coasts are singularly well adapted for the establishment of cod and ling fisheries on a large scale; and the numerous salt-water lochs and bays in these quarters are annually, but at irregular periods, frequented by shoals of the rich and valuable description of herrings common in similar places along the west coast of Scotland. The east coast of the county, again, is annually visited, for nearly two months after the middle of July, by those immense shoals of herrings that regularly pass along the eastern shores of Caithness and the opposite coast of the Moray Frith; and which, by the regularity of their appearance and course, have occasioned the permanent establishment of fishing and curing villages and stations at many otherwise inhospitable parts of the sea-coast. Thus the village of Helmsdale, in this county, has arisen, from a hamlet of three or four cottages, within the last thirty years, to a bustling, industrious, and prosperous village, with all the means of future increase and success, from the active prosecution of the herring fishery; and here, of late years, no less than 40,000 barrels of herrings, on an average, have been cured annually within the Helmsdale district, of which nearly 25,000 barrels were annually exported. Vast numbers of lobsters are taken along the coasts of Sutherland, and sent to the London market; and fishing-smacks from the Thames regularly frequent the fishing-banks off the northern and west coasts, and convey to London cod of the best quality.

Formed roads were only commenced in this county in the year 1811; and since that period the whole circuit of the county of Sutherland has been provided with roads of the best construction, and numerous bridges, embankments, and mounds necessary to connect and complete them. Cross-roads lead through the interior parts, and across the county from one extremity to the other, and the whole are kept in the best state of repair, without levying a single toll within the county from the public; the original construction was effected by the munificence of the late duke and duchess of Sutherland, and the repair of the roads is defrayed by an equitable assessment borne equally by landlord and tenant.

Dornoch is the only burgh within the county, and joins with Wick, Kirkwall, Tain, Cromarty, and Dingwall in returning a member to parliament. It was antiently the seat of the bishops of Caithness, part of whose palace is still entire, and used for county purposes; and the old cathedral of the diocese, which stood here, after being burnt during the desperate feuds of the sixteenth century, was partially repaired at different subsequent periods, and was ultimately rebuilt in its present handsome and chaste form within the last few years, at the sole expense of the late duchess-countess of Sutherland. This cathedral contains the remains of the Sutherland family from the thirteenth century, and here were deposited, amidst the sincere lamentations of thousands of their tenantry, the bodies of the late duke of Sutherland in the year 1833, and of the late duchess-countess of Sutherland in 1839. Dornoch derived its origin from being the seat of the bishopric: being without trade or manufactures, it is a small town, and important only as being the county town. The larger villages of the county are Helmsdale, Brora, Golspie, and Bonar; but Loch-Inver, Scowrie, Kirkiboll, Port-Skerra, Port-Gower, Spiningdale, Clashmore, and Embo are called villages, and form small rural or fishing hamlets.

The population of this county, by the census of 1841, is stated at 24,666; which shows a decrease of 852 from the population of 1831. This arises from the absence of manufactures within the county, and the emigration of some of the rural population. Sutherland returns one member to parliament; and of the thirteen parishes within the county the duke and earl of Sutherland is proprietor of the whole lands in ten of these parishes, and that part of the parish of Reay which lies in Sutherland, and also of estates and lands in the remaining three parishes. The antiquities of Sutherland consist principally of rude structures of ages so remote as to be lost even to tradition, but which, if closely studied, might be interesting in relation to the period of the Pictish kingdom in Scotland. Upright stones, tumuli, stone battle-axes, and old battle-fields have reference to the invasions of the Danes; and the foundations and ruins of old towers and strongholds attest the existence of feudal usages.

The history of Sutherland is in many respects interesting and instructive. At the earliest period of Scottish history, the thanes of Sutherland, then the only title of nobility in Scotland, figure conspicuously in the transactions of the kingdom; and in the thirteenth century their descendants appear as earls of Sutherland, and the succession of this antient family has continued in unbroken direct descent down to the present time, the late duchess-countess of Sutherland having, by a solemn decision of the House of Lords in 1771, when she was an infant, been adjudged to have 'right to the title, honour, and dignity of the earldom of Sutherland, as heir of the body of William, who was earl of Sutherland in 1275.' The present duke of Sutherland, eldest son of the late duke and duchess-countess, is now the twentieth earl of Sutherland, in direct lineal descent from Earl William of 1275, and is consequently premier earl of Scotland.

(*Communication from Scotland.*)

SUTLEGE, or SUTLEDGE. [HINDUSTAN, p. 219.]

SUTTEE (*Sati*, from the Sanscrit *sat*, good), properly means a chaste and virtuous wife, and in ordinary use is applied to one who burns herself on her husband's funeral pile. The term has subsequently been employed by Europeans to denote the act of self-immolation as practised by Hindu widows. When this practice was first introduced cannot be determined with any degree of certainty: it is described by the Greek writers of the age of Alexander, and by Mohammedan and Christian travellers of the sixteenth and seventeenth centuries. The Hindus have been subdued by various conquerors; and a foreign and bigoted race of people has been incorporated among them: but this practice by its continuance affords a sufficient proof that it was always considered as an act of religious duty, based upon a strong faith in the immortality of the soul, and not, as has been asserted by some writers, a consequence of the degradation to which women in India are condemned after the death of their husbands. Diodorus (xix. 33) gives an instance of a Suttee which occurred in the army of Eumenes upwards of 300 years before the Christian æra; and he ascribes the zeal for this kind of self-sacrifice, in most instances, to the infamy which attached to those widows who refused to conform to the custom. This is also the view taken by our missionaries; but as Elphinstone ('History of India,' i. 358) justly observes, if the motive were one of so general an influence, the practice would scarcely be so rare. It is not improbable that the doctrine of transmigration generally held throughout India may have had some influence in the establishment of the custom of the Suttee. A widow by burning herself with the corpse of her husband was to be immediately released from further migration, and enter at once on the enjoyments of Heaven, to which by this act she would also entitle the deceased. Again, perhaps the hope of meeting the departed in the Swarga (Sahagamana) would be sufficient to induce a faithful wife to sacrifice herself. But though this barbarous custom may appear to be antient, it is in fact comparatively modern; for in no authentic antient writings of India, whether legal or religious, do we find any mention of it. It is certain that Manu, in his directions to Hindu widows (book v.), does not even allude to it. This circumstance is urged as a proof of the high antiquity of the code known by the name of this legislator. This, as well as the fact that those passages which have been brought forward as supporting self-immolation are either spurious or perverted from their meaning, may lead us to suppose that the Suttee arose at the same time as the prevailing worship of Kalî, of which no mention is made in the sacred books. And indeed, according to the minutes laid before the House of Commons in 1830, there were in 1825 more Suttees in the district of Calcutta, where the worship of Bhâvanî or Kalî is most common, than in any other part of India. It cannot be denied however that some good Indian authorities recommend the practice, but by no means command it. According to a summary of the law and custom of Hindu castes, compiled by Arthur Steele, and printed at Bombay by order of the governor in 1827, the most virtuous mode of becoming a Suttee is to die of affliction and grief on the husband's death. The usual practice indeed is self-immolation on the husband's funeral pile; but the many cases under which a widow is excused becoming a Suttee, strongly support the supposition that none of the Hindu law-books imperatively command it. The exceptions are as follows: 1, if pregnant; 2, if under puberty; 3, if she has a sucking child; and 4, if the sacrifice is merely made with the view of escaping distress, &c. Diodorus mentions the exception of the woman being pregnant and having children. The authorities to which Mr. Steele refers are the 'Bâla-Chandra Sâstra,' the 'Mitaksharâ,' and some others of the greatest weight. How far and under what conditions Hindu lawgivers allow the self-immolation of widows, will appear from Raja Rammohun Roy's translation, pp. 196-266. The success which has attended the attempts of the British government to abolish the Suttee, is a sufficient proof that the natives themselves were not so averse to its suppression as had been expected. Alfonso de Albuquerque, when he established himself at Goa, prohibited the burning of a widow alive; but since that time no attempt was made to follow up what he began until 1821, when a man who had assisted at a Suttee was tried for murder before an English court of justice. In 1826 the government declared the burning of a widow without the body of the deceased (*anumarana*) illegal; and all persons, whether relations or others, aiding or abetting in such an act, either before or after the death of the husband, were to be committed for trial at the circuit courts, and were made liable to the punishments for murder and homicide. Also the burning of a widow under the following circumstances was declared illegal: 1, if the widow is with child; 2, if the widow is under twenty years of age; 3, if the death of the husband has been occasioned by violent or accidental means; 4, if the previous written authority of the magistrate has not been obtained; 5, if the husband has a child under six or seven years of age; and 6, it was declared illegal for any other woman to be burnt than the legal widow by marriage, under any circumstances. In fact only those Suttees were considered lawful where the widow appeared in court and solicited permission in person from the magistrate, who had power to permit the performance of the rite. At the same time all the property, real and personal, in actual possession or otherwise of the deceased husband, and widow who performed Suttee under the sanction of the proper authorities, was declared to be forfeited to government. Moreover it was declared that no person should be eligible to any office under government in whose family a Suttee should take place after the promulgation of this regulation. It was however not until 1829 that a regulation was passed, on the 14th December, by the governor-general Lord W. Bentinck, in council, consisting of Lord Combermere, W. B. Bailey, and C. T. Metcalfe, declaring the practice of Suttee, or of burning or burying alive the widows of Hindus, with or without the body of the deceased (*anumarana* or *sahamarana*), to be illegal and punishable by the criminal courts.

The mode of burning is the same throughout India, varying only according to the rank of the deceased or the province where it is performed. The accounts of all Eastern travellers abound with instances of Suttees; it will be sufficient here to give a short sketch of the ceremony. The husband is directed by the physician, when there are no hopes of his recovery, to be carried to the river side, and the wife then breaks a small branch from the mango-tree, takes it with her, and proceeds to the body, where she sits down. The barber paints the sides of her feet red; after which she bathes, and puts on new clothes. During these preparations the drum beats a certain sound, by which it is known that a widow is about to be burnt with the corpse of her husband. On hearing this, all the village assembles. The son, or, if there be no son, a relation, or the head man of the village, provides the articles necessary for the ceremony. A hole is dug in the ground, round which stakes are driven into the earth, and thick green stakes laid across to form a kind of bed, upon which are laid abundance of dry faggots, hemp, clarified butter, and other combustibles. The widow now presents her ornaments to her friends, ties some red cotton on both wrists, puts two new combs in her hair, paints her forehead, and puts some parched rice and cowries into the end of the cloth which she wears. While this is going forward, the dead body is anointed with clarified butter and bathed, prayers are repeated over it, and it is dressed in new clothes. Ropes and another piece of cloth are spread upon the pile. The widow walks seven times round the funeral pile, strewing parched rice and cowries, and then she ascends the pile, or rather throws herself upon it.

From returns published in a parliamentary paper (*Hindoo Widows*, 178, sess. 1830), it appears that the numbers who were burned or buried alive in the presidency of Bengal was 583 in 1822, 575 in 1823, 572 in 1824, 639 in 1825, and 518 in 1826. In the presidency of Bombay the number was 158 for the four years ending 1827. No return is given from the Madras presidency. In the province of Benares the average age of widows who immolated themselves varied from forty-four to fifty-six years, in the several years from 1820 to 1825: none were under twenty, and several exceeded eighty years of age.

(Ward's *Hindoos*, ii. 99; Elphinstone, *History of India*, *Parliamentary Papers on Suttee;* Sir John Malcolm's *Memoir of Central India*.)

SUTTON. [NOTTINGHAMSHIRE.]

SUTTON, T. [CHARTERHOUSE.]

SUTURE, in Anatomy. [ARTICULATION; SKELETON.]

SUTURE, in Surgery, is the method of sewing together the edges of wounds; and the term is also applied to the threads with which the operation is effected.

The only wounds in which the application of sutures can be beneficial are those of which the edges, if held together, are likely to unite. They are therefore improper in all contused wounds, in the majority of lacerations, and in those wounds which extend so deep that, though the superficial parts might be brought together, the deep ones would remain open. But in cleanly-cut wounds, whose edges can be placed and kept in contact without any painful stretching of the parts adjacent to them, sutures are, if applied with proper cautions, by far the most convenient and secure method of obtaining a speedy reunion.

The necessary cautions are, that they should not be allowed to remain in the wound till they excite acute inflammation, and that, if from any cause the wound become inflamed, they should be at once removed. In general thirty-six hours are sufficient for a wound through the skin and the superficial parts to unite so far that it does not need sutures to keep its edges in contact. After this time therefore the sutures should be removed; and in cases of deeper wounds, and of amputations, it will not be necessary to retain them more than twenty-four hours longer.

The several kinds of suture employed in surgery are named the interrupted, the uninterrupted, and the twisted.

In the first, the edges of the wound, having been duly cleaned, are brought together by several single stitches placed an inch or more apart. A threaded curved needle is passed through the skin from one side of the wound to the other, so as to include about one-third of an inch of healthy skin on each side of it, and then, the needle being cut off, the two ends of the thread are tied pretty firmly in a double knot over the line of the wound. This is repeated as many times as the length of the wound requires, and the spaces between the successive sutures, where the edges of the wound usually gape a little, may be held together by sticking-plaster. The latter alone will suffice when the sutures are removed.

In the uninterrupted or glovers' suture, a single thread is carried alternately from one side to the other along the whole length of the wound, the needle being in each stitch passed from the border of the wound towards the adjacent healthy skin. There are only two kinds of cases in which this mode of suture can be usefully employed, namely, first, in certain wounds of the stomach and intestines, when those organs are to be returned into the abdomen, and it is of the highest importance that every part of the opening into them should be closed, so that their contents may not escape; and, secondly, in ordinary cuts of the palm of the hand or the fingers, where, the cuticle being thick, the uninterrupted suture may be made without pain; for in these cases, if a fine needle and thread be used, it is not necessary to pass them so deep as the cutis, and no inflammation can be excited by the holes made in the cuticle.

The twisted suture is employed for wounds in those parts of the skin which are very loose, and in which it is desirable to obtain a very exact union by the first intention, such as the lips, the eye-lids, the cheeks, &c. Instead of threads, one or more pins are passed across the wound and through the adjacent skin, and the edges of the former being brought together, are retained in their places by coils of silk wound like the figure 8 upon the projecting ends of the pins. This is the mode of suture commonly employed after the operation for hare-lip. [HARE-LIP.]

With all kinds of sutures it is of the highest importance that the dressings over them should be very light and cool. It is probably owing to the neglect of this caution, and of that already given respecting the time during which they should be retained, that some surgeons have been led to regard sutures as more mischievous than beneficial, ascribing to them the injuries produced by the injudicious management of other parts of the treatment.

SUVO'ROV-RYMNIKSKI, ALEXANDER VASSILYEVICH, COUNT, PRINCE ITALINSKI, field-marshal and generalissimo of the Russian forces, one of the most celebrated generals of the eighteenth century, was born in Finland, on the 13th November, 1730. His family was of Swedish origin, and, before its settlement in Russia, was called Suvor. The father of Suvórov had distinguished himself in the army, and had been promoted to the rank of général-en-chef in the reign of Catherine I. Upon his retiring from service, he was made senator, and lived at his country-seat in the south of Russia, upon a moderate income which his services had procured him. The predilection he had for a military life induced him to put his son in the army at the age of thirteen years. Young Suvórov remained in the regiment of Semenov until 1754, when, in the twenty-fifth year of his age, he obtained a lieutenancy in a regiment of the line, and distinguished himself so much, that three years after the date of his commission he was raised to the rank of first lieutenant, and in 1758, when the war with Prussia broke out, he was entrusted with the command of the garrison of Memel. But this situation was ill-suited to the active spirit of young Suvórov, whose energies demanded a far wider field of action. He begged to be sent on active service. His petition was granted, and in 1759 he was present at the battle of Kunnersdorf. He continued in the rank of first lieutenant until the death of the empress Elizabeth, when the Russian troops were recalled from Prussia. Suvórov, who during the war had received the approbation of his superior officers, was dispatched in 1763 to announce to the court of St. Petersburg the return of the Russian army. A letter of introduction brought him before Catherine II., who named him colonel of the Astrakhan regiment of infantry. Five years afterwards he was commanding officer of a part of the Russian troops which were engaged in warfare with the confederation of Bary in Poland. Here he first showed how worthy he was of the command entrusted to him: in a time almost incredibly short he dispersed the armies of both Pulawskis, took Cracow by storm, and obtained so many advantages over the enemy, that the success of the campaign has chiefly been attributed to him. On his return he was made major-general, and such was the fame he had already acquired, that in 1773 he was sent against the Turks: field-marshal Rumyantsow was commander-in-chief. Three victories by Suvórov over the troops of Mustapha III., which were commanded by the khan of the Crimea, prepared for the complete defeat of the Turks, and having effected a junction with the army of General Kamenskoy, a fourth victory put an end to the contest. This battle, one of the most sanguinary in this war, was fought at Kasledgi, about the end of June, 1774. In the mean time Pugacheff, a Cossack of the Don, who pretended that he was Peter III., had assembled a numerous army. A formidable insurrection threatened to overthrow the throne of Catherine; the negotiations with the Ottoman Porte had scarcely terminated when Suvórov was ordered to meet the insurgents. He settled the troubles, and soon restored perfect tranquillity to the empire. In 1783 he subjugated the Cuban Tartars and those of Budziac, and having forced them to swear allegiance to the Russian crown, the empress raised him to the chief command, which he held throughout the second Turkish war, which broke out in 1787. He had now no superior to bear off the credit of his actions, and could show that his skill as a tactician was fully to equal his courage. Suvórov was well aware of the enormous responsibility which now lay upon him; his measures therefore were extreme, and although he is accused of having sacrificed too many lives, he cannot be charged with not exposing his own. It was in this war that he first made almost exclusive use of the bayonet, which afterwards so much distinguished the Russian troops. In the battle of Kinburn, in 1787, he ordered his regiments of infantry to throw away their knapsacks and to attack the enemy with the bayonet. The Turks, who occupied a position much stronger than he suspected, repelled the repeated attacks of the Russians; Suvórov himself was wounded, his cavalry fled, and the Cossacks retreated from the field of battle. In this critical moment Suvórov, regardless of his wound, mounted his horse, overtook his flying horsemen, and, throwing himself in the midst of them, exclaimed, 'Run, cowards, and leave your general to the mercy of the Turks.' The effect was instantaneous, and notwithstanding the disadvantages he had to contend with, the battle was won. Nevertheless his courage frequently led him into difficulties which he could have avoided, as at the siege of Oczakow (December 17, 1788), where he would have been irretrievably lost, if Prince Repnin had not come to his assistance. The celebrated battle of Fokshany, which took place on the 1st of August, 1789, between the Seraskier Mehmet Pasha and the Prince of Coburg, who commanded a part of the Russian army, was chiefly won through Suvórov's intrepidity. In September of the same year the Prince of Coburg was surrounded by the Turks; and the Russian army stationed on the river Rymnik was in imminent danger. Suvórov reached the spot with a comparatively small force; the armies met on the 22nd September, and the Turks were completely defeated. It was for this victory that the emperor Joseph II. raised him to the rank of count of the empire, and Catherine to the dignity of a Russian count with the name of Rymnikski (*i.e.* he of the Rymnik).

The fortress of Ismail had in the course of this war withstood repeated attacks from the Russian armies. Prince Potemkin at last gave orders to Suvórov for its reduction. Suvórov was determined to take the fortress; he promised his soldiers the plunder of the place, and ordered them to give no quarter. The evening before the storming, he said to his soldiers: 'To-morrow morning, an hour before daylight, I shall rise, say my prayers, wash myself and dress, and then crow like a cock, and you will storm according to my orders.' The signal was given, and the army began the attack. The Russians were twice forced to give ground under the overwhelming fire of the enemy: at last they succeeded in scaling the walls. Thirty-three thousand Turks were killed or severely wounded, and ten thousand were made prisoners after the slaughter had ceased. Suvórov's report to the empress on this occasion is laconic 'Praise be to God, and praise be to you: the fortress is taken, and I am in it.' Eight days were required for burying the dead. Suvórov took a horse to supply the place of the one he had lost in the action, and this was all the share he had in the booty.

In 1792, when peace was made between Russia and the Porte at Yassy in Moldavia (January 9), the empress Catherine appointed Suvórov governor-general of the province of Yekaterinoslaw, the Crimea, and the lately acquired provinces round the mouth of the Dniester. Kherson was the chief town in these districts, and there Suvórov remained two years. In 1794, when the Poles revolted, Suvórov received the command of the regiments destined to repress the insurrection. He gained several victories over the insurgents, and the storming of Praga, which was taken after a desperate fight of four hours, and which opened to him the gates of Warsaw, on the 9th of November, reduced the Poles to obedience. On this occasion Catherine made him a field-marshal, and gave him a staff of command made of gold, with a wreath of jewels in the form of oak-leaves, the diamonds alone of which were valued at 60,000 roubles.

In 1795 Catherine died, but Suvórov did not lose any of his authority. In 1799 the emperor Paul gave him the command of the troops which fought in Italy against the French. The Russian armies combined with those of Austria, and Suvórov was appointed to the chief command. His brilliant victories, as those of Piacenza, Novi, and Alessandria, and the activity with which he took from the French all the towns of Upper Italy, procured him the title of Prince Italinski. In consequence of a change in the plan of operations, he crossed the Alps and Mount St. Gothard, in order to help Prince Korsakov in the neighbourhood of Zürich. Through mismanagement on the part of the Austrians, Suvórov came too late, and Korsakov was defeated by Massena, and obliged to retreat over the Rhine. This mishap, as well as the want of energy shown by the Austrians, obliged Suvórov to retreat as far as the lake of Constance. His object was to join the army of Korsakov. The French generals tried to prevent this junction. Suvórov was surrounded by them, and entirely enclosed in the valley of the Reuss. On the 28th of September he threw himself into the valley of Schlacken, and led his men, one by one, along a footpath, known only to chamois hunters, over steep rocks and bordered by deep abysses, into the village of Mulden, where Korsakov's troops were stationed. The extraordinary behaviour of the Austrian army and the apathy of the court of Vienna roused the indignation of Paul, and he recalled his forces. The protestations of Suvórov were in vain, and his representations regarding the necessity of the war being continued were rejected. Meanwhile the emperor had given orders for the reception of the generalissimo. He was to make a triumphal entry into St. Petersburg, and apartments were prepared for him in the Imperial palace. Scarcely however had Suvórov arrived in Russia, when a severe illness obliged him to stay at his country-seat in Lithuania. The emperor's own surgeon was dispatched to him. Yet in the midst of the preparations for Suvórov's triumphal procession Paul changed his mind; a circumstance so trifling as to be scarcely worth mention withdrew the imperial favour from a man to whom Russia was most deeply indebted. Suvórov learnt in Riga that he was in disgrace; nevertheless he continued his journey to St. Petersburg, and was received in the house of a niece. Sixteen days after his arrival at St. Petersburg, on the 18th of November, 1800, Suvórov died, at the age of seventy.

His funeral was celebrated with great solemnity, and 15,000 of his soldiers accompanied his body to the grave. The emperor Alexander erected in St. Petersburg, in 1801, a colossal statue of the first of Russian generals. Suvórov was an extraordinary man. Though thin and of a weak constitution, he maintained himself in good health by severe exercise and cold baths. He slept on a bed of straw or hay, under a light blanket, and his food was the same as that of his soldiers. Change in his fortune did not induce him to change his diet. His wardrobe consisted merely of his uniform and a sheepskin. Owing to this temperate mode of life, he preserved his youthful vigour even in his old age. He was very strict in performing all the duties of the Russian church, and compelled all who were under his command to observe them with the same strictness: on feasts and Sundays he used to read to them from religious books. He never gave the signal for a battle without making the sign of the cross and kissing the image of St. Nicholas. He was equally firm in his resolves and true to his promises; and his quickness of decision showed itself in the short and laconic style of his orders. A studied conciseness was likewise observable in his conversation, where, as well as in his writings, he frequently used rhyme. His rough and uncouth manners made him the favourite of his soldiers, for whom he had peculiar terms of endearment. Although he used to say that the whole of his tactics consisted in the two magic words, *Stupay i bey!* ('Advance and strike!') he showed in the course of his career great skill in the higher parts of the art of war. He was averse to all petty regulations with regard to dress and the like. His well-known remark upon Paul's introducing pigtails and curls, that curls would not serve for guns, nor queues for lances, might have been dangerous to him had it come to the ears of the emperor. That he might be more careful in his expressions and composed in his behaviour, he gave orders to his adjutants to check any rising passion by reminding him of the orders of field-marshal Suvórov; and he always obeyed. Once he forgot himself so far as to strike a soldier: the adjutant came up to him and said, 'Field-marshal Suvórov has ordered that no one should be overcome by anger.' 'Did he say so?' said Suvórov; 'well, we must obey.' Courage, determination, and quickness in executing his plans, were qualities in which Suvórov has scarcely ever had an equal. He has been accused of cruelty and blamed for want of deliberation; nevertheless he is one of the few generals who never lost a battle.

(Anthing, *Versuch einer Kriegsgeschichte des Grafen Suvorov*, 3 vols., Gotha, 1796-1799 (this work has been translated into English, and published under the title, *History of the Campaigns of Count Alexander Suworow Rymnikski*, 2 vols., London, 1799); Geo. von Fuchs, *Anecdotes of the Life of Count Suvorov*, Leipz., 1829; Fr. von Smitt, *Suworow's Life and Campaigns*, 2 vols., Vilna, 1833. The correspondence of Suvórov has been published by Sergius Glinka, in 2 vols., Moskow, 1810.)

His son General Arcadius Alexandrovich Suvórov was drowned in the Rymnik, in 1820; and his nephew Prince Sergius Suvórov, a man of remarkable talents, has lately been appointed commanding officer in the Circassian war. Having received a foreign education, he does not speak Russian, a circumstance much to be lamented in the only descendant of the great Suvórov.

SUZOOS, a nation of Western Africa, whose territory extends north-westward from the neighbourhood of the river Kissee, beyond the Rio Pongas, and nearly as far as the Rio Nunez, or from 9° 25′ to 10° 40′ N. lat., and in the widest part from 12° 15′ to 13° 36′ E. long. The Suzoos have another country, their native seat, more inland, beyond the sources of the rivers Kissee and Scarcies, probably as large as this, but which is less known and the limits less determined, and the inhabitants of which are distinguished as Benna Suzoos. The two territories might have been described as one before the continuity was broken by a tribe of Mandingoes, who drove out the Suzoos and established themselves upon the rivers Kissee and Berreria. Of the tract first indicated the Suzoos dispossessed a nation called the Bagoes, who were once masters of the whole of the Rio Pongas and of the country between that river and the Rio Nunez, as well as of a considerable line of sea-coast extending from the Rio Nunez southward to the river Dembia, opposite the Isles de Los. They have still a few villages among the Suzoos, but are chiefly confined to the coast and to the islands, upon the largest of which (Tamara) they have plantations and villages. The Suzoo capital is Kanoffee, upon the river Pongas. The Suzoos are under a chief or king, but all matters of much importance are debated and concluded in the palaver, or national council, whose decisions are however inoperative if the king withholds his consent. In critical times, extraordinary palavers are held, attended sometimes by as many as 3000 or 4000 men. Three-fourths of the people are slaves to the other fourth; and it is said that there is a marked difference, not only in carriage, but in person, between the free and the servile races. The Suzoos generally are of inferior personal appearance to their neighbours the Bagoes, Bulloms, and Timannees: there is more of a yellow hue in the complexion, the lips are more thick, and the nose flatter. Like them, they shave until the beard turns grey with age, and then let it grow. Their food and habits of life are the same as those of the other pagan negroes of this quarter. All of them are fond of spirituous liquors, but the Suzoos have a peculiar drink, which they use as beer, and which they prefer to palm-wine. It is tolerably palatable, and is obtained by the fermentation of the ashes of a plant called Yin-ying infused in water. The population of the Suzoo towns ranges from 1000 to 3000: they are commonly surrounded by a lofty palisade of bamboos, or by a wall of sun-dried bricks protected by a sloping thatch from the rains. The Suzoos are mostly pagans, although Mohammedanism has been making progress among them, through the example and exertions of the Mandingoes. They however pay a kind of worship to a god, and never undertake an affair of importance without sacrificing to him a bullock, with which a feast is afterwards made. White they deem a colour agreeable to their god; and they are said to pray, for that reason, with a white fowl or a sheet of white paper in their hand. Among them is a secret society called *Semo*, the members of which have a language of their own, and are marked by incisions (chiefly abdominal) in a peculiar manner. The novices live for a year apart in the woods, where none but the initiated dare intrude. The Suzoo language is to the ear the most agreeable of the African dialects, approaching in softness to the Italian. It is not only spoken throughout a considerable space near the coast, but is also the language of the extensive district called Jallonkadoo, and is understood by great numbers of the Foulahs, Mandingoes, Bulloms, and Timannees. The church missionaries have composed a grammar and reading lessons in this language, and the Gospel of St. Matthew has been translated into it.

(Matthews's *Voyage to the River Sierra Leone;* Winterbottom's *Account of the Native Africans in the Neighbourhood of Sierra Leone;* M'Lachlan's *Travels into the Bagoe and Suzoo Countries; Missionary Register.*)

SVENDBORG. [FÜNEN.]

SWABIA. [SUABIA.]

SWAFFHAM. [NORFOLK.]

SWALLOWS, *Hirundinidæ*, a family of insectivorous birds, in which the powers of flight are very highly developed, but which have the feet comparatively weak.

Belon placed the Swallows at the end of his birds, immediately following his *Petit Mouchet* or *Moineau de Haye*, which is engraven with a fly in its mouth. Brisson arranges the Swallow, together with the Goat-sucker, in his eighth order, consisting of birds which have the bill very small, compressed horizontally at its base, and hooked at its end, its aperture being larger than the head. This order stands between that containing *Upupa* and *Promerops* and that containing *Tangara* and the Finches.

The genus *Hirundo* is placed, in the twelfth edition of the *Systema Naturæ*, between *Caprimulgus* and *Pipra*, in the second division of the *Passeres*, viz. *Curvirostres, Mandibul. superior. apice incurvata.* In Latham's method it also appears in the second section of the *Passeres*, which is characterised much in the same way. In Lacépède's arrangement, *Hirundo* and *Caprimulgus* form his third order of birds (1st subclass and 1st subdivision) with *Bec très court*, standing between the antecedent order, consisting of those with the *Bec droit et menu* (the last genus of which is *Motacilla*) and the succeeding one, comprising birds with *Bec arqué*, the first genus of which is *Glaucopis*. M. Duméril arranges the Swallows in his sixth family (*Planirostres* or *Omaloramphes*) of the *Passeres*. Meyer's *Chelidones* (his sixth order) consist of *Hirundo, Cypselus*, and *Caprimulgus*. The same genera appear in Illiger's method as his family *Hiantes*, the last of his order *Ambulatores*. In Cuvier's system the Swallows and Goatsuckers, including *Podargus*, form his family *Fissirostres*, which stands between the *Dentirostres* and *Conirostres*. M. Vieillot's *Chelidons* are placed between his *Baccivores* and his *Myothères*, in his second tribe (*Anisodactyli*). M. Temminck's eighth order, embracing the Swallows and Goatsuckers, stands between the orders consisting of the Kingfishers and the Pigeons. In M. Latreille's method the first genus of the first family (*Latirostres*) of his second order (*Passereaux*) contains the Goatsuckers and Swallows.

Mr. Vigors states that the families which compose the first tribe (*Fissirostres*) of his second order (*Insessores*) are distinguished from those of all the other, except the *Tenuirostres*, by their habit of feeding on the wing. From the latter, or the *Suctorial Birds*, which meet them at one of the extremes of the tribe, and of which the typical families feed also on the wing, they are distinguished, he observes, by their animal food, which they take by their bills or in the gape of their mouths; while the *Tenuirostres* live chiefly upon vegetable juices, which they extract with their tongue. 'The *Fissirostres*,' says Mr. Vigors in continuation, 'depending so much on the powers of their wings, exhibit a proportional deficiency in the strength of their legs. These members are not only shorter and weaker than in the other *Perchers* (the typical families of the *Tenuirostres* here again being excepted, which correspond with them in this particular also), but they have their external toes in general to such a degree united with the internal, for the most part as far as to the second phalanx, that they are deprived of the free play of the joint; and the bird is thus rendered nearly incapable of using its legs in walking, or for any purpose besides that of mere perching. But even in this particular a group of the typical family appears deficient; for the toes of the genus *Cypselus*, being all placed in front, seem to assist the bird only in suspending itself, where other birds would perch. All the families of the tribe are again united by a striking conformity in their mode of nidification. They deviate from the manners of the *Perchers* in general in forming their nests on the ground; or if, like some of the *Hirundinidæ*, they choose elevated situations for that purpose, they build up the exterior of their nests with earth cemented into a solid substance, and thus preserve a similarity in their construction to those nests which are actually formed on the ground. The two typical groups of this tribe may be observed to be separated from the other three by the shortness of their bills and the wider gape of the mouth. Their mode of seizing their prey is conformable to these characters: they receive it in full flight into the cavity of their mouths, which remain open for that purpose, and where a viscous exudation within, and a strong reticulated fence of *vibrissæ* on the exterior, assist in securing the victim: while, on the other hand, the longer-billed families catch their food by their bills. The series of succession in the tribe may be stated as follows, the typical families being placed in the centre:—

'*Meropidæ.*
Hirundinidæ.
Caprimulgidæ
Todidæ.
Halcyonidæ.'

After alluding to the approximation between the *Meropidæ* and *Hirundinidæ*, Mr. Vigors notices the union between the latter and the *Caprimulgidæ*. [NIGHT JARS, vol. xvi., p. 224.]

M. Latreille makes the *Latirostres* the first family of his second order (*Passereaux*); and the first division of the family comprises the Goatsuckers and the Swallows. In the method proposed by M. de Blainville in 1815 and 1821, and developed by M. Lherminier in 1827, the *Martinets* (*Cypselus*, Ill.) form the seventh family and the *Engoulevents* (*Caprimulgus*, Linn.) the eighth of the first subclass (Normal Birds), the sixth being the *Colibris* (*Trochilus*, Linn.), and the ninth the Cuckows (*Cuculus*, Linn.).

Mr. Swainson, as we have seen [CAPRIMULGIDÆ, vol. xvi., p. 225], enters the family of *Hirundinidæ*, which, he observes, present many singular variations of structure among themselves, by the *Balassian Swift*. In the true Swifts (Cypselus), the hind-toe, he remarks, is so placed that it can be brought nearly forward, and all four are armed with very strong crooked claws, giving to the bird such a firm grasp that it can sustain itself by the side of perpendicular rocks or buildings with the greatest facility. 'Others,' says Mr. Swainson in continuation, 'with less robust feet (*Chætura*, Stev. (Steph.)), are compensated for the deficiency by being furnished with a very stiff and pointed tail, which serves as an additional support, when resting in such situations. In the long-winged Swifts of India (*Macropteryx*, Sw.) all these characters are modified, and we see the Swifts changed almost into the Swallows. The two typical groups of the *Fissirostres* are thus united, and both may be characterised by a very short bill. The third group, as usual, contains three others, all exhibiting, more or less, a similar economy, but having the bill considerably more lengthened.'

The genera comprised in the family by Mr. Swainson are *Cypselus* (with the subgenera *Cypselus, Macropteryx*, and *Chætura*) and *Hirundo*.

The Prince of Canino arranges the *Hirundinidæ* as the second family of the *Passeres*, and in the first section of that family (*Ambulatores**). The following are the Prince's subfamilies and genera:—

a. Cypselinæ.

Genera:—*Cypselus*, Ill.; *Chætura*, Sw.

b. Hirundininæ.

Genera:—*Progne*, Boie; *Chelidon*, Boie; *Cotyle*, Boie; and *Hirundo*, Linn. (*Cecropis*, Boie). The family stands between the *Caprimulgidæ* and the *Ampelidæ*.

Mr. G. R. Gray divides the *Fissirostres* into two subtribes:—1. *Fissirostres nocturnæ*, consisting of the family *Caprimulgidæ*, with its subfamilies; and, 2. *Fissirostres diurnæ*, the first family of which last subtribe is *Hirundinidæ*, with the following subfamilies:—

1. *Cypselinæ.*

Genera:—*Cypselus*, Ill. (*Apus*, Scop.; *Micropus*, W. and Mey.; *Hirundo*, L.), *Macropteryx*, Sw. (*Macropterus*, Sw.), *Hemiprocnes*, Nitzch., *Acanthylis*, Boie (*Chætura*, Steph.; *Hirundo*, L.), *Collocalia*, G. R. Gray (*Hirundo*, L.).

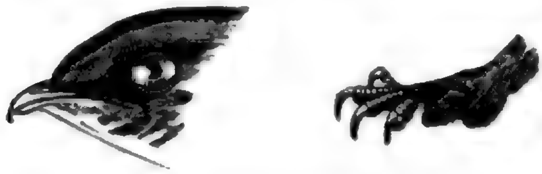
2. *Hirundininæ.*

Genera:—*Hirundo*, L. (*Cecropis*, Boie), *Progne*, Boie (*Hirundo*, Gm.) *Cotyle*, Boie (*Hirundo*, L.), *Chelidon*, Boie (*Hirundo*, Vieill.).

EUROPEAN SWALLOWS.

The European species of this family are the *Swift* (*Cypselus Apus*, *Cypselus murarius*, Temm.); the *White-bellied* or *Great Gibraltar Swift* (*Cypselus Melba*, *Cypselus Alpinus*, Temm.); the *Rock-Martin* (*Hirundo rupestris*); the *Rufous Swallow* (*Hirundo rufula*, Temm.); the *Chimney Swallow* (*Hirundo rustica*, Linn.); the *Martin* (*Hirundo urbica*, Linn.); and the *Sand-Martin* (*Hirundo riparia*, Linn.). Of these the first and the three last are British (summer visitors); and of the second, three specimens have been killed, and one found dead in Britain. (Yarrell.)

Cypselus.—Tarsus thickly feathered. All the four toes directed forwards; the two middle equal. The hallux, or inner toe, shorter than the exterior. Tail forked or even. (Sw.)



Head and foot of Common Swift. (Sw.)

Belon considers this to be the Ἄπους (*Apus*) and κυψέλλος, or κύψελος (*Cypsellus*, *Cypselus*) of Aristotle (*Hist. Anim.*, ix. 30); and indeed Aristotle states that it would be difficult to distinguish these ἄποδες or κυψέλλοι from Swallows (χελιδόνες), if it were not that the former have the leg covered with feathers (δασεῖαν). M. Camus however thinks that those zoologists who are of opinion that Aristotle had here the Swifts in view are wrong; for the latter says (*loc. cit.*) that the birds thus designated by him made long nests of mud, with only just room enough to enter, which, M. Camus remarks, Swifts do not, but House-martins do; and therefore he thinks the birds last named are meant.

The Common Swift, which usually comes to this country from Africa early in May, and leaves us generally by the middle of August, is the *Moutardier*, *Martelet*, *Martinet noir ou Grand Martinet* of the French; *Rondone*, *Dini*, and *Dardano* of the Italians; *Ring-swala* of the Swedes; *Thurm Schwalbe* of the Germans; *Gier Zwaluw* of the Netherlanders; *Screech*, *Screech Martin*, *Deviling*, *Screamer*, and *Black Martin* of the country-people in various parts of Britain; and *Martin dû* of the antient British.

'This species,' says Pennant, 'is the largest of our Swallows; but the weight is most disproportionately small to its extent of wing, the former being scarcely one ounce, the latter eighteen inches; the length near eight inches. The feet of this bird are so small, that the action of walking and rising from the ground is extremely difficult; so that nature hath made it full amends by furnishing it with ample means for an easy and continual flight. It is more on the wing than any other Swallows; its flight more rapid, and that attended with a shrill scream. It rests by clinging against some wall or other apt body, from whence Klein styles this species *Hirundo muraria*. It breeds under the eaves of houses, in steeples, and other lofty buildings; makes its nest of grasses and feathers, and lays only two eggs, of a white colour. It is entirely of a glossy dark sooty colour, only the chin is marked with a white spot. The fabulous history of the *Manucodiata*, or *Bird of Paradise*, is in the history of this species in great measure verified. It was believed to have no feet, to live upon the celestial dew, to float perpetually on the Indian air, and to perform all its functions in that element. The Swift actually performs what has been in these enlightened times disproved of the former; except the small time it takes in sleeping, and what it devotes to incubation, every other action is done on the wing. The materials of its nest it collects either as they are carried about by the winds, or picks them up from the surface in its sweeping flight. Its food is undeniably the insects that fill the air. Its drink is taken in transient sips from the water's surface. Even its amorous rites are performed on high. Few persons who have attended to them in a fine summer's morning but must have seen them make their aërial course at a great height, encircling a certain space with an easy steady motion. On a sudden they fall into each other's embraces, then drop precipitately with a loud shriek for numbers of yards. These birds and swallows are inveterate enemies to hawks. The moment one appears, they attack him immediately: the swifts soon desist; but the swallows pursue and persecute those rapacious birds till they have entirely driven them away.'

Temminck states that the Swift lays three or four pure white eggs. Mr. Yarrell (*British Birds*) remarks that in windy days the bird will remain for hours in its retreat motionless and in the dark. 'How great,' says that practical ornithologist, 'is the contrast when on other occasions it is seen darting rapidly or wheeling in circles, and screaming aloud, while in pursuit of its insect food; at one time sailing with ease and pleasure at an elevation where the bird is scarcely perceivable, and at another passing the angle of a building, as has been observed, with the almost inconceivable swiftness of a meteor. Great power of vision seems indispensable both to enable the bird to obtain its food as well as to ensure its safety under such rapid movements; nor is even this power always sufficient to guard it against accident: a Swift on eager wing was seen in its flight to be carried against a wall; it was picked up stunned, and died almost immediately in the hand of the observer.'

In White (*Selborne*), to whom Pennant owed, as he acknowledges, much that he has written of the Swift and other *Hirundinidæ*, and in the author last quoted, will be found many highly interesting particulars relating to the habits of the Swift, especially with regard to the structure of the nest, its constant use (by the same birds, as has been proved in some instances) for years in succession, and the treatment of the young by the parents under certain circumstances. Mr. Salmon has verified the fact of their producing three, and sometimes even four eggs, though two appear to be the ordinary number.

The old quatrain, in the *Portraits d'Oyseaux*, sums up the qualities of the Swift thus:—

> 'Le Moutardier, ou bien grand Martinet,
> Est à voler tres-leger et fort viste:
> Mais sur la terre il ne pose, ny giste:
> Car y estant, sur pieds mobile n'est.'

The bird appears to spread over Europe in the summer and breeding season. They visit Lapland, Norway, Denmark, and Sweden; in which last country Professor Nillson states that it makes its nest in hollows of trees in the woods. Its eastward range appears to be as far as the mountain-lake Baikal. At Erzerum it has been observed in numbers from May till September. Mr. Yarrell states that he has never seen this species in any collection brought from India. It has been noted at Madeira. Montagu extends its southward range in Africa as far as the Cape: Temminck limits it to the tropics. In our own country it has been remarked that Swifts are less plentiful with us than they formerly were. We cannot close our notice of the

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* This term, used in like manner by Illiger, accords ill with the feeble and weak lower limbs of the Hirundinidæ.

European species without some account of the *Martin* or *House-Martin* (*Hirundo urbica*):—

> 'Ce martinet fait en forme spherique
> Son nid si fort, qu' impossible est de mieux,
> En l'attachant aux bastiments fort vieux;
> Duquel l'entrée est estroicte et oblique.'

This summary in the *Portraits d'Oyseaux* is very characteristic, but the *modus operandi* of the architect is so admirably given by White, that no apology is necessary for introducing his description.

'A few house-martins,' says White, 'begin to appear about the 16th of April; usually some few days later than the swallow. For some time after they appear the *hirundines* in general pay no attention to the business of nidification, but play and sport about, either to recruit from the fatigue of their journey, if they do migrate at all, or else that their blood may recover its true tone and texture after it has been so long benumbed by the severities of winter. About the middle of May, if the weather be fine, the martin begins to think in earnest of providing a mansion for its family. The crust or shell of this nest seems to be formed of such dirt or loam as comes most readily to hand, and is tempered and wrought together with little bits of broken straws to render it tough and tenacious. As this bird often builds against a perpendicular wall without any projecting ledge under, it requires its utmost efforts to get the first foundation firmly fixed, so that it may safely carry the superstructure. On this occasion the bird not only clings with its claws, but partly supports itself by strongly inclining its tail against the wall, making that a fulcrum; and thus steadied, it works and plasters the materials into the face of the brick or stone. But then, that this work may not, while it is soft and green, pull itself down by its own weight, the provident architect has prudence and forbearance enough not to advance her work too fast; but by building only in the morning, and by dedicating the rest of the day to food and amusement, gives it sufficient time to dry and harden. About half an inch seems to be a sufficient layer for a day. Thus careful workmen when they build mud-walls (informed at first perhaps by this little bird) raise but a moderate layer at a time, and then desist; lest the work should become top-heavy, and so be ruined by its own weight. By this method in about ten or twelve days is formed an hemispheric nest, with a small aperture towards the top, strong, compact, and warm, and perfectly fitted for all the purposes for which it was intended. These industrious artificers are at their labours in the long days before four in the morning: when they fix their materials, they plaster them on with their chins, moving their heads with a quick vibratory motion. It has been observed that martins usually build to a north-east or north-west aspect, that the heat of the sun may not crack and destroy their nests: but instances are also remembered where they bred for many years in a hot stifled inn-yard against a wall facing to the south. Birds in general are wise in their choice of situation; but in this neighbourhood every summer is seen a strong proof to the contrary at a house without eaves in an exposed district, where some martins build, year by year, in the corners of the windows. But as the corners of these windows (which face to the south-east and south-west) are too shallow, the nests are washed down every hard rain; and yet these birds drudge on to no purpose from summer to summer, without changing their aspect or house. It is a piteous sight to see them labouring when half their nest is washed away and bringing dirt—

> —"generis lapsi sarcire ruinas."

'Thus is instinct a wonderful unequal faculty; in some instances so much above reason, in other respects so far below it.' (*Selborne.*)

It would be a waste of space and words to combat now the antient but long since exploded doctrine of the hybernation of swallows in holes and crevices and even under water. Some late birds may be unable to follow the march of their congeners southward, and be seen occasionally on a warm day after the rest are departed, or may be found in a semi-torpid state laid up in crevices, and be revived by the warmth of a fire: but these are exceptions to the great law of migration.

Generic Character of Hirundo.—Bill flattened its whole length; the margins not inflected. Rictus smooth. Feet insessorial. Lateral toes equal; middle toe longer than the tarsus. (Sw.)

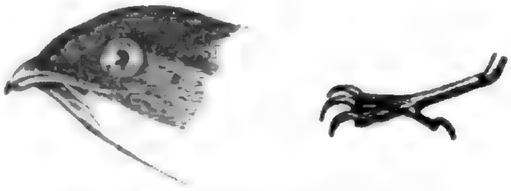
Asiatic Swallows.

Macropteryx.—Tarsus remarkably short, naked. Anterior toes long; the outer scarcely shorter than the middle; the inner shortest; hinder toe very short. Tail long, forked. India. (Sw.)

Example, *Macropteryx longipennis.*

Description.—Above obscure glossy green; throat, breast, and lower part of the back light-grey; belly, spot on the scapulars, and line over the eye white; ears rufous; front with an incumbent crest.

Mr. Swainson, whose description this is, and who has given an elegant figure of the bird in the second series of his *Zoological Illustrations*, inquires whether the *Hirundo Klecho* of Dr. Horsfield (*Sambor-galeng* of the Javanese), which is described by the Doctor in the 13th vol. of *Linn. Trans.* as 8½ inches in length, is not the female of this species. Mr. Swainson considers *Macropteryx* intermediate between the typical Swifts and the Swallows. To the first, he remarks, it is allied by its strong scansorial feet; to the latter by the length and fixed position of the hind toe, and the depression of the bill.



Head and foot of Macropteryx longipennis.

We must here notice the Indian species, *Hirundo esculenta*, which makes the edible nests that form a considerable article of Chinese commerce. The species, which is the *Lawet* of the Javanese, is small. It is brown above, and whitish beneath and at the end of the tail, which last is forked. The nests are made of a particular species of *Fucus* [Sea-Weeds, vol. xxi., p. 156] which the bird macerates and bruises before it employs the material in layers so as to form the whitish gelatinous cup-shaped nests so highly prized as delicacies and restoratives by the Chinese when dissolved in their soups. Bontius, who seems to have thought that the nest was formed of no vegetable material, says of these birds, 'ex spuma maris basin scopulorum alluentis, tenacem quandam materiam colligunt, sive ea Balænarum seu aliorum piscium sit semen, ex qua nidos suos ædificant, in iisque ova ponunt, et pullos excludunt.' The nests are affixed to the rocks, and the finest are semi-transparent. Coarse or dirty nests are used for glue, but the good ones are eagerly sought after. 'Chinenses hos nidos e scopulis avulsos, ingenti quantitate per Indiam venales ferunt, gulosis in summas delicias, qui eos gallinæ, seu vervecis decocto dissolutos, avidè devorant, et ostreis, fungis, et cæteris gulæ irritamentis, longè anteponunt.' This recipe for making the famous birds'-nest soup ends a chapter which begins poetically and pathetically with the following lines:—

> 'Quid scopulos, Progne, quid inhospita littora nidis
> Optas, per medias hos gula quæret aquas?'

There is another species, *Hirundo fuciphaga*, the *Linchi* of the Javanese, about five inches long, nearly an inch shorter than *Hirundo esculenta*, which has a white abdomen and longer wings in proportion to its size. This species constructs its nests of mosses and lichens connected by the same glutinous substance which composes the edible nest of *Hirundo esculenta*. Dr. Horsfield, who states this in his *Systematic Arrangement and Description of Birds from the Island of Java* (*Linn. Trans.*, vol. xiii.), there remarks that the specimens of *Hirundo esculenta* examined by him in Java and those which he brought home differ from Latham's description in being uniformly of a blackish-colour without a white extremity to the *rectrices*. Bontius, who gives a rude cut of the nests adhering to the rock, with the birds sitting and approaching, describes his birds, in the chapter '*De nidis hirundinum edulibus*,' above referred to, as 'Aviculæ parvæ discolores, hirundinum specie.' Specimens of *Hirundo esculenta* and *Hirundo fuciphaga* are preserved in the museum of the East India Company.

AFRICAN SWALLOWS.

Example, *Hirundo Senegalensis*.

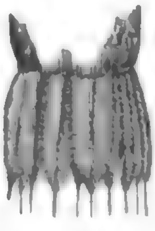
Description.—Large; tail forked; plumage above glossy-black; sides of the nape and neck, and lower part of the back, rufous; beneath ferruginous, verging to white on the throat and breast; under wing-coverts and thighs pure white. (Sw.)

This is the *Senegal Swallow* of authors; *Le Grande Hirondelle à ventre roux de Senegal*.

Mr. Swainson, who has given a most characteristic figure of this species in his 'Birds of Western Africa,'[*] observes that this is the largest of the true swallows that he has yet seen, for it measures full eight inches in its total length. 'Its structure,' says that observing author, 'is precisely similar to our common *Hirundo rustica*, excepting that the hind toe and claw, which in that bird is of equal length with the shank, is in this a slight degree longer. In the general cast of its colouring it has such a close resemblance to the *Hirundo Capensis* figured by Le Vaillant as an inhabitant of the Cape of Good Hope (*Ois. d'Afr.*, 5, pl. 245, *fig.* 1), that we were at first tempted to believe it was the same, particularly as Le Vaillant forgets to give us the size of his bird, an omission which all the compilers since his days have perpetuated. It appears however that the Cape species has a small white spot on the inner web of all the lateral tail-feathers, excepting that which is elongated, and that the feathers of the vent have a black stripe down the middle of each.' In the same volume will be found a description of the small but very beautiful *White-bodied Swallow, Hirundo leucosoma*, Sw.

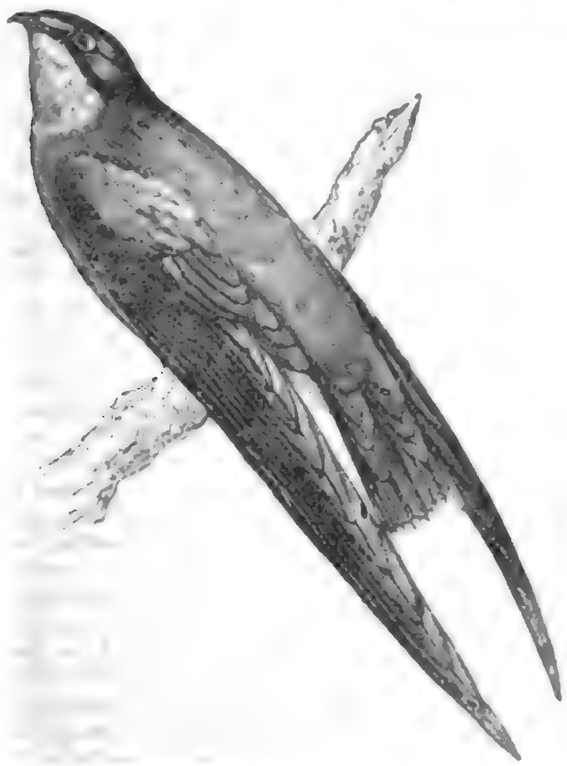
AMERICAN SWALLOWS.

Chætura,[†] Steph.—Feet as in *Macropteryx*, but the tarsus longer than the middle toe. Tail short, even; the shafts prolonged into acute points. (Sw.)



Tail of Chætura. (Swainson.)

The type of this genus is *Chætura Pelasgia*, Steph., *Hirundo Pelasgia*, Linn., of which we shall presently treat.



Chætura macroptera—Long-winged Swift. (Swainson, *Zool. Ill.*, 2nd series.)

Of the *Chætura macroptera*, which is brown, with the wings and tail glossed with greenish-blue, the back being of a grey-white, the chin and under tail-covers snowy, and the tail even, Mr. Swainson says that *Hirundo albicollis* and it are two of the largest species yet discovered of a very singular group of swifts; wherein the tail-feathers are spined, and even more rigid than those of the woodpeckers: by this structure, he remarks, the birds can remain for a considerable time in the most perpendicular situations. The expanded tail, he adds, thus acts as a powerful support, which is further increased by the size and strength of the claws, these last being much larger than those of ordinary swallows. Most of the species are natives of America, but Mr. Swainson does not say whether this is a native of that country.

The species of *Hirundines* enumerated by Nuttall, in his interesting 'Manual of the Ornithology of the United States and Canada,' are, the *Purple Martin* (*Progne purpurea*, Boie; *Hirundo purpurea*, Linn.); the *Barn Swallow* (*Hirundo rufa*, Gm.; *Hirundo Americana*, Wils.); the *Fulvous* or *Cliff Swallow* (*Hirundo fulva*, Vieill.; *Hirundo lunifrons*, Say); the *White-bellied Swallow* (*Chelidon bicolor*, Bonap.; *Hirundo bicolor*, Vieill.; *Hirundo viridis*, Wils.); the *Bank-Swallow* or *Sand-Martin* (*Cotyle riparia?* Boie; *Hirundo riparia*, Wils.); and the *Chimney Swift* or *Swallow* (*Chætura Pelasgia*, Steph.; *Cypselus Pelasgius*, Temm.; *Hirundo Pelasgia*, Linn., Wils.).

Our limits will only permit us to notice two of these highly interesting birds, and we will take the first and the last.

The male *Purple Martin* is dark-bluish glossy purple: the wings and forked tail are brownish-black. The female and young are bluish-brown, and have the belly whitish. Tail considerably forked. Length about 8 inches. Alar extent, 16.

'This beautiful species,' says Nuttall, 'like many others of the family, seeks out the dwellings of man, associating himself equally with the master and the slave, the colonist and the aboriginal. To him it is indifferent whether his mansion be carved and painted, or humbled into the hospitable shell of the calabash or gourd. Secure of an asylum for his mate and young, while under the protection of man, he twitters forth his gratitude, and is everywhere welcomed to a home. So eager is he to claim this kind of protection, that sometimes he ventures hostilities with the Blue-birds and domestic pigeons, whom he often forces to abandon their hereditary claims. Satisfied with their reception and success, like so many contented and faithful domestics, they return year after year to the same station. The services of the martin in driving away hawks and crows from the premises he claims are also important inducements for favour; he has even the courage to attack the redoubtable King-bird,[*] when his visits are too familiar near the nest. At the approaching dawn the merry martin begins his lively twitter, which, continuing for half a minute, subsides until the twilight is fairly broken. To this prelude succeeds an animated and incessant musical chattering, sufficient, near the dwelling, to awaken the soundest sleeper. His early vigils are scarcely exceeded by the domestic cock: the industrious farmer hears the pleasing call to labour, and associates with the favourite bird the idea of an economical, cheerful, and useful guest. In the Middle States, from the 15th to the 20th of April, the martins begin to prepare their nest, which is usually made of small green or dry leaves, straws, hay, and feathers, laid in considerable quantities. The eggs, pure white, are from four to six, and without spots. They rear two broods in the season. Several pairs also dwell harmoniously in the same box. The male, very attentive to his sitting mate, also takes part in the task of incubation; and his notes at this time have apparently a peculiar and expressive tenderness. The food of the martin is usually the larger winged insects; as wasps, bees, large beetles, such as the common *Cetonia* or goldsmiths, which are swallowed whole. His flight possesses all the swiftness, ease, and grace of the tribe. Like the swift, he glides along as it were without exertion. Sometimes he is seen passing through the crowded streets, eluding the passengers with the rapidity of thought; at others he sails among the clouds at a dizzy height, like something almost ethereal.'

The chimney swift, or swallow, is sooty-brown, and has the chin and line over the eye of a dull whitish. It is about

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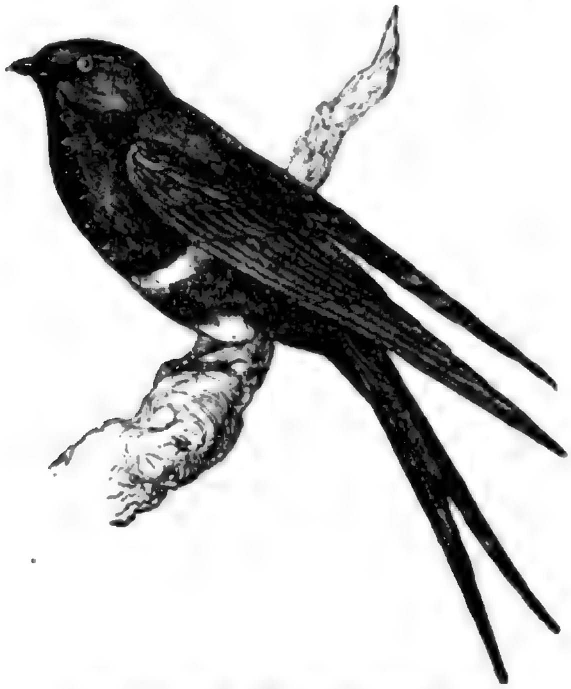
[*] 'Naturalist's Library,' Ornithology, vol. viii.

[†] Employed in entomology and botany.

[*] Tyrant Flycatcher, *Milvulus Tyrannus*, Bonap., *Muscicapa Tyrannus*, Linn.

4½ inches in length, but 12 in alar extent. The wings extend far beyond the tail, which is even, and, like that of the rest of the genus, mucronate.

'This singular bird,' says the interesting author last quoted, 'after passing the winter in tropical America, arrives in the Middle and Northern States late in April or early in May. Their migrations extend at least to the sources of the Mississippi, where they were observed by Mr. Say. More social than the foreign species, which frequent rocks and ruins, our swift takes advantage of unoccupied and lofty chimneys, their original roost and nesting situation being tall gigantic hollow trees, such as the elm and button-wood (*Platanus*). The nest is formed of slender twigs, neatly interlaced somewhat like a basket, and connected sufficiently together by a copious quantity of adhesive gum or mucilage secreted by the stomach of the curious architect. This rude cradle of the young is small and shallow, and attached at the sides to the wall of some chimney or the inner surface of a hollow tree: it is wholly destitute of lining. The eggs are usually four, and white. They have commonly two broods in the season. So assiduous are the parents, that they feed their young through the greater part of the night: their habits however are nearly nocturnal, as they fly abroad most at and before sunrise, and in the twilight of evening. The noise which they make while passing up and down the chimney resembles the rumbling of distant thunder. When the nests get loosened by rains, so as to fall down, the young, though blind, find means to escape by creeping up and clinging to the sides of the chimney-walls: in this situation they continue to be fed for a week or more. Soon tired of their hard cradle, they generally leave it long before they are capable of flying. On their first arrival, and for a considerable time after, the males, particularly, associate to roost in a general resort. This situation, in the remote and unsettled parts of the country, is usually a large hollow tree open at top. These well-known *Swallow-trees* are ignorantly supposed to be the winter-quarters of the species, where, in heaps, they doze away the cold season in a state of torpidity; but no proof of the fact is ever adduced. The length of time such trees have been resorted to by particular flocks may be conceived perhaps by the account of a hollow tree of this kind by the Rev. Dr. Harris, in his journal. The *Platanus* alluded to grew in the upper part of Waterford in Ohio, two miles from the Muskingum: and its hollow trunk, now fallen, of the diameter of 5½ feet, and for nearly 15 feet upwards, contained an entire mass of decayed swallow-feathers, mixed with brownish dust and the exuviæ of insects. In inland towns they have been known to make their general roost in the chimney of the court-house. Before descending, they fly in large flocks, making many ample and circuitous sweeps in the air; and as the point of the vortex falls, individuals drop into the chimney by degrees, until the whole have descended, which generally takes place in the dusk of the evening. They all however disappear about the first week in August. Like the rest of the tribe, the chimney swift flies very quick, and with but slight vibrations of its wings, appearing as it were to swim in the air in widening circles, shooting backwards and forwards through the ambient space at great elevations, and yet scarcely moving its wings. Now and then it is heard to utter, in a hurried manner, a sound like *tsip tsip tsip tsee tsee*. It is never seen to alight but in hollow trees and chimneys, and appears always most gay in gloomy weather. The wonderful account of the swallow-roosts in Honduras, given by Captain Henderson, appears to be entirely applicable to this species.



Hirundo fasciata. (Sw., *Zool. Ill.*, 2nd series.)

As an example of the more southern *Hirundinidæ*, we select the *Hirundo fasciata* of Latham.

Description.—Glossy blue-black; thighs and band on the abdomen snowy.

This is *L'Hirondelle à ceinture blanche* of Buffon, the *White-bellied Swallow* of Latham.

Mr. Swainson speaks of this as a very rare bird; and, according to Buffon, it is sometimes seen perched on floating trees in the rivers of Guiana. Length to the end of the deeply forked tail about six inches. The first quill is longest.

We shall treat of the Australian WOOD-SWALLOW (*Artamus*) under that title. There are several species, but they can hardly be classed with the true swallows, though they approximate to them in some points. Their bills and feet remove them from the *Hirundinidæ*.

SWAMMERDAM, JOHN, was born at Amsterdam in 1637. His father was an apothecary in that city, and was celebrated for a large collection of objects of natural history and other curiosities which he had formed. His grandfather first took the name of Swammerdam from the place of his birth, a village on the Rhine between Leyden and Woerden.

John Swammerdam was originally intended for the church, but he preferred medicine. During his preparatory studies, following the example of his father, he devoted himself with great ardour to the study of natural history, and especially that of insects, in which he is said to have obtained, even while a young man, far more knowledge than the writers of all preceding ages. In 1651 he went to Leyden, and studied under Van Horne and Francis Sylvius. He applied himself very diligently to minute dissections of the human body, and, bringing with him the tact which he had acquired in the examination of insects, was eminently successful. After two years' residence at Leyden he went to Saumur in France, where he continued his observations upon insects, and in 1664 discovered the valves of the lymphatics, but lost the full credit of his industry by Ruysch having at the same time made similar observations, and published them before his were printed. From Saumur Swammerdam went to Paris, and lived with Nicholas Steno, with whom he had been a fellow-pupil and an intimate friend at Leyden. Here also he gained the acquaintance of M. Thévénot, who was afterwards his chief patron, and obtained leave for him, on his return to Amsterdam, to dissect the bodies of those who died in the hospital. In 1666 he went again to Leyden, and made numerous anatomical researches in company with Van Horne. Early in the following year he first employed the method of preparing the blood-vessels by means of waxen injections, and was soon after admitted doctor of medicine: his thesis was an essay on respiration. About this time also he invented the method of making dry preparations of hollow organs, which is now usually employed.

After receiving his diploma, Swammerdam devoted nearly all his time to the study of the anatomy and the natural history of insects; and in 1669 he first published his general history of them. In 1672 he communicated to the Royal Society of London some plates of the human uterus, together with an account of his injections of the spermatic vessels, and some specimens of the success of his invention. At this time also he was engaged in numerous dissections of fishes, especially of their glands; and made several useful investigations respecting the pancreatic fluid. In 1673 he discovered an important error in the received opinions respecting hernia; and proved that when the intestine is protruded, the peritoneum is not torn, but stretched, so as to form a saccular prolongation from the lining of the abdomen; a fact which was first published, with several other results of Swammerdam's inquiries, in Schrader's observations. In the same year he published his treatise on the natural history of bees; 'a work,' says Boerhaave, 'which all the ages from the commencement of natural history have produced nothing to equal, nothing to compare with.' But the labour it had cost him, and the incessant fatigue to which he had been exposed in making microscopic observations for hours together under the heat of a burning sun, destroyed his health, which had always been delicate, and he determined to sell his museum, and renounce all his former pursuits for a religious life, for which his desire had been excited by Antoinette Bourignon, with whom he had long maintained a correspondence. But it was not easy to find a purchaser for so extensive a collection: his friend Steno, on the part of the duke of Tuscany, offered him 12,000 florins for it if he would become a Roman Catholic: but this he angrily refused, and Thévénot tried in vain to dispose of it in France. While various negotiations were pending, he completed the arrangement of his museum, and made catalogues of it; and in 1675 published his last work, on which he had been engaged for more than ten years, 'The Anatomy of the Day fly.' In 1676 he went to Copenhagen with another disciple of Antoinette Bourignon, to obtain from the king of Denmark leave for her to reside in his kingdom, the Lutheran divines of Holland having endeavoured to remove her from Holstein. His application however was unsuccessful; and on his return to Amsterdam he found his father enraged at him for his continued neglect of all profitable employment, and determined to allow him but an insufficient income for his maintenance. He was in utter despair what course to pursue consistently with his anxiety for a life of quietude and religion. In a few months his father died. Instead however of inheriting money enough for the purpose of his retirement, he found himself involved in a dispute with his sister respecting the division of the property, which, with his continued anxieties about the sale of his museum, brought on a severe illness, with melancholy, and he died early in 1681.

Swammerdam left all his manuscripts on insects to Thévénot; after whose death, having passed through several different hands, they were bought by Boerhaave, and published in one volume. His heirs endeavoured to obtain 5000 florins for his museum, but in vain; and it was at length broken up and sold in small portions to different purchasers. All the works of Swammerdam were translated from the Dutch into Latin by Gaubius, and most of them at different periods into English, French, and German. Boerhaave, with his edition, published a Life of the Author, which is added to the English translation of 'The Book of Nature, or the History of Insects,' by Thomas Floyd, folio, London.

SWAN RIVER, a river which takes its rise in the Darling Mountains, on the western side of New Holland. It was discovered by Vlaming, a Dutch navigator, in 1697, who gave it the name of Swan River on account of the number of black swans which he observed on its banks. The mouth of the Swan River is in 32° 4′ N. lat. and 115° 40′ E. long. The entrance of the channel is obstructed by a bar of rocks. Higher up it is narrow, and is then seven or eight feet in depth. After half a mile the navigation is free, and in mid-channel the depth is not less than eight or nine feet. The river then turns in a northerly direction for seven miles without any large bends. On the eastern bank there are two shoals, but on the opposite side there is a passage. Farther up, the river forms a basin two miles and a half wide, beyond which it is blocked up by shoals and islets (Harrison's Isles), between which the depth is not more than two or three feet; but it gradually deepens from five to fifteen feet. The river is then not more than one-third of a mile wide, and it continues in a winding course with a channel from seven to ten feet deep. It then becomes unfit for the navigation of vessels of burthen. Capt. King does not mention the length of the Swan River, nor does its exact source appear to be known. (King's *Survey of the Coasts of Australia.*)

SWAN RIVER, the name generally given to all that part of New Holland between the parallels of 31° and 35° 8′ S. lat., and to the westward of 119° E. long.

Coast.—The coast of Swan River is characterised by numerous æstuaries, each of which receives several rivers, which respectively discharge into the sea by a narrow mouth. It is deficient in good harbours. The best is in Cockburn Sound, in 32° 10′ S. lat., which is described by Sir James Stirling as perfectly secure at all times, and capable of receiving the largest vessels, as well as any number of them. It is however by other authorities stated to be encumbered with rocks. King George's Sound, in 35° 6′ S. lat. and 118 E. long., is perhaps the next. Its position however exposes it to strong easterly gales. Harbours for boats and small vessels also exist near the entrance of Peel's Inlet (32° 30 S. lat., 115° 34′ E. long.), Augusta (34° 18′ S lat., 115° 8′ E. long.), and Cape Riche (34° 4′ S. lat., 119° E. long); but those which have been named are all which merit notice.

Mountains, &c.—About fifty miles from the coast of Swan River is a range of hills called the Darling Mountains, extending nearly the whole length (north and south) of the colony, and varying from 800 to 1600 feet above the level of the sea; or, according to other accounts, to 2000 feet. St. Anne's and Mount William are said to attain 3000 feet. The Darling range has not been fully explored, though it has been crossed in many directions by straggling parties in search of land. With few exceptions it is described as a sterile belt, the surface consisting in great measure of hard red-sandstone: in some places the granite appears in masses. There is a profusion of coarse herbage on it, and numerous plants resembling the English heath, with forests of large mahogany and blue gum-trees. Mr. Ogle specifies several minerals which have been discovered in different parts of the Darling Mountains: roofing-slate, lime, marl, selenite, silicious and calcareous petrifactions, magnetic iron-ore, peacock iron-ore, chromate of lead, crystals of quartz; and he adds, on the authority of Capt. King, copper Nearly all the rivers which flow to the westward appear to take their rise in the Darling Mountains. The Stirling range of hills contains several mountains of considerable height: Toolbrunup, 3000 feet; Koi-kyenneruf, 2500 feet; and Hume, 1800 feet. (Ogle's *Western Australia.*)

The valleys of this part of Australia are of two kinds: those which are almost ravines, bounded by inaccessible cliffs; and wide valleys, bordered by fertile plains, which occur where the basaltic rocks are developed. 'The soil found in the valleys of the former kind is extremely rich, but they are all subject to very heavy inundations. The sandstone formation is intersected in all directions by valleys of this kind, which are seldom more than from two to three miles apart.' The richest land is found in the valleys of the second class. (Ogle and Grey, *Journal of the Royal Geographical Society*, No. 1, vol. i.)

Along part of the coast south of the Swan River there is a continuous calcareous ridge. In this part no gramineous plants are to be found, but several species of herbaceous plants rise out of the sandy surface, which afford tolerable nutriment for sheep and cattle. Adjoining this district of light sandy soil is a considerable breadth of red land, in an easterly direction, extending to the base of the Darling Mountains, the soil of which varies from red sandy loam to the richest clay and red marl, and is apparently fit for all agricultural purposes. The fourth variety of country is the uneven surface of the mountain-range, which is of granite and trap formation. The valleys of this range are exceedingly rich and verdant, and the hills themselves, though occasionally rugged, owing to the protrusion of the rocks, contain magnificent timber and very excellent sheep-lands. The fifth and last variety of soil is that which is found on the banks of the rivers and streamlets. It is alluvial, and generally very rich, bearing spontaneously good native flax, many edible roots, and thirty or forty species of grasses. This description of the country applies more particularly to the extent of about forty miles to the southward of the Swan River. Farther south the sandy tract disappears, and the rocky ground is less protruding.

In that part of Swan River which borders on the south coast there are three distinct parallel ranges of mountains running from north to south. The highest and most eastern of these has its southern termination near to King George's Sound, in 35° 6′ S. lat. The second terminates at Cape Chatham, 35° S. lat. Cape Leuwin, in about 34° 20′ S. lat., is the southern termination of the third range, which is inferior in altitude, as well as in extent, to the other two: it terminates on the north at Cape Naturaliste, 33° 27′ S. lat. On these ranges, and in their intervening valleys, the soil varies according to position and altitude. On the mountains and higher hills the surface is rugged and stony; in the lower sides of both the soil is excellent; but in the principal valleys and the lower grounds, where the sandstone formation prevails, it is of a very inferior description, except where the alluvial deposit of the rivers gives it a different character. (*Report* of Captain Stirling, in 'Journal of the Royal Geographical Society,' vol. i.)

Captain Bannister, who travelled in a south-easterly direction from Freemantle, 32° 2′ S. lat., to King George's Sound, has described the country between these places. His party passed the Darling range near the summit of St. Anne's Hill. The hills are here exceedingly rugged, but covered with the finest timber, known in the colony by the name of mahogany. In some of the valleys he found the soil tolerably good, of a light hazel colour, with abundance of herbage fit for cattle on their passage from a good interior country to the coast; on the uplands ironstone, with a little gravel and scrub. From the higher range of the Darling Mountains to about 117° 15′ E. long. the distance was computed to be about forty miles, and the character of the country traversed was generally not good, but there were tracts of excellent land. Pursuing a south by east course for eighty or ninety miles, a very great proportion of the land was fit for sheep, or the plough, or cattle. 'The beauty of the scenery near to and distant from the rivers which we crossed,' says Captain Bannister, 'is equal to any I have seen in the most cultivated timber country in those parts of Europe which I have happened to pass through. The character of the country generally is undulating, with here and there moderately high hills, some of them crowned with rocks of granite, pudding-stone rocks, and a blue stone: but there are broad flat lands and valleys, the former of which not unfrequently extended several miles, even in some places far beyond our power to ascertain. The hills were in general so gradual in their ascent, that where those of a rougher character were seen, they only gave a certain character that destroyed the dull feeling of the mind which a mere flat country engenders in many.' Changing his course to the south and south-west by west, he perceived from some high mountains nothing but one vast forest, twenty to thirty miles distant, the intermediate country presenting occasional open valleys winding between apparently high hills to the eastward. Changing again to due south, he traversed a country as rough as can be imagined. In two days his party could not travel more than seven or eight miles, toiling the whole of each day, owing to the dense scrub. To the eastward of Cape Chatham the country was wooded and hilly, but the soil occasionally rich. The forest-trees were the mahogany, and the red and white gum. On the higher hills and on the poor lands, the former predominated; on the lower lands and sides of the hills, where good land was, the latter: there were also the usual trees, such as Banksia, tea-tree, &c. To the south-west and west the underwood was so thick for many miles, that it was with the greatest difficulty a passage could be made: occasionally Captain Bannister's party were obliged to make a road with a hatchet. Some of the trees were very large: they were principally blue gum; 'and if others had not seen them,' says Captain Bannister, 'I should be afraid to speak of their magnitude. I measured one: it was, breast-high, 42 feet in circumference, and in height before a branch, 140 or 150, we thought at least, and as straight as the barrel of a gun.' Within a few miles from the sea, sand-hills, very difficult to pass over, were encountered; they had however abundance of grass.

The country between Augusta and Perth, that is, between about 34° 8′ and 31° 53′ S. lat., is of the same unequal character as that which has been described. According to the report of Mr. Busfield, in the neighbourhood of Augusta the land is very sandy, and the timber of minor growth. To the north it improves: the trees are of a larger size, and very thick; the prevailing timber is white gum, and on the bad land in general mahogany. Farther on in the same direction the soil deteriorates; tracts of sand occasionally and granite rocks abound in extensive fields; the country is hilly, but contains no elevation of sufficient height to command a view. 'After about a mile and a half of such a country,' says Mr. Busfield, 'we came to a large flat, abounding in Banksia, grass-trees, and a swampy vegetation: this flat was a black sand, with however a considerable admixture of soil.' Beyond this in a westerly direction the country was found to be more hilly, and rivulets were more frequent; the land fertile, but encumbered with timber of stupendous size, all white gum. A portion of the country traversed toward the sea-coast is thus described: 'The hills I had lately left stretched apparently to a great distance, in a line with the coast; they constituted a limestone range, the rock of solid texture.....The soil was generally sandy and barren, but where the least symptom of an admixture of mould showed itself, the grass-tree, of stunted stature, as though just struggling for existence, was always seen, and sometimes in extensive tracts..... We encountered a valley, the most difficult of passage of anything I have ever yet met with in the shape of bush: its vegetation consisted solely of shrubs advanced to a larger standard than usual in this country; the ground (I suppose in consequence of perpetual shade and want of circulation) was covered with moss, and on this we were obliged to crawl under the thicket, while sliding down and climbing up the numerous and steep ascents and acclivities in which the place abounded.' (*Collection of Papers on Western Australia.*)

Rivers.—The rivers on the west coast of Australia generally rise at no great distance from the sea. Near their sources they are mountain-torrents, but in the low lands they become slow streams. They are liable to sudden rises, which are caused, Capt. Grey supposes, by the rain which falls in those parts where they have their source. At other times their channel, in some places many feet deep, is quite dry. They offer little or no facility for internal navigation. Besides the Swan, there are the Avon, the Murray, the Canning, the Harvey, the Preston, the Collie, the Vasse, the Blackwood, the Donnelly, and the Kalgan. (*Western Australia*, by Thomas John Buckton.)

The Canning rises in the Darling range: it is smaller than the Swan, and only navigable for a few miles. Shoals impede the navigation, and in dry weather boats must be pushed over them for fully half a mile. The Canning enters the south side of Melville Water, about five miles south from Perth. The Murray takes its rise also in the Darling range, and empties itself into Peel's Inlet. The Preston and the Collie unite about fifty miles south of the Murray, and run into an æstuary called Leschenhault, and form a bar, over which the river is very shallow. (Ogle, *Western Australia*, 1839.)

For the Botany and Zoology of Swan River, see the article AUSTRALIA.

Climate.—The climate of Swan River has the same general character as that of Eastern Australia. [AUSTRALIA.] It has not generally been found prejudicial to Europeans, while in the case of some persons it has proved highly favourable. Major Irwin represents the temperature as resembling that of the south of Italy, parts of Spain and Portugal, and the Cape of Good Hope. According to thermometrical observations at Perth, the capital of the colony, situated in about 31° 53′ S. lat. and 115° 50′ E. long., the maximum and minimum height of the thermometer in the shade in the month of January (1831) was 106° and 68°; February, 102° and 62°; March, 96° and 60°; April, 98° and 48°; May, 78° and 44°; June, 70° and 38°; July, 67° and 33°; August, 76° and 42°; September, 78° and 45°; October, 79° and 48°; November, 95° and 54°; December, 96° and 60°. But though thus variable, the western part of New Holland is not so uncertain as New South Wales in the supply of rain and moisture. This is obviously explained by its more mountainous character, and by the prevalent winds. According to observations made in Perth, in 1831 also, the state of the weather in the successive months of the year was—January, generally fine and very sultry; February, thunder on the 7th, 13th, and 14th, with rain in these days; March, rain on the 27th and 28th, at full moon, remainder fine; April, fine, with the exception of three rainy days; May, much rain and heavy dews; June, lightning and thunder on the 8th, 12th, and 13th, frequent showers, but neither long-continued nor heavy; July, the greater part fine—severe thunder-storm on the 8th, ice on the 9th, thunder on the 16th; August, a good deal of rain, a strong gale on the 5th; September, mostly cloudy, and occasional showers, thunder on the 2nd, 10th, and 19th; October, variable, cloudy, and rainy for the greater part; November, squally, cloudy, and rainy at beginning, latter part fine; December, generally fine, a regular land and sea breeze, with a little rain. (*Report of Dr. Milligan of the 63rd Regiment.*)

Major Irwin divides the seasons into wet and dry, and represents the first as beginning generally in March and ending in November, the rain not being heavy except in August and September. The height of the dry season is during the harvest, in January, when the nights are distinguished by heavy dews. The seed-time lasts from early in May to the end of August. By December the grain is ripe: hay is cut in November. Tomatos, pumpkins, gourds, vegetable-marrow, chillies, egg-plants, besides every English vegetable, ripen in the open air; and also the following among other fruits—melons, bananas, almonds, figs, grapes, peaches, and strawberries. The olive, pomegranate, apricot, plum, mango, lemon, and orange; the mulberry, apple, nectarine, pear, and several others, give promise of succeeding, but they have been scarcely proved yet. Fig-cuttings produce fruit the first year, and vines the second or third. (Irwin, *State and Position of Swan River.*)

Natives.—It appears from the reports of Major Mitchell and of Captain Grey, who have respectively travelled in the eastern and western parts of Australia, that the natives of the latter are superior in intelligence and humanity to those of the former. They live in patriarchal subjection, choosing a chief only in time of war. Polygamy is general. Marriages are regulated by certain rules. No man can marry a woman of the same family-name as himself, and the children take the family-name of the mother. The sons inherit the property of the father, and the land is of course never for two generations in the hands of men bearing the same family-name; and in the event of the head of a family having had several wives of different family-names, his land is divided among several new families. The country is thus divided into comparatively small properties, the boundaries of which are strictly defined. (Captain Grey's *Travels*, vol. ii., p. 232, 233.)

They hold an annual fair, called *Mundja*, which takes place in the spring of the year, when the natives of different districts meet for the purpose of exchanging various articles of utility with one another; the Murray men and the Perth men meet, and the following exchanges take place between them: the Murray men bring the girdle of opossum's hair worn round the waist, a long straight spear, the native knife, the dow-uk,[*] a dog's tail, a tuft of feathers, burnt ochreous clay, a tuft of cockatoo feathers, the string of opossum's hair worn round the head, &c. The Perth men bring a hammer, a cloak, the hair of the opossum spun into thread, a stone, &c. When they meet, the following ceremony takes place: they rapidly pass fire-sticks from hand to hand, endeavouring to drop a small piece of lighted wood on the females in such a manner that they get slightly burned before they can shake it off. In passing the fire-sticks from hand to hand, they also endeavour to do it so dexterously as to burn the person they give them to. (Captain Grey's *Vocabulary of the Dialects of Western Australia.*)

Their huts are not always so miserable as they have been represented. They are constructed with sticks in a bee-hive shape, for the accommodation of a family, and are covered with the bark of the *Melaleuka*, or tea-tree. This bark is a soft cottony substance, and strips off the tree in large flakes. The entrance is made on the side sheltered from the prevailing winds: here they kindle their fire, toward which they stretch their feet when they lie down.

Neither is their cooking so bad as it is supposed to be. Major Irwin, speaking of the way in which they dress fish, tells us that he has often partaken of it with them, and that it would be no disgrace to a Parisian cook. The fish, after being washed and prepared, is wrapped in soft bark, and placed in hot ashes. 'By this process an acid from the bark is communicated to the fish, imparting so agreeable a flavour, that no other sauce is required.'

They are superstitious. No death results from natural causes, but always from sorcery, according to their belief. A magician or doctor, called *Mulgarradock*, is recognised among them; he is considered to possess the power of driving away wind or rain, as well as of bringing down lightning or disease upon an obnoxious individual. The hand of the Mulgarradock is supposed to confer strength or dexterity, and he is frequently applied to for that purpose. The operation by which strength and dexterity are imparted consists in simply drawing the hand repeatedly, with a firm pressure, from the shoulder downwards to the fingers, which are afterwards extended until the joints crack.

Their funeral solemnities are peculiar. A grave is dug about four feet long and three wide, perhaps a yard in depth. The earth that is removed is arranged on one side of the grave in the form of a crescent; at the bottom is placed some bark, and then small green boughs; and upon this the body is laid, ornamented and enveloped in a cloak, with the knees bent up to the breast and the arms crossed. Over the body are heaped more green boughs and bark, and the hole is then filled with earth. Green boughs are placed over the earth, and upon them are deposited the spears, knife, and hammer of the deceased, together with the ornaments that belonged to him; his throwing-stick[*] on one side, and the curl[†] or towk on the other side of the mound or grave. The mourners then carve circles in the bark of the trees that grow near the grave, at the height of six or seven feet from the ground; and, lastly, making a small fire in front, they gather small boughs, and carefully brush away any portions of the earth that may adhere to them. They then colour their faces black or white, laid on in blotches across the forehead, round the temples, and down the cheek-bones: and these marks of mourning are worn for a considerable time. They also cut the end of the nose and scratch it, for the purpose of producing tears. During the period of mourning they wear no ornaments or feathers. It frequently occurs that two individuals bear the same name; and in this case, if one should die, the other changes his name for a certain time, in order that the name of the deceased should not be uttered. When a female is interred, her implements[‡] are likewise deposited in her grave. (Sir James Stirling.)

The *corroboree* dance, common to the natives of Australia and Van Diemen's Land, is remarkable. Major Mitchell has very graphically described this singular custom. 'The surrounding darkness,' says he, 'seems necessary to the effect of the whole, all these dances being more or less dramatic; the painted figures coming forward in mystic order from the obscurity of the background, while the singers and beaters of time are invisible. Each dance seems most tastefully progressive, the movement being at first slow, and introduced by two persons displaying the most graceful motions both of arms and legs, while others, one by one, drop in, until each imperceptibly warms into the truly savage attitude of the corroboree jump, the legs striding to the utmost, the head turned over one shoulder, the eyes glaring and fixed with savage energy in one direction, the arms raised and inclined towards the head, the hands usually grasping waddies[§], bommerengs[‖], or other warlike weapons. The jump now keeps time with each beat, and at each leap the dancer takes six inches to one side, all being in a connected line, led by the first dancer. The line is doubled or tripled according to space and numbers; and this gives great effect, for when the front line jumps to the left, the second jumps to the right, the third to the left again, and so on until the action acquires due intensity, when all simultaneously and suddenly stop.' (*Travels in Eastern Australia.*)

Language.—According to Captain Grey, there are the following arguments to prove that all the Australian dialects have a common origin: '1st, A general similarity of sound and structure of words in the different parts of Australia; 2nd, The recurrence of the same word with the same signification, to be traced in many instances round the entire continent, but undergoing various modifications; 3rd, The same names of natives occurring frequently at totally opposite portions of the continent. In all known parts of Australia it is ascertained that the natives name their children from any remarkable circumstance which may occur soon after their birth; such being the case, an accordance of the names of natives is a proof of a similarity of dialect.'

It is a singularity observed in reference to the dialects of Australia, that those of districts widely removed from one another sometimes assimilate very closely, whilst those spoken in the intermediate ones differ considerably from either of them. In a comparison embracing Swan River (Perth), King George's Sound, South Australia, and Sydney, the degree of similarity is exhibited in Tables by Captain Grey. For the word smoke the expression used in the first is booyoo; in the second, poou; in the third, puiyu; in the last, poito. For water, kowin, koin, kowe, kokoin; for wood, kalla, kal, karla, kollai; for the hand, mara, murr, murra, mutturra; for the eye, mail, mil, mena, mael. This comparison embraces dialects in use at distances of between two and three thousand miles, in countries differing totally in their vegetation, and in which the birds and reptiles are also in many instances different. These physical differences must account for the existence in one part of many words, original and derivative, not to be found in the other. The greatest resemblance is in words expressing ordinary actions, in personal terms, or in pronouns. With regard to the pronouns, in the singular, plural, and dual numbers they almost coincide in Western Australia, Southern Australia, and Sydney. The following are illustrations of this: nginnee, ngintoa, ninna; ngalee, ngalin, ngadli; nurang, nura, niwa; ngando, nganto, ngando; ngannee, ngan, nganna; nganno, nganbo, ngangko. (Grey's *Travels*, c. ix., vol. ii.)

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[*] *Dow-uk*, 'a short heavy stick, used in knocking down the smaller kinds of game, much in the same manner that poachers do hares and rabbits in England.'—(Grey.)

[*] Throwing stick, called the *kiley*, 'is thrown into flights of wild fowls and cockatoos for the purpose of killing them.'—(Grey.)

[†] The *towk* is only another name for the *dow-uk*.

[‡] Among the contents of a woman's bag, Captain Grey enumerates a flat stone to pound roots with; quartz, for the purpose of making spears and knives; stones for hatchets; needles made of the shin-bones of kangaroos shells used for cutting hair.—(*Travels*, vol. ii., p. 266.)

[§] *Waddies*, a kind of club.

[‖] *Bommereng*, a thin curved missile about 2 feet 4 inches long: it can be thrown by an accustomed hand so as to rise upon the wind with a rotatory motion, and in a crooked direction, towards any given point with great precision, and to return, after a considerable flight, to within a yard or two of the thrower; or, by first striking the ground near him, to bound, so as to hit at a given distance any object behind a tree.—(Mitchell.)

The natives of Western Australia are, like other savages, very fond of singing. 'To a sulky old native his song is what a quid of tobacco is to a sailor: is he angry, he sings; is he glad, he sings; is he hungry, he sings; if he is full, provided he is not so full as to be in a state of stupor, he sings more lustily than ever.' Their songs are naturally varied in form, but they are all represented to be concise, conveying in the simplest manner the most moving ideas. They quickly spread from tribe to tribe, until from change of dialect the very words are not understood by the people. The usual accompaniment to their songs is the clapping of hands, or the beating of a short round stick against the flat board with which they throw their spears. Some songs have a peculiar dance connected with them. Their music, although very different in character from that to which European ears are accustomed, is not without a power to move or to affect even a European listener. Captain Grey, speaking of their funeral chants, offers a testimony, which is given also by Major Mitchell. He says, 'Nothing can awake in the breast more melancholy feelings than the funeral chants of these people.' Several specimens of Australian songs are given in Captain Grey's *Travels*.

Among a people thus singular in their customs, and on the outskirts as it were of humanity, there are striking evidences of affinity to races far removed from them in local habitation and in social history. Customs entirely arbitrary in character, whose existence is not explained by similar wants and circumstances, are observed among the Australians, the distinct counterpart of which we find frequently mentioned in sacred history and in eastern travels. A collection of these may be seen in the interesting publications of the Aborigines' Protection Society. (See 'Extracts,' vol. ii., No. IV.)

No systematic attempt, worthy of the name, has yet been made to promote the civilization of the aborigines of Western Australia; but they have not been found deficient in capacity where it has been incidentally tested. They readily acquire a knowledge of the language, the customs, and the temper of their European neighbours, to whom they accommodate themselves with wonderful facility. It seems due to the unfortunate races whose territory our necessities oblige us to appropriate, that we should carry among them not our vices only, but so much of our religion and civilization as they can be made to receive. Major Mitchell, Captain Grey, and other travellers in Australia, appreciating the interests of settlers, as well as the claims of the natives, have strongly recommended the adoption of systematic measures for their improvement. (Aborigines' Protection Society's Papers, *Outline of a System of Legislation for the Benefit of the Aborigines of British Colonies*.)

Towns.—The capital of Swan River is Perth, which is situated on the Swan River, in 31° 53′ S. lat., 115° 50′ E. long. Messrs. Backhouse and Walker describe this town as it was above four years since, between which and the present time improvements may have been made; although, from the slow progress of emigration to Swan River, they cannot be great. 'The houses here (they say) are built at short distances from each other, surrounded by land, making the town cover a large surface compared to its population. The native blacks are numerous about Perth. They usually wear a small rug of Kangaroo skin about their shoulders, sometimes brought partially before; at other times hanging over their backs, and not unfrequently they walk about Perth in a state of nudity, which custom appears so to reconcile, that little pains are taken to discourage it. They cut wood, draw water, and perform many little offices for the European population.' 'Along the borders of the Swan River there are narrow alluvial flats of good land, which are chiefly cultivated with grain, of which a supply equal to the wants of the colony is raised. In the range of this country there are several small farming establishments within sight one of another, and a few large ones, for this country, are also interspersed.' Freemantle, near the mouth of the Swan River, consists of scattered houses. It is situated in a less fertile part of the country than Perth. Vines and figs however thrive in Freemantle upon little more than the limestone rock covered with sand. Augusta, and Albany at King George's Sound, are insignificant places.

Owing to the system on which colonization was carried out, population is much dispersed in Swan River.

History.—Swan River dates its history as a British colony from the year 1829. The favourable representations more especially of Captain Stirling, R.N., who became the first governor, led to its adoption as a place of settlement. The principle on which its colonization was commenced was erroneous, and involved the early settlers in severe trials, and the progress of the colony has ever since been tardy and discouraging. As a marked distinction from the other Australian colonies established at that time, it was determined that no convicts should be sent to Swan River. Along with this supposed advantage, land was to be disposed of at an exceedingly low price. Persons arriving in the settlement prior to the end of the year 1830, were to receive grants of land free of quit-rent, proportioned to the capital they were prepared to invest in it, at the rate of 40 acres for every sum of 3*l*. 'Investment of capital' was to imply stock of every description, implements of husbandry, and other articles applicable to the purposes of productive industry, or necessary for the establishment of the settler on his location. For the introduction of labouring persons an allowance of 200 acres for each adult labourer was to be made to the emigrant who paid for the passage of the labourer to the colony: women and children above ten years of age came under the description of labouring persons. After the date of 1830 grants were to be reduced to 20 acres for every 3*l*. capital; capital being represented as above. For the introduction of labourers, 100 acres for each labouring person were to be allowed (labouring persons included women and children above twelve years of age); and for every child under twelve and above six years, 60 acres; under six years, 30 acres.

In New South Wales and Van Diemen's Land, for many years prior to this, land had been granted free of all payment, in proportion to the capital possessed by the emigrant, and under this system those colonies had wonderfully advanced in population and in wealth. But while the land-granting system was in operation, the system of penal transportation was continually supplying the settlers with labourers, whose penal condition precluded them from becoming landed proprietors until their period of servitude was ended. Swan River however was founded on conditions which excluded this kind of labour, and allowed only of that which was free. Two elements, apparently conflicting, were thus brought together,—cheap land, and labourers in whose power it was to become landed proprietors. The consequence was, that the colony of Swan River was scarcely founded when the ambition of the labourers to become proprietors reduced the infant colonizing population entirely to the latter class, and for a time impeded all advance.

Shortly after this unfortunate issue, a petition was addressed by some of the colonists at Swan River to the home government, praying the repeal of that condition by which they were deprived of convict labourers.

Down to the year 1837 the disastrous influence upon the progress of the colony of the false principle of its colonization was apparent to two most intelligent travellers, members of the Society of Friends, who visited Swan River, after having spent several years in New South Wales and Van Diemen's Land, engaged purely in labours of benevolence, and uninterested personally in commercial speculations calculated to prejudice their representations. They say, 'We have often been reminded, since our arrival here, of the saying of a man in Van Diemen's Land (who had quitted Swan River in 1831): "It is a country to make one's heart break."' (See extracts from the communications of J. Backhouse and G. W. Walker, published by the Society of Friends.)

Latterly, important modifications which have been introduced into the system of colonization, considerable efforts which have been made to promote the emigration of capitalists and labourers, and chiefly the establishment of a new settlement in the proximity of Swan River, under the aus pices of the Western Australian Company, have contributed to brighten the prospects of the colony, and in a few years it will probably exhibit signs of health and hope equal to the other Australian colonies. The following statistical returns exhibit its social and commercial condition at the latest period in reference to which authentic information has been obtained. Revenue for the year ending March 31, 1841, 9650*l.* 8*s.* 2*d.*; shipping in 1838, which entered the harbours of the colony, 12,892 tons; in the year ending as above (1841), 30,000 tons. Exports of wool in 1838, 25,800 lbs.; in 1840-1, 60,000 lbs. Stock in the colony in 1838, including every kind, 21,939 head; in 1840, 40,000. The population in 1838 was between three and four thousand; in 1840-1, upwards of 4000. Churches and chapels are rapidly rising in the different settled districts, and several schools are established. Two newspapers are published weekly.

The colony is divided into fourteen counties:—Twiss; Perth; York; Murray; Grantham; Trellington; Wicklow; Sussex; Nelson; Goderich; Hay; Lanark; Stirling; Plantagenet.

Government.—The public affairs of the colony are administered by a governor, who is responsible for the exercise of his functions to the colonial department of the British government. The laws of the mother-country are incorporated into the local enactments by the governor and legislative council, and are enforced by a competent judicial establishment.

Australind.—Australind is the name given to that part of Australia lying between Gantheaume Bay, in 27° 40′, and the Arrowsmith river, in 29° 30′ S. lat.

Captain Grey is the only traveller who has given a description of Australind. From his 'Journal' we collect such passages as the following:—'In the morning completed my survey of the shores of Gantheaume Bay, and of the river, which discharges itself into the sea about the centre of the bay, and started in the afternoon to walk overland to Perth, distant about 300 miles in a straight line. We found the bed of a stream occupied by pools of water, which runs into the sea from the south-east through the opening in the south part of Gantheaume Bay, which is laid down upon Captain King's charts. The country hereabouts was composed principally of a sandstone rock resembling in character the antient sandstones of England, and differing altogether from the sandstone formations of the south-eastern portion of Australia: the form of the hills was that of a series of table-lands intersected by deep and rocky ravines, which were so narrow that the small extent of good land on them could scarcely be occupied, for in the rainy season the whole of the bottoms of these ravines must be flooded and occupied by the waters of mountain-torrents. The vegetation on the hills consisted chiefly of an almost impenetrable bed, composed of a species of tea-tree (of the colonists): in the ravines grass and trees of a larger growth were found. The country being of so impracticable a nature, our progress was slow and toilsome, and we halted for the night at the brow of one of the ravines, having climbed to the top of a cascade, down which the water was slowly dropping.' After travelling for upwards of an hour over a country corresponding to the above, on the following day Captain Grey fell in with a beaten native path, which ran along the summit of the table-land, winding round the heads of the ravines, and thus avoiding them. 'Travelled two and a half miles south by east over sandy downs thinly clothed with Banksia trees and scrub; one and a half miles south by east through a similar country. From this point the country changed its character from barren precipitous sandstone to gently sloping limestone hills and valleys, affording good feed for sheep and cattle. The limestone was of an altogether different character from the recent limestone formation found along the coast.' After travelling three miles south by east through a country of the nature above described, in which a spring of water was met with at nearly every half mile, the country was found by Captain Grey becoming densely wooded with a species of tea-tree, 'and it took us,' says Captain Grey, 'nearly two hours and a half to make as many miles in a straight line, and even then we were dreadfully torn by the bushes.' Travelling for some miles again over 'an indifferent country, consisting of elevated sandy downs covered with scrub and a species of Banksia,' Captain Grey then entered a rich and thickly wooded limestone valley, in which he found the most northern grass-tree (*Xanthorrhea*), and the most southern gigantic ant's nest;' from which circumstances of animal and vegetable life he concluded that he was entering 'that portion of the continent where the productions of the tropical and more temperate regions were becoming confounded, previous to an absolute change from the one to the other taking place.' 'For the next four miles we travelled,' says Captain Grey, 'south by east, along the native path, which ran through a low country composed of a rich soil, and which produced abundantly the warran, or native yam, which always grows in the most fertile districts.'

On the third day after leaving Gantheaume Bay the party reached a verdant and flourishing district, to which Captain Grey refers in the following terms: 'It seemed certain that we stood in the richest province of South-West Australia, and one which so differs from the other portions of it in its geological characters, in the elevations of its mountains, which lie close to the sea-coast, in the fertility of its soil, and the density of its native population, that we appeared to be moving upon another continent (vol. ii., pp. 15-16). This district has been named the Province of Victoria, and extends fifty miles north and south (between the parallels of 27° 30′ and 29° 30′ S. lat.), and is bounded on the east by a 'lofty chain of mountains, flat-topped, and so regular in their outline that they appeared rather the work of art than of nature.' They are distant from twenty to twenty-five miles from the coast, and were named by Captain Grey the Victoria Range. The country to the north and south is comparatively unproductive, and that on the north-east and south-east has not yet been explored. Of the whole Province of Victoria Captain Grey says: 'There is no other part of extra-tropical Australia which can boast of the same number of streams in an equal extent of coast frontage, or which has such elevated land so near the sea; and I have seen no other which has so large an extent of good country.' The principal river is the Hutt, but it is not known whether it is navigable, though Captain Grey supposes it to be so. There are two other considerable streams, the Buller and the Murchison.

The country examined during Captain Grey's expedition lies between Cape Cuvier and Swan River, having for its limits the parallel of 24° and that of 32° S. lat. Ten rivers were discovered, 'which are, when considered with reference to the other known ones of Western Australia, of considerable importance, some of them being larger than any yet found in the south-west of this continent: many smaller streams were also found.' Besides the Province of Victoria, two other extensive districts of good country were also found: one, the district of Babbage, situated in nearly the central part of the western coast of Australia, and watered by the river Gascoyne; and another, adjacent to Swan River, to which a name was not given. A second range of mountains, called Gairdner's Range, was also discovered, which, says Captain Grey, 'forms a very important feature in the geography of this part of Australia.'

The great recommendation of the settlement of Australind is a harbour superior to, or rather supplying the deficiencies of, those hitherto made available in Western Australia. This harbour, named in honour of the enterprising traveller whose name we have so frequently mentioned, Port Grey, is situated in lat. 28° 55′ S.: it is about four miles in length in the direction of the coast, and two miles and a half from within the reef from the coast, and may thus contain six or eight square miles of surface. It is protected by two headlands, which stretch from the coast to the westward; and from the northern headland runs out a reef of rocks nearly due south, thus extending the shelter against winds from the northward and westward. The anchorage is in seven fathoms at all parts of the harbour. (*The New Settlement of Australind*, by H. S. Chapman.)

The settlement of this part of Western Australia has scarcely more than commenced, under the auspices of the Western Australian Company, which has purchased from the British government a very extensive tract of country. The principle on which colonization is to be carried out is that which has been applied in South Australia. Land is disposed of at a fixed price for ready money; and a proportion of the fund thus raised is appropriated to the introduction of the various kinds of labourers which a young country requires; another proportion to the expenses of surveys, local administration, and other purposes.

Some hundred emigrants are already settled in Australind.

SWAN. In England the swan is said to be a bird royal, in which no subject can have property, when at large in a public river or creek, except by grant from the crown. In creating this privilege the crown grants a swan-mark (cygninota), for a *game* of swans, called in law Latin deductus (a pastime, un déduit) cygnorum, sometimes volatus cygnorum. (7 Coke's *Rep.*, 17.) In Scotland the swan is said not to be a royal bird (Erskine's *Instit.*, b. ii., tit. 6); but whilst all proprietors in that country have the right of fowling within their own grounds, swans, unless specially granted, appear to be reserved to the crown. (Stair's *Instit.*, b. ii., t. 3, s. 60; and see Ducange, *Cygnos habendi jus.*) In the reign of Elizabeth, upwards of 900 corporations and individuals had their distinct swan-marks, some of which may be seen in Yarrell's 'British Birds,' vol. iii., 121, &c.

Sometimes, though rarely, the crown, instead of granting a swan-mark, confers the still greater privilege of enjoying the prerogative right (within a certain district) of seizing white swans not marked. Thus the abbot of Abbotsbury in Dorsetshire had a game of wild swans in the æstuary formed by the Isle of Portland and the Chesil Bank. The swannery at Abbotsbury is the largest in the kingdom, which, though formerly considerably more extensive, still numbers many hundreds of these birds, forming an object of considerable attraction and interest to those who visit this part of the south coast: it is now vested in the earl of Ilchester, to whose ancestor it was granted on the dissolution of the monasteries. (7 Co. *Rep.*, 17; Hutchins, *Dorset*, i. 538.)

The privilege of having a swan-mark, or game of swans, is a freehold of inheritance, and may be granted over. But by 22 Edw. IV., c. 6, no person, other than the king's sons, shall have a swan-mark, or game of swans, unless he has freehold lands or tenements of the clear yearly value of five marks (3*l.* 6*s.* 8*d.*), on pain of forfeiture of the swans, one moiety to the king, and the other to any qualified person who makes the seizure. In the first year of Richard III. the inhabitants of Crowland in Lincolnshire were exempted from the operation of this act upon their petition setting forth that their town stood 'all in marsh and fen,' and that they had great games of swans, 'by which the greatest part of their relief and living had been sustained.' (6 *Rot. Parl.*, 260.)

The city of Oxford has a game of swans by prescription, though none are now kept. In the sixteenth century (when a state dinner was not complete unless a swan were included in the bill of fare) this game of swans was rented upon an engagement to deliver yearly four fat swans, and to leave six old swans at the end of the term. By the corporation books it also appears that in 1557 barley was provided for the young birds at 14*d.* a bushel, and that tithes were then paid of swans.

Two of the London Companies have games of swans, the Dyers' and the Vintners' Company, and are, with the crown, the principal owners of swans in the Thames. In August, 1841, the queen had 232, the Dyers 105, and the Vintners 100 swans in the river. Formerly the Vintners alone had 500. The swan-mark of the Dyers' Company is a notch, called a 'nick,' on one side of the beak. The swans of the Vintners' Company, being notched or nicked on each side of the beak, are jocularly called 'swans with two *necks*,' a term which has been long used as a sign by one of the large inns in London.

On the first Monday in August in every year the swan-markers of the crown and the two Companies of the city of London go *up* the river for the purpose of inspecting and taking an account of the swans belonging to their respective employers, and marking the young birds. In antient documents this annual expedition is called swan-*upping*, and the persons employed are denominated swan-*uppers*. These are still the designations used amongst the initiated, though popularly corrupted into swan-*hopping* and swan-*hoppers*.

The swan-markers proceed to the different parts of the river frequented by the swans for breeding, and other places where the birds are kept. They pay half-a-crown for each young bird to the fishermen who have made nests for the old birds, and two shillings per week to any person who during the winter has taken care of the swans by sheltering them in ponds or otherwise protecting them from the severity of the weather.

Where, as it sometimes happens, the cob bird (male) of one owner mates with a pen bird (female) belonging to another, the brood are divided between the owners of the parent birds, the odd cygnet (except in Buckinghamshire) being allotted to the owner of the cob.

The young or brown birds, being marked with the marks of their respective owners and pinioned, are put into the river, as are also the white or old swans after the completing of the pinioning of such of them as, on account of their weakness, had in their first year been deprived of one joint only of the wing. If any white swans are found by the king's marker in an open and common river or creek, he seizes them, and the crown mark is put upon them. But swans kept in private waters need not be marked. A subject who has white swans not marked in his private waters may retake them upon fresh pursuit, if they escape therefrom into an open and common river; though it is otherwise if they have gained their natural liberty, and are swimming in open rivers without such pursuit.

The king had formerly a swanherd (magister deductus cygnorum, *Rot. Parl.*, 16 R. II.; 4 *Inst.*, 280) not only on the Thames (6 *Rot. Parl.*, 1 H. VII., fo. 359), but in several other parts of the kingdom (*Abb. Rot. Original.*, 266 b; *Cal. Rot. Pat.*, 174 a). We find persons exercising the office of 'master of the king's swans' (sometimes called the swanship) within the counties of Huntingdon, Cambridge, Northampton, and Lincoln (6 *Rot. Parl.*, 360 b), and at the same time the office of 'supervisor and approver' of all swans being within any mere or water in the first three counties (*Ib.*, 360 b).

Antiently the crown had an extensive swannery annexed to the royal palace or manor of Clarendon in Wiltshire. It had also a swannery in the Isle of Purbeck (Hutchins, *Dorset*, vol. i., pp. 24, 171); and by an entry in the council-book of 16th March, 1635, now at the Privy Council Office, it appears that the inhabitants complained that their means of maintaining their families by furnishing the country with swans were lessened by 'common shooters in guns.'

Stealing swans marked and pinioned, or unmarked, if kept in a mote, pond, or private river, and reduced to tameness, is felony. (Hale, *Pleas of the Crown*, 68.) Stealing swans not so marked or so kept, or so pursued, is merely a trespass or misdemeanour. (Dalton's *Justice*, c. 156.)

The law is said to have formerly been, that when a swan is stolen in an open and common river, lawfully marked, 'the same swan (if it may be) or another swan shall be hung in a house by the beak, and he who stole it shall in recompense thereof be obliged to give the owner so much wheat that may cover all the swan by putting and turning the wheat on the head of the swan until the head of the swan be covered with the wheat.' (7 Co., *Rep.*, 18 a.)

Under the 11 Henry VII., c. 17, stealing the eggs of swans out of their nests was punished by imprisonment for a year, and a fine at the king's pleasure. But this enactment was superseded by the 1 Jac. I., c. 27, § 2, which declares that every person taking eggs of swans out of their nests, or wilfully breaking or spoiling them, may upon conviction before two justices be committed to gaol for three months, unless he pay to the churchwardens for the use of the poor 20*s.* for every egg; or, after one month of his commitment, become bound, with two sureties in 20*l.* a-piece, never to offend again in like manner. And see *Calend. Rot. Pat.*, 153 b, 165 b, 166 a, 168 a.

The 2 Henry IV., c. 21, which directs that no lord shall give any livery or sign to any knight, esquire, or yeoman, contains a proviso, that the prince may give his honourable livery of the *Swan* to his lords, and to gentlemen his menials. (3 *Rot. Parl.*, 478 a.)

(See Blomfield's *Norfolk*; Kemp's *Losely MSS.*; *Archæologia*, vol. xvi.; Colonel Hawker.)

SWANEVELT, HERMANN VAN, called the Hermit of Italy, one of the most eminent landscape painters of the Dutch school, was born in 1618 or 1620, at Woerden. It is generally supposed that he was at first a pupil of Gerard Douw; he however went, very young, to Italy, where, having chosen landscape painting as the branch of the art most conformable to his taste, he became a pupil of Claude Lorraine, and soon proved himself worthy of so great a master. He was unremitting in his study of nature, and his retired way of life, which was wholly devoted to his art, caused him to be called 'the hermit,' by which name he was soon generally known. All his works, his paintings, his drawings, and his etchings bear the stamp of a faithful imitation of nature. The scenes which he represents are diversified and picturesque; the perspective, light and shade, the tone of the sky, are admirable, and expressed with a firmness and decision that indicate the hand of a master. It is said that, in company with Claude, he was fond of observing the effect of the first faint tinge of the morning light on the surfaces of objects, and the changes that gradually take place as the sun rises higher in the heavens, and as he progressively declines from his meridian splendour; effects which are delineated with so much truth and beauty in Claude's four splendid pictures of Morning, Noon, Evening, and Night, formerly in the gallery of Hesse-Cassel, whence they were removed by order of Napoleon to Malmaison, and, after the treaty of Paris, not restored to the elector, but sent by the emperor Alexander to St. Petersburg.

Swanevelt's pictures have the sweetness and tenderness of Claude, but they want his warmth, and are less striking in their effect; but his figures both of men and animals are superior to those of Claude. His paintings are excessively rare, as well as his drawings. Dr. Waagen, in his work on the 'Arts in England,' mentions only a single picture by Swanevelt as having been seen by him. This was at Luton House, in the collection of the Marquis of Bute, of which he says, 'It is a large landscape of extraordinary beauty in the composition, very clear in the colouring, and careful in the execution.' His etchings, 116 in number, have never been surpassed in the choice of the subjects, the judicious distribution of light and shade, the pleasing groups of figures with which they are adorned, and the spirit and perfection of the execution. To appreciate their merit, we must have good impressions, which usually have the master's name on them; for the plates have passed through many unskilful hands, and many can scarcely be recognised. His pictures were so much sought for, even in his life, that they were sold at excessively high prices. The time of his death, which took place at Rome, is rather uncertain; some say it was in 1690, others in 1680: the latter date appears to be the more correct.

(Pilkington; Fuseli; *Conversations Lexicon*; Waagen.)

SWANS, a subfamily of web-footed birds, belonging to the family *Anatidæ*, order *Anseres* of Linnæus.

For a general notion of the position of the subfamily *Cygninæ*, genus *Cygnus*, Meyer, the articles DUCKS, FULIGULINÆ, and GOOSE should be consulted.

In the first of these articles [vol. ix., p. 175] will be found the arrangement proposed by Mr. Vigors.

Mr. Swainson makes the genus *Cygnus* the first of his subfamily *Anserinæ*, with the following character:—

Size large. Base of the bill tumid, fleshy, and naked. Neck remarkably long. Feet short. Hinder toe simple. (*Classification of Birds.*)

The Prince of Canino, in his *Birds of Europe and North America*, arranges the *Anseres* as his fifth order of birds. The *Anatidæ* stand as the first order of the *Anseres*, and comprise the subfamilies *Cygninæ*, *Anserinæ*, *Anatinæ*, *Fuligulinæ*, and *Merginæ*. The *Cygninæ* consist of the single genus *Cygnus*, of which the Prince records *Cygnus Olor*, *Cygnus immutabilis*, *Cygnus musicus*, and *Cygnus Bewickii*, as European species, and *Cygnus Americanus* and *Cygnus Buccinator*, as American species. The *Cygninæ* in the Prince's method are immediately followed by the *Anserinæ*.

The *Anatidæ* form the first family of Mr. G. R. Gray's eighth order, PALMIPEDES, Cuv. The *Cygninæ* compose the fifth subfamily of the *Anatidæ*, and are placed between the *Anserinæ* and the *Anatinæ*. The following genera are arranged under the *Cygninæ*: *Cygnus*, Briss. (*Anas*, Linn.); *Olor*, Wagl. (*Anas*, Linn.); *Chenopis*, Wagl. (*Anas*, Lath.); *Microcygna*, G. R. Gray (*Anas*, Gm., *Bernicla*, Steph., *Cheniscus* (Brooke), Eyton, *Anserella*, Sw.?). The subfamily is placed between the *Anserinæ* and the *Anatinæ*. (*List of the Genera of Birds*, 1st edition.) In the second edition of the same useful work, the *Cygninæ* form the fourth subfamily; the third subfamily of the first edition, *Cereopsinæ*, being cancelled, and the genus *Cereopsis* transferred to the subfamily *Anserinæ*.

Only two true swans are recorded by Linnæus, and those as varieties of *Anas Cygnus*, viz. var. *α*, *Cygnus ferus*, and var. *β*, *Cygnus mansuetus*. Since his time the researches of zoologists have added considerably to the catalogue.

The peculiarities of organization in this subfamily deserving of notice are the great length of the neck, consisting of 23 vertebræ, and the cavity in the sternum for the reception of a considerable portion of the trachea.

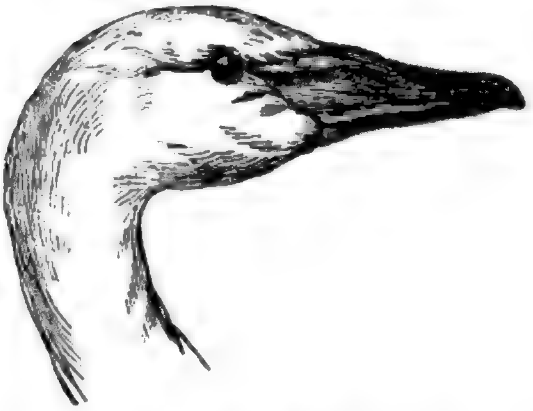
Generic Character of Cygnus.—Beak of equal breadth throughout its length; higher than wide at the base; depressed at the point; both mandibles furnished along the sides with transverse serrated lamellæ. Nostrils oblong, lateral, near the middle of the beak. Neck slender and very long. Legs short, the hind toe small and free. (Yarrell.)

EUROPEAN AND ASIATIC SWANS.

Cygnus ferus, Ray.—*Male.*—Pure white, with occasionally a buff tinge on the top of the head. Bill black and depressed anteriorly, quadrangular at the base and yellow, which tint extends forward along each lateral margin of the upper mandible beyond the aperture of the nostrils, which are black: bare space between the base of that mandible and the eye also yellow, which colours the back part of the lower mandible. Iris brown. Feet black. Length, with neck stretched out, about five feet. Across expanded wings about eight feet.

Female.—Similar to the male, but smaller, and the neck more slender.

Young.—Those that we have seen, when about a week old, have been covered with a grey down above and a whitish down below, with flesh-coloured feet, or rather of a dusky flesh-colour; the bill flesh-coloured, and rather dusky above, anteriorly. Mr. Yarrell states that at ten weeks old the bill is dull flesh-colour, the tip and lateral margins black; the head, neck, and all the upper surface of the body pale ash-brown; the under surface before the legs of a paler brown; the portion behind the legs dull white; the legs, like the bill, of a dusky flesh-colour. This description was taken from young birds in the Garden of the Zoological Society in the middle of August. In the middle of October the same zoologist found the bill black at the end, with a reddish-orange band across the nostrils, and the base and lore pale greenish-white; the general colour pale greyish-brown; a few of the smaller wing coverts white, mixed with others of a pale buffy-brown, and the legs black. He also observes that the young Hoopers bred in 1839 had almost all their brown feathers at the autumnal moult of 1840, and that before their second winter was passed they were entirely white. (*British Birds.*)



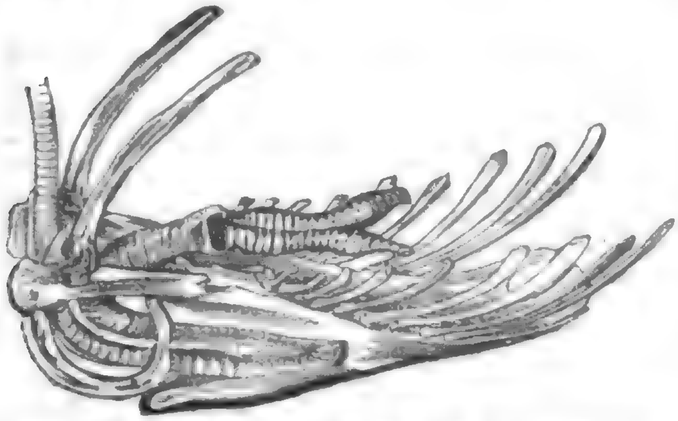
Head of Hooper.

This is the *Cygnus musicus* of Bechstein, and, as there are now more than one wild species well defined, the Prince of Canino and others adopt that specific name, instead of the original *ferus*; but the propriety of this may be doubted. It is the *Cygne Sauvage* of the French; *Cigno* and *Cigno Salvatico* of the Italians; *Singschwan* and *Nordöstliche Singschwan* of the Germans; *Vild Svane* of the Danes; *Hooper*, *Elk*, and *Whistling Swan* of the modern British; and *Alarch gwylt* of the antient British.

Geographical Distribution.—Northern regions of Europe and Asia, residing in summer within the arctic circle, Iceland, Scandinavia. Winter visiter to the British Islands (where however it has been known to breed in the Shetland and Orkney Islands and in Sutherlandshire), Holland, France, Provence, and Italy, and, according to Mr. Bennett, going as far south as Barbary and Egypt. Eastward it extends as far as Japan. This species is in all probability the swan so much celebrated by the antient poets for its dying song.

Habits, &c.—The note of this wild swan resembles the word 'hoop' uttered several times successively. They fly in a wedgelike figure, uttering this note as they proceed, and when heard from above it is not unmusical. The apparatus for producing these sounds was known to Aldrovandi, Sir Thomas Browne, Willughby, Ray, Latham, and others. Mr. Yarrell, who has paid so much attention to the tracheæ of birds, has thus well described it:—

'The cylindrical tube of the trachea or windpipe passes down the whole length of the long neck of the bird, in the usual manner, but descends between the two branches of the forked bone called the merrythought, to a level with the keel of the breast-bone or sternum. The keel of the breast-bone is double, and receives between its two plates or sides the tube of the trachea, which, after traversing nearly the whole length of the keel, turns suddenly upon itself, passing forwards, upwards, and again backwards, till it ends in the vertical bone of divarication from whence the two long branchial tubes go off, one to each lobe of the lungs. The depth of the insertion is not so considerable in females or young males'



Sternum of Hooper with a portion of one side of the keel removed to show the convoluted tube within. (Yarrell.)

The Hooper, like the rest of the Swans, feeds on aquatic plants and insects, can keep the head under water for some time, but never dives. The large nest is constructed on the ground with flags, rushes, leaves, and marshy plants. The eggs, six or seven in number, are whitish tinged with yellowish-green. Length of egg 4 inches, breadth 2¾ inches.

This species breeds in captivity, and may frequently be seen on ornamental pieces of water in a half-domesticated state.

Cygnus Bewickii.—Independent of external characters, the anatomical distinctions pointed out by Mr. Yarrell, who first proposed to separate the species under the name here given, clearly point out the difference between it and the Hooper. 'The principal and most obvious difference,' says Mr. Yarrell, 'is in the trachea. The tube of the windpipe is of equal diameter throughout, and, descending in front of the neck, enters the keel of the sternum, which is hollow, as in the Hooper, traversing the whole length. Having arrived at the end of the keel, the tube, then gradually inclining upwards and outwards, passes into a cavity in the sternum destined to receive it, caused by a separation of the parallel horizontal plates of bone forming the posterior flattened portion of the breast-bone, and producing a convex protuberance on the inner surface. The tube also changing its direction from vertical to horizontal, and reaching within half an inch of the posterior edge, is reflected back, after making a considerable curve, till it once more reaches the keel, again transversing which, in a line immediately over the first portion of the tube, it passes out under the arch of the merrythought; where, turning upwards and afterwards backwards, it enters the body of the bird, to be attached to the lungs in the usual manner. This is the state of development in the oldest bird I have yet met with. The degree next in order, or younger, differs in having the horizontal loop of the trachea confined to one side only of the cavity in the sternum, both sides of which cavity are at this time formed, but the loop of the tube is not yet sufficiently elongated to occupy the whole space; and the third in order, from a still younger bird, possesses only the vertical insertion of the fold of the trachea.' Mr. Yarrell adds however that in this last case the cavity in the posterior part of the sternum already exists to a considerable extent.

Bewick's Swan is much smaller than the Hooper, the whole length being from three feet ten inches to four feet two inches.

'Young birds,' says Mr. Yarrell, 'as they appear here in the plumage of their first winter, are greyish brown. At their second winter, when they have acquired the white plumage, the irides are orange; the head and breast strongly marked with rusty red; base of the beak lemon yellow when older, some continue to exhibit a tinge of rust-colour on the head, after that on the breast has passed off. The adult bird is of a pure unsullied white; the base of the beak orange-yellow; the irides dark; the legs, toes, and membranes black.'

The anterior part of the bill is black, and, in the males, orange-yellow at the base, which is of a lemon-colour in the females.

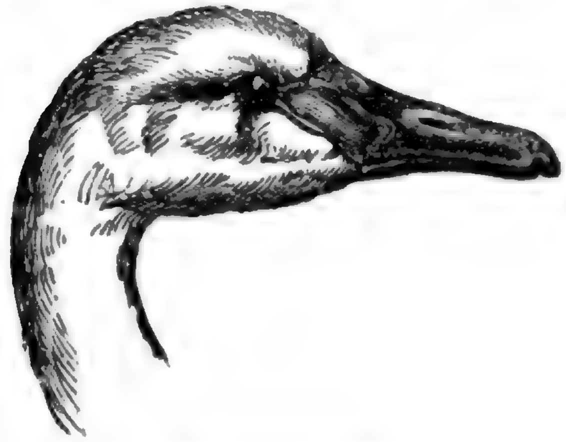
Geographical Distribution.—North of Europe and America certainly, and of Asia probably. It breeds within the Arctic Circle, and in Iceland in May, according to Temminck, who says that it has been found on the maritime coasts of Picardy. It is an occasional visiter to the British Islands, especially in severe winters.

Habits, &c.—The nest, according to Captain Lyon, is constructed of moss-peat, is nearly six feet long, four and three-quarters wide, and two feet high on the outside, with the cavity a foot and a half in diameter. The eggs, six or seven in number, are of a yellowish-brown, according to Temminck; brownish-white slightly clouded with a darker tint, according to Lyon. The call-note of this species is said to be a low-toned whistle, according to Mr. Sinclaire, but this was in confinement. Mr. Blackwall describes their calls in their wild flights as loud, and says that a flock of twenty-nine of them were very clamorous.

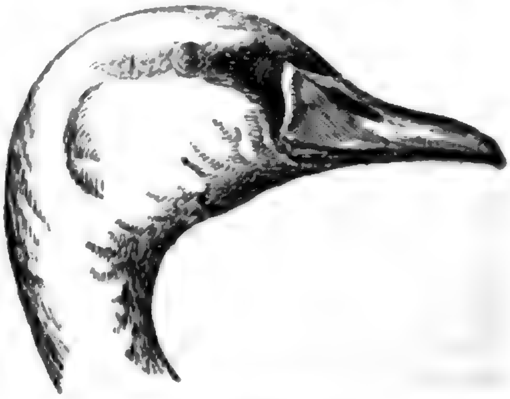
The Polish Swan, *Cygnus immutabilis* of Yarrell, is another wild species, and its cygnets, unlike those of the other white swans, are pure white. It has been kept in captivity Mr. Yarrell states that Lord Derby purchased a pair of these swans and sent them to Knowsley. The female died. The male paired with a Mute Swan, *Cygnus Olor*, and a brood was the result; but the hybrids, though old enough, neither paired among themselves nor with any of the Mute Swans on the same water.

The following is Mr. Yarrell's description of the Polish Swan:—

'In the adult bird the beak is reddish-orange; the nail, lateral margins, nostrils, and base of the upper mandible black; the tubercle, even in an old male, of small size; the irides brown; the head, neck, and the whole of the plumage pure white; legs, toes, and intervening membranes slate-grey. From the point of the beak to the end of the tail, fifty-seven inches. From the carpal joint to the end of the second quill-feather, which is the longest in the wing, twenty-one inches and a half; tarsus four inches; middle toe and nail five inches and three-quarters. Its food and habits



Head of Bewick's Swan.

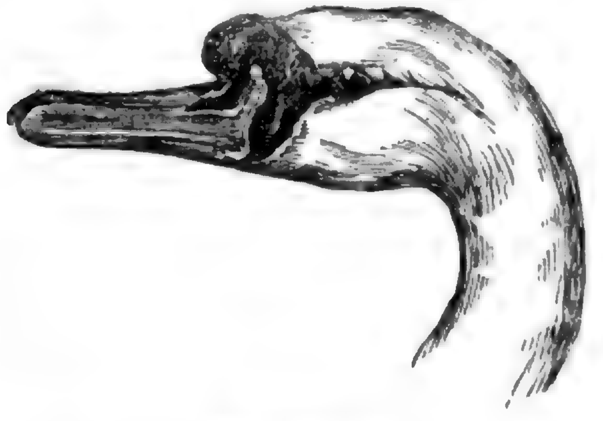


Head of Polish Swan.

closely resemble those of the Mute Swan. The organ of voice appears, from one that I examined, to be like that of the Mute Swan; but Mr. Pelerin has found considerable differences in various parts of the head; the description and measurements were given in a paper published in the 'Magazine of Natural History' for 1839, page 178.'

Mr. Yarrell then extracts Mr. Pelerin's comparative measurements of the crania of adult Mute and Polish Swans, and states that he has verified all his observations.

Cygnus Olor (Genus *Olor*, Wagl.).—Our Mute half-domesticated Swan is too well known to require description. The trachea has none of the complicated structure of that of the Hooper, and is even more simple than that of the Black Swan. The large tubercle, or berry, as the swan-nerds term it, at the base of the bill, at once distinguishes this graceful species from its congeners.

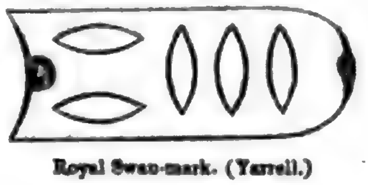


Head of Mute Swan.

It is the *Cygne* of the French; *Cigno* and *Cigno Reale* of the Italians; *Schwan* and *Höcker Schwan* of the Germans; *Tam Svane* of the Danes; *Tame Swan* or *Mute Swan* of the modern British; and *Alarch* of the antient British.

This elegant bird is said to exist in a wild state in Russia and Siberia. The Prince of Canino, in his *Specchio Comparativo*, speaks of it as occurring in the neighbourhood of Rome ('Raro Avventizio d'inverno'); and in his 'Birds of Europe and North America' he gives North-Eastern Europe as the locality. The Polish Swan above noticed should not be forgotten in assigning these northern localities to our Tame Swan, and very probably was not by the skilful ornithologists who have noted these localities. Temminck says, 'Habite en état sauvage les grandes mers de l'interieur, surtout vers les contrées orientales de l'Europe.'

In the Thames, at present, the greatest number of swans belong to the Queen, and the companies of vintners and dyers own the next largest proportion; but the birds are far less numerous than they used to be. The swan-marks are made upon the upper mandible with a knife or other sharp instrument. The swan-hopping or upping, that is, the catching and taking up the swans to mark the cygnets, and renew that on the old birds if obliterated, in the presence of the royal swanherd's man, is still continued by the companies above mentioned. Below is the royal swan-mark used in the three last reigns and the present, from the cut given by Mr. Yarrell, in whose interesting *British Birds* much curious information on this subject, together with no less than sixteen swan-marks, will be found.



Royal Swan-mark. (Yarrell.)

American Swans.

Dr. Richardson (*Fauna Boreali-Americana*) records only two American swans, *Cygni Buccinator* and *Bewickii*. The Prince of Canino, in his 'Specchio Comparativo,' gave one, *Anas Cygnus* (meaning, apparently, the hooper). Nuttall notices three: 1st, the wild or whistling swan, *Cygnus ferus* of Ray; 2nd, the trumpeter swan, *Cygnus Buccinator;* and 3rd, *Cygnus Bewickii*. The Prince, in his 'Birds of Europe and America,' records two species, *Cygnus Americanus*, Sharpl. (*Cygnus musicus*, Bonap.); and *Cygnus Buccinator;* but he does not record *Cygnus Bewickii* as an American species. Nuttall declares that in the winter of 1810 he saw two individuals of *Cygnus ferus* (*C. musicus*, Bechst. and Bonap.) in a state of domestication near St. Louis (Missouri), which were obtained, with several others at the same time, in consequence of the extreme cold. The Prince of Canino evidently considers his *C. musicus*, which he gives as a synonym of *C. Americanus*, a different species from *Cygnus Bewickii*, which last stands opposite to *C. Americanus* in the European column.

We select *Cygnus Buccinator*, which, according to Dr. Richardson, is the most common swan in the fur-countries, and to which the bulk of the swan-skins imported by the Hudson's Bay Company belong.

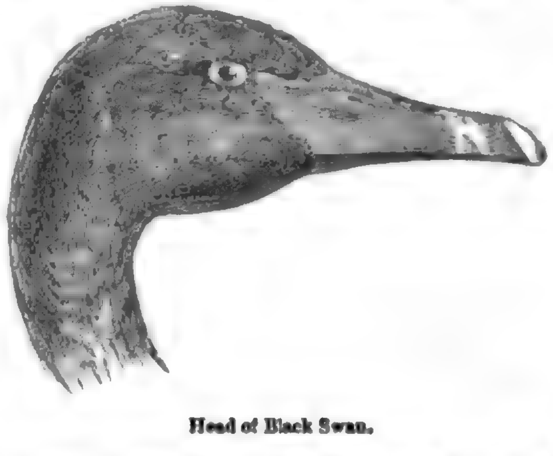
Description of a specimen killed at Hudson's Bay, and now in the Hud. Bay Museum. *Colour* white, the forehead alone tinged with reddish orange. Bill, cere, and legs entirely black. *Form.*—Bill nearly resembling that of *C. ferus* in form, though longer and rather more depressed. Wings: third quill the longest. Tail consisting of twenty-four feathers: a specimen in the Zoological Museum has the crown and cheeks bright chesnut. Total length 70 inches. (Richardson.)

Dr. Richardson remarks that it breeds as far south as 61° lat., but principally within the Arctic Circle, and that in its migrations it generally precedes the geese. He observes that *Cygnus Bewickii* makes its appearance amongst the latest of the migratory birds; while *C. Buccinator* is the earliest, with the exception of the eagles. He states that a fold of its windpipe enters a protuberance on the dorsal or interior aspect of the sternum at its upper part, which is wanting both in *Cygnus ferus* and *C. Bewickii;* in other respects, he adds, the windpipe is distributed through the sternum nearly as in the latter of these species. In the Supplement to Sir Edward Parry's first voyage, *Anas Cygnus, Wild Swan*, with references which leave no doubt that the hooper was meant, is noted as breeding on the North Georgian Islands; but *Cygnus Bewickii* had not then been distinguished.

Australian Swans.

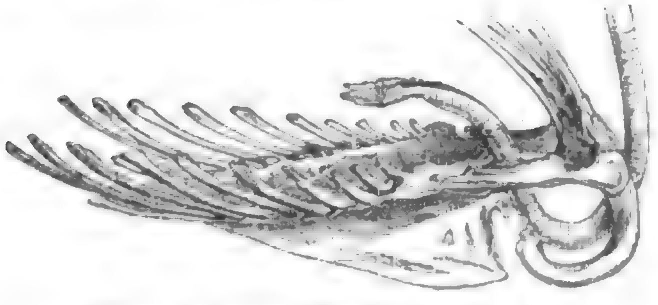
Cygnus atratus (Genus *Chenopis*, Wagl.).—This, the *Anas Plutonia* of Shaw, has now become so common in our menageries, where it breeds freely, as not to justify the occupation of space with more than a cut of its head and of the course of its trachea, which is not unlike that of the mute swan.

Description.—Black, except the primary and a few of the secondary quills, which are white. Bill bright-red above, and, sometimes, with a slight tubercle at the base, which the female wants. The anterior part of the upper mandible is crossed by a whitish band, and the under one is greyish-white. Legs and feet dull ash-colour. Size less than that of the mute swan and hooper. Irides red. Young, when about a fortnight old, covered with dusky-grey down above, lighter beneath; bill, eyes, and feet dusky-black.



Head of Black Swan.

Mr. Yarrell observes that the structure of the trachea is intermediate between that of the hooper and the common mute swan. It 'quits the neck at the bottom, and descends to the centre circular portion of the furcula, to which bone it is firmly bound by a tough membrane: the remaining portion then rises over the front of the breast-bone between the clavicles, and passes backward to the lungs, the last portion of the tube immediately preceding the bone of divarication being flattened horizontally. The form of the trachea in our common swan, in which it follows the neck without deviation, being remembered, and Dr. Latham's figure of the wild swan referred to, it will be observed that the black swan exhibits an interesting link between the two.' (*Linn. Trans.*, vol. xv.)



Sternum and trachea of Black Swan. (Yarrell.)

Geographical Distribution.—Van Diemen's Land, New South Wales, west coast of New Holland.

Habits.—In a state of nature the black swans are generally seen floating on some lake in flocks of eight or nine. When disturbed, they generally fly off in line or single file; and are so shy, that it is difficult to get within gunshot. Their note is far from harsh, at least when uttered in captivity.

SWANSEA, a seaport town of Glamorganshire, 204 miles from London on the mail-coach road through Bristol and Carmarthen to Milford, is situated on the right bank of the river Tawe, which falls into the Bristol Channel at Swansea Bay, close to the town. The harbour, which is left nearly dry at low-water, is formed by a pier springing from the land on each side, leaving an opening for the admission of shipping; and there is also a cross-pier within the harbour. On the western pier there are a lighthouse and watchhouse. Vessels of 300 tons are enabled to load and unload at the wharfs. The communication between the two banks of the river is by a ferry; but it has been proposed to erect either a suspension-bridge or to form a floating harbour with a swing-bridge. On the north-east and north-west the bay is backed by lofty hills, and the beach consists of an extensive level of firm sand. Swansea is the port of a rich mineral district. The principal branches of industry are the smelting of copper-ore and the export of coal. Copper-ore is brought from Cornwall, Devonshire, parts of Wales, Ireland, and from foreign countries. From 1821 to 1827 the quantity of copper-ore sold at Swansea averaged 5557 tons; and from 1828 to 1833 inclusive, 13,589 tons. In the year ending 30th June, 1839, the quantity of ore smelted was 49,337 tons, valued at 597,847*l.*; and the quantity of metal obtained was 7293 tons, or 14¾ per cent. Of the above quantity of ore, 22,238 was foreign, producing 5090 tons, or 23 per cent. of metal. The quantity of coal and culm shipped coastways was 476,265 tons in 1838, 486,792 in 1839, 460,201 tons in 1840, and 450,119 tons in 1841; and more than one-half of the above quantities consisted of stone-coal or anthracite. The annual export of coal to foreign countries averaged 9189 tons from 1828 to 1834, and 27,651 from 1835 to 1841 inclusive. Iron-ore is not at present smelted at Swansea. Besides the works for smelting copper, there are iron-foundries, yards for building and repairing ships, roperies, tanneries, breweries, and two potteries. The number of vessels belonging to Swansea in 1830 was 122, of 7772 tons. In 1841 the number above 50 tons was 86, aggregate tonnage 10,116 tons. In 1840 the gross revenue of customs duties collected at the port was 8934*l.* The traffic with the country is facilitated by several canals and tram-roads. A canal about 17 miles in length runs along the valley of the Tawe into Brecknockshire; another connects the Neath river and canal with Swansea harbour; and a third communicates with collieries on the north-east of the town. On the western side of the harbour there is a tramway, 7½ miles long, which passes along the coast to Oystermouth and the Mumbles, the western headland of the bay. There is a lighthouse at the Mumbles. There are several other tramways connecting the different smelting-works and collieries with the canals and wharfs. The trade of the town has increased very rapidly during the present century, and Swansea is now a thriving place, well-paved, and lighted with gas, and most of the houses are modern and well-built. Commodious lodging-houses have been erected in favourable situations, commanding views of the bay. The number of persons resorting to Swansea for the benefits of sea-bathing is annually increasing. There is a communication by steam-boats with Bristol and Ilfracombe, and the Bristol and Liverpool steam-boats land and take up passengers from Swansea pier. The population of Swansea more than doubled between 1801 and 1831. The parish consists of four divisions: the 'Franchise,' sometimes called the town, which contained 13,256 inhabitants in 1831; Swansea Higher, 678; Swansea Lower, 559; and the hamlet of St. Thomas, which lies east of the harbour, contained 438 inhabitants: making the total population 14,931. The increase of population has been very considerable since 1831.

Before the passing of the Reform Act Swansea was a contributory borough to Cardiff, which, with several other places, returned one member to parliament; but it is now a principal borough, and returns one member in conjunction with Neath, Loughor, Aberavon, and Kenfig, which are its contributory boroughs. The limits of the parliamentary borough were extended by the Reform Act, so as to comprise the hamlet of St. Thomas and a considerable district on each side of the river north of the town of Swansea. The number of registered electors for Swansea, &c. in 1839-40 was 1371. The corporation claims to be a corporation by prescription, but the earliest charter is dated 18 Henry III. They have in their possession the translation of a charter purporting to be granted to the burgesses in 1305 by the lord of the seignory of Gower; and also one of 2nd Henry III., granting the lands of Gower to the wife of John de Mowbray. The duke of Beaufort is the present lord of Gower, and holds courts-leet twice a year.

Before the passing of the Municipal Corporation Reform Act in 1835, the corporation were in possession of an estate of six hundred acres, called the Town Hill, and some land upon the shore of the bay. The corporate body consisted of a portreeve, twelve aldermen, two attorneys, a chamberlain, a recorder, two serjeants-at-mace, and an unlimited number of burgesses. Under the above-mentioned act the town is divided into three wards, and the corporation consists of a mayor, six aldermen, and eighteen councillors. There is a court for the recovery of debts under forty shillings; and the petty sessions for the hundred and the Michaelmas quarter-sessions for the county are held at Swansea. There are fairs in May, July, August, and October, and markets every Wednesday and Saturday.

There are two churches in the parish, and above fifteen chapels belonging to different denominations of dissenters. St. Mary's church is 72 feet by 54, and has a lofty square tower. St. John's is a small edifice, and was formerly a chapel belonging to the Knights of Jerusalem. The living of the former is a vicarage, of the gross annual value of 302*l.*; and the latter is a perpetual curacy, valued at 67*l.* per annum. The principal public buildings are the South Wales Royal Philosophical Institution, the infirmary, the theatre, the house of correction, the union workhouse, the town-hall, and the assembly-rooms. The only remains of the antient castle are a massive square tower, which commands a fine view of the bay. The town-prison and the workhouse occupy a part of the site of the castle, which was founded by an earl of Warwick, who subjected the sons of the prince of Gower. Henry de Gower, bishop of St. David's, founded an hospital at Swansea in 1332. The infirmary and a dispensary are supported by donations and subscriptions. In 1684 Hugh Gore, bishop of Waterford, founded and endowed a free-school, and, with 20*l.* given by the corporation, it has an income of 60*l.* a year. In 1831 an infant-school was established, which was attended in 1833 by 215 boys and girls. In the latter year there were thirty-two daily schools, three of which were chiefly supported by subscriptions; and there were eleven Sunday-schools. In the higher and lower divisions of the parish there were three daily and three Sunday schools. There is a mechanics institute.

SWARTZ, OLOF, a celebrated Swedish botanist, was born in the year 1760, at Norrköping in East Gothland, where his father was a considerable manufacturer. He commenced his studies at Upsal, in 1778, in the year that Linnæus died. Having acquired a taste for botany, he made several excursions in the years 1779-80-81 and 82, through various districts of Sweden, for the purpose of studying their botany, and visited Lapponia, Finland, and Gothland. In 1781 he took his degree as doctor of medicine, having presented a thesis entitled 'Methodus Muscorum Illustrata.' In this work he gave a new arrangement of the mosses, and laid the foundation for a larger work, entitled 'Dispositio

Systematica Muscorum Frondosorum Sueciæ,' which was published at Erlangen in 1799. This work was illustrated with plates and descriptions of many new mosses. In 1783 he made a voyage to the western coast of America, and visited Jamaica and other islands in the West Indies; and, loaded with botanical treasures, he visited England on his return home, in 1788. He remained in this country a year, during which time he was occupied in examining the herbaria of Sir Joseph Banks, Sloane, and other botanists. He returned to his own country in 1789, and was elected a member of the Royal Academy of Sciences of Stockholm in 1790, and was appointed professor of natural history in the Medico-chirurgical Institution at Stockholm. He was also honoured by being made a knight of the order of Vasa and of the Polar Star. In 1788 he published at Stockholm his 'Nova Genera et Species Plantarum;' this work contained a description of the plants which he had collected in the West Indies; most of them had never before been described. This work was succeeded by his 'Observationes Botanicæ,' containing remarks on the structure and affinities of the plants of the West Indies, in 1791. From 1794 to 1800 he published in folio the 'Icones Plantarum Incognitarum,' which contained drawings of the rarer plants which he had discovered in the West Indies. He completed his labours on the botany of this part of the world by the publication of his 'Flora Indiæ Occidentalis' in 1806, which appeared in 3 volumes, illustrated with plates. The above works on West Indian botany were entirely devoted to the phanerogamic or flowering plants; but he did not neglect cryptogamic plants, and in 1806 he published the 'Synopsis Filicum,' which contained a number of new genera and species of ferns. After these publications he turned his attention more particularly to the botany of his own country, and published anonymously at Stockholm, in 1814, a work entitled 'Summa Vegetabilium Scandinaviæ systematicè coordinatorum.' He also contributed the text from the 5th to the 8th volume of the 'Svensk Botanik,' a national work on the botany of Sweden, produced by several authors. In addition to the above works, he contributed a number of papers on botanical subjects to the Transactions of various societies; amongst others, to the 'Philosophical Transactions,' and to the 'Transactions of the Linnæan Society,' of which he was a foreign fellow. He also contributed several papers on zoology to various journals and Transactions. He died in the year 1818.

As a botanist Swartz ranked amongst the first of his day, and was a worthy disciple of the school of Linnæus. His principal labours were directed to descriptive botany, in which he was remarkable for acuteness without prolixity, purity of expression, and freedom from novel technicalities. He has contributed greatly to our knowledge of the vegetable kingdom, having added upwards of 50 genera and 850 species to the list of flowering plants, besides a great number to the class of Cryptogamia. A genus of Leguminous plants has been named after him Swartzia. A volume of his posthumous papers, with notices of his life and labours, by Sprengel and Agardh, was published at Stockholm in 1829, by J. E. Wickström, under the title 'Adnotationes Botanicæ quas reliquit O. Swartz.'

SWA'RTZIA, the name of a genus of plants, given by Willdenow in honour of Olof Swartz, a Swedish botanist. [SWARTZ.] This genus belongs to the great natural order Leguminosæ or Fabaceæ of Jussieu. This order was divided by De Candolle into two groups, Curvembriæ and Rectembriæ: the former with the radicle of the embryo bent back upon the cotyledons; the latter with the radicle straight. The curvembryose group contains two suborders, of one of which, Swartzia, the present genus is the type. The suborder Swartzia is known by possessing a bladdery calyx with indistinct lobes, and hypogynous stamens, and by being either destitute of corolla or having only one or two petals. The other genera in this order are Baphia and Zollernia. The species are natives of South America and the West India Islands.

The genus Swartzia is known by its calyx being divided into 3 or 4 pieces or teeth, which are at first united, but afterwards break up and separate. It has sometimes one petal, which is flat and lateral; sometimes this is entirely wanting. The stamens are 10, 15, or 25 in number, with frequently 2 or 4 of them much larger than the others, and the rest are often connected a little way at the base. The seeds have an arillus, and do not possess albumen. The species are trees, with simple or unequally pinnated leaves, having racemose flowers, which grow from the axils of the leaves.

S. tomentosa, tomentose Swartzia: leaves with 5-7-leaflets; petioles terete, which, as well as the branchlets, are velvety; leaflets oval-oblong, pointed, velvety beneath; stipules nearly orbicular. This species forms a high thick tree, with strong angular branches, and grows on the borders of rivers in Guiana, where it is called *Anacoco* and *Bois pagaie blanc*. It has a fine reddish-coloured wood, which becomes black by age, and is considered very indestructible, and is used for the making of rudders for ships. The bark of this tree is very bitter, and is used as a medicine in its native country. There are about 16 other species of Swartzia. (Don's Miller, vol. ii.)

The genus *Baphia* has a calyptriform calyx which encloses the corolla, and at length bursts altogether. The corolla has a roundish vexillum, linear wings, and an acute carina. Stamens, 10. Legume, falciform. Seeds, 6, lenticular. There is only one species, the *B. nitida*, which grows in Sierra Leone, and yields the cam-wood, or king-wood of commerce. It is brought to this country, and used in considerable quantities as a dye of a red colour: hence the name, from *baphe* (βαφη), a dye.

The genus *Zollernia* is a native of Brazil. It was so named in honour of Frederick William III., late king of Prussia, who was descended from the princes of Hohenzollern.

The soil best suited for the cultivation of these plants is a mixture of sandy loam and peat. Cuttings with their leaves on may be grown under a hand-glass in a pot of sand in the hothouse.

SWEARING, a profane use of the name of the Deity. By the 109th canon, churchwardens are to present those who offend their brethren by swearing, and notorious offenders are not to be admitted to communion until they are reformed. Profane cursing and swearing were first made an offence punishable by law by 20 J. I., c. 21 (continued by 3 Ch. I., c. 4; 16 Ch. I., c. 4; and 6 and 7 W. III., c. 11). The practice however does not seem to have diminished, for, subsequent to these acts, we find Swift saying, 'It is the opinion of our most refined swearers that the same oath or curse cannot, consistently with true politeness, be repeated above nine times in the same company by the same person.' By the 19 G. II., c. 21, it is recited that these vices were become so frequent, that 'unless speedily and effectually punished, they may justly provoke the divine vengeance to increase the many calamities these nations now labour under,' and that the existing laws did not answer the purposes for which they were intended. It then goes on to enact, that if any person shall profanely curse or swear, and be convicted thereof on confession, or on the oath of one witness, before any magistrate, he shall forfeit, if a day-labourer, common soldier, sailor, or seaman, 1*s.*; if any other person under the degree of gentleman, 2*s.*; if of or above the degree of a gentleman, 5*s.*; for every second conviction double, and for every third and subsequent conviction treble. The penalties are to go to the poor of the parish. If the offence is committed in the hearing of the magistrate, he may convict without further proof. Constables who hear the offence committed by an unknown person are forthwith to take him to the next justice. If the person is known, the constable is speedily to inform against him. Parties who do not pay the penalties and costs may be imprisoned and kept to hard labour ten days for the penalties, and six other days for the costs. Magistrates and constables are liable to penalties if they wilfully omit to do their duty under the act. No person can be prosecuted except within eight days after he has committed the offence. By 22 G. II., c. 33, persons belonging to the navy who are guilty of profane oaths or curses are liable to punishment by court-martial.

(Com., *Dig.*, 'Justices of Peace,' b. 23; Burn's *Justice*, 'Swearing.')

SWEAT. [SKIN.]

SWEATING-SICKNESS. Ephemera Sudatoria, Ephemera Maligna, Sudor Anglicus, Hydronosus, are the various names which have been given to a severe epidemic disease that prevailed in this country and in some parts of the Continent at different periods during the latter part of the fifteenth and the beginning of the sixteenth centuries. The invasion of this disease was generally quite sudden, some persons experiencing a sensation as of a hot vapour extending over the body, while others felt as if consumed by an internal fire; there was violent fever, pain in the head and limbs, prostration of strength, hurried breathing, a small frequent pulse, nausea, great thirst, delirium, and excessive restlessness. Shortly after the appearance of these symptoms a profuse clammy fetid perspiration broke out over the whole body; the thirst became more intolerable, and the patients either died in a state of delirium or coma, or recovered as suddenly as they had been first attacked. Such was the rapidity with which this disease ran its course, that its victims were sometimes carried off in three or four hours, or even before the sweating stage had set in; and all danger was considered to be at an end if the patient survived the first twenty-four hours. The profuse sweating which characterised the disease was looked upon as an effort of nature to get rid of some morbific matter from the system, and the early appearance of this stage was therefore regarded as a favourable circumstance. Accordingly, when persons were attacked, it was usual to put them immediately to bed, without even removing their clothes, to enjoin absolute quietude, and to encourage the outbreak of the perspiration by heating the room, covering them well up from the air, and giving them mild cordials. If the sweating stage were tardy in appearing under the influence of these means, friction was had recourse to; and if the patient were at the same time very feeble, drinks of a more stimulating quality were administered, such as undiluted wine, or spirituous infusions of aromatic herbs: fumigations with storax, laurel, or juniper berries were also employed. These remedies were persisted in till the sweating was fully established. After twelve or fifteen hours the coverings of the patient were diminished, the apartment was made cooler, and the air was impregnated with the vapour of vinegar; sleeping was not allowed at this stage of the complaint unless the pulse was strong, it having been observed that those who indulged in this propensity seldom woke again. At the end of twenty-four hours the linen was all changed, nourishing food was gradually administered; and on the second or third day, if the weather was propitious, the patients were allowed to go out. This mode of treatment, which is so different from that pursued in the present day in analogous diseases, does not appear to have been adopted simply with the view of hastening the accession of the sweating stage, but from the experience of the injurious influence of cold in this disease, several fatal cases having been attributed to the mere exposure of the patient's arms to the air while in bed.

The sweating-sickness is said to have made its first appearance in this country in the army of the earl of Richmond, on his landing at Milford Haven in the year 1485. On the 21st of September of the same year it reached London, where it raged till the latter end of October. It reappeared in this country during the summers of 1506, 1517, 1528, and 1551. From 1525 to 1530 it visited Holland, Germany, Denmark, Sweden, Poland, and parts of Russia; and Forestus informs us (lib. vi., obs. 8) that it broke out in Amsterdam on the 27th of September, 1529, where it raged but four days, sparing only old people and children, and attacking above one hundred persons a day. With respect to the mortality of this disease accounts are somewhat vague. Bacon informs us that in the first epidemic the patients recovered if they were attended to in time, but that many died before a remedy was discovered. The epidemic of 1517 appears to have been particularly fatal, frequently destroying its victims in two or three hours, and in some places carrying off one-third, and even one-half of the inhabitants: that of 1528 was also very fatal, but was remarkable for its short duration in each place: Hamburg lost 2000 of its inhabitants, and Copenhagen 400 by this epidemic. The last outbreak of this disease in England happened at Shrewsbury in the year 1551, and was extremely fatal, sparing neither age nor sex: it raged from April to September, becoming milder in character towards its termination.

A remarkable feature of the sweating-sickness, if we are to credit the accounts of those who have written upon it, was its partiality for Englishmen: hence the name of Sudor Anglicus. It is affirmed that foreigners residing in England escaped the infection, while Englishmen who fled abroad for safety were attacked just the same; and in confirmation of this, it is asserted that Calais, which was in the hands of the English during the epidemic of 1517, suffered dreadfully, while all the rest of France, and even Scotland and Ireland, escaped. However true this may be as regards the two first epidemics, it certainly is not so of that which broke out in 1528, and which, we have already seen, visited nearly all the principal places on the Continent. Such is a brief sketch of this singular malady, the origin and causes of which are still involved in considerable mystery. Bacon speaks of it as a terrible and unknown disease, that had its origin neither in the blood nor in the humours; a surprise of nature, rather than obstinate to remedies. Drs. Caius and Mead believed it to be a modification of the plague; and Dr. Mead says that it was imported into this country from France, whither it had been conveyed in 1480, from the island of Rhodes, at that time besieged by the Turks. Caius affirms that the two epidemics of 1517 and 1528 were brought to England from Florence and Naples, at which places the plague was then raging, and that it was the same disease, only modified by climate. Dr. Cullen thought it a variety of typhus; and Dr. Willan suggested that it might have been produced by some disease in the wheat at those periods at which it prevailed, just as the Asiatic or malignant cholera has been attributed to the eating of bad rice. Opinions are not less at variance respecting the antiquity of this disease, and its identity with that which still prevails on some parts of the Continent, to which the term of 'La Suette' has been applied. M. Rayer, without giving a decided opinion on the subject, admits that although there are noteable differences between the two diseases in point of duration and gravity, yet there is an incontestible analogy between them. It is perhaps impossible at this distance of time to decide the question: we shall therefore conclude this article by referring those who may feel an interest in the subject to M. Rayer's *Histoire de l'Epidémie de la Suette-Miliare qui a régné en* 1821, *dans les Départemens de l'Oise et de Seine-et-Oise*, 8vo., Paris, 1822.

SWEDBERG, JESPER, a Swedish prelate and theological writer, was born on the 28th of August, 1653, at Sveden, near Fahlun, the estate of his parents, Daniel Isaacson and Anne Bullernosia, who were members of a respectable family among the miners of Stora Kopparberg. Swedberg took his degree at Upsala in 1682, was appointed chaplain to the Royal Guards in 1684, chaplain to the court in 1685, and was promoted to the living of Vingåker in 1690. He was called to Upsala as professor of theology in 1692, and made primate and provost of the cathedral of that place in 1694. Charles XI. appointed him over the Swedish communities in Pennsylvania (America): and in 1702 Charles XII. created him bishop of Skara in Westrogothia. In 1705 he became doctor of theology at Upsala; and in the same year Charles XII. placed him over the Swedish communities in London. He procured for the city of Skara a privileged press, to which he gave employment by his numerous writings. In 1712 the episcopal palace was destroyed by fire, and the bishop lost his library and many MSS. In 1719 the whole town of Skara was burnt, but the gymnasium and cathedral were rebuilt in five years through his exertions. On the 3rd of May, 1719, his family was ennobled by the name of Swedenborg. In 1730 another fire deprived him of nearly the whole of his property. He was vigorous and active to the end of his life, which terminated on the 26th of July, 1735. He died at the age of eighty-two, and was buried in the convent-church of Varnhem. Bishop Swedberg was three times married: first, to Sarah Behm [SWEDENBORG, EMANUEL]; secondly, to Sarah Berghia; and thirdly, to Christina Urrhusia: he had seven children, four daughters and three sons, of whom the eldest was Emanuel Swedenborg. (Gezelius, *Försök til et Biographiskt Lexicon*, 8vo., Stockholm, 1778-80.)

The bishop's writings are voluminous, and they are not confined to theology, but take in a wide range of subjects. He was one of the earliest writers on Swedish orthography: his book on this subject drew down on him the censure of one Urban Hjaerne, who, in a violent pamphlet that he put forth in the form of dialogue, accused the worthy bishop of πολυπραγμοσύνη (in fact, of being a busybody in literature). A very complete list of Swedberg's extensive works may be seen in the *Catalog. Libr. Impr. Biblioth. Reg. Acad. Upsal.*, 3 tom., 4to., Upsal., 1814.

Many particulars of his history are given in Lagerbring's *Sammandrag af Swea-Rikes Historia*, 8vo., Stockholm, 1778-80; and a good biography of him is prefixed to Dr. Tafel's *Swedenborg's Leben*, Tübingen 1841, pp. 1-43. He left behind him in MS. an Autobiography in 1002 folio sheets; a copy of which he is said to have given to each of his children. The title of this document (which is written in Swedish, and still extant in Sweden) may be translated as follows: 'Manuscript: The Life of Jesper Swedberg, Bishop of Skara, written in detail by himself, in accordance with the truth; in order to remind him of the goodness of God and of his wonderful Providence; and to give to his children and posterity necessary instruction for passing through life happily; whereto may God grant them his grace:' Brunsbo, Nov. 15, 1728. (Warmholtz, *Bibliotheca Sueo-Gothica*, 8vo., Upsal, 1782, et seqq.)

'This Jesper Swedberg,' says the Rev. Nicholas Collin, rector of the Swedish church in Philadelphia, 'was well qualified for one of the principal bishoprics in Sweden. His plain manner of living enforced his zealous remonstrances against pomp and luxury, which if not very common, yet were the more pernicious in that distressful period, when Sweden had lost her veteran armies, and depended in a great measure on lads and old men for opposing the combined forces of Russia, Poland, and Denmark; and was moreover consuming by famine and pestilence. The bishop's influence animated that patriotic fortitude which sustained such burdens and misery, and blazed in so many battles! His popularity gave particular energy to some public regulations, which lessened the havoc of pestilence. a judicious and pathetic address to the people convinced them that interring in new grounds was a necessary measure, though a temporary sacrifice of their laudable attachment to the consecrated ground in which the earthly remains of their beloved relatives reposed. The bishop was for many years superintendent of the Swedish mission about Delaware. His letters to the clergy and to the congregations, which are preserved in its records, bear witness to his zeal, kindness, and love of science. He requested of the missionaries to inform him of any extraordinary events in the moral and physical world which happened in these parts of America.'

SWEDEN, a country in Europe, which occupies the eastern and larger portion of the Scandinavian peninsula, and is situated between 55° 20′ and 69° N. lat., and between 11° and 27° E. long. About one-sixth of the country lies within the Polar Circle. On the east of Sweden, from its southern extremity to 66° N. lat., extends the Baltic and the Gulf of Bothnia, which divide it from Russia. A little south of 66° the two countries are contiguous, and continue so to the most northern point of Sweden, and in this part the boundary runs up along the Tornea Elf to its confluence with the river Muonio, which takes place near 67° 10′ N. lat. Farther north the course of the Muonio constitutes the boundary as far as the confluence of its two upper branches, the Lätäs Eno and the Köngämä, from which point it follows the course of the last-mentioned river to its source in the small lake of Koltejaur, which is on the boundary of Norway. On the west of Sweden is Norway. The boundary between these two countries runs along the range of the Kiolen Mountains, and as far south as 65° it follows the watershed, though not the most elevated part of the range. In these parts the watershed, and consequently the boundary, runs in a very irregular line. Between 65° and 64° N. lat. Norway extends to the east of the watershed; and some branches of the Angerman Elfven and Indals Elfven, which fall into the Gulf of Bothnia, rise within Norway. South of 64° N. lat. the boundary returns to the watershed, and follows it to Mount Sylfyellën (63° N. lat.), whence it runs nearly in a straight line southward along a high ridge to Mount Heryehogna (61° 42′ N. lat.). From this mountain it continues in a general southern direction, but in a more irregular line, which is not marked by any natural feature, to its southern extremity a little south of 59° N. lat., when it turns west, and soon reaches a very long and narrow lake called Bullaren, which extends northward, and is connected with the Cattegat by a sound called Swinesund. The boundary lies along the lake and sound. The Skagerack washes the western coast of Sweden between 59° and 58°, and the Cattegat between 58° and 56°. North of 56° the strait called Oresund, or simply the Sound, begins, which extends to the most southern extremity of Sweden, and separates it from the Danish island of Zealand. South of Sweden is the western part of the Baltic, which separates it from Germany. [BALTIC, vol. iii., p. 347.]

The length of this country from south to north is somewhat more than 900 miles: its width between 58° and 68° N. lat. varies from 150 to 200 miles; but south of 58° and north of 68° it is not so wide. Its area, according to the estimate of Forsell, is 3868 Swedish square miles, equal to about 170,000 English square miles: it consequently covers a surface larger than that of the British Islands by 58,000 square miles, or by more than half their area, and falls short of the area of France only by about 34,000 square miles.

Coast.—The coast of Sweden is somewhat more than 1400 miles, exclusive of the deep inlets. The coast along the Skagerack, Cattegat, and Sound is near 300 miles: the remainder is washed by the Baltic. Along the most northern part of the Gulf of Bothnia, or that which is called by the Swedes Botten Viken [BOTHNIA, GULF], the coast is low, and consists of sandy alluvial matter brought down by the numerous rivers which fall into this part of the Baltic. The islands which line this coast in all its extent are of the same character. The coast begins to rise as it approaches the Quarken, or strait which connects the Botten Viken with the Botten Hafvet or Sea of Bothnia, and the islands which lie across the strait are rocky. South of the Quarken, as far as the town of Gefle (near 60° 40′ N. lat.), the coast presents an alternation of low and moderately elevated shores, in some places rocky, but in others sandy and composed of alluvium. The islands which line this tract of coast are less numerous than farther north, but larger, and they resemble the neighbouring coast, many of them being low and sandy, while others are undulating, and contain low rocky hills. A few of the larger islands, especially in the vicinity of the Angerman Elfven, are partly rocky and partly composed of alluvium. The semicircular projection of the Swedish coast between Gefle on the north (60° 40′ N. lat.), and the Bråviken near Norrköping on the south (58° 35′ N. lat.), has a rocky shore, indented by numerous inlets, which are generally small, with the exception of that which unites Lake Mälaren with the sea. In consequence of these inlets, this coast consists of a succession of small peninsulas. Though extremely rocky, the coast in general is of moderate elevation: in a few places it may rise to 100 feet. The islands, which are very numerous along the whole coast, but especially to the south of Alands Haf (the Sea of Aland), consist all of rocks, but the greater part of them are only a few feet above the sea. These rocky islands and islets are called *skars*, and many of them are surrounded by sand-banks. South of the small bay called Bråviken, as far as the parallel of the northern extremity of the island of Oland (57° 22′ N. lat.), the coast is partly rocky and somewhat elevated, and partly low and sandy. It is likewise intersected by many inlets, all of which run from east-south-east to west-north-west, so as to give to this part of the coast nearly the appearance of a saw. The rocky islands and cliffs which line it are still more numerous than farther north, and render the access to it very difficult. The west coast of the Strait of Calmar, which divides the island of Oland from the mainland of Sweden, runs in a less broken line, though there are a few indentations in its northern part, but these inlets are short. The shores are generally low. The islands in this strait are comparatively few; and south of Calmar they disappear almost entirely. The Strait of Calmar terminates on the south with Cape Tornhamnsudde or Torrumudde, a low rocky point east of Carlscrona, at which the coast, which up to this point extended nearly due north and south, suddenly turns to the west. This is the most broken rocky and elevated part of the coast of Sweden, and it extends to a few miles west of Carlshamn. Nearly the whole of this coast consists of rocks, sometimes rising 50 feet high with a steep ascent: but between the projecting masses, and especially at the mouths of the small rivers, it sinks nearly to the level of the sea; and such places generally form good harbours and anchorages, being protected from the wind and sea by the numerous islands which line the coast. The largest of these islands are at a short distance from Cape Torrumudde, and form the harbour of Carlscrona. [CARLSCRONA.] The rocky elevated coast terminates at the peninsula of Sölvetsborg; the shores of the peninsula of Scania, which forms the most southern part of Sweden, being low, sandy, and free from islands and rocks, but in a few places lined with sand-banks. Cape Kullen, which forms the northern entrance of the Sound on the east, is of moderate elevation, but north of it the coast sinks down nearly to the level of the sea, and continues so to Warberg, up to which place no islands or rocks occur. The coast rises a little north of Warberg, and the rocky islands reappear and increase in number as we proceed northwards: the coast also gradually rises higher, though the elevation never exceeds 30 feet. The coast is very rocky, and intersected by several large inlets, especially north of Götheborg, where the arms of the sea run up to Uddevalla, and separate from the mainland two large islands, Työrn and Orust, which are rather hilly. The other islands are only rocky cliffs of small extent and moderate elevation; and as we approach the boundary of Norway several of them consist of sand and other alluvial matter.

General Description of the Surface.—In that part of Sweden which lies north of 62° N. lat., the country rises continually from the Gulf of Bothnia to the boundary of Norway. South of that parallel the slopes extend in a different direction. Between 62° and 59° the country slopes to the south, and attains its lowest level at the place where the three great lakes of Wenern, Hielmarn, and Mälaren nearly intersect the country: south of these lakes the country rises again, and from 58° to 57° 10′ it constitutes an elevated table-land bounded by slopes. This table-land is connected with the mountain-region north of 62° by a low narrow ridge, which runs nearly due north of it between 14° and 15° E. long. as far north as 60° N. lat., and afterwards declines to the north-west. This ridge constitutes the watershed between 58° and 62°.

The most elevated part of Sweden lies along the boundary-line of Norway, and is called the Kiölen Mountains, which range extends as far south as 64° N. lat. The mountainous country continues farther south to 61° N. lat., but this southern portion is a part of what is called Norska Fiellen, or the mountains of Norway. A more detailed description of both ranges is given under NORSKA FIELLEN, vol. xvi., p. 283.

1. The *Northern* part of the mountain-region of Sweden, or that which extends from the banks of the rivers Muonio and Tornea to 64° N. lat., has a great uniformity of surface. The western districts, being occupied by the most elevated portion of the Kiölen range, contains very high mountains, and a considerable tract surrounding Mount Sulitelma is always covered with snow. Forsell calculates that about 720 square miles of the area of Sweden are covered with perpetual snow and ice. Probably 600 of these 720 square miles lie within this region, in the vicinity of the Sulitelma, and of the summits which stand south and north of that mountain. The lowest parts of the highest portion of the range are probably 4000 feet above the sea-level. From these parts the country slopes towards the Gulf of Bothnia; but the descent is not regular, being more rapid near the range, and more gentle towards the sea. The whole distance between the crest of the range and the gulf is rather more than 200 miles. About 40 miles from the crest the whole region has descended to about 2000 feet. In this highest region all the mountains rise above the level on which trees grow, and it is only in the valleys enclosed by them that some diminutive firs and pines are found. The greater part of these valleys are filled with lakes or swamps. This region is not quite uninhabited, but only a few poor families subsist here on the fish (*Salmo alpinus*) which they take in the lakes, and on their cattle. Below this mountain-region extends the elevated region, in which the country descends from the general level of 2000 feet to that of 800 feet above the sea-level. The width of this tract is about 60 miles, being equal to once and a half the breadth of the mountain-region. The numerous ridges which branch off from the principal range of the Kiölen Mountains within the mountain-region at right angles traverse the whole width of this tract, and their summits are generally above the line of vegetation, or at least of trees, being 3000 feet high; but the mountains occupy a much smaller surface, and the valleys are several miles wide in many places, but nearly all of them are occupied either entirely or principally by alpine lakes. These lakes are frequently of great extent, 30 or 40 miles long, and from 3 to 5 miles wide. One of them, the Horn Afvan, from which the Skelleftea Elf issues, occupies the whole width of this tract, and is more than 60 miles long, and in some places 10 wide. The greater part of the low ground in the valleys is always under water, and the remainder is inundated twice in the year; in the beginning of June, when the snow on the lower mountains melts, and at the end of July, when the long days produce the same effect on the higher part of the range, and consequently no part of this tract is cultivable. These inundations, especially those in July, are exceedingly favourable to the growth of grass, and the inhabitants are thus enabled to maintain a great number of cattle. they also take a great quantity of fish in the lakes, as the Salmo alpinus, the Salmo thymaleus, and the Salmo lavaretus. This higher tract contains some good forests, but their situation, and still more the rapidity of the rivers, which do not admit either navigation or the floating of wood, render them quite useless, except as fire-wood for the use of the inhabitants. Nearer the sea is the lower region, the general level of which sinks from 800 to 300 feet. It is wider than the elevated region, measuring from east to west about 70 miles. The ridges which traverse the whole breadth of the elevated region extend to this region, and may even be said to cross it; but they sink into hills, being, with few exceptions, hardly more than 500 feet above the general level. They are generally wooded to their summits. These hills are not usually steep, and there are small level tracts between them which are dry; but only a small surface is cultivated, owing to the severity of the climate and the poverty of the soil. Potatoes and cabbages, and a little barley and rye, are grown. The inhabitants live mainly on the produce of their cattle. The lakes in this tract are few, and most of them hardly larger than ponds. The fir and pine cover the greater part of the country, and pitch and tar are made from them. The best portion of this lower tract is in the northern districts, where there is a large plain on both sides of the Calix Elf, which extends eastward to the banks of the Tornea Elf. This plain has rich pastures. Between this lower tract and the Gulf of Bothnia extends the lowest region, the average width of which is about 30 miles; and its general level descends gradually from about 300 feet to the low shores of the gulf. The hills which cross the lower region cease as we approach this tract, and enter it only in a few places, except south of the Skelleftea Elf, where the country is hilly nearly to the shores of the sea. The surface of the remainder of this tract rises and falls in gentle slopes, with extensive flats between them. The fertility of the soil is never above mediocrity, with the exception of the plain between the Tornea and Lulea Elf, which produces fine grass. That portion which lies between the Lulea Elf and the Skelleftea Elf is sterile. The tract south of the Skelleftea Elf is much better cultivated, but the fertile ground occupies a very small portion even of this tract: a little rye and oats, and a somewhat greater quantity of barley, are grown. The cultivation of potatoes has lately increased. The tracts used as pasture-ground and meadows are more extensive. Tar is made from the pine-trees. Forsell gives the following account of the Läns of Pitea and Umea, which comprehend nearly the whole of this region. The whole contains an area of 62,496 square miles, being about 4000 square miles larger than England, including Wales, and about 1000 square miles larger than the state of Georgia in North America. Of this area about one-fifth, or, more exactly, 12,499 square miles, are within the range of the Kiölen Mountains; about three-tenths, or 19,109 square miles, are in the elevated region; about seven-twentieth parts, or 21,333 square miles, are in the lower region; and only three-twentieth parts, or 9555 square miles, in the more level country on the shores of the gulf. The surface of the lakes and swamps occupies about one-tenth, or 6250 square miles.—All the cultivated tracts do not exceed 66 square miles, or about one-third of the smallest county in England, Rutlandshire. The meadows occupy about 390 square miles, and all the remainder is either covered with forests or a useless waste. More particulars of this region are given under BOTHNIA.

2. The *Central* portion of the mountain-region, or that which lies between 64° and 62° N. lat., though in some respects it resembles the northern portion, is distinguished by some peculiar features. The average width of Sweden in this part does not exceed 170 miles. The highest part of this region, situated within the Kiölen Mountains, is much narrower, and never exceeds 30 miles in breadth, being usually 20 miles wide, and in some parts even less. Only a few summits are always covered with snow, among which the most elevated is the Sylfiallen, or Sylfiellen, which is 5860 feet above the sea-level. The rivers which originate in this region run only in ravines, and the whole tract is entirely uninhabited, and only visited in summer by a few Laplanders, who find pasture for their reindeer on the declivities of the Sylfiellen and the adjacent mountains. The country adjacent to this mountainous tract forms a kind of table-land, extending about 80 miles in every direction. In the lowest part of this table-land there is the Great Lake, or Storsiön, whose surface is 978 feet above the sea-level; it is 40 miles long from north to south, and in some parts

12 miles wide. The river which issues from the north-east side of the lake is the principal feeder of the Indals Elf. [Angermanland, vol. ii., p. 18.] This table-land forms a basin, being enclosed by higher land, which is not much more elevated on the east, but rises to a considerable height on the north and south. On the south the table-land is divided by a continuous range of very high ground from the upper valley of the river Ljungan. From the Kiölen range, west of the basin, a branch advances into the basin for a few miles, and then terminates abruptly with the high summit of Mount Areskutan, which is 4716 feet above the sea-level: its declivities afford pasture to the reindeer in summer. The surface of the table-land, which may be called the table-land of Jemtland (Yemtland), may be considered as somewhat more than 1000 feet above the sea. It is very much broken, and interspersed with steep rocks and swamps. Besides the Great Lake there are ten or twelve others, each of them from 10 to 15 miles long, and more than a mile wide. In spite of the great elevation of the country, agriculture is carried on to some extent. Wheat does not succeed, but barley and rye and oats are grown. Several kinds of vegetables, especially potatoes and peas, grow very well. The soil however is stony, and far from being fertile; and towards the end of August the crops are sometimes destroyed by frost. At that season, when a north wind blows with a clear sky, the inhabitants light fires on the north side of their fields, to protect their crops against the destructive effects of the wind, which always brings frost. The pastures being extensive, and many tracts covered with fine grass, the domestic animals are rather numerous, especially cattle, sheep, and goats: there is also a due proportion of horses and hogs. South of the table-land of Jemtland are the upper valleys of the river Ljungan and Ljusnan: that of the latter is called the valley of Herjedalen (Heryedalen), and formed a separate province in the antient division of the country. These two valleys are of considerable width, and though interspersed with hills, they contain level tracts which are cultivated. But these valleys are tracts much more elevated than the table-land, that of Herjedalen being 1200 feet above the sea, in the eastern districts, and rising to above 1800 feet. Near the Kiölen range the crops very frequently fail, and the inhabitants are obliged to mix the inner bark of the pine-tree with their bread. This is also sometimes done on the table-land, but not so frequently as in these valleys, which are the most elevated part of Sweden in which agriculture is carried on.

From the high ground which forms the eastern border of the table-land of Jemtland, and which may be about 1200 feet above the sea-level, the country descends in a regular slope towards the sea, and at the distance of about 30 miles from it, sinks to 300 feet. There are no considerable hills on this slope, but the rivers which cross it run in narrow valleys considerably depressed below the general level, in which they frequently expand in long narrow lakes, and usually form rapids and cataracts. In this tract agriculture is very limited, for the valleys alone can be cultivated; but the higher grounds contain good pasture and support cattle of various kinds. The remainder of the region, extending about 40 miles west and east, and reaching to the shore of the Gulf of Bothnia, is almost entirely occupied with isolated hills or short ranges; they have generally steep declivities, and some of them rise nearly 1000 feet above the sea. Between them are valleys or level grounds of small extent, which are in some places more than a hundred feet deep, and the lowest part of which is occupied by a winding river, or by a small lake, on the banks of which there are meadows alternating with woods. The slopes of the hills, and generally their summits also, are clothed with trees. This tract contains a much larger portion of cultivated ground than any of those which have been described. Wheat however does not succeed, except in a few sheltered places. Barley is very extensively cultivated, but rye and oats are very little. Potatoes and peas are grown to some extent. But the rearing of domestic animals constitutes the principal occupation of the inhabitants. The number of black cattle and sheep is proportionally great, and that of goats considerable, but horses and hogs are few in number. As a great part of this tract is covered with trees, many of which are fine timber, and as they are at no great distance from the sea, a considerable quantity of timber is exported: a little tar is also made.

According to Forsell, this central portion of the mountain-region covers 28,169 square miles, and is nearly equal to half the area of England without Wales. The mountain-tract within the Kiölen range is calculated to occupy 4687 square miles; and the table-land of Jemtland, with the adjacent ridges and valleys, covers very nearly half the region, or 14,825 square miles. The tract intervening between this table-land and the hilly tract along the coast contains less than one-sixth of its surface, or 4209 square miles, and the hilly tract itself somewhat more than one-sixth, or 4972 square miles. A little more than 85 square miles are under cultivation, and 454 square miles are meadows and good pasture-grounds.

3. The *Southern* part of the mountain-region lies south of 62° N. lat. Its southern boundary would be tolerably well marked by a line drawn from the great bend of the river Glommen in Norway at Kongsvinger, in a north-east direction to the most southern bay of Lake Siljan (Silyan), near 60° 45′ N. lat., and hence continued to the town of Söderhamn, on the Gulf of Bothnia. Near the boundary-line of Norway this southern part extends rather more than 110 miles from north to south, but in proceeding east it grows gradually narrower, until, on reaching the shores of the gulf, it does not much exceed 50 miles. From west to east it extends nearly 140 miles. The area of this region is about 13,222 square miles, or somewhat more than double that of Yorkshire. That part of this region which may properly be called mountainous is not extensive. It does not constitute a part of the Kiölen range, but must rather be considered as an appendage of the Norrska Fiellen. From Mount Sylfiellen, which stands near the eastern termination of that extensive mountain-system, numerous ridges issue in all directions, so that this mountain properly constitutes a mountain-knot. To the east run three ridges enclosing the upper valleys of the rivers Ljungan and Ljusnan, and towards the south those which divide the branches of the Dal river, the Oster and Wester Dal Elfven, from each other, and the latter from the Klar Elfven, whilst the most western ridge separates the Klar Elfven from the Glommen Elf. These three last-mentioned ridges are of considerable width, and lie close to one another, having between them only narrow and high valleys, and accordingly they constitute a mountain-region of considerable extent, which projects from the Norrska Fiellen between the mining town of Roraas and Mount Sylfiellen southward, and divides the lower country of Osterdalen on the Glommen in Norway from that which extends over the middle districts of Dalecarlia, or Dalarne. The width of this mountain-region from east to west is about 70 miles, and its length from Mount Sylfiellen (63° N. lat.) to near 61° N. lat., about 100 miles. The most elevated part of this region surrounds Lake Fämund in Norway, where several summits attain the snow-line, as the Tronfiellet (5619 feet), the Sölenfiellet (5842 feet), and some others. The general level of this region, as far south as 61° 30′, is 2000 feet above the sea; but south of that line it lowers rapidly, so that at its southern extremity, near 61° N. lat., it has sunk to nearly 800 feet above the sea-level. The narrow valleys of this tract are too elevated to be cultivated, and are only inhabited by a few families who cut the wood in the fine pine-forests, with which the lower parts of the mountains are clothed. About one-half of this mountain-region belongs to Norway.

That elevated ridge which separates the valley of the Wester Dalelfven from that of the Klarelfven, preserves a considerable elevation south of 61° N. lat., running south-south-east until it has passed 60° N. lat., when it turns to the south. Near the mountain-region its general elevation is more than 1500 feet above the sea; but south of 60° 30 N. lat. it is hardly more than 1000 feet. It sinks still lower south of that line, where, running from north to south, it forms the watershed between the rivers that fall into Lake Wenern on the west, and those running to Lake Mälaren to the east, and farther south separates the basins of the lakes Wenern and Wettern. In these parts it is called the Tifveden range, and it attains only a height of from 500 to 700 feet above the sea-level, and from 300 to 400 feet above its base. It seldom exceeds three or four miles in width.

The country to the east of this ridge and of the mountain-system of Mount Sylfiellen, and north of a straight line drawn from Söderhamn on the Gulf of Bothnia through the most southern bay of Lake Siljan, until it meets the ridge of the Tifveden Mountains, resembles in its great features the countries which lie farther north, consisting of a higher, lower, and lowest tract. The higher tract, whose general level is more than 800 feet above the sea, is the most extensive: it stretches from the mountains to the western extremity of Lake Siljan, a distance of about 40 miles. North of that lake it extends much farther to the east, and here it occupies from west to east about 80 miles, leaving between it and the sea a space not quite 40 miles wide. The surface is less broken than that of the regions farther north, consisting chiefly of long and gentle swells, the summits of which form levels of considerable extent. A few hills are dispersed over these summits, but their sides are not steep, and they do not rise more than 300 or 400 feet above their base. These hills are numerous in the vicinity of the mountains, especially on the west of Lake Siljan, but they become rarer in the country farther east. Agriculture is limited to a few valleys of moderate extent, and to the low grounds surrounding the lakes, where rye, barley, and especially oats, are cultivated, and some vegetables are grown. Domestic animals are reared, chiefly cattle, sheep, and goats. The goats are more numerous here than in any other district of Sweden. Nearly the whole tract is covered with forests, the produce of which finds a ready sale in the adjacent Region of the Mines.

Lake Siljan, which is situated near the southern border of this tract, is of considerable extent: its length from north-west to south-east exceeds 25 miles, and for nearly 15 miles it is six miles wide: its surface is 555 feet above the sea-level. On the west and south it is surrounded by very low hills, alternating with level plains. On the south and east the hills are much higher, but the declivities are usually gentle, and enclose narrow fertile valleys. In the district surrounding this beautiful lake agriculture is conducted on a larger scale than in the country to the east and north of it.

The eastern portion of this region, extending from the Gulf of Bothnia about 40 miles inland, is an inclined plain, which gradually rises from the sea to an elevation of 800 feet. The ascent is somewhat more rapid in its western part, and the whole may be divided into two equal sections running parallel to the sea, of which that on the shore rises in the space of 20 miles from the level of the sea to 300 feet, and farther inland in an equal distance from 300 to 800 feet. The surface of this tract is interspersed with numerous hills of moderate elevation and with lakes. Most of the hills have gentle declivities, but a few of them are steep. A plain of considerable width extends along the shores from 61° 40′ N. lat. to the mouth of the Dalelfven (60° 40′): this is the most northern part of Sweden in which wheat is grown. Barley and potatoes are most extensively cultivated; rye, oats, and peas are also grown. Sheep and cattle are very numerous, and there are also other domestic animals. The soil of this region is better than it is farther north, containing a greater proportion of clay mixed with the gravel and sand.

According to a rough estimate founded on data taken from Forsell, the area of this region is thus divided:—The mountain-system of Mount Sylfiellen, as far as it belongs to Sweden, comprehends 1220 square miles; and the extensive region, which is more than 800 feet above the sea-level, comprehends 6137 square miles. A tract of land west of the Tifveden range, at the base of the Sylfiellen mountains, is lower than 800 feet, and occupies about 870 square miles. The country surrounding Lake Siljan, which is on an average 600 feet above the sea, contains 1221 square miles. The lower region along the Gulf of Bothnia has an area of 3776 square miles, and is equally distributed between that tract which is more than 300 feet high and between that which sinks lower. The cultivated ground probably does not exceed 100 square miles, but the meadows and rich pasture-grounds occupy more than four times that extent.

4. South of the region just described extends the *Region of the Mines*. It occupies the whole bread thof Sweden, extending from the boundary of Norway to the Gulf of Bothnia from south-west to north-east. Its northern boundary is a straight line drawn from the great bend of the Glommen at Kongsvinger, through Lake Siljan to Söderhamn. Its southern boundary runs west of Lake Wenern, along 59° N. lat.; east of that lake it begins at 59° N. lat., whence it runs east-north-east to the town of Orebro, at the western extremity of Lake Hielmaren, and thence north-east to the most southern bend of the Dalelfven, which river forms the boundary from that place to its mouth. The area is 16,000 square miles, or twice that of Wales. The Tifveden ridge crosses it nearly in the middle; and its elevation in these parts probably never falls below 1000 feet above the sea. This is the greatest elevation of the region, whose slope on the west of the range is directed towards the south, and terminates on the banks of Lake Wenern. Two-thirds of this slope are less than 300 feet above the sea. The country lying east of the Tifveden ridge slopes to the south in the southern and to the east in the northern districts. Its elevation above the sea is never less than 300 feet, except on the level plain along the Gulf of Bothnia from Söderhamn to the mouth of the Dalelfven. On the west side of the great southern bend of the last-mentioned river, and only a few miles from it, is a tract of considerable extent, which rises from 800 to 1000 feet above the sea. The surface of this region is exceedingly uneven, and it is covered with a succession of low unconnected hills, the slopes of which are very gentle, and generally covered with wood. The low grounds between the hills are of small extent, and the lowest part is generally occupied by a small lake or by a marshy tract. These small lakes and marshes are almost countless. Some of these lakes however are several miles in length. In the country west of the Tifveden ridge the lakes lie from north to south. The largest among them are, from west to east, the lakes Legen, Lelanf, Glas, Wermelen, Mellan, and Ofre, each of which is above 20 miles long, but they seldom exceed two miles in width. The lakes to the east of the Tifveden ridge have a more irregular form, and are not so large. South of the Delelfven are the lakes Wesman, Barken, and Amänningen, and north of it Runn and Storsiön: the last-mentioned lake is in the low country west of Gefle. Though the soil of this region consists chiefly of gravel and sand with a mixture of clay, nearly every spot that is of any value is carefully cultivated, as there is a ready market for the produce among the miners, whose number is proportionally very great, the greatest number of the iron-mines of Sweden and the richest being situated within this region. But only few spots admit of cultivation; and most of them are on the banks of the lakes, and they are of small extent. Oats are most extensively cultivated, and next to them rye; barley and wheat are little cultivated. Potatoes and peas are grown to a considerable extent. In a few places there are good pastures; and cattle, sheep, horses, and hogs are numerous in the southern districts. Though the soil is inferior to that of many districts farther north, a larger portion of it is under cultivation than in the more northern provinces. The arable lands occupy about 400 square miles, or one-fortieth part of the area. But the meadows, or enclosed pasture-grounds, hardly extend over more than 800 square miles. Thus only three-fortieth parts of the surface produce food for man: the remainder is covered with trees, few of which produce timber, but they are valuable for the working of mines.

5. To the south-east of the Region of the Mines is the *Central Agricultural Region*, which comprehends the greatest extent of low country in Sweden. No part of this tract exceeds 300 feet above the sea-level. Its southern boundary is a higher tract, which is connected with the Tifveden ridge, north-west of the northern extremity of lake Wettern, and extending from the ridge eastward, terminates on the north shores of the bay called Bräviken, on the shores of the Baltic. The area of this region is about 10,353 square miles, which exceeds that of Wales by a little more than 2000 square miles. The population is about half a million, and consequently there are 48 individuals to each square mile, while in Wales there are 112, according to the census of 1841. That portion of the region which is north of lake Mälaren is nearly a level plain, interspersed with a few isolated and low hills, which occur at great distances from one another, and are more numerous in the northern than in the southern districts. In the southern districts there are some sandy hills, which run from east to west, and extend several miles. The country south of the lakes Mälaren and Hielmaren is more undulating, and in some places it is broken and interspersed with rocks. In these districts there are numerous lakes, which are not common in the country north of the lakes. Though the substratum of this region is rocky, the surface consists of sand, with which a considerable proportion of clay is mixed, which gives to the country a greater degree of fertility than is usual in Sweden. This is shown by the greater proportion of the surface which is under the plough, which is more than 603 square miles, or nearly

one-seventeenth part of the area. If we add to this the area occupied by meadows and pastures, which amounts to 924 square miles, we find that more than one-seventh of the surface is employed to produce food for man. Rye is the principal object of cultivation, and the produce is greater than that of all other grains taken together. Next to rye are barley and wheat; very little oats are grown, but potatoes and peas are largely cultivated. Cattle and sheep, horses and hogs, are numerous.

6. South of the central agricultural region is the *Plain of Linköping*, which is separated from the central region by a more elevated tract, which surrounds the northern extremity of the lake Wettern, and extends eastward with a width of about 18 miles, until it approaches the bay of Bräviken, when it contracts to a ridge hardly two miles wide. This narrow ridge, which is called Kolmoren, runs along the northern shore of the bay to its termination in the Baltic. The general elevation of this tract is between 300 and 400 feet above the sea, and about 200 feet above the lower countries north and south of it. The surface is uneven and in many places interspersed with rocky eminences, between which there are numerous lakes of some extent. The greater portion of this tract is covered with wood, especially pine, fir, and birch. The soil is very variable, but the fertile tracts are not numerous. In general this tract is better fitted for pasturage than for cultivation.

The plain of Linköping is certainly one of the most fertile, if not the most fertile tract in Sweden. From the shores of the Baltic to the banks of lake Wettern, from east to west, it measures above 60 miles. West of the town of Linköping, which is situated nearly in the centre of the plain, its average width is 30 miles, of which one-third is north of the Göta Canal and two-thirds south of it. In the meridian of Linköping the plain begins to grow narrower, as the hilly country which lies along the Baltic, south of the plain, advances farther north. East of the meridian of Norrköping it is hardly 15 miles wide. Its area is about 1500 square miles, or nearly that of Hampshire. The surface is generally level, interrupted in a few places by low hills with very gentle slopes, and in the vicinity of the hills, which surround it on the south and north, by a few low rocks. From the shores of the Baltic the country rises gradually towards the west, so that lake Roxen, which is nearly in the middle of the plain, is 106 feet above the sea-level, and on the banks of lake Wettern the country is about 300 feet high. It is only in the vicinity of the efflux of the river Motala that the level reaches that of Lake Wettern, whose surface is 287 feet above the sea-level. At the distance of about 10 miles south of the efflux of the river, there rises, on the shores of the lake, Mount Omberg, whose summit is 845 feet above the sea, and from this hill a ridge of elevated ground runs southward close to the borders of the lake, separating it from the plain. The soil of the plain is a mixture of clay and sand, and in some places of loam, especially towards Lake Wettern, where also its fertility is much greater than in the eastern districts. In no other part of Sweden is wheat so extensively cultivated as in this plain, but rye and barley are grown to a still larger amount. Peas and potatoes are also much grown. Along the numerous watercourses, especially to the south of the Motala, and on the banks of the river, there are extensive flats, which are inundated in spring, and make excellent meadow-grounds. All kinds of domestic animals are numerous, with the exception of goats. There are however some extensive tracts which are not cultivated, but are covered with woods, especially birch. The inhabitants derive their fuel from these woods, and use them as pasture-ground in certain seasons of the year. These unenclosed tracts cover more than one-third of the plain, for all the cultivated tracts do not occupy more than 200 square miles, and the meadows and enclosed pasture-grounds occupy about 750 square miles.

7. To the south of the plain of Linköping rises the *Table-land of Småland*. This extensive region, with its declivities, occupies nearly the whole of the country south of 58° N. lat., leaving only comparatively narrow tracts of lower grounds along the sea, which bounds it on the east, south, and west. At the south-western extremity of this region is the extensive level of Scania. The eastern border of the table-land itself is west of 16° E. long., but not far from it, and the southern border is a short distance south of 56° 30′ N. lat. The western border runs parallel to the shores of the Cattegat, at the distance of about 15 miles. The northern boundary of the table-land is generally well defined by the parallel of 58° N. lat., but on both sides of Lake Wettern the high country extends a few miles farther north. A rough estimate, founded on data from Forsell, gives to this table-land a surface of more than 14,000 square miles, or nearly double the area of Wales. Along the outer borders the elevation of the table-land is between 300 and 400 feet above the sea-level, but in the centre it rises much higher. The highest part, extending over about one-third of the region, is more than 800 feet above the sea. It surrounds the southern extremity of Lake Wettern, and extends from it southward for about 36 miles. This, the most elevated portion of the table-land, is traversed by a ridge of higher ground, which may be considered as a continuation of the Tifveden ridge. This last-mentioned ridge, which is between 500 and 600 feet high where it separates the basins of the lakes Wenern and Wettern, continues southward along the western banks of Lake Wettern, preserving nearly the same elevation, but interrupted in some places by short depressions; but as it approaches the southern extremity of the lake it rises higher, and where it meets the table-land it has an elevation of more than 900 feet. Nearly 10 miles south of the lake there rises on this ridge a high hill, called Taberg, whose summit is 1100 feet above the surface, and has attracted the attention of geologists, as about three-fourths of it consists of pure ironstone. From this summit the ridge runs westward, and near the centre of the higher portion of the region it again rises to more than 1100 feet above the sea, and divides into two branches, of which one runs west and the other south-west: both of them terminate on the margin of this region. The general elevation of this ridge may be about 1000 feet above the sea, and less than 200 feet above the general level of the country. This is the highest ground in Sweden south of 60° 30′ N. lat. The surface of the table-land varies greatly. There are many tracts of considerable extent, which are level plains: other districts have a broken surface. On the higher part of the table-land there are only a few lakes, but in its western district, and still more its southern, they are very numerous, and some of them are at a considerable elevation. Lake Helga, north of Wexiö, is 472 feet above the sea-level. As the table-land is not protected by a range of mountains against the winds, it suffers much from gales, and its climate is severer than that of the adjacent lower districts. The winter lasts seven months: the cold is very intense for three months, and a great quantity of snow falls. This last circumstance however must be considered advantageous, as it gives to the dry soil that degree of moisture which enables it to maintain vegetation all the year round. The great mass of rocks on which the table-land rests is composed of gneiss, and as these rocks when disintegrated form the worst kind of soil, this region is of very moderate fertility. Tracts many miles in length and width are covered with sand, on which nothing grows but common heath, and some spots are quite destitute of vegetation. Where the soil is mixed with a little vegetable mould, the country is covered with wood, especially birch; but the trees have not a vigorous growth, except in the more hilly tracts which lie along the outer borders of the table-land. In those districts whose surface is uneven, there are tracts with a better soil, which are cultivated with great care, but they hardly pay for the labour bestowed on them. The best tracts are those which surround the lakes. Wheat is grown in a few places, but they are of small extent, and the produce is scanty, yielding only from three to four times the seed. Rye yields about four times the seed, and is rather extensively cultivated. The principal grain raised on the higher part of the table-land is oats, and on the lower part barley. Potatoes are much cultivated on the higher part. The cattle, sheep, and hogs are rather of small size, and the wool of the sheep is very coarse. The meadows are bad, with the exception of some tracts along the lakes, and the pasture-grounds in the woods have little grass. Though much has recently been done to extend cultivation to those tracts, which were formerly lying waste, that portion of the area of the table-land which produces food for man does not much exceed 160 square miles, or one-ninetieth part of the whole; and of this extent only one-fifth, or little more than 30 square miles, produces corn and vegetables: the remainder consists of meadows and enclosed pastures.

8. *The Maritime Region of Smäland*, or the eastern declivity of the table-land of that name, extends opposite

the island of Oland, from south to north, but it advances northward within five or six miles of the Göta Canal. Its length rather exceeds 140 miles, but the width is inconsiderable for two-thirds of its length, not much exceeding 15 miles, though towards the north it widens to nearly 25 miles. Its area is about 2700 miles. The general level rises mostly with a north-western slope from the sea to the table-land, near the borders of which it attains an elevation of 300 feet above the sea-level. The surface presents great varieties. The southern districts, or about one-third, are rather undulating than hilly; and between the slight elevations there are extensive flats. The soil of this tract is generally sandy, and of indifferent quality. The greater part is covered with woods, consisting mostly of fir and birch, but there are few timber-trees. The northern districts, or rather more than two-thirds of the whole, have a much more broken surface, presenting a succession of hills, valleys, and small plains. The hills are generally steep, and enclose narrow valleys. Some of the most extensive lower tracts are filled with lakes. The soil contains a greater mixture of clay or vegetable mould than farther to the south, but as in many places it has little depth, and in other parts is very stony, these districts are not much better adapted for cultivation than the southern. Nevertheless a comparatively large portion of the surface is under the plough. But most of the valleys and declivities of the hills, though unfit for cultivation, produce abundance of grass, and there are pasture-grounds and meadows. But the forests, which cover all the hills and the rocks, constitute the great wealth of this tract: they contain pine, fir, birch, beech, and oak, and a considerable number are large trees. Timber is the principal article of export; tar and pitch are also exported. Rye and barley are extensively cultivated, and generally yield five times the seed. Oats are not much grown, and wheat only in a few more favoured tracts. Potatoes however are much planted, and this branch of agriture is continually increasing. Domestic animals of every description, with the exception of goats, are abundant, which is shown by the extent of the meadows and pasture-grounds, which cover about 420 square miles, or more than one-seventh of the region, whilst the area of the part under cultivation does not exceed 90 square miles, or only one-thirtieth part.

The island of Oland, which is opposite this region, may be considered as an appendage of it. This island lies parallel to the coast, and is very long, but comparatively narrow. The length somewhat exceeds 80 miles; the width varies between eight and two miles, and on an average may be estimated at five miles, which gives an area of 400 square miles. The surface consists of a long uninterrupted swell, which is never more than 200 feet above the sea-level, and generally only half as much. This swell is composed of chalk, which is covered with a layer of earth, and its fertility is superior to that of the opposite coast. The northern part is covered with woods. The greatest portion of the islands is used as pasture-ground, and the ponies are distinguished by their strength: they are exported in great numbers. Rye and barley are extensively cultivated, and also other kinds of grain to a small amount.

9. The *Maritime Region of Blekinge* extends over the southern coast of Sweden from about 14° 30′ to 16° E. long., somewhat more than 50 miles in length. Its width may be estimated at 15 miles. The surface does not exceed 770 square miles. This is the most broken portion of the Swedish coast. The rocky masses of the table-land of Småland divided into small ridges by numerous watercourses, which run in deep and narrow valleys, advance within a short distance from the shores, where they terminatte in hills from 200 to 300 feet high. East of the town of Carlskamn these rocky masses come close up to the sea, so as not to leave any level space for a road. The small rivers, descending from an elevated tract more than 400 feet above the sea-level, and falling into the sea at a distance of only 15 miles from it, are extremely rapid, and form many small and beautiful cataracts. The level grounds are much less extensive in this region than in any other part of Sweden, but they possess a considerable degree of fertility. They are cultivated with care, and the crops return in general six times the seed, and in some places more. Wheat is much grown, though the cultivation of rye is ten times more extensive; but in other districts of Sweden the disproportion is still much greater, except in Scania, the plain of Linköping, and the southern part of the Central Agricultural Region. Barley and potatoes are also much cultivated. The meadows in the valleys along the banks of the river, though not extensive, yield abundance of grass; and the slopes of the hills make excellent pasture, though their summits are almost destitute of such vegetation as is adapted for useful purposes. In some parts they are covered with wood, especially birch and fir; but these trees have usually a stunted growth, though there are large trees in the valleys, and among them some beech and oak. The rearing of cattle and hogs constitutes one of the principal objects of domestic economy, and much cheese is made. The proportion of the area which produces food for men is much larger than in most other regions, as nearly one-sixth of the whole surface, or about 45 square miles are cultivated: the extent of meadow-grounds and enclosed pastures is double that amount.

10. The *Plain of Scania* occupies all the peninsula which constitutes the most southern portion of Sweden, between the Sound on the west and the Baltic on the south and east. A straight line drawn from the innermost recess of the Skelder Vick, a large and open bay of the Cattegat, on the west, to the peninsula of Sölvetsburg on the east, may be considered as marking tolerably well its northern boundary, where it joins the table-land of Småland and the maritime regions of Blekinge and of Halland. It extends from south to north about 55 miles; the width varies between 50 and 60 miles, being greater towards the north than along the southern coast: it hardly exceeds 3000 square miles, so that it is only about 200 square miles larger than the county of Lincoln, to which it bears some resemblance in its surface, soil, and products. It is not a level plain, but is traversed in its length by a low broad swell of high ground, which begins at the most north-western point of the plain with Cape Kullen, a moderately elevated headland at the northern opening of the Oresund. From this point it extends in a south-east direction to the lakes called Ringsion, where it enlarges to a great width, enclosing these lakes, and covering a space of considerable extent with numerous hills, most of which are covered with wood. From the banks of these lakes it declines a little more to the south, running towards the south-east portion of the plain; but it terminates, about twelve miles from the sea, in low hills. The tract of country between the termination of this swell and the south-eastern shores of Scania is a level, with numerous depressions, which are occupied by marshes and swamps. That portion of the region which is situated to the south-west of the swell contains a large level plain, which extends along the shores of the Oresund, from the southern extremity of the peninsula to the vicinity of Helsingborg, varying in width from 6 to 10 miles: it is wider towards the south than towards the north. The soil of this tract is of first-rate quality, consisting of a strong rich loam, which yields good crops of wheat, the produce varying from eight to twelve times the seed. This large tract is under cultivation, with very few exceptions. The country between this rich plain and the swell above mentioned is not so level, being interspersed with small isolated hills, which are very numerous in some parts, especially to the south, where they also rise to a greater elevation. One of them, called Romele Klint, is 291 feet above the sea-level. The soil of this tract, though better than that of most other districts in Sweden, is much inferior to that of the plain, and it contains a great deal of sand. Rye and barley are extensively grown; the rye yields from seven to nine times its seed, and the barley about six times. The hills are in some places covered with wood, but in others destitute of trees, and make only indifferent pasture-grounds. That portion of the plain which lies north-east of the swell contains also a considerable level round the town of Christianstad, which has a fertile soil, but it is not equal to that of the plain along the shores of the Oresund. Wheat and rye are cultivated. The remainder of the country resembles the hilly district west of the swell in surface, soil, and productions. As the hilly tracts occupy more than three-fourths of the plain, and only a small portion of them is cultivable, the remainder is used as pasture-grounds for sheep, which are more numerous here than in any other part of Sweden, and the wool also is better. The high state of cultivation in the level tracts requires a considerable number of horses and oxen, and these animals are likewise more abundant than elsewhere. The same remark applies to the hogs. Only a few goats are kept in the hilly districts. More than one-half of the region, or 1666 square miles, is not regularly cultivated for the pro-

duction of food, and is used only at certain seasons as sheep-walks. The cultivated fields are calculated to cover an area of 654 square miles, and the enclosed pasture-grounds and meadows 680 square miles.

11. The *Maritime Region of Halland*, which extends along the eastern shores of the Cattegat, is the western declivity of the table-land of Smäland. Its southern boundary is on the shores of the Skelder Vik, whence it extends northward to the mouth of the Göta Elf, which two parts are nearly 112 miles distant from one another; but its width is inconsiderable, being in general about 15 miles. The area is about 1800 square miles. The level portion of this region is separated from the plain of Scania by a tract of high land, which projects from the south-western corner of the table-land of Smäland, and running westward, terminates in the peninsula of Halland's As, between Skelder Vik on the south, and the Bay of Laholm on the north, close to the sea. This high land rises in general from 400 to 500 feet above the sea-level, and the highest part resembles the table-land, being mostly a level, but frequently interspersed with hills. The soil is sandy, partly covered with heath, and partly wooded. In some places there are swamps. Beech is abundant, and there are many large trees. The width of this elevated tract is about eight miles. To the north of it lies the most level portion of the region, which extends to 57° N. lat., and even a little farther, to the vicinity of Warberg. In these parts the slope of the table-land of Smäland is more regular than that on the south and east. It descends with a continuous declivity, which is only broken by the watercourses, nearly to the sea-level, leaving between its base and the shores a tract of undulating ground about 8 miles wide. The soil, though inferior to that of the plain of Scania, and even to that of the maritime region of Blekinge, is generally above mediocrity, yielding between four and five times the seed of rye and barley: it is seldom strong enough for wheat or peas, but it produces abundant crops of potatoes. The slopes of the hills at the back of the undulating plain make good sheep-walks. The northern districts of this region, from Warberg to the mouth of the Göta Elf, have a much more broken surface. Rocky hills of moderate elevation extend from the table-land to near the shores of the sea, and between them are wide valleys, which are partly filled with long lakes, which lie in the direction of the general slope, which is to the south-west. Though a few of the hills are without vegetation, most of them are covered with stunted trees or with grass. On the banks of the lakes there are large meadows; and the pasture-grounds on the hills, though not rich, are very extensive. Large numbers of sheep and cattle are kept, and also many horses. Only a small portion of this tract is under cultivation, and it produces chiefly rye and barley. The cultivated portion of the whole region has been estimated at about 123 square miles, and the meadows and enclosed pasture-grounds occupy 224 square miles. More than one-sixth of the whole country is employed in producing food for man.

12. The *Southern Basin of Lake Wenern* extends over the wide isthmus which separates the two lakes of Wenern and Wettern. The parallel of 58° may be considered as its southern and that of 59° with the Tifveden ridge as its northern boundary; on the west it borders on the Göta Elf. The basin of lake Wenern is very limited on the east and west. On the east the Tifveden ridge, running parallel to its eastern banks, is only about 8 or 9 miles distant. On the west the stony masses of the rocky region advance still nearer to the border of the lake. But towards the south the basin of the lake extends about 60 miles, and to the north 120 miles. The northern portion of this basin forms part of the region of mines, and the southern constitutes this region. The area of this region may be about 3950 miles. From south-west to north-east it measures more than 80 miles, but the width, which at its southern boundary is 70 miles, grows less as it proceeds northward along the south-eastern shores of lake Wenern, until at 59° N. lat. it is hardly 10 miles wide. The greater part of this region is an inclined plain, which descends northward towards its lowest level, lake Wenern, with a gentle declivity, and on the east and south is surrounded by higher land. At its most northern boundary the Tifveden ridge enters the region, and between the lakes Skagern and Unden it runs south-west. In this part of the country it is about 550 feet above the sea-level, 416 feet above lake Wenern, and 263 feet above lake Wettern. Soon afterwards it turns to the south, and is interrupted by a deep depression, containing lake Viken, which is only 296 feet above the sea-level, or 11 feet above lake Wettern. South of this lake the ridge gradually rises higher, and south of the middle of the last-mentioned lake it attains a general elevation of 800 feet, and soon joins the table-land of Smäland. The northern edge of this table-land constitutes the southern boundary of the plain, which descends from it gradually and with a gentle declivity northward. On the plain there are a few isolated mountains of considerable height, consisting of sandstone, limestone, and alum slate. The highest and most extensive of these mountains are the Billungen and the Kinne Kulle. The Billungen is nearly in the centre of this region, north-east of the lake of Hornborga, and is above 10 miles long, with an average width of three miles: it is 899 feet above the sea. The Kinne Kulle stands on the banks of lake Wenern, and is 9 miles from south to north, and 5 miles wide: the highest part is 902 feet above the sea-level. The declivities of this mass, where they consist of limestone, are very fertile, well cultivated, and populous. Hunniberg and Hallberg, which stand near the most southern extremity of lake Wenern, are similarly formed, but of much less extent, and do not rise to half the elevation of the Kinne Kulle. Though the general slope of the plain is regular, its surface is only occasionally level, and is often undulating. The soil is an alluvium, composed of sand and clay, and possesses a considerable degree of fertility: some tracts where the sand predominates are covered with heaths. Rye and barley are extensively grown, but not much wheat or oats. Wheat and rye yield six times their seed, but barley and oats only four times. Potatoes are grown to a great extent, and yield ten times the seed. The meadows and pasture-grounds are less valuable than in most of the other provinces of Sweden, except on the borders of the lakes. The cultivated ground is stated to occupy about one-eleventh part of the area, or 352 square miles, and the meadows and enclosed pastures about one-seventh part, or 563 square miles. That part of the surface therefore which is regularly employed in producing human food considerably exceeds one-fifth of the whole area.

13. The *Rocky Region* extends over the north-western portion of Southern Sweden, occupying the whole tract between the course of the Göta Elf on the west and the Skagerack on the north, as far as 59° N. lat. and the boundary-line of Norway. From south to north it measures nearly ninety miles; but the width, which at the southern extremity hardly exceeds ten miles, increases as we proceed northward, so that at the northern boundary it is rather more than 55 miles across. Its area is about 1800 square miles. It may be divided into three districts, which extend longitudinally over the region. The rocky district lies along the shores of the Skagerack, and extends ten or twelve miles inland; the southern part of the region, as far north as Tyrollhättan, is entirely occupied by it. The surface of this tract is covered with rocks, rising near the sea with a precipitous ascent from 100 to 300 feet, and then extending in some parts on a level, with very inconsiderable depressions or eminences, and in others with a hilly surface. Farther north, especially near the boundary of Norway, the rocky masses rise 400 or 500 feet, and on them there occur other masses, which are from 100 to 200 feet higher. The rocks are in general only covered with lichens; and most of the narrow or flat valleys, in which a thin layer of earth occurs, are only peat-mosses, or overgrown with juniper bushes. Very few of them contain trees, or are cultivable. Even fire-wood is scarcer than in any other part of Sweden, except the plain of Scania. The middle tract may be called the wooded district. It begins in the parallel of the southern extremity of Lake Wenern, where it is of inconsiderable width, but it grows wider as it proceeds farther north, where it is 25 miles across. The surface is from 300 to 500 feet above the sea, and towards the north it rises higher. The hills and rocks with which it is covered have rounded tops, and the declivities are much less precipitous: they are generally covered, both on the tops and declivities, by a layer of earth, and are wooded with birch, fir, and pines, and make tolerable pasture-grounds. The depressions and valleys are rather extensive and wide. They are from 100 to 200 feet below the higher surface, and contain many cultivated tracts, whilst others are used as meadows, especially along the numerous lakes. The eastern portion of the region is an agricultural district, which lies along the banks of Lake Wenern, and runs from its most southern extremity near

Wenersborg to the north of 59°. But it is not of great extent, as it only reaches a distance of six or eight miles from the borders of the lake. The surface of this tract towards the south is very even and slightly elevated above the level of the lake, of which it formerly seems to have constituted a portion, as the whole is covered with a rich alluvium. Towards the north however the low offsets of the hills which lie farther west advance nearly to the shores of the lake, and render the surface of this tract undulating, and in some places hilly. But the soil is of good quality, being a mixture of clay and loam. In this district much rye and barley are cultivated, and a considerable proportion of wheat. Peas and potatoes are grown extensively. Peas are stated to yield fourteen times their seed, potatoes ten times, and rye twelve times. The agricultural produce of this tract finds a ready sale in the Region of the Mines. In the other two districts, where the soil is very light and contains much sand, oats and potatoes are the most common objects of cultivation. The wooded district has good pasture-grounds for cattle, and the rocky part contains, in many places, good sheep-walks. The extent of the cultivated tracts is about 170 square miles, or more than one-eleventh part of the whole area; and that of the enclosed pastures and meadows is 280, or more than one-seventh. Thus one-fourth of this region is employed in producing food for man.

From this description of the natural regions of Sweden it is evident that the proportion of cultivated land, and of the meadows and enclosed pastures, is much greater in the southern provinces than in the northern. If a line is drawn across the country in the parallel of the town of Gefle, it appears that the part of Sweden which is situated to the north of that line contains 110,180 square miles, or, exclusive of the lakes and swamps, which occupy 11,524 square miles, 99,676 square males. The provinces south of the line contain 60,300 square miles, or, exclusive of the lakes and swamps, which cover 10,422 square miles, 49,878 square miles. Thus the northern portion contains somewhat more than two-thirds of the whole area. In the northern provinces the meadows and enclosed pastures, taken together, occupy only 1498 square miles, or less than one sixty-sixth part of the country; but in the southern parts they amount to 5062 square miles, or to more than one-twelfth part of their surface. The surface covered by the cultivated fields in the northern portion is only 357 square miles, or a little less than one 280th part, whilst in the southern portion it occupies 3093 square miles, or nearly one-twentieth part of the area.

This difference is less the effect of the climate than of the soil. Though in the southern portion there are several extensive tracts which consist of bare rocks, as on the table-land of Småland and in the Rocky Region, they are small in proportion to tracts of the same kind in the extensive regions of the north, whose surface is composed of bare rocks. The boulders diminish the extent or value of the cultivable tract: there hardly occur ten square miles, with the exception perhaps of the level plain of Scania, in which there are not erratic rocks in great numbers, and in some places they cover nearly half the surface. These rocks, as well as those *in situ*, are of gneiss, and the soil derived from their disintegration is barren. The most fertile tracts are those which have an alluvial soil, and next to these the soils where the rock is limestone, which frequently occurs in the southern parts, but only at one place in the northern, on the table-land of Jemtland, in the country surrounding the Storsiön or Great Lake.

The lowering of the sea along the coast of Sweden is a fact that has been much questioned, but it seems established beyond all doubt by continued observations for a whole century. This decrease of the water is greatest towards the northern extremity of the Gulf of Bothnia, where the difference observed within a century has been found to amount to four feet. In proceeding southward it diminishes gradually, and its effect seems to disappear along the southern coast of Sweden in Blekinge and Scania: but it has been noticed in the Cattegat north of Cape Kullen, and still more north of the mouth of the Göta Elf, where it is about as much as on the eastern coast, which is situated under the same parallel. It is not known whether it has taken place on the coast of Norway, no observations having been made there. The difficulty of explaining this phenomenon satisfactorily has suggested the notion that the whole Scandinavian peninsula is raised gradually higher by the force of some internal power.

Lakes; Rivers; Canals.—The number of lakes in Sweden, large and small, is very great. According to the estimate of Forsell, they cover 21,946 square miles, or nearly one-eighth of the area of the kingdom. In the northern mountainous district they render the country habitable, as the best meadows which are found there lie on their banks, and as their fish supply the principal food on which the inhabitants subsist. Some of the larger lakes have been already mentioned. We shall here notice those which facilitate the commercial intercourse of the country.

The largest lake is the Wenern, which is traversed by 59° N. lat.: the surface is 144 feet above the sea-level. The two headlands projecting from the northern and southern shores divide it into two unequal parts, of which the western and smaller is designated by the name of Lake Dalbo. Lake Dalbo extends from south to north about 55 miles, and from east to west 20 miles. The passage by which it is connected with Lake Wenern is about 15 miles wide, but numerous small rocky islands lie across the strait, leaving only narrow passages, a circumstance which renders the navigation dangerous, on account of the gales, which are not unusual on the lakes. Only four of these passages have depth enough for the vessels that are used on the lake. Lake Wenern is 60 miles long from south to north, and 30 miles wide where broadest. A large part of the shore is lined with rocky islands: this is also the case with Lake Dalbo. The two lakes cover a surface exceeding 2000 square miles, and receive the waters of numerous rivers. Those which fall into it from the south have not a long course, and do not bring much water; but the northern rivers flow from other lakes of considerable extent, and contain much more water. The largest river is the Klar Elf.

The Klar Elf originates in that elevated mountain-range which extends along the boundary-line between Sweden and Norway, south of the Sylfiellen. Several small rivers, the outlets of lakes, fall into Lake Fämund, which is 2290 feet above the sea, and is situated within Norway. The river issuing from its south-western extremity is called Tryssild Elf, and runs southward. After a rapid course of more than 70 miles, it enters Sweden a little north of 61° N. lat., and takes the name of Klar Elf. At this point it is probably not more than 600 feet above the sea-level, or 456 feet above its outlet in Lake Wenern. Its course in Sweden is first south-south-east, and afterwards south-east, and it runs more than 120 miles, without taking into account its numerous windings. In the upper part of its course in Sweden its current is comparatively gentle, but in the vicinity of 60° N. lat. it descends from a higher country to a lower, and falls more than 130 feet within a few miles, and is broken by rapids and cataracts. Below this place the river runs with less rapidity, but it cannot easily be navigated except in the last 20 miles of its course. Wood however is floated down from the upper country. Near its mouth it divides into two arms, which enclose a small island called Tingwalla, on which the town of Carlstad is built.

The waters of Lake Wenern are carried to the Cattegat by the Göta-Elf, which runs more than 50 miles, to the west of south. It has a great volume of water, and about 14 miles from its mouth, near Kongelf, divides into two arms, which enclose the large island of Hisingen. In its natural state the river was rendered unfit for navigation by several cataracts, which occur in the first 18 miles of its course, within which distance the river descends about 130 feet: but art has supplied this deficiency. The first cataract is about two miles from the place where the river leaves the lake, near Ränum, and is called the Cataract of Ränum: it is more than 15 feet high: it is now avoided by the Charles Canal, which begins on the eastern side of a small bay of Lake Wenern, called Wasbotton, and extends south-east, joining the river more than two miles below the cataract. It is about two miles long. About four miles below the place where the Charles Canal joins the river, the rapids of Trolhättan commence, which occupy about five miles, within which space the river descends 108 feet. The canal, by which they are now avoided, is cut through the rock, and is considered one of the most perfect works of its kind: it is called the Trolhättan Canal. A fall near Akerström, more than three feet high, is avoided by a short cut and a lock. The last cataract occurs at Lilla Edet, about 18 miles from the efflux of the river, and is nearly 10 feet high, and is likewise avoided by a single lock. A few rapids occur lower

down, especially at Hanström, two miles below Lilla Edet but they present no great obstacles to navigation. Thus the Göta Elf has been rendered navigable for vessels not drawing more than six feet of water; and the whole country about Lake Wenern has the advantages arising from an easy water-communication with the sea. The Trolhättan Canal, which was finished in 1800, is about two miles long, and has eight locks

Lake Wettern, which occupies the centre of Southern Sweden, extends from south to north about 80 miles, and its width is about 10 miles. The surface is about 900 square miles. It is on the highest general level of Sweden, between 57° and 58° N. lat., and the surface is 288 feet above the sea, while at the distance of a few miles east and west the level country is several feet lower. It is surrounded by rocks and hills, except on the north-east, where for nearly 20 miles it is contiguous to the plain of Linköping, and the shores rise only a few feet above its level. In these parts it also receives the only river that enters it; for all the other streams that flow into it are only torrents. It partakes of the nature of an alpine lake, being in one place more than 70 fathoms deep. It is subject to heavy gales.

The river Motala issues from this lake on the north-east, and after having traversed the plain of Linköping, carries its waters to the Baltic. The distance between the eastern shores of the lake and the Baltic in a straight line is about 64 miles. The course of the river, notwithstanding its windings, is shorter, as it falls into the western end of the Bay of Bråviken, which enters about 24 miles inland. The Motala flows first eastward, traversing, at the distance of three miles from its efflux, Lake Boren, which is 237 feet above the sea, and 51 feet below the level of Lake Wettern; and at the distance of about 10 miles from the place where it leaves Lake Boren it enters Lake Roxen, which is 101 feet above the sea, and 187 feet below the level of Lake Wettern. The river leaves Lake Roxen at its eastern extremity, and changing its direction runs west by north seven miles to Lake Glan, which is only 68 feet above the sea-level. Leaving this lake it runs again to the east, and after a course of about five miles it enters the Bråviken at the town of Norrköping. The whole course of the river, exclusive of the lakes, is only about 25 miles, and it descends 288 feet, or 11½ feet per mile. The channels by which the lakes are connected with one another are too rapid for navigation.

The abundance of water on this line has been used for establishing the canal system which is called the Göta Navigation, from its crossing the southern part of Sweden, which is called Götaland. A canal has been made between the lakes Wenern and Wettern, which is called the Western Göta Canal; and another canal between Lake Wettern and the Baltic, which is called the Eastern Göta Canal. The Western Göta Canal is about 20 miles long, exclusive of Lake Viken, which is the summit-level of the line, 296 feet above the sea, 8 feet above Lake Wettern, and 152 feet above Lake Wenern. As the descent to Lake Wenern is so great, this line has required 24 locks. Lake Viken cannot supply so much water as is required for them, but to the north of it is Lake Unden, which is 87 feet higher, and discharges its waters into Lake Viken. The Eastern Göta Canal is about 64 miles long, inclusive of the lakes which it traverses, and which have been deepened to obtain the necessary depth for the vessels: it extends along the banks of the Motala eastward to its efflux from Lake Roxen, whence it continues in a straight line through the small lake of Asplangen (86 feet above the sea), and enters the Baltic, where it forms a considerable inlet, called the Släte Baken, two miles below Söderköping. The Eastern Göta Canal has 35 locks. The Göta Canal is 10 feet deep, 48 feet wide at the bottom, and 82 feet at the surface. These two canals were begun in 1810, and in 1830 the whole was finished, and the navigation opened. The width of Sweden near 58° 30′ N. lat., near which parallel the greater part of this inland navigation is situated, is about 200 miles. The navigation through the Göta-Elf, the lakes Wenern and Wettern, and the two Göta Canals, does not exceed 260 miles.

In the parallel of the northern part of Lake Wenern, but much more to the east, is Lake Hielmarn, which extends about 35 miles from east to west, and is about two miles wide at both extremities; but it enlarges in the middle to eight miles. The surface is 78 feet above the sea-level, and it covers an area of about 150 square miles. It communicates by a canal with the river Arboga, which runs north of the lake, and falls into Lake Mälaren. This canal, called the Hielmar canal, begins on the northern bank of the lake, and is about seven miles long it has eight locks, and is six feet deep. Some time ago another canal was planned, which is to lead from the eastern extremity of Lake Hielmarn through Eskilstuna immediately to Lake Mälaren we are not acquainted with the progress of this work.

Lake Mälaren differs greatly from all the other lakes of Sweden. It consists of many small lakes, united by short channels, which enclose islands. The number of the small islands is in some places very great. Hardly a clear sheet of water of a mile square can be found. From what may be called the main body of the lake several narrow arms branch off to the south and north, and penetrate to a great distance inland. One of them, which extends northward, is more than 25 miles long. All these numerous arms and branches are navigable for boats. If we consider the town of Stockholm to be built at the eastern extremity of the lake, its length exceeds 60 miles. It is nearly on a level with the Baltic.

The advantages of the navigation on Lake Mälaren have been increased by the Södertelge and Strömsholms canal. The Södertelge canal is a cut about two miles long, which unites one of the arms of Lake Mälaren, which penetrates several miles inland to the south, with a deep inlet of the Baltic, called the Järne (Yärne) Fiord. By means of this cut vessels of about 20 tons burden can reach the Baltic without passing through the long channels that lead to Stockholm and thence to the open sea. This canal is about 18 miles west-south-west of Stockholm. The Strömsholms canal joins the lake not far from its western extremity, and comes from the north. It leads to the interior of the region of the mines, and terminates in the lake of Barken, which is 327 feet above the sea-level. Its length, including the lakes Barken and Amänningen, which together occupy more than 20 miles, exceeds 50 miles. It can only be navigated by vessels drawing four feet of water, and has 25 locks.

The only navigable rivers in Sweden are those which have been rendered so by art. The rivers south of 60° have generally a short course, but north of 60° there are several which run above 300 miles, descending from the higher portion of the Kiölen range, and falling into the Gulf of Bothnia. Nearly all of them run from the north-west to south-east. The largest is the Dal-Elfven. [DALECARLIA, vol. viii., p. 289.] Farther north is the Liusnan or Liusne Elf, whose most remote branches originate on the southern declivity of Mount Sylfiellen. Its upper course is in the elevated valley of Herjedalen, and is very rapid. East of 15° E. lat. it descends into the lower country, forming numerous small cataracts. In the lower country it often extends to the width of two or three miles, so as to resemble a lake. This river falls into the Gulf of Bothnia south of the town of Söderhamn, after having run about 250 miles. Farther north the Gulf of Bothnia receives the Liungan Elf, the Indals Elf, and the Angerman Elf. [ANGERMANLAND, vol. ii., p. 18.] The rivers of BOTHNIA (vol. v., p. 255) are the Umea Elf, the Skelleftea Elf, the Pitea Elf, the Lulea Elf, the Calix Elf, and the Tornea Elf.

Climate.—The difference in the climate of various places in Sweden is chiefly to be attributed to the difference of latitude and elevation above the sea-level. The most northern point of the country lies 2½ degrees beyond the polar circle the most southern is situated nearly 11 degrees to the south of it. A small portion of the country is so elevated that it is always covered with snow; and large tracts along the sea-coast are only a few feet above the sea. The elevation at which perpetual snow occurs is less as we proceed farther north. Near 60° N. lat. it is about 5600 feet, at 61° N. lat. 5400 feet, at 62° N. lat. 5100 feet, at 64°, 4650 feet, and at 71° N. lat. 2300 feet above the sea. The table-land of Småland rises from 400 to 900 feet above the sea-level, and that of Jemtland is about 1100 feet. The inclined plain in the most northern district of Sweden rises near the boundary of Norway to 2000 feet above the sea. A part of Southern Sweden is also exposed to the influence of the Atlantic Ocean, which always has the effect of raising the temperature in winter, and of moderating the heat in summer. The following tables give the result of meteorological observations continued for many years, at ten places, which are at considerable distances from one another, and at different levels above the sea.

Table I., *containing the Mean Temperature of five Places in Sweden, South of* 60° *N. lat., and of Edinburgh and London.*

Months.	Lat. 57° 42' Lund, altitude 60 feet.	Lat. 56° 53' Wexiö, altitude about 500 feet.	Lat. 57° 42' Göteborg near the sea-level.	Lat. 59° 23' Carlstad, altitude 175 feet.	Lat. 59° 20' Stockholm, altitude 125 feet.	Lat. 55° 58' Edinburgh, altitude 60 feet.	Lat. 51° 31' London, altitude 120 feet.
December	+31·81°	+28·66°	+34·42°	+27·30°	+27·98°	+39·72°	38·71°
January	28·51	27·86	29·99	25·60	24·32	36·32	36·34
February	29·10	26·18	30·11	28·43	25·86	38·48	39·60
March	33·36	30·68	34·95	31·26	29·58	41·36	42·01
April	41·29	40·80	43·84	39·64	36·76	44·14	47·[illegible]
May	51·69	53·12	53·02	50·30	48·26	49·36	55·40
June	60·31	62·20	61·04	[illegible]·34	57·02	56·30	59·36
July	63·25	66·04	64·08	63·44	63·46	59·00	62·97
August	62·64	63·12	61·28	60·80	60·80	56·66	62·90
September	56·17	54·30	55·90	54·18	53·65	55·32	57·70
October	47·01	44·43	48·66	44·48	44·18	45·14	50·79
November	37·90	35·42	38·65	38·65	35·38	41·54	42·40
Winter	29·54	28·23	31·51	27·11	25·82	38·27	38·22
Spring	41·78	41·53	43·74	40·40	38·20	44·96	48·34
Summer	62·07	63·45	62·13	61·16	60·43	57·32	61·74
Autumn	47·[illegible]	44·73	47·74	44·47	44·37	47·33	50·29
Annual mean	45·10	44·56	46·34	43·28	42·18	46·97	50·05

On comparing the climate of Edinburgh and London with that of five towns in Sweden, it appears that the mean temperature of the summer is greater in three of the Swedish towns than at London, and in all five greater than at Edinburgh. It is remarkable that the mean temperature of the summer of Wexiö exceeds that of Edinburgh by more than 6 degrees; though Wexiö is 500 feet above the sea, and nearly a degree farther north than Edinburgh. This is probably to be attributed to the dryness of the air on the table-land of Smaland during the summer. But the difference of the mean temperature of the winter is 10 degrees in favour of Edinburgh. Göteborg lies nearly 2 degrees nearer the pole than Edinburgh, but the mean annual temperature does not differ from that of Edinburgh much more than half a degree, though that of the winter differs nearly 8 degrees. In the winter the prevalence of northern and north-eastern winds makes the inhabitants of Göteborg feel their more northern situation, whilst during the three other seasons the temperature is raised by the prevailing south-western and western winds, the temperature of which has been increased by passing over the Atlantic. It is generally observed that the weather is much more inconstant and wet on the western shores of Sweden, along the Skagerack and the Cattegat, than on the eastern shores along the Baltic, but not so subject to great changes. A closer inspection of the table would induce us to think that the prevailing opinion of the climate of Southern Sweden being a very cold one is not correct. The common opinion respecting the climate does not rest on continuous observation, but on single facts; and such facts would certainly lead us to think that the winters are very cold and the summers very hot in Sweden. On the 20th of January, 1814, the thermometer at Stockholm sunk to −26·6°, whilst at London and Edinburgh it never sinks to zero. On the 3rd of July, 1814, the thermometer at Stockholm was 96·8°, a degree of heat never experienced in the British Islands. But such extremes of cold and heat never last more than a few days.

Table II., *containing the Mean Temperature of five Places in Sweden, North of* 60° *N. lat.*

Months.	Lat. 60° 39': Falun, alt. 400 feet.	Lat. 62° 38': Hernösand.	Lat. 63° 24': Ostersund, alt. 1050 feet.	Lat. 63° 50': Umea.	Lat. 68° 30': Enontekis, alt. 1440 feet.
December . .	+ 24·18°	+ 18·70°	+ 20·95°	+ 13·64°	+ 2·44°
January . .	18·68	16·32	9·25	11·60	0·1[illegible]
February . .	23·30	17·04	15·30	14·93	1·92
March . . .	28·86	23·78	25·7[illegible]	22·18	11·52
April . . .	37·44	31·04	33·00	33·98	26·15
May . . .	47·46	42·88	43·38	43·28	37·20
June . . .	57·30	53·30	54·48	51·50	49·02
July	60·35	58·64	57·90	61·24	58·10
August . . .	57·34	56·25	55·96	56·70	56·72
September . .	50·62	47·48	46·24	47·66	42·06
October . .	43·68	39·24	39·40	38·25	27·46
November . .	30·22	28·50	29·04	27·10	11·75
Winter . . .	22·04	17·35	15·17	13·41	1·49
Spring . . .	37·82	35·73	34·[illegible]	33·1[illegible]	24·96
Summer . .	58·33	56·06	56·11	57·48	54·61
Autumn . .	41·51	38·41	37·[illegible]	37·67	27·07
Annual Mean .	39·92	36·36	35·80	35·42	27·04

The difference in the mean temperature of the summer in these five places lies within four degrees, though the most southern and the most northern are nearly eight degrees of latitude distant from one another, and the most northern is more than 1000 feet more elevated above the sea-level. This fact is to be attributed to the long stay of the sun above the horizon in that reason, which, at Enontekis, lasts more than three weeks. This circumstance enables the inhabitants of these northern countries to cultivate a few plants which require a sudden heat, as barley, which is sown and reaped within seven weeks. The winters however are extremely cold. Forsell observes that north of 61° the quicksilver frequently freezes, which indicates that the thermometer descends at least 40° below zero. The heat increases all over Sweden most rapidly in the two months preceding the summer solstice, and we find that the difference between the mean temperature of April and June in the south of Sweden generally amounts to twenty degrees, and in the northern somewhat more. In the British Islands this difference does not amount to more than twelve degrees. On this fact is founded the observation, made by almost every traveller, that in Sweden there is hardly any spring; the hot summer almost immediately follows the cold winter. The same observation however might also be made respecting the winter following the summer, as the temperature decreases nearly in the same ratio in October and November.

The annual quantity of rain is not known for the northern provinces, nor for the districts in the interior of the peninsula. In the low country bordering on the Baltic it amounts to between 21 and 22 inches, which is a less quantity than falls at London; but the snow is probably not included in this account. The number of rainy days in the year is said to be 149 in the southern districts. The prevailing winds blow between south-west and north-west. The number of days on which the wind blows from south-west is 77; on 43 it comes from the west, and on 56 from north-west. From the north the wind blows 13 days; from north-east 63 days, from east 14 days, from south-east 38, and from south 18 days. The number of days which are quite calm is 36 These observations respecting the winds were made at Göteborg, on the west coast of Sweden.

As to the effect of the climate on cultivation, it is observed that at Enontekis (68° 30′ N. lat.) only barley and turnips succeed; and that in thirty years only nine crops have paid for the labour. Rye cannot be grown with advantage north of 66° N. lat.; and so far also the cultivation of hemp extends. Oats cease to ripen north of 64°, and up to this latitude wheat is cultivated in a few spots, but in general it cannot be grown with advantage north of 62° N. lat. Flax is grown as far north as 64° N. lat., but it does not ripen to seed north of 63° N. lat. Tobacco rarely succeeds north of 61°. Potatoes are cultivated as far as 66° N. lat., but cabbages only to 64° N. lat. Hops grow as far as 62° N. lat. Cherry-trees are met with as far north as 63°, but other fruit-trees rarely beyond 60° N. lat. In the plain of Scania mulberry-trees, chestnut-trees, and walnut-trees are planted, and the fruit ripens.

The pine, fir, and birch extend to the most northern parts of Sweden; and near 68° N. lat. there are fine trees. Alders are found up to 63°, ash and willows to 62°, and elm and lime trees to 61° N. lat. The oak-tree grows wild between 60° and 61° N. lat., but some planted trees are found farther north. Beech does not grow wild north of 57°, and so far it forms forests; but farther north only single beech-trees occur.

Pine-trees cease to grow at an elevation of 3000 feet below the snow-line; and lakes which approach nearer to the snow line do not contain the Salmo thymallus and the Salmo lavaretus. Bears are not met with above 3000 feet; and at that height barley ceases to ripen. The few families which live nearer the snow-line live on the produce of their fisheries and of a few cattle. Men do not fix their permanent dwelling nearer than 2500 feet to the snow-line. Firs are only found at 2600 feet under the snow-line, but full-grown birch within 1800 feet. In the lakes which occur at such an elevation only the Salmo alpinus is found. Some bushes and the dwarf birch grow at 1200 feet below the snow-line; and so far the Arctic bramble (Rubus arcticus is found; but above them trees and bushes cease to grow and the mountains are covered with brown plants and lichens. The Laplanders advance with their reindeer in summer to 750 feet below the snow-line

Agriculture and Productions.—The climate and soil are less favourable to the growth of grain in Sweden than in most other parts of Europe. It is stated that in seven years one year occurs in which the crops entirely fail; that in three the produce is indifferent, and in three rather plentiful. Formerly Sweden did not produce so much corn as was required for home consumption, and considerable quantities were imported. Between 1777 and 1790 the quantity imported amounted to nearly 400,000 quarters; and even between 1810 and 1816 to 150,000. The great disproportion between the produce of the crops and the consumption induced government to make every effort to extend cultivation, which has been accomplished by settling such portion of the landed property of the crown which seemed to be fit for cultivation, and by inducing the agricultural inhabitants to build their dwellings in the centre of the pieces of ground which had fallen to their share in the new distribution of the lands. When the agriculturists lived in villages, the land was divided among the proprietors, so that each of them possessed a long narrow piece of ground, the farthest extremity of which was frequently two or three miles from the dwelling of the farmer. The fields which were at such a distance were of course neglected, though the soil was not inferior to that of the fields near his home. Government induced and partly obliged the farmers to divide these fields, so as to form more compact estates, in the middle of which the premises of the farmers were erected. This change, more than any other, has enabled Sweden to produce as much corn as is required for its consumption. The principal objects of cultivation are wheat, rye, barley, oats, mixed grain, and peas. According to the estimates of Forsell, wheat yields 6½, rye 5¼, barley not quite 5, oats 3½, mixed grain 4, and peas 4⅝ times its seed. This produce coincides nearly with that of the northern countries of Germany and with that of Poland. Though the whole produce between 1805 and 1828 increased by 42 per cent., it would not even now be sufficient for home consumption if the cultivation of potatoes had not greatly increased. In 1805 only about 200,000 quarters of potatoes were grown, but in 1828 the potato crop was nearly 1,800,000 quarters.

Other objects of cultivation are hemp, flax, and tobacco; buckwheat and carraway-seed are also grown; and hops and madder. Nearly all the kitchen vegetables grown in England are cultivated in the southern provinces of Sweden, and most of them with tolerable success. Cherries, apples, and pears are abundant only in the southern districts; cranberries and other berries abound in the northern districts.

The forests are very large, sometimes extending 80 miles in length, with a width exceeding 25 miles, as the great forest which covers the mountains between the table-land of Jemtland and the valley of Herjedalen. But a great portion of the northern provinces (north of 64° N. lat.) is destitute of trees. Nevertheless the woods cover more than one-fourth of the surface, or 48,500 square miles; but they contain a comparatively small number of timber-trees. In most parts the soil does not favour their growth, and only small trees occur, and at the distance of many feet from each other: the bushes and underwood in many places occupy the intervals, and in other places there is no underwood. Accordingly the export of timber, though considerable, is not in proportion to the immense extent of the woods. But these forests supply firewood, of which a great quantity is consumed, as Sweden has no coal. Large quantities of charcoal are also used in the mines and in the manufactures. In some parts, especially towards the north, tar and pitch are extracted, chiefly from the roots of pine-trees, and are minor articles of export. Several kinds of coniferous trees and birch compose the greater part of these forests. Oak and beech form forests of small extent, but only in the southern districts. The immense tracts of country which are still uninhabitable, are generally used as pasture-ground, though it is of a very indifferent description; the domestic animals must be kept in stables from four to six or seven months, and their number is consequently limited by the extent of the meadows. Many tracts, at present used as meadows, could be cultivated, but it is found more advantageous to use them for making hay. As the pasture-grounds are in general very indifferent, the animals are small, especially the horses. Cattle and sheep are the most numerous, but the former are of small size, and the wool of the sheep is coarse. Some attempts have been made in Scania to cross the sheep with merinos. In the northern districts (north of 64°) reindeer are kept by the Laplanders, who bring them in summer to the most elevated parts of the Kiölen range, where they feed on the reindeer moss (Lichen Islandicus), and in summer they pasture them on the low tracts near the Gulf of Bothnia. Wild animals are very numerous, especially in the northern parts, but some of the larger size begin to be scarce, as bears and beavers. A few wild reindeer are still found in some places. Wolves, lynxes, gluttons, foxes, hares, squirrels, martens, and others are common. Lemmings sometimes come down in large numbers from the Kiölen Mountains, and lay waste the low country. Elk and deer are found in some of the large forests. The largest of the wild birds are eagles, capercailzies, and woodcocks. The seas of Sweden contain abundance of fish. Formerly large shoals of herrings came to the Cattegat, and in the latter half of the last century there was a very extensive fishery on the west coast of Sweden, but it has dwindled away, as the herrings no longer appear on that coast. It is stated that 58 different kinds of salt and fresh-water fish are brought to the markets of Göteborg, among which the turbot is common. There are also oysters and lobsters. The fishery in the Baltic gives subsistence to a great number of families. A smaller kind of herrings, called strömings, is caught in the summer, along the whole extent of the east coast, from the Quarkan to the peninsula of Scania. This fish is very numerous, and is prepared in different ways: it is rarely exported, but forms a large branch of internal commerce. Salmon is caught abundantly in almost all the rivers. The Salmo thymallus and the Salmo lavaretus abound in the lakes.

Sweden is rich in minerals. Gold is found on the table-land of Småland, at Adelforss, and was worked to the commencement of the present century, but the produce was so small, and the expenses of working the mine so great, that it has been abandoned. Silver is worked at Sala, in Westeras Län, and at some other places, and in Falu Län; but the produce amounts only to about 3000 marcs annually, of which the mines of Sala alone yield 2500 marcs. The expenses of working these mines are so great, that, according to Forsell, some disposition has lately been shown to abandon them. Copper is more abundant. The annual produce of the copper-mines amounts to nearly 1000 tons. The richest mines are those at Falun, in Falu Län, which annually produce 682 tons: next to them are those of Otvidaberg in Linköping Län, with an annual produce of 176 tons. Other copper-mines are worked in Westeras, at Riddarehytta, in Oresund near Mount Areskuta, and in Orebro near Hokanbo, and at a few other places; but their produce is small. The lead-mines, which are worked in Westeras, and in Falu, produce annually about 44 tons. Iron-ore is found in nearly every district of Sweden, and there is no part where it is not worked more or less, with the exception of the plain of Scania, where it seems that no iron-ore exists. The richest iron-mines are worked in that part of Sweden which has been noticed under the name of the region of the mines. But there are other places which contain inexhaustible layers of iron-ore, which cannot be worked on account of the access to them being difficult, or their being situated in a country destitute of fuel. This is the case with the mountains near Gellivare in Pitea Län, which are composed entirely of iron-ore, containing from 70 to 80 per cent. of metal, and which could furnish the whole world with iron for many centuries; but they are far from the sea, in a country nearly uninhabited, and almost destitute of fuel. The large mass of iron-ore in the Taberg, on the table-land of Småland, contains only 25 per cent. of metal, and it is too poor to be worked alone, though the metal is of good quality. The best iron is obtained from the mines of Dannemora in Upsala Län, and is well adapted for making steel. Nearly the whole of the produce, amounting annually to more than 3000 tons, goes to England, where it is called Oregrund iron, being shipped at the town of that name. But the largest quantities of iron are produced in Carlstad, Orebro, Gefle, Falu, and Westeras. The iron goes from Carlstad to Göteborg, but from the other provinces to Stockholm, and from these two places it is sent to foreign countries. The annual produce of all the iron-mines of Sweden amounts to more than 67,000 tons of bar-iron. In Orebro Län are rich mines of cobalt, which yield annually more than 600 tons; others are found in Calmar and Nyköping Län, but their produce is not great, as all the cobalt-mines of the kingdom do not produce more than 730 tons. At some places alum and vitriol are obtained, but only in small quantities. Coal of an inferior kind, called brown coal, is worked near Cape Kullen in Scania; but only to a small amount, as these mines are near the sea, where English coal of a superior quality may be obtained nearly for the same price. Porpbyry is got at Elfvedal, in the upper valley of the Dalelfven, north-west of Lake Silijan; and marble in the Kolmorden ridge, north of Norrköping, and in a few other places.

Inhabitants.—The bulk of the population are Swedes, a nation of Teutonic origin, and resembling the inhabitants of Great Britain, except that they are of a somewhat more slender make and fairer. They are distinguished by their predilection for scientific researches and a spirit of enterprise and activity. Besides the Swedes, there is a small number of Fins and Laplanders. The Fins [FINS] are numerous on the banks of the Tornea Elf, near the boundary of Russia, and excel in the rearing of cattle and the management of dairies. There are some families of Fins more to the south, especially in the woody country near the boundary-line of Norway, south of 61° N. lat., to which place they were transplanted more than 200 years ago by Charles IX. . They rarely intermarry with the Swedes, and they preserve their habits and language.

The Laplanders were formerly in possession of all Lapland [LAPLAND], but many Swedes and Fins have settled among them. They call themselves Sami, and their country Samilanda. Though their language proves that they are only a branch of the Finnish nations, they are distinguished from them by the form of their body and their mode of life. Their stature is short, varying in general between four and five feet; which seems to be the effect of the cold, to which they are exposed in winter in their miserable huts: for in the richer families, who have more comforts and protect themselves better from the severity of the weather, there are persons who measure five feet six inches. Their complexion is a dirty yellow, which is partly to be attributed to the smoky huts in which they pass the winters. Their face is generally broad and their nose short; the hair is rather black; the eyes are brown, narrow, and lengthened; and the mouth small. They are not strong, but they are very active, and of a cheerful disposition. A few families obtain their livelihood by fishing in the lakes and rivers, but the greater number live on the produce of their herds of reindeer, which supply the Laplanders with food, dress, and articles of exchange. They live on the milk and flesh of the reindeer, convert their skins into dresses, and sell their smoked flesh, and especially their tongues, which are considered a great dainty. These animals are also used in drawing the sledges. The Laplanders live only in the country north of 64° N. lat.: in winter they come with their herds to the lower country near the Gulf of Bothnia, and in summer they migrate to the Kiölen mountains. There are a few families south of 64° N. lat., who live the whole year near the mountains which are connected with Mount Areskuta and Mount Sylfiellen, and in summer remove to the higher part of the range. It is stated that the whole number of Laplanders in Sweden does not exceed 7000 individuals.

Population.—The population of Sweden in 1839 was 3,109,772, so that there were about 18 persons to each square mile. But the increase of the population, especially of late years, has been so great that Sweden must be considered as a newly settled country, when it is considered that the whole increase is the effect either of the extension or the improvement of agriculture. The following table shows this increase for the last 85 years:—

Population of Sweden from 1751 *to* 1839.

Year.	Population.	Increase.	In what Period.	Annual Increase.
1751	1,785,727	. .		
1760	1,893,246	107,519	9	11,946
1772	2,012,772	119,526	12	9,960
1780	2,118,281	105,509	8	13,189
1785	2,142,273	23,992	5	4,798
1790	2,150,493	8,220	5	1,644
1795	2,280,441	129,948	5	25,989
1800	2,347,303	66,862	5	13,372
1805	2,412,975	65,672	5	13,134
1810	2,377,851	35,123 dec.	5	7,025 dec.
1815	2,465,066	87,215	5	17,443
1820	2,584,690	119,624	5	23,925
1825	2,771,252	186,562	5	37,312
1830	2,888,082	116,830	5	25,366
1839	3,109,772	221,690	9	24,632

From this table it appears that in 85 years the population has increased by 1,324,045 individuals, or nearly three-fourths of the population of 1751, though the effect of the continental system of Napoleon on the welfare of Sweden is perceptible in the decrease of the population between 1805 and 1810. The great increase which is observed in the last twenty years is mostly to be attributed to the new system of farms, which has been already noticed. Between 1820 and 1830 the population increased 293,392 individuals, or 11·3 per cent. In Scotland the increase between 1831 and 1841, according to the recent census, has been only 11·1 per cent., though Sweden has not experienced any increase in its manufactures, which has certainly been the case in Scotland, as is proved by the increase of the population in Glasgow, Dundee, Paisley, and other manufacturing towns.

The population is very unequally distributed. The most northern district, the Län Pitea, contains only 1½ individuals to a square mile; the most southern, the Län Malmö, has more than 122 on the same extent of country. The following table shows the differences in the area and population of the different läns:—

Population of the different Districts of Sweden in 1839.

Names of the Districts.	Extent in square miles.	Population in 1839.	Number of Persons on each square mile.
City of Stockholm	. .	83,885	. .
Stockholm Lan .	2,918	111,342	38·3
Upsala . .	2,095	85,393	40·8
Westeras . .	2,667	92,411	38·4
Nyköping . .	2,512	113,752	45·3
Linköping . .	4,263	200,588	44·4
Jönköping .	4,302	148,595	34·5
Wexiö . .	3,795	118,309	31·1
Calmar . .	4,267	179,300	42·0
Wisby . .	1,230	42,580	34·6
Carlscrona . .	1,170	93,849	80·2
Christianstad .	2,438	162,809	66·5
Malmö . .	1,785	218,074	122·2
Halmstads . .	1,904	94,832	49·8
Göteborg . .	1,909	164,598	81·4
Wenersborg .	5,047	218,698	43·3
Mariestad . .	3,324	179,449	53·9
Orebro . .	3,261	125,393	38·4
Carlstad . .	6,960	192,879	27·7
Falu . . .	12,285	141,208	11·3
Gefle . . .	7,577	109,382	14·4
Hernösand .	9,521	85,242	89·0
Ostersund . .	19,175	45,517	2·4
Umea . .	29,445	55,256	1·9
Pitea . .	33,104	46,422	1·4
	166,045	3,109,772	18·7
Add the surface of the four great lakes of Southern Sweden .	3,590		
Total	169,635		

Historical and Political Divisions and Towns.—Sweden is divided into three great sections, of which the most southern is called Götaland or Göta Rike, the central section more properly Sweden or Swea Rike, and the northern Norrland. Each of these great sections was in course of time subdivided into several provinces, according as it appeared requisite for the purposes of administration. But this division into provinces being found inconvenient, another was adopted, by which some of the provinces were divided into two or three districts; whilst, on the other hand, in a few cases two provinces of the older division were united into one administrative district: these new districts are called läns. We shall give both the older and the more modern divisions.

The towns of Sweden are very small: many of them in England would hardly be called villages. They amount to

88, but more than 30 of them have not 1000 inhabitants, and a few have only from 200 to 300. There are only four towns whose population in 1839 exceeded 10,000, and only thirteen which were inhabited by more than 4000. Most of the smaller towns are inhabited by farmers, who have their small estates contiguous to the town, and a few tradesmen and mechanics.

I. Götaland, or Göta Rike, comprehends nearly the whole country south of 59° N. lat., and also that portion of the region of the mines whose drainage runs southward into Lake Wenern. It was formerly divided into ten provinces, and now contains 13 läns. The island of Gothland constitutes part of it.

1. Skane, generally called in England Scania or Schonen, extends over the Plain of Scania, and the high ground which lies north of it, comprehending also a small portion of the table-land of Smäland. It is the most fertile and most populous part of Sweden, rich in agricultural produce and all kinds of domestic animals. It is divided into two läns, Malmö Län and Christianstads Län.

a. Malmö Län extends over the south-western and best cultivated portion: it contains three towns with more than 4000 inhabitants, MALMÖ with 9720, LUND with 4970, and Ystad with 4325 inhabitants. Ystad, which is on the south coast, has an indifferent harbour, and is the place from which a regular communication is maintained with Germany, especially Stralsund in Pomerania. Steam-boats are now used. It contains some dye-houses and tanneries. Landscrona, built on the shores of the Oresund, is a fortress, and has a good harbour. It has a population of 3975 inhabitants, and a few tanneries, and soap and sugar houses. Helsingborg is situated at the narrowest part of the Oresund, opposite Helsingör in Denmark, and has a harbour, 2854 inhabitants, and some manufactures, on a small scale, of hats, ribands, and cast-iron pots. To the north of this place, at Höganas, about five miles from Cape Kullen, is the only coal-mine in Sweden. The small island of Hween, in the Oresund, on which are still some ruins of the observatory of Tycho de Brahe, belongs to this län.

b. Christianstads Län contains the eastern and northern and less fertile part of the plain of Scania, and a small portion of the table-land of Smäland. The capital is CHRISTIANSTAD, with 4710 inhabitants. Towards its southern extremity, near the boundary of Malmö Län, is a considerable alum-work, at Andrarum.

2. Blekinge contains the whole maritime region of Blekinge, with a narrow strip of the table-land of Smäland: it is generally fertile, and has good fisheries along the coast and in the rivers. It forms only one län.

c. Carlscrona Län has for its capital CARLSCRONA, with 12,850 inhabitants. The most commercial town is Carlshamn, with 4196 inhabitants, and a small but good harbour. Sail-cloth, starch, and tobacco are made for the consumption of other places. Vessels are built here.

3. Smäland comprehends nearly the whole of the table-land which bears its name, and the maritime region of Smäland. It is divided into three läns, Calmar, Wexiö, and Jönköping.

d. Calmar Län comprehends all the maritime region and a small portion of the table-land. It is rather fertile in agricultural productions, and has good forests of timber-trees. There are mines of iron, which yield a considerable produce; cobalt and alum are also got. It exports timber and the produce of the mines. CALMAR, the capital, has 6920 inhabitants. Westervik, farther north, has a good harbour, and above 3000 inhabitants: it exports timber and the produce of the cobalt-work in its vicinity. Vessels also are built. The island of Oland, which is included in this län, is fertile, but it contains no town. The population is about 35,000 individuals.

e. Wexiö Län extends over the southern and lower portion of the table-land of Smäland. It is a poor country, and less populous than any other portion of Götaland. There are some mines of iron, but the produce is small. The capital, Wexiö, has 1844 inhabitants. Paper and hats are made.

f. Jönköping Län extends over the northern and more elevated portion of the table-land: the soil is not much better than that of Wexiö Län, but the iron-mines are more considerable, especially those at the Taberg. The capital, Jönköping, is built at the southern extremity of Lake Wettern, and in modern times an artificial harbour has been made to protect the vessels which navigate the lake against the gales and swell. It has 4215 inhabitants, and a considerable commerce with the countries that surround the lake. There are an arsenal and a manufacture of arms. The gold-mine of Adelforss is within this län.

4. Halland comprehends the maritime region of that name, and the western declivity of the table-land of Smäland. It forms one län.

g. Halmstads Län has good forests and fisheries, especially in the rivers; the salmon is considered the best in Sweden, and forms a considerable article of export to other provinces. The capital, Halmstad, has 1853 inhabitants, and exports timber, pitch, tar, and the produce of the mines of Jönköping Län. Woollen stuffs are manufactured.

5. Western Götaland comprehends the north-western portion of the table-land of Smäland, and its declivity in that direction to the banks of the Göta Elf, and also the plain south of Lake Wenern. The whole of Mariestad Län, the largest part of Wenersborg Län, and a small part of Göteborg Län are in this province.

h. Mariestad Län comprehends the greater part of the plain south of Lake Wenern, and is fertile, well cultivated, and populous. It has some iron-mines and alum-works at Mount Kinne Kulle. There are also some considerable glass-houses. The capital, Mariestad, is on the shores of Lake Wenern, and has 1573 inhabitants. Skara, in a very fertile district, has 1497 inhabitants.

i. Wenersborg Län extends over the western and smaller part of the plain south of Lake Wenern, the north-western part of the table-land of Smäland, and the eastern part of the valley of the Göta Elf. It contains the province of Dalsland. A part of it is fertile, but the remainder has an indifferent soil. It has some iron-mines, but the produce is not great. The capital, Wenersborg, is built near the efflux of the Göta Elf from Lake Wenern, and carries on a considerable commerce in iron. The population is 2500.

6. Bohusland extends over the western and more sterile portion of the rocky region. The inhabitants of the coast obtain their livelihood by fishing and gathering lichens, which are used as a dye-stuff. In the eastern parts are fertile spots and good pasture-grounds. It forms the greatest part of Göteborgs Län.

k. Göteborgs Lan comprehends Bohusland and a small portion of Western Götaland, which surrounds the capital. The last-mentioned district is rather fertile. The capital is GÖTEBORG, with 19,800 inhabitants. Marstrand is built on a rocky island, about four miles from the continent: it has a good harbour, and is inhabited by fishermen. The population is 1113. Udevalla, built at the innermost recess of a deep inlet, has a good harbour, and exports timber. It has a manufacture of cables and a sugar-house. The population is 3917. Strömstad, near the boundary-line of Norway, has a harbour, and 1500 inhabitants, who are mostly occupied in fishing lobsters and oysters, which abound along this coast.

7. Dalsland is the smallest province of Sweden, and forms the northern part of Wenersborg Län. It comprehends the eastern and more fertile districts of the rocky region. The low tract along Lake Wenern is one of the most fertile districts in Sweden. In this province is the small town of Amal, with 1457 inhabitants.

8. Vermland comprehends that part of the region of mines whose drainage runs into Lake Wenern, and extends northward to 61° N. lat. There are fertile tracts along the banks of the lake: the interior has an inferior soil, but is richer in iron-mines than any other province of Sweden. Their annual produce amounts to 12,500 tons, or nearly one-fifth of the produce of the kingdom. The iron is collected at Carlstad and Christinehamn, and hence sent to Göteborg by way of Wenersborg. From Göteborg this iron is exported to all parts of the world. Vermelands forms Carlstad Läns.

l. Carlstads Län has for its capital a town of the same name, built on the small island of Tingvalla, near the influx of the Klar Elf into Lake Wenern: it is the centre of a considerable commerce with all the mining districts of Vermland: the population is 3034. Christinehamn is situated at the most north-eastern angle of Lake Wenern, and exports iron and timber to Wenersborg and Göteborg: the population is 1759.

9. Eastern Götaland lies between lake Wettern on the west and the Baltic on the east, and contains the whole of the plain of Linköping, together with the higher grounds south and north of it. The plain is rich in agricultural produce: the higher grounds have considerable iron-mines, which

produce annually 1300 tons of bar-iron: there are copper-mines at Otvidaberg. The eastern part of the Göta canal traverses Götaland from west to east. It forms one län.

m. Linköpings Län: the capital of this län is situated in the centre of the province, about two miles south of Lake Roxen and the Göta canal: it is a pretty, well-built place, with a fine cathedral and a good grammar-school. It has some manufactures of wool, stockings, and tobacco: the population is 3710. Söderköping is situated on the Göta canal, about two miles from the place where it joins the Släte-baken, an inlet of the Baltic: it is a small place, with about 1000 inhabitants. The largest place is NORRKÖPING, with 12,880 inhabitants. Wadstena is built on the banks of Lake Wettern, and contains 2188 inhabitants: much lace is made here, and some carpets and woollen cloth.

10. The island Gothland [GOTHLAND] forms

n. Wisby Län.

II. Sweden, properly so called, or Swea Rike, comprehends the central provinces of the kingdom, which lie chiefly between 59° and 61° N. lat. It extends over the country surrounding the lakes Mälaren and Hielmarn and over the basin of the Dalelf. It was formerly divided into five provinces, and contains six läns.

11. Nerike, the most south-western part of Swea Rike, is composed of a portion of the region of mines, and of another belonging to the central agricultural region. The mines occupy the northern, and the agricultural district the southern part of the province. Besides very extensive and numerous iron-mines, which yield an annual produce of nearly 9000 tons of bar-iron, it has mines of copper, cobalt, alum, brimstone, and vitriol. It forms one län.

o. Orebro Län: the capital, also called Orebro, is built near the western extremity of Lake Hielmarn, and is one of the most commercial places in the interior of Sweden: the mining districts north of the town bring their produce to this town, and take in return corn, and manufactured articles and foreign goods, which are brought to Orebro by Lake Mälaren and the Arboga canal. The population is 4198. Woollen stuffs, wax-cloth, and arms are manufactured at Orebro. Askersund, a small town at the northern extremity of Lake Wettern, has 871 inhabitants, and a harbour, the only natural one on the banks of this lake.

12. Södermanland, or Sudermania, comprehends the country between the Kolmoren ridge on the south, and the lakes Hielmarn and Mälaren on the north; and contains the best part of the central agricultural region: much wheat is grown. It has some mines of iron, and marble of good quality is worked in the Kolmoren range. The western part of this province forms Nyköpings Län, and the eastern, which is much smaller, constitutes a part of Stockholms Län.

p. Nyköpings Län has a capital of the same name, which is built at the innermost recess of a short inlet of the Baltic; forming a harbour, which is choaked up with sand, and only admits small vessels. It has some manufactures of wool, linen, silk, tobacco, stockings, pins, paper, and brass. Cannons are also cast. It exports iron, timber, and brass; the population is 3000. Eskilstuna, which is situated between the eastern extremity of Lake Hielmarn and Lake Mälaren, is the most important manufacturing place in Sweden for iron. Arms and cutlery are made to some extent. There is also a copper-work. It is a thriving place, and contains above 2500 inhabitants.

13. Upland extends from the northern banks of Lake Mälaren to the banks of the Dalelf along the Baltic, and about 60 miles inland. It comprehends the largest portion of the central agricultural region, and produces much rye and barley. It has also considerable iron-mines, the annual produce of which amounts to 4700 tons: the mines of Danemora yield iron of the finest quality. Upland is divided into two nearly equal parts, of which the western forms Upsala Län, and the eastern belongs to Stockholms Län.

q. Stockholms Län comprehends the eastern half of Upland, and also the eastern districts of Södermanland. The capital is STOCKHOLM, the capital of the kingdom, with 83,885 inhabitants. Södertelge, a small town with 1065 inhabitants, lies west-south-west of Stockholm, on the Södertelge canal: it has some commerce in provisions. Norrtelje, at the innermost corner of an inlet of the Baltic, has 1036 inhabitants, some commerce in grain, and some cloth manufactures. Oregrund, near the northern extremity of the Län, has a good harbour, in which the produce of the iron-mines of Danemora is shipped to England: the population is 671. Sigtuna, a small place with 598 inhabitants, on an arm of Lake Mälaren, is remarkable for the antiquities in its vicinity.

r. Upsala Län has for its capital the town Upsala [UPSALA], with 4897 inhabitants. Near Löfsta, towards the northern part of the Län, there are extensive iron works.

14. Vestmanland, west of Upland and east of Nerike, contains a small part of the central agricultural region, and a larger part of the region of mines. The iron-mines yield an annual produce of more than 7000 tons. At Sala there are the richest silver-mines in Sweden. There are also copper and lead mines, but their produce is not great. This province forms Westeras Län.

s. Westeras Län has obtained that name from its capital, Westeras, which is built on an arm of Lake Mälaren, and carries on a considerable commerce in iron. It has 3344 inhabitants, and manufactories of tobacco and some dye-houses. Sala, north of Westeras, has 2916 inhabitants: in its vicinity are the silver-mines. Arboga, on the river Arboga, which begins to be navigable for river boats at that place, has some commerce in iron and grain, and 1747 inhabitants. Strömsholm, a royal palace, is built on the banks of Lake Mälaren, south-west of Westeras, where the Strömsholms Canal joins the lake.

15. Dalarne, or Dalecarnia, lies entirely within the region of the mines, with the exception of the northern part, which belongs to the southern mountain-region. [DALECARLIA, vol. viii., p. 289.] It constitutes Falu Län.

t. Falu Län contains Falun [FALUN], with 4050 inhabitants; and Hedemora, a small town situated in a fertile district, with 1033 inhabitants.

III. Norrland extends over the three mountain-regions, with the exception of a part of the southern, which is included in Dalecarlia, and forms part of Swea Rike. It is composed of eight provinces, which form five Läns.

16. Gestrikland is situated within the region of the mines, of which it constitutes the most north-eastern portion. This is the most northern part of Sweden in which wheat is grown to any extent. It has good forests and mines, and forms the southern part of Gefle Län.

17. Helsingland, north of Gestrikland, within the southern mountain-region, produces rye and barley, and has good forests and mines. It forms the northern part of Gefle Län.

u. Gefle Län is composed of Gestrikland and Helsingland, and has rich iron-mines which yield an annual produce of more than 9000 tons. Flax is cultivated on a large scale, and exported to a considerable amount, though more linen is manufactured here than in any other part of Sweden. The forests supply other articles of export. Gefle, the capital, is built on the banks of a small inlet of the Gulf of Bothnia, which forms a good harbour. It is one of the best-built towns of Sweden, has 8200 inhabitants, and several good institutions for instruction, among which is a school for navigation. The commerce is considerable, and 76 vessels, with an aggregate of 15,000 tonnage, belong to the town. The exports consist of iron, timber, tar, flax, and linens; and the imports principally of corn and salt. It has some sugar-houses, and manufactures of sail-cloth, linens, and tobacco. Many vessels are built; and some families obtain their living by fishing. Söderhamn, at the extremity of a narrow inlet of the Gulf of Bothnia, has 1629 inhabitants, and exports butter, flax, and linens. Sail-cloth and linens are manufactured. Hudvicksvall, on a tolerably wide inlet of the Gulf of Bothnia, has 1877 inhabitants, and exports timber, flax, linens, and butter.

18. Medelpad, and

19. Angermanland, form

v. Hernösand Län, of which a description is given under ANGERMANLAND (vol. ii., p. 18).

20. Herjedälen consists only of the elevated and narrow valley of the upper course of the Ljusnau Elf, and extends to the declivity of Mount Sylfiellen. It has some iron-mines, and forms part of Oresunds Län.

21. Jemtland contains the table-land which derives its name from it, the upper valley of the Ljungan Elf, which lies south of it, and a large mountain-tract which lies north of the table-land, and contains the upper valleys of the rivers Indals and Angerman. No iron-mines are worked, but there is a copper-mine at the base of Areskuta. Agriculture is followed only on the lower part of the table-land, near the large lake called Störsiön. It is a part of Oresunds Län.

w. Oresunds Län, consisting of the provinces of Herjedälen and Jemtland, has for its capital the town of Ostersund, a small place with 418 inhabitants, and situated on the eastern banks of Lake Störsion.

22. Westerbotten, and

23. The Lapmarks, viz. Asele, Umea, Pitea, Lulea, and Tornea Lapmark, constitute the two läns of

x. Umea and

y. Pitea, of both of which a full account is found under the heads of BOTHNIA (vol. v., 255) and LAPLAND (vol. xiii., 329).

Manufactures.—Manufacturing industry has made no great progress in Sweden. The annual produce of the manufactures of the kingdom, in 1831, amounted only to 9,699,456 Swedish dollars, or 751,898*l.* The most important were those of woollen cloth and other stuffs, which amounted to 2,821,284 dollars, or 218,704*l.* The largest cloth manufactures are in Norrköping and Stockholm. A part of the material, to the value of 259,418 dollars, or 20,100*l.*, was imported from foreign countries. Next to the woollen manufactures, if the value of the produce alone is considered, were the sugar-houses, the produce of which amounted to 1,813,069 dollars, or 140,548*l.* The largest manufactures of this description are at Göteborg. Tobacco is manufactured in many places, and at Norrköping on a large scale: the whole produce amounted, in 1831, to 817,225 dollars, or 63,351*l.*: a considerable portion of the material is imported. Next in importance are the paper manufactures which, in 1831, produced 517,215 dollars, or 40,094*l.* The largest establishments of this kind are in Christianstad Län and in Falu Län. Tanning is perhaps the most important branch of manufacturing industry. Though the produce of the tanneries, according to the published accounts in 1831, amounted only to 502,993 dollars, or 38,992*l.*, it must be remembered that this quantity was only made in large establishments, where the leather is prepared in the English way; but there are tanneries in most of the towns, the produce of which is not included in the account. The largest manufactures of this description are at Stockholm. A small portion of the material was imported. The produce of the glass-houses amounted, in 1831, to 298,268 dollars, or 22,424*l.* The largest glass-houses are in Mariestad Län. The cotton manufactures have decreased, partly on account of the larger importation of English cotton goods, and partly because the inhabitants buy cotton-twist, and manufacture cotton-cloth in their houses. In 1831 the produce of the manufactures both of cotton-cloth and calicoes amounted to 330,643 dollars, or 25,624*l.* But the produce of the cotton-spinning establishments is considerable, and has been much increased by the erection of two or three manufactories within the last ten years. The produce of the silk manufactures, in 1831, amounted to 509,589 dollars, or 39,503*l.* All manufactures of this description are at Stockholm or in the neighbourhood. There are two manufactures of chinaware, the produce of which, in 1831, amounted to 161,243 dollars, or 12,500*l.* The manufactures of cast-iron yielded a produce of 155,512 dollars, or 12,055*l.*; but it was observed that a considerable number of small establishments, in which iron was cast, existed all over the mining districts, the produce of which was not known. Sailcloth was made, especially in Göteborg and its vicinity, to the amount of 111,555 dollars, or 8,647*l.* The soap-houses produced, in 1831, to the value of 104,800 dollars, or 8,124*l.*; and the oil-mills to the amount of 103,788 dollars, or 8,046*l.* The manufactures of watches, ribands, wax candles, and vinegar were inconsiderable. The most considerable branch of manufacturing industry, that of linens, is not included in this account. Linens are extensively manufactured in several parts of the kingdom, especially in the hilly portion of Wenersborg Län, where the produce was estimated, in 1831, to amount to 2,250,000 ells, or more than 2,000,000 of yards. Great quantities of linen are also made in Hernösand, Gefle Län, Colmar, and Halmstad Län. The whole produce of this branch of industry, which is carried on in the houses, is stated to amount to between four and four and a half millions of yards. Another important branch of industry, not included in the account, is the building of vessels, which is carried on to some extent in most of the harbours of the Baltic. No account is also taken of the produce of the numerous distilleries and breweries. When all these branches are added, it may be conjectured that the total annual produce of the manufacturing industry of Sweden does not fall much short of 15 millions of dollars, or 1,169,000

Internal Commerce.—The internal commerce must be considerable in a country a great part of which, such as the mining districts, does not produce sufficient corn for the consumption, and must be supplied with bread from other parts of the country. Several other articles, as salt, must also be brought from remote places to the inland provinces. The manufactured goods, especially the linens of Wenersborg Län, which are carried to the most remote parts of the country, add also greatly to the internal commerce. This commerce is facilitated by the excellent roads, and in winter by the whole country being covered with snow for four or five months, which renders the conveyance of goods in sledges easy and expeditious. In summer, a like advantage is derived from the navigation of the sea, which washes most of the provinces. In the provinces which lie farther inland, there are large lakes and extensive canals, which render the transport of goods easier and less expensive. It is said that the number of vessels employed in the coasting trade to carry the goods from one port to another amounted, in 1831, to 1209, and that the aggregate burden was about 67,000 tons. The number of large river barges and boats which are used on the canals is much greater. The statements respecting the navigation of the canals give us some idea of the internal commerce of the country. In 1831 the Trolhättan Canal was navigated by 1604 barges of 40 tons burden and upwards, and by 363 barges of less than 40 tons burden, besides 377 large boats and 32 rafts. They brought to Göteborg large quantities of iron and steel, and timber in planks and boards; and they carried into the interior corn, whiskey, salt, herrings, sugar, butter, fish, wine, and some other articles. The navigation began on the 21st of April and closed on the 31st of December. Through the Arboga Canal there passed, in the same year, 129 barges of 12 tons burden and upwards, and 30 barges of less than 12 tons. They brought to Stockholm bar-iron, alum, and corn, and took to the interior salt, herrings and strömings, whiskey, and some other articles. The navigation began on the 4th of May and closed on the 15th of November. The Strömsholm Canal is navigated by barges varying between 12 and 30 tons burden, of which 621 passed through the canal. They carried to Stockholm large quantities of bar-iron, and took to the mining districts corn, salt, and salt-fish, with some minor articles. The navigation began in May and closed in November. The Södertelge Canal was navigated by 1102 barges of more than 12 tons burden, and 491 barges of smaller size and boats. The total tonnage of these barges was 12,000. The navigation began on the 1st of May and closed on the 27th of November. The Göta Canal was navigated by 434 barges of more than 12 tons burden, and by 70 smaller vessels. The goods which they carried were of very different descriptions: the most important were iron, corn, herrings, salt, bricks and tiles, and whiskey. The navigation began on the first of May and closed on the 27th of December.

Navigation.—The Swedes are much given to a seafaring life. Their vessels visit most of the countries contiguous to the Atlantic, and they are also employed in the carrying trade between other countries, especially in the Mediterranean, and on the coasts of South America. The number of sea-going vessels amounted in 1832 to 1081, with a tonnage of 136,268. Of this number 406 smaller vessels, with a tonnage of 26,875, were employed in the coasting trade, in the navigation on the lakes of Wenern and Wettern, and in the fisheries. The remainder, 675 vessels, with a tonnage of 119,393, carried on the commerce and navigation with other countries. The largest amount of shipping is owned by the following twelve towns: Stockholm has 146 vessels, with 30,500 tons burden; Gefle, 76 vessels, with 17,712 tons burden; Göteborg, 72 vessels, with 16,960 tons burden; Wisby, 77 vessels, with 8495 tons burden; Calmar, 87 vessels, with 6912 tons burden; Westervick, 35 vessels, with 4142 tons burden; Carlshamn, 35 vessels, with 4135 tons burden; Sundsvall, 21 vessels, with 3910 tons burden; Carlscrona, 48 vessels, with 3442 tons burden; Malmö, 42 vessels, with 3325 tons burden; Hernösand, 25 vessels, with 2690 tons burden; and Udevalla, 12 vessels, with 2627 tons burden.

Foreign Commerce.—The commerce of Sweden may be called large when it is considered that a scanty population is dispersed over an immense tract of country. The value of the exports varies between ten and fourteen millions of dollars, or between 772,798*l.* and 1,081,965*l.*; and that of the imports between ten and fifteen millions of dollars, or between 772,789*l.* and 1,159,196*l.* The imports sometimes considerably exceed the exports in value, but this is only the case when the crops have failed, and considerable quantities of corn are imported, which was the case in 1826 and 1827.

The most active commerce subsists between Sweden and the countries surrounding the Baltic, the Netherlands, Great Britain, France, and Portugal. The commerce with Spain and the states of Italy is less important. The commerce with Brazil is very considerable. The statements respecting the commercial intercourse of Sweden in 1831 are contained in the following tables:—

Table I., exhibiting the Value of the Goods imported into Sweden.

Names of Countries from which exported.	In Swedish vessels.	In foreign vessels.	Total.
Norway	£50,880	£68,515	£119,395
Russia	86,171	82,653	168,824
Prussia	5,596	6,782	12,378
German States, exclusive of Hamburg and Lübeck	8,017	495	8,512
Denmark	70,834	18,455	89,289
Hamburg and Lübeck	155,950	500	156,450
Netherlands	14,417	1,233	15,650
Great Britain	44,581	90,282	134,863
France	25,595	4,348	29,943
Spain	11,943	..	11,943
Portugal	23,148	75	23,223
Naples and Sicily	2,469	..	2,469
United States of N. America	12,404	57,577	69,981
Brazil	104,283	3,539	107,812
	616,288	334,444	950,732

Table II., exhibiting the Value of Goods exported from Sweden.

Names of Countries to which imported.	In Swedish vessels.	In foreign vessels.	Total.
Norway	£12,908	£27,616	£40,526
Russia	10,882	59,797	69,679
Prussia	34,396	8,817	43,213
German States, exclusive of Hamburg and Lübeck	28,811	5,183	33,994
Denmark	110,001	10,309	120,310
Hamburg and Lübeck	67,257	384	67,641
Netherlands	17,995	8,233	26,228
Great Britain	113,880	143,979	257,859
France	48,910	5,655	54,565
Spain	3,095	91	3,186
Portugal	44,047	12	44,059
Gibraltar	1,081	..	1,081
Sardinian States	4,263	..	4,263
Tuscany	10,349	..	10,349
Naples and Sicily	522	..	522
Austria	1,445	..	1,445
Algiers	402	..	402
Egypt	3,197	..	3,197
United States of N. America	52,164	247,237	299,401
Brazil	26,255	..	26,255
	591,860	517,313	1,109,173

The principal articles of export from Sweden are iron and timber. Great Britain, France, and Portugal take large quantities of both articles; the United States of America and Prussia take only iron; the countries of Italy, timber; Norway takes a considerable quantity of iron, and sends fish in return. The intercourse between Sweden and Russia is of a peculiar nature. The two countries have nearly the same productions, and there would of course be very little commercial intercourse between them if Stockholm did not receive from Finnland three-fourths of the firewood which it consumes. Some years ago the Swedish legislature gave a considerable premium for firewood brought to Stockholm from the northern provinces, but it was found that the expense of conveying it to the capital was too great, and that the firewood thus imported could not enter into competition with that from Finnland. Finnland also exports a considerable part of its produce to Stockholm, as meat, butter, cheese, bacon, flour, hides, pitch, and tar. The intercourse with the other provinces of Russia is inconsiderable.

The other articles of export, besides iron and timber, consist of copper, cobalt, and alum, of tar, pitch, hemp, oil, paper, tree-bark, tobacco and snuff, bricks, furs, some linens, vessels, and some minor articles. The chief articles of import are sugar, coffee, salt, fish, hides, cotton-twist, cotton in wool, woollen stuffs, linens, cottons, wine and brandy, wool, dye-stuffs, raisins, almonds, pepper, cinnamon, arrack and rum, butter, bacon, tobacco, soap, train-oil, oil, ginger, lacquered ware, tea, tallow, potashes, and oil.

Table III., exhibiting the amount of Shipping employed in the commercial intercourse of Sweden with different Countries in 1831.

Names of the Countries.	Tonnage of vessels bound inward.			Tonnage of vessels bound outward.		
	Swedish vessels.	Foreign vessels.	Total.	Swedish vessels.	Foreign vessels.	Total.
Norway	11,632	37,096	48,728	25,766	18,783	44,549
Russia	14,418	51,827	66,245	28,430	54,739	83,169
Prussia	11,174	3,779	14,953	14,895	3,759	18,654
German States, exclusive of Hamburg and Lübeck	9,925	1,437	11,362	11,322	1,279	12,601
Denmark	46,469	5,836	52,305	67,555	4,352	71,907
Hamburg and Lübeck	15,117	9,081	24,198	22,678	690	23,368
Netherlands	3,645	5,686	9,331	8,068	3,628	11,696
Great Britain	10,159	42,288	52,447	22,590	52,452	75,042
France	7,088	1,889	8,977	30,674	4,668	35,342
Spain	12,775	..	12,775	28,430	273	28,703
Portugal	14,313	381	14,694	6,832	..	6,832
Gibraltar	..	..	..	5,201	..	5,201
Sardinian States	..	..	..	3,125	..	3,125
Tuscany	..	..	..	6,812	..	6,812
Naples and Sicily	6,382	..	6,382	8,588	..	8,588
Austria	..	..	..	1,490	..	1,490
Algiers	..	..	..	593	..	593
Egypt	..	..	..	3,920	..	3,920
United States of America	1,246	4,905	6,151	5,379	22,545	27,924
Brazil	5,477	530	6,007	8,870	..	8,870
	168,820	164,745	333,565	310,418	167,258	477,676

Education.—Sweden has two universities, Upsala and Lund. The number of students who were matriculated in 1830 amounted to 2085, of which number however only 1265 were attending the lectures. The number of grammar-schools, of which some are called gymnasia, and others trivial schools, is considerable: they were attended in 1830 by 6481 boys. Besides these there are in most of the larger towns middling schools. The number of boys who attended these schools amounted in 1830 to 3083. There are regular elementary schools only in the towns, and not in all of them: in 1830 there were only sixty-six schools of that description, in which 282 teachers were employed in teaching 4340 boys. In some parts of the country there are parish schools, and some larger villages have their own schools; but the country children are generally instructed by ambulatory teachers. For that purpose every parish is divided into school districts, each of which is visited at a certain season of the year by one or more teachers, who remain there from six to twelve weeks. This arrangement is made necessary by the population being so much scattered: the children would be obliged to walk a great distance if schools were established at fixed places. This system of instruction might be supposed to be defective; but it is stated by authority, on which every reliance can be placed, that the proportion of persons who cannot read to those who can is as 1 to 1000. It is however a general practice in Sweden for parents, especially those who live in the country, to instruct their children in the long winter evenings.

(Von Buch's *Travels through Norway, Lapland, and Sweden*; Thomson's *Travels in Sweden*; Everest, *Travels through Norway, Lapland, and part of Sweden*; Schubert's *Reise durch Schweden, Norwegen, Lapland, &c.*; Forsell's *Sta-*

tistik von Schweden; Forsell's *Anteckningar ofver Sverige*, Stockh., 1839.)

History.—The early history of Sweden, as of the other Scandinavian nations, is known chiefly from the Sagas, or chronicles, which present little more than a confused mass of fables and heroic legends. The first ascertained dynasty of kings is that of the Ynglings (so called from the third of their number, Freyer-Yngve, a grandson of Odin), who reigned from the arrival of Odin in the north, an event variously fixed at from B.C. 50 to A.D. 250, till about A.D. 630, when the last of these princes, Olaf Trætelia, was expelled by Ivar Vidfadme, a Danish king of the race of the Skioldungs, another branch of the progeny of Odin. The thrones of Sweden and Denmark continued for some time united under the descendants of Ivar Vidfadme, till at the death (794) of the famous pirate-king Ragnar Lodbrok, who fell in an expedition against the English coasts, Sweden again became a separate kingdom under his second son Biorn Ironside. Under Biorn II., grandson of Biorn Ironside, Christianity was first introduced in Scandinavia: but the mass of the people still adhered to paganism; and Erik, who reigned 993-1001, perished in a popular revolt provoked by his demolition of the heathen temples. His son Olaf however (1001-26), surnamed Skot-Konung, or the Tribute-King, from a tax which he paid to the pope, formally established the Christian faith; and the conversion of the nation was completed by his son Emund-Jacob (1026-51), for whom the severity of his legislative enactments procured the surname of Kolbrenner (the Coalburner). His successor, Emund Slemme (1051-6), fell in battle against the Goths of Gothland, then a separate nation from the Swedes; and the male descendants of Biorn Ironside being extinct, a fresh dynasty was founded (1056) by Stenkill, under whom the Swedes and Goths were for the first time united. The princes of his line, four of whom ruled from 1066 to 1129, were chiefly remarkable for their pacific virtues, and their zeal for extirpating the relics of paganism. On the death of the last, Inge II., the Swedes conferred the royal dignity on a private individual named Sverker (1129-50); while to obviate the discontent of the Goths, who supported the claims of Erik (afterwards canonized), a descendant by females of the house of Stenkill, it was agreed that Erik should succeed Sverker, and that the representatives of the two families should in future reign alternately. The reign of St. Erik (1155-61) was signalized by the final conquest and conversion of the Fins (1154), and by the compilation of an excellent code of laws: but after his death, the strange arrangements above mentioned gave rise, as might have been foreseen, to endless dissensions and civil wars. The alternate succession was however adhered to through the reigns of Charles (1161-7), son of Sverker I.; Knut or Canute, son of St. Erik (1167-99); Sverker II., son of Charles (1199-1210); Erik, son of Knut (1210-16); John Sverkerson (1216-22); and Erik Erikson (1222-50), surnamed Læspe, or the Stammerer, with whom expired the male line of St. Erik, as that of Sverker had done with John.

Waldemar (1250-76), of the Folkungar family, and a nephew of Erik Læspe by the sister's side, was raised to the vacant throne by election of the states, the government being confided during his minority (till 1266) to his father, Birger Jarl, who founded Stockholm (1254), removing the capital thither from Upsala, and first legalized hereditary nobility and inheritance by females. Waldemar was dethroned by his brother Magnus Ladulæs (1276-90), a wise and politic monarch; but the reign of his son Birger (1290-1319) was again a scene of fraternal discord, ending in his deposition in favour of his infant nephew Magnus Smek (1319-63), who also succeeded in right of his mother to the crown of Norway. The long reign of this weak and perfidious prince was a series of domestic treasons, and disastrous civil and foreign wars: he was deposed by the Diet in 1343, and his son Erik XII. substituted; and though restored on the death of Erik in 1359, he was soon finally displaced by his sister's son, Albert of Mecklenburg (1363-89). But the rule of Albert was as unpopular as that of his predecessor; and he was overthrown and made prisoner (1389) by Margaret, surnamed the Semiramis of the North, Queen of Norway and Denmark.

This remarkable princess was daughter of Waldemar Atterdag, the last male of the antient Danish kings, and widow of Hakon, king of Norway, a son of Magnus Smek. On the death of her son Olaf (1387), she had been declared queen-regnant of these two kingdoms; and having by the fall of Albert become mistress of Sweden, she formed the three northern realms into a confederate monarchy by the famous Union of Calmar (1397), the three crowns being declared indissolubly united, though the internal administration of each kingdom continued independent and separate. Margaret was succeeded by her grand-nephew Erik of Pomerania (1413-39), but his tyranny irritated the Swedes, who from the first had borne with impatience a foreign yoke: the Swedish Tell, Engelbrekhtson, expelled the Danes in 1433, and Charles Knutson Bonde was elected Riksforestandare, or administrator of the kingdom. On the death of Christopher of Bavaria, the successor of Erik, he usurped the royal title as Charles VIII. (1448-70); but though he was unable to maintain himself as king, the office of administrator was revived in his nephew Sten or Stephen Sture (1471-1505), under whom the university of Upsala was founded (1476), and printing introduced (1483). The rule of this chief and of his successors, Svante Nillson Sture (1505-12), and Sten Sture II. (1512-20), is marked by the incessant efforts of the Danish kings to render their nominal supremacy over Sweden effectual, either by policy or arms; till Christian II., aided by the powerful family of Trolle, which was at feud with that of Sture, defeated and slew Sten Sture II. at Bogesund, and massacred at Stockholm (October 8, 1520) ninety-four prelates, senators, and nobles of the opposite party. The Swedes now flew to arms under Gustavus Erikson Vasa, the son of one of the victims; and the expulsion of the Danes (Christian being opportunely dethroned at the same time in Denmark) was followed by the unanimous proclamation of Gustavus, as king of the Swedes and Goths. Thus ended the Union of Calmar.

With the establishment of the dynasty of Vasa, the history of Sweden, as an independent and respectable kingdom, may properly be said to commence; and the new æra was further marked by a change of religion. The Lutheran doctrines had been introduced in 1522 by Olaus Petri, a disciple of the great reformer, and so rapid was their progress, that in 1528 the Confession of Augsburg was solemnly adopted as the standard of faith by the king and people at the diet of Westeras, at which the peasants first appeared as a fourth and separate estate. By the 'Act of Hereditary Union' (1540) the crown was settled on the male heirs of the king; and the treaty of Fontainebleau (1542), by which Denmark and Sweden allied themselves with France against Charles V., affords the first instance of a diplomatic correspondence between the Scandinavian states and the kingdoms of Southern Europe: but peace was concluded with the empire in 1544; and the only other wars in which Gustavus engaged were two short and indecisive ones (1536 and 1555) with Russia. The conclusion of commercial treaties with England and the Netherlands (1550) gave a new impulse to trade and navigation; and foreign artizans and men of science were invited and encouraged to settle in the country, which under this wise policy attained a degree of affluence and prosperity hitherto unknown, and was raised from the condition of a semi-barbarous and dependent territory to the rank of a considerable state. But Erik XIV. (1560-8), son and successor of the great Gustavus, was a gloomy and cruel tyrant; and after entering into rash and unsuccessful wars with Poland and Russia (1562) for Esthonia, and with Denmark (1563) on the question of national supremacy, became insane from remorse for the slaughter of the Sture family and their adherents (1567), and was deposed by the states in favour of his brother John III. (1568-92), who confined Erik in a dungeon, and at length (1577) put him to death. The rule of John was at first prosperous; the dispute with Denmark was amicably adjusted (1570) by the peace of Steitin; and the peace of Zapolia with Russia (1583) gave Ingria and Carelia to Sweden. But the attempts which he made, at the instigation of his wife, a Polish princess, to restore a modified form of Catholicism, gave rise to religious disputes which occupied great part of his reign; and Charles, duke of Sudermania, the king's brother, headed the Lutheran party, which regained the ascendant on the queen's death, though Catholicism was still tolerated. John was succeeded by his son Sigismund (1592-1604), who had, in 1587, been elected king of Poland in right of his mother: but his open profession and patronage of Catholicism speedily alienated the Swedes, and a civil war commenced, which continued at intervals till 1604, the king being supported by Polish troops: till at length the diet of Norrköping formally prohibited the obnoxious faith, and raised the duke of Sudermania to the throne as Charles IX. (1604-11) in the place of his nephew. From this revolution arose the Swedo-Polish war of succession, which continued almost without intermission for 60 years (1600-60). At first the Poles were successful, overrunning Livonia, &c., and defeating the Swedes at Kerkholm (1507): but the attention of both was drawn off by the distracted state of Russia, which had become a prey to anarchy and civil war since the extinction of the line of Rurik in 1598. Sweden at first espoused the cause of the czar Schuiski, and sent a force to his aid under the famous General de la Gardie: but on the fall of their ally the Swedes occupied Kexholm and Novgorod, and even attempted to raise Charles Philip, second son of the Swedish king, to the throne of Russia. A short but bloody war with Denmark (1611-13), usually called the war of Calmar, on the subject of the northern limits of Lapland and Norway, was ended to the disadvantage of Sweden by the peace of Siorod: but in the meantime Charles IX. had been succeeded by his son, the famous Gustavus Adolphus (1611-32). The first acts of his reign were directed to legislative improvements and the extension of commerce and agriculture, in which he was aided by his illustrious minister Oxenstierna; while the privileges of the nobles, which his father had curtailed, were restored and even extended. By the peace of Stolbova (1617), concluded under the mediation of England, Russia ceded all her remaining territory on the Baltic; and the king, heading his army against the Poles, took Riga (1621), and subdued Livonia and Polish Prussia, which were ceded to Sweden (1629) by the truce of Altmark. His arms were now turned towards Germany, where the success of Austria in the Thirty Years' War seemed to threaten Protestantism with annihilation; and being chosen captain-general of the Protestant league, he landed in Pomerania, June, 1630: but the campaigns and victories of the Lion of the North, till his fall in the moment of triumph at Lützen (November 6, 1632), belong to German rather than Swedish history.

Christina (1632-54), the daughter of Gustavus Adolphus, succeeded at the age of six years, under the guardianship of Oxenstiern, who administered the kingdom with consummate ability; while the generals Wrangel, Torstensohn, Bannier, and Bernhard of Saxe Weimar, carried the renown of the Swedish arms to the highest pitch in Germany. A short war with Denmark (1643-45), in which Sweden was the aggressor, was terminated to the advantage of the latter by the peace of Bromsebro; and at the general peace of Westphalia (1648), Sweden received Pomerania, Rugen, Bremen, &c., with the annexed rights as a state of the empire: acquisitions which elevated her to the rank of a first-rate power. But the eccentric tastes of Christina, who was devoted to abstruse literature, indisposed her for the cares of government; and in 1654 she abdicated the crown in favour of her cousin, the Count Palatine of Deux-Ponts, she retired to France, and afterwards to Rome, where she died a Roman Catholic in 1689. The new king, Charles Gustavus (1654-60), renewed the war with Poland, which he completely overran, taking Warsaw, Cracow, &c.: then attacking Denmark, which had espoused the cause of Poland, he crossed the Belts on the ice, menaced Copenhagen, and compelled the cession (by the peace of Roskilde, 1658) of Scania and all the other Danish provinces beyond the Sound. A fresh attempt to subdue Denmark completely was frustrated by the succour of the Prussians and Dutch, who repulsed the Swedes from before Copenhagen; and the disappointed ambition of the king is said to have hastened his death. During the minority of his son Charles XI. (1660-97), the long contest with Poland was concluded (1660) by the peace of Oliva; Livonia, Esthonia, and Oesel were confirmed to Sweden, and the claim of the Polish kings to the Swedish crown was given up. The rise of the French and anti-French parties at court produced several changes of policy; but the predominance of the former at length gave rise to a war with Prussia and Denmark (1675-79), in which the Swedes were generally worsted, but at the peace of Fontainebleau (1679) regained all that they had lost. This reign was also the epoch of the first struggle between the crown, supported by the burghers and peasants, and the power of the senate and nobles: the resumption of the crown lands (1680), and the liquidation of the public debt by raising the value of the currency (1686), were the preliminary measures; and in 1693 the king was formally declared absolute by an act of the Diet. He died in 1697, leaving his dominions to his son, the famous Charles XII. (1697-1718), then only fifteen, in the highest state of prosperity and organization; but the inexperience of the young king tempted the attacks of his neighbours, and a coalition was formed against him (1699) by Poland, Denmark, and Russia. Charles assumed the offensive, and leading his forces first against Denmark, in six weeks reduced the king to sue for peace (peace of Travendahl, 1700): he next utterly routed the Czar before Narva; then invading Poland (victory of Riga, 1701—capture of Warsaw and Cracow, and victory of Clissau, 1702—victory of Pultusk, 1703), he in two years expelled the king, Frederic Augustus, elector of Saxony, and dictated the election of Stanislaus Leczinki (1704) in his room; while Frederic Augustus, attacked in his electoral dominions, was compelled to cede his rights by the treaty of Alt-Ranstadt (1706). Europe viewed with amazement the career of the Swedish hero: but his invasion of Russia (1708-9) was fatal to his schemes of ambition. Having turned aside into the Ukraine to form a junction with the Cossack chief Mazeppa, he was overthrown at Pultowa (July, 1709), and took refuge for five years in Turkey: while the league against him was joined by Denmark, Prussia, and England; and all his conquests, in spite of the efforts of his generals, were lost as rapidly as they had been gained. In 1715 he returned to Sweden; but while he was endeavouring to re-establish his power both by arms and by the subtle diplomacy of his minister Görtz, he fell at the siege of Fredericshall in Norway, leaving his kingdom on the verge of ruin. His sister Ulrica-Eleonora (1718-20), though proclaimed by the senate as elected queen, was compelled to renounce all hereditary right, and restore the constitution as before 1693; but after concluding the peace of Stockholm (1720) with England, Denmark, Prussia, and Poland, she resigned the crown in favour of her husband Frederic of Hesse-Cassel (1720-51), whose authority was still further limited by the Act of Royal Assurance, exacted from him by the states. The treaty of Nystad with Russia (1721) at length gave peace to the exhausted kingdom; but Ingria, Livonia, Esthonia, Carelia, Oesel, &c., were ceded to the Czar, and Sweden sunk thenceforth into a second-rate power.

For the next twenty years the court of Stockholm was a scene of foreign intrigue and corruption, in which the Hats, or French party, and the Caps, or Russian faction, alternately predominated, the royal prerogative being almost annihilated by the power of the aristocracy: but agriculture and commerce nevertheless flourished, while Linnæus and his disciples gave a new impulse to science, and legislation was improved by the publication of a new code (1734). The ascendancy of the Hats led to a war (1741) with Russia, which was vainly opposed by the king; but the Swedes were everywhere defeated, and the peace of Abo (1743) was obtained, through British mediation, by the cession of part of Finland, and the recognition of duke Adolphus Frederic of Holstein-Gottorp as heir to the throne, the king being childless.

The orders of the Sword, Seraphim, and Polar Star were instituted or revived during this reign.

The reign of Adolphus Frederic (1751-71) was peaceful in its foreign relations, with the exception of the share taken against Prussia, through the influence of the Hats, in the Seven Years' War, concluded by the peace of Hamburg (1762) without territorial changes: but the struggles of the Hats and Caps kept the nation in a constant ferment, and the thraldom of the king by the nobles was carried to such an extent as to produce a threat of abdication (1768, The counter-revolution did not take place however till the reign of his son Gustavus III. (1771-92), who, in 1772, supported by the army and the body of the people, forcibly repealed the constitution of 1720, re-establishing the relative powers of the various branches of government nearly as before 1680: while the party-names of Hats and Caps were for ever prohibited, the use of torture abolished, and the press declared free. These changes were distasteful to Russia, to whose policy the consequent increase of national energy was unfavourable, and whose partizans, the Caps, had been dominant immediately before: but no rupture followed at the time; and in 1780 Sweden joined the Armed Neutrality of the northern powers against England, headed by the Czarina: while a commercial treaty was concluded (1783) with the United States of America. But an alliance with the Porte (1787) led to a war the next year with Russia, and with Denmark as her ally: but the mutinous conduct of the Swedish officers, who refused to invade Russia without orders from the States, produced the Act of Safety (1789), which was forced on the nobles by the other orders of the Diet, and which gave the king absolute power of war and peace, at the same time abolishing the senate, the last stronghold of aristocratic power. In the sea-fight of Viborg (July 3, 1790) the Swedes were defeated; but they gained a decisive victory (July 10) at Svenkasund, taking or destroying 42 ships and 8000 men; and the peace of Werela (1790) was concluded on the basis of mutual restoration. The outbreak of the French revolution induced an alliance (1792) with Russia and Austria, and a plan was concerted for a combined invasion of France under the command of Gustavus: but the king was assassinated the same year (March 16) by Ankarström, an agent of the discontented nobles; and his brother, the duke of Sudermania, who was regent till 1796 for his nephew Gustavus IV. (1792-1809), not only withdrew from the coalition, but recognised the French republic in 1795. The search of neutral vessels by the English, and some acts of hostility thence arising, provoked the formation of the Armed Convention of the North (1800) between Russia, Denmark, Sweden, and Prussia; but it was dissolved the next year at the death of the emperor Paul. In 1805, an alliance was formed with Russia and England against Napoleon, whom Gustavus had refused to acknowledge as emperor; but the French occupied Pomerania and Stralsund (1807); and Russia, after the conferences of Tilsit, turned her arms against her late ally, and seized upon Finland, the impregnable fortress of Sveaborg being betrayed by the governor. An auxiliary force of 11,000 English, under Sir John Moore, was dismissed without effecting anything: the Danes also declared war; and Tornea and the Aland Isles were taken by the Russians (1809). These multiplied misfortunes were ascribed to the incapacity of the king, who was considered to have shown symptoms of mental derangement: and he was deposed (March, 1809) by a conspiracy of military officers, his uncle Charles XIII. (1809-18) being called to the throne to the exclusion of the son of Gustavus, who was declared incapable of ever inheriting. A few aristocratic modifications were introduced in the constitution, as the appointment of a state-council of nine members, &c.; but the general outline was left as settled in 1772. The peace of Fredericksham with Russia (1809) was dearly purchased by the cession of Finland, East Bothnia, and Aland (or nearly one-fourth of the territory, with one-third of the population, of the kingdom): but France restored Pomerania (1810) on the adoption of the continental system prescribed by Napoleon. The sudden death (1810) of the prince of Holstein-Augustenburg (who had been declared heir to the throne), and the age and childlessness of the king, necessitated a fresh election of a crown-prince; and the choice of the states fell on Bernadotte, prince of Ponte-Corvo, the ablest of the marshals of Napoleon, whom this selection was probably intended to propitiate. Bernadotte assumed, on his arrival, the reins of government; but though compelled by France to declare war against England, he too clearly perceived the true interests of Sweden to enter on active hostilities; and, on the reverses of Napoleon in Russia, peace and alliance was concluded with England at Orebro, and with Russia at Abo. During the War of Liberation (1813) in Germany, the Swedish troops were led by the crown-prince, to whose counsels the plan of the campaign has been usually attributed; and their services were rewarded (1814) by the acquisition of Norway, which Denmark was compelled to cede by the peace of Kiel, Sweden at the same time resigning to Prussia Pomerania and her remaining German possessions. After some fruitless resistance on the part of the Norwegians, this arrangement was carried into effect by the convention of Moss (August 14), the two crowns being declared indissolubly united, though each kingdom retained its separate constitution. On the death of the king in 1818, the crown-prince mounted the throne as Charles XIV., and was crowned at Stockholm and Trondheim; and his rule, from that period to the present, has been marked by the uniform and increasing prosperity of the Scandinavian kingdoms. A quarter of a century of peace, and the unceasing attention paid by the king to the cultivation and improvement of the internal resources of his dominions, have in a great measure remedied the accumulation of evils resulting from a long period of misgovernment, domestic broils, and disastrous foreign wars. Notwithstanding the loss of Finland, the commerce of Sweden is now more than double what it was in 1800, and the opening of the Gotha canal (1832) has greatly added to the facilities for internal water-communication. It has been said that a party in the state will attempt, on the demise of the king, to supplant his son Oscar in the succession, and restore the son of Gustavus IV., now a general in the Austrian service: but it is improbable that such an enterprise would be successful; and whatever may be the stability of the present dynasty, the memory of Charles XIV. will be deservedly held in reverence by his subjects in both kingdoms.

The Swedish constitution, after its repeated fluctuations between absolute monarchy and aristocratic predominance, may be considered as having settled, since the last modifications in 1809, into a tolerably fair equilibrium. The crown is declared hereditary in the male line, and the king is required to profess the Lutheran religion, which is the established creed of the realm. The state-council consists of nine members, who are the privileged advisers of the king, and who must also be Lutherans, and Swedes by birth: six of the number are appointed by the king, but three of these must be civil functionaries: the chancellor and the ministers of justice and foreign affairs are *ex-officio* members; and the four secretaries of state may be summoned to give advice on matters relating to their own departments. The foreign relations (both as to peace and war, and commercial and other treaties), the supreme administration of justice, and the command of the army and navy, are vested in the king; who has also the appointment of the archbishops and bishops, and the judges: but these are removable only for misconduct. He has also a negative voice on the resolutions of the diet, and the right to introduce measures for their consideration: but he can neither control the freedom of their deliberations, nor (without their sanction) impose new taxes, contract loans, or alienate any part of the territory. The diet, or parliament of the kingdom, in which resides the supreme legislative power, consists, as of old, of the four orders of nobles, clergy, burghers, and peasants (landholders who are not noble): the number of members varies considerably. In the house of nobles, the head of each of the 2300 noble families has a seat by right, but seldom more than 400 to 500 attend. The ecclesiastic order (of which the archbishop of Upsala is always president) consists, besides the twelve bishops, of about sixty deputies from the various dioceses. The presidents of the burgher and peasant houses are named by the king, and a small property qualification is required for a deputy: the proper number of burgher representatives is 97, of whom Stockholm returns 10, Gottenborg 3, Norrköping 2, and 82 other cities and towns each 1: the peasant deputies should be 144, returned by different districts; but the full number rarely if ever make their appearance. The expenses of the representatives of the three last classes are partly reimbursed by their constituents; and the civil and military employés of government, far from being ineligible, usually form a large majority of the whole number. The four orders sit and deliberate sometimes separately, and at other times altogether; and the question is carried or lost by a simple majority, unless it involves a fundamental change in the laws or constitution. In this case the motion cannot be debated in the same meeting in which it is propounded, but is adjourned to the next session, when it is discussed by a general congress of the four orders, and can only be passed by a unanimous vote. The Diet meets at Stockholm every fifth year, and the session should close at the end of three months, unless prevented by a press of business.

SWEDENBORG, EMANUEL (the second child and eldest son of Jesper Swedberg, bishop of Skara in Westrogothia, and of Sarah Behm, daughter of Albert Behm, assessor of the board of mines), was born at Stockholm on the 29th of January, 1688. [Swedberg.] Of his childhood and youth there is no record, excepting that his mind was early occupied by religious subjects. 'From my fourth to my tenth year,' says he, in a letter to Dr. Beyer, 'my thoughts were constantly engrossed by reflecting on God, salvation, and the spiritual affections of man. From my sixth to my twelfth year, it was my greatest delight to converse with the clergy concerning faith, and I often observed to them that charity or love is the life of faith, and that this vivifying charity is no other than the love of one's neighbour.'

Bishop Swedberg bestowed great care on the education of his son, which he received principally at the University of Upsala. He was uncommonly assiduous in the study of the learned languages, mathematics, and natural philosophy. At the age of twenty-two he took his degree of doctor of philosophy, and published his first essay,—the academical dissertation which he had written for the degree. This essay is entitled 'L. Annæi Senecæ et Pub. Syri Mimi, forsan et aliorum selectæ sententiæ, cum annotationibus Erasmi et Græca Versione Jos. Scaligeri. Quas cum consensu Ampl. Fac. Philos. notis illustratas sub præsidio Viri amplissimi Mag. Fabiani Törner, Philos. Theoret. Prof. Reg. et ord. publico examini modeste submittit Emanuel Swedberg in audit. Gustav. maj. d. 1. Jun. 1709, Upsaliæ.'*

In 1710 Swedberg came to London, just at the time the plague was raging in Sweden, when all Swedish vessels were commanded by proclamation to keep strict quarantine. He was persuaded to land (probably in ignorance of the regulation); and he has recorded, in his Itinerarium of these travels, that he narrowly escaped being hanged for the offence. He spent some time at Oxford, and lived afterwards for three years abroad, chiefly in Utrecht, Paris, and Greifswalde, returning to Sweden in 1714, through Stralsund, just as Charles XII. was commencing the siege of that city. His next productions were, a small volume of fables and allegories in Latin prose ('Camæna Borea, cum heroum et heroidum factis ludens, sive Fabellæ Ovidianis similes, sub variis nominibus scriptæ, ab E. S., Sueco, Liber i. Gryphiswaldiæ,' 1715) ('Act. Liter. Sueciæ,' vol. i., p. 589), and a collection of Latin poems ('Ludus Heliconius, seu Carmina Miscellanea, quæ variis in locis cecinit Eman. Swedberg, Skara').* In 1716 Swedberg commenced his 'Dædalus Hyperboreus,' a periodical record of inventions and experiments by Polhem and others, and of mathematical and physical discoveries of his own. This work was published at Upsal in Swedish, in six parts (the fifth part with a Latin version); it is said to contain the lucubrations of a scientific society which was instituted by Berzelius among the professors of the university. (*Nov. Act. Reg. Soc. Scient.*, Upsal., vol. v., 1792.) In the course of 1716 Swedberg was invited by Polhem, the great Swedish engineer, to repair with him to Lund to meet Charles XII., on which occasion he was admitted to much intercourse with the king, who, without solicitation on Swedberg's part, and while he was yet at the university, appointed him assessor in the Royal Metallic College of Sweden. The diploma conferring the appointment, dated at Lund, the 18th of October, also stated 'that the king had a particular regard to the knowledge possessed by Swedberg in the science of mechanics, and that the royal pleasure was that he should accompany and assist Polhem in constructing his mechanical works.' These works were to consist of the formation of the basin of Carlscrona, and of locks between Lake Wener and Gottenburg, among the rapids and cataracts at Trolhätta. (*Hist. de Ch. XII. de Nordberg*, tom. iv., app. n. ccxxi.) The king also had the design of uniting his engineers by closer ties, for he recommended Polhem to give his daughter in marriage to Swedberg: the match was however prevented by the lady, who had a more favoured suitor.

The 'Dædalus Hyperboreus' was completed in 1718, in which year 'Swedberg executed a work of the greatest importance during the memorable siege of Frederickshall, by transporting over mountains and valleys, on rolling machines of his own invention, two galleys, five large boats, and a sloop, from Stromstadt to Iderfjol, a distance of fourteen miles. Under cover of these vessels the king brought his heavy artillery, which it would have been impossible to have conveyed by land, under the very walls of Frederickshall.' (Sandel's *Eulog.*) Swedberg's next literary works were, 1. 'The Art of the Rules' (an Introduction to Algebra, of which a full analysis may be seen in the 'Acta Literaria Sueciæ,' vol. i., p. 125 to 134); only a part of this work was published: the manuscript portion, according to Lagerbring, contains the first account given in Sweden of the Differential and Integral Calculus; 2. 'Attempts to find the Longitude of places by means of the Moon.' (*A. L. S.*, vol. i., pp. 27 and 315.) These treatises were both in Swedish, and were both published at Upsal in 1718.

In 1719 he was ennobled by Queen Ulrica Eleonora under the name of Swedenborg. From this time he took his seat with the nobles of the Equestrian order in the triennial assemblies of the states. His new rank conferred no title beyond the change of name, and he was not, as is commonly supposed, either a count or a baron: he is always spoken of, in his own country, as 'the assessor Swedenborg.' In this year he published three works in Swedish: 1. 'A Proposal for a Decimal Arrangement of Coinage and Measures, to facilitate Calculation and suppress Fractions' (Stockholm); 2. 'A Treatise on the Motion and Position of the Earth and Planets' (Skara); 3. 'Proofs derived from appearances in Sweden, of the depth of the Sea, and the greater Force of the Tides in the earliest ages' (Stockholm). Occasional papers by him appeared in the 'Acta Lit. Suec.' for 1720-21. Two of these have been translated into English. (See *Acta Germanica*, pp. 66 to 68, and pp. 122 to 124, vol. i., London, 1742.)

In the spring of 1721 he again went abroad through Denmark to Holland, and published the six following small works at Amsterdam: 1. 'A Specimen of Principles of Natural Philosophy, consisting of New Attempts to Explain the Phenomena of Chemistry and Physics by Geometry' (Prodromus Principiorum Rerum Naturalium, sive novorum tentaminum Chemiam et Physicam experimentalem Geometrice explicandi): 2. 'New Observations and Discoveries respecting Iron and Fire, with a new mode of constructing Stoves' (Nova Observata et Inventa circa ferrum et ignem; una cum nova camini inventione); 3. 'A new method of finding the Longitude of Places, on Land or at Sea, by Lunar Observations' (Methodus nova inveniendi Longitudines Locorum, Terra Marique, Ope Lunæ); 4. 'A mode of constructing Docks' (Modus construendi Receptacula Navalia); 5. 'A new way of making Dykes' (Nova Constructio Aggeris.Aquatici); 6. 'A mechanical method for Testing the Powers of Vessels' (Modus Mechanice explorandi Virtutes Navigiorum). From Amsterdam he went to Aix-la-Chapelle, Liège, and Cologne, and visited the mines and smelting-works near those places. He arrived at Leipzig in 1722, and there published, in three parts, 'Miscellaneous Observations on Natural Objects, particularly Minerals, Fire, and Mountain-strata' (Miscellanea Observata circa Res Naturales, præsertim mineralia, ignem et montium strata). At Hamburg, during the same year, he published a fourth part, 'On Minerals, Iron, and the Stalactites in Baumann's Cavern' (Precipue circa mineralia, ferrum, et stalactitas in Cavernis Baumannianis). (*Act. Eruditor. Lipsiens.*, 1723, p. 96-7.) This work, like those which precede it, shows a rare power both of accumulating facts and applying principles. We learn from it that Swedenborg, among his other employments, was officially appointed to visit, and to propose for selection the parts of the Swedish coast which were best fitted for the preparation of salt; on which subject the 'Miscellaneous Observations' contains an admirable business-like memoir. The fourth part gives the substance of several conversations between Charles XII. and Swedenborg, in which the king proposed a new 'sexagenarian calculus.' Swedenborg made the last-mentioned tour principally to gain a practical knowledge of mining. At Blankenburg he experienced great kindness from Louis Rudolph, duke of Brunswick, who defrayed the whole expense of his journey, and at his departure presented him with a golden medallion and a weighty silver goblet. After being abroad a year and three months, he returned home, and in the course of 1722 he published anonymously, at Stockholm, a work entitled 'Om Swenska Myntets Förnedring och Förhojning' ('On the Depreciation and Rise of the Swedish Currency') (*Cat. Bibl. Upsal*, Upsal, 1814); and at the end of the same year he entered, for the first time, on the actual duties of the assessorship, the functions of which he had been unwilling to exercise before he had perfected his knowledge of metallurgy. For the next ten years he divided his time between the business of the Royal Board of Mines and his studies. In 1724 he was invited by the consistory of the university of Upsala to accept the professorship of pure mathematics, vacant by the death of Nils Celsius, because 'his acceptance of the chair would be for the advantage of the students, and the ornament of the university;' but he declined the honour. In 1729 he was admitted a member of the Royal Academy of Sciences at Upsala. In 1733 he again travelled into Germany. It seems from his posthumous 'Itinerarium' (edited by Tafel, Tübingen, 1840) that he visited Berlin, Dresden, Prague, and Carlsbad, and, arriving at Leipzig at the end of the year, put to press a great work he had just completed. During the printing of this work he spent twelve months in visiting the Austrian and Hungarian mines.

Swedenborg's 'Opera Philosophica et Mineralia' were published in 1734, in 3 vols. folio, at Dresden and Leipzig; his patron, the Duke of Brunswick, at whose court he was a visitor, defrayed the cost of the publication. This large work consists of three distinct treatises. The 1st volume is 'Principles of Natural Philosophy, consisting of new attempts to explain the phenomena of the elemental world in a philosophical manner' (Principia Rerum Naturalium, sive Novorum Tentaminum Phænomena Mundi Elementaris Philosophice explicandi). It is dedicated to the Duke of Brunswick, and has an engraved likeness of the author, but of very inferior execution. The 'Principia' is an attempt to construct a cosmology *à priori*. The second and third volumes are together called the 'Regnum Minerale;' the second is on iron, the third on copper and brass. They treat of the methods employed in all parts of Europe, and in America, in preparing and working these metals. Part of the second volume has been translated into French, and inserted in the 'Description des Arts et Metiers.' Each volume is subdivided into three parts, and illustrated by numerous copper engravings. (For an opinion on the practical merits of this work, see Mortimer's *Translation of Cramer's Elements of the Art of Assaying Metals*, p. 13, 2nd edition, London, 1764.) In the same year, and at the same places, Swedenborg published 'An Introduction to the Philosophy of the Infinite, and the Final Cause of Creation; treating also of the Mechanism of the Operation between the Soul and the Body' ('Prodromus Philosophiæ Ratiocinantis de Infinito, et Causa Finali Creationis; deque Mechanismo Operationis Animæ et Corporis'). This work connects his cosmology with his physiology.

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* The dissertation and the poems were edited and reprinted last year, 1841, by Dr. J. F. I. Tafel, at Tübingen, Wirtemberg.

Swedenborg's reputation was now established throughout Europe, and Christ. Wolff and other foreign literati eagerly sought his correspondence. On the 17th December, 1734, the Academy of Sciences of St. Petersburg appointed him a corresponding member. In 1736 he again travelled, and in 1738 visited Italy, and spent a year at Venice and Rome. The journal of his tour, from 1736 to 1739, is in MS. in the Academy at Stockholm. At this time he no doubt applied himself particularly to anatomy and physiology, of a masterly acquaintance with which he gave evidence in his 'Economy of the Animal Kingdom' ('Œconomia Regni Animalis'), a large work in two parts, 4to., which he published at Amsterdam in 1740-41. The first part treats of the blood, the arteries, the veins, and the heart, concluding with an introduction to rational psychology. The second part treats of the coincidence between the motions of the brain and the lungs, of the cortical substance of the brain, and of the human soul. In 1741 he became a fellow, by invitation, of the Royal Academy of Sciences of Stockholm, the Memoirs of which he enriched with a paper on inlaying. (*Kongl. Swenska Wetens. Acad. Handlingar*, vol. xxiv., p. 107-113.) He still continued earnest in the pursuit of physiology, and in 1744 published the 'Animal Kingdom' ('Regnum Animale') parts i. and ii., 4to., at the Hague, and in 1745, part iii., in London. The first part of this work is an analysis of the abdominal viscera; the second, of the thoracic viscera; the last part treats of the skin, of the senses of taste and touch, and of organised forms in general. The plan of both the foregoing works is peculiar to Swedenborg. Although he cultivated anatomy practically, he considered that the standard authorities of his time were more to be relied on than his own dissections (*Œcon. R. An.*), on which account he premised the descriptive statements of Heister, Winslow, Malpighi, Morgagni, Boerhaave, Leeuwenhoek, Swammerdam, &c., as his basis for induction. On the facts supplied by these authorities he built his own superstructure, which, if not strictly a physiological one, in the modern meaning of the word, is at least an elevated and original system of animal geometry and mechanics. These great works were regarded by him as only the commencement of a work in which he designed to embrace the entire circle of physiology and psychology. (*Regn. Anim.*, n. 14.)

At the beginning of 1745 Swedenborg published in two parts, 4to., 'The Worship and Love of God' ('De Cultu et Amore Dei'): the first part, on the origin of the earth, on paradise, and the birth, infancy, and love of the first man; the second part, on the marriage of the first man, and on the soul, the intellectual mind, the state of integrity, and the image of God. This book is a sublimation of Swedenborg's scientific system, with a correlative statement of his psychical doctrines, in which both are blended, and clothed with the narrative form: it is the link between his physiology and a class of doctrines which was yet to come.

A number of unpublished scientific MSS., written by him previously to this period, and which are preserved in the Royal Academy of Sciences at Stockholm, manifest his industry, and the largeness of his designs. The most important of these papers appear to be—'De Magnete,' p. 273, 4to.; 'De Sale Communi,' p. 343; 'Principia Rerum Naturalium, ex priori et posteriori educta,' p. 569; 'De Sensatione,' cap. xiii.; 'De Actione,' cap. xxxv.; 'De Cerebro, Medulla Oblongata, et Spinali, de Nervis, analytice, physice, philosophice;' 'De Aure Humana;' 'Tractatus Partium Generationis utriusque Sexus, et de Processu Generationis.' (*Intellectual Repository*, January, 1836; *Rep. of London Printing Society*, 1841.)

We shall now endeavour to take a brief review of Swedenborg's scientific progress, with particular reference to method, principles, and doctrines. His proper career may be dated from the publication of the 'Prodromus Principiorum.' In this work he attempted to account for chemical combination by a theory of the forms and forces of the particles of bodies, and to resolve chemistry into natural geometry, that it might have the benefit of first principles, and the rank of a fixed science. Of these forms he gave many delineations. (Plates to *Prodr. Princip.*) He broached the ingenious doctrine that the particles of primary solids are moulded in the interstices of fluids, and take the shape of those interstices; and that particles so modelled, by undergoing fracture at their weakest points, give rise to new shapes, which become the initial particles of new substances. He anticipated Dr. Wollaston's suggestion of the spheroidal composition of crystals, as well as the atomic theory of Dalton, and even some of its details, as when, geometrically predicting the composite nature of water, he assigned to it the equivalent of 9. (*Prodromus Principiorum.*)

The rules which he proposed for investigating the constitution of the magnetic, luminous, and atmospheric elements come next under our notice. '1. That we take for granted that nature acts by the simplest means, and that the particles of elements are of the simplest and least artificial forms. 2. That the beginning of nature is the same as the beginning of Geometry: that natural particles arise from mathematical points, precisely as lines, forms, and the whole of geometry; and this, because everything in nature is geometric; and vice versâ. 3. That all the above elements are capable of simultaneous motion, in one and the same place; and that each moves naturally without hindrance from the others. 4. That ascertained facts be the substratum of theory, and that no step be taken without their guidance.' (*Miscell. Obs.*, part iii.)

From these rules we pass to their application, in the outset to which Swedenborg boldly averred that the records of science, accumulating as they had been for thousands of years, were sufficient for an examination of things on principles, and *à priori*; that a knowledge of natural philosophy does not presuppose the knowledge of innumerable phenomena, but only of principal facts which proceed directly, and not of those which result obliquely and remotely, from the world's mechanism and powers; and that the latter species of facts confuse and disturb, rather than inform the mind. Also, that the restless desire, from age to age, for more facts, is characteristic of those who are unable to reason from principles and causes, and that no abundance would ever be sufficient for such persons. (*Principia, de Mediis ad Ver. Philos.*, p. 3, 4.) The following is a statement of the doctrine of the elemental world proposed in the 'Principia:'—'1. In the simple (substance) there is an internal state and corresponding effort tending to a spiral motion. 2. In the first finite which arises from it there is a spiral motion of the parts; so also in all the other finites. 3. From this single cause there arises in every finite a progressive motion of the parts, a motion of the whole on its axis, and if there be no obstacle, a local motion also. 4. If a local motion ensues, an active arises; each active similar to the others. 5. From finites and actives arise elementaries, each so similar to the others, as to differ from them only in degree and dimension. Thus we presume the existence of only three kinds of entities—finites, actives, and their compounds, elementaries, of which the finites occupy the surface, the actives the interiors. With regard to the finites, one is generated from the other, and they are all exactly similar, excepting in degree and dimension: thus, the fifth finite is similar to the fourth, the fourth to the third, the third to the second, the second to the first, and the first to the simple; so that when we know the nature of one finite, we know that of all. Precisely the same may be said of the actives and of the elementaries. In the effort of the simple towards spiral motion lies the single cause and the first force of all subsequent existences.' (*Principia*, p. 450-1.) Swedenborg first states these doctrines synthetically, and then educes the same from, and confirms them by, the phenomena of nature. We may here, with propriety, introduce a remark from Sandel:—'He thus formed to himself a system founded upon a certain species of mechanism, and supported by reasoning; a system, the arrangement of which is so solid, and the composition so serious, that it claims and merits all the attention of the learned; as for others, they may do better not to meddle with it.'

In approaching the human body he again insisted on the necessity for principles and generalization, without which, he said, 'facts themselves would grow obsolete and perish;' adding that, 'unless he were much mistaken, the destinies of the world were leading to this issue.' A knowledge of the soul became the professed object of his inquiry, and he 'entered the circus with a resolve to examine thoroughly the world, or microcosm, which the soul inhabits, in the assurance that she should be sought for nowhere but in her own kingdom.' In this search he repudiated synthesis, and 'resolved to approach the soul by the analytic way,' adding, 'that he believed himself to be the first investigator who had ever commenced with this intention;' a surmise in which he is probably correct. We shall here content ourselves with a brief illustration of one of those doctrines which, 'with the most intense study,' he elaborated for his guidance, we mean the 'doctrine of series and degrees.' Each organ, he observed, commences from certain unities or least parts which are peculiar to it, and derives its form from their gradual composition, and its general function from the sum of their particular functions. The mass is therefore the representative of its minute components, and its structure and functions indicate theirs. The vesicles or smallest parts peculiar to the lungs are so many least lungs; the biliary radicles of the liver, so many least livers; the cellules of the spleen, so many least spleens; the tubuli of the kidneys, so many least kidneys; and the same function is predicable of these leasts, as of their entire respective organs, but with any modification which experience may declare to be proper to the minuter structures. This new method of analysis, in which the greatest things were presumed to indicate the least, with just such reservation as our experience of the least necessitates, was designed to throw light on the intimate structure and occult offices of single organs—the same way identified the higher with the lower groups of organs—the cranial with the thoracic, and both with the abdominal viscera. Whatever is manifested in the body is transferrible to the brain, as the source of all functions and structures. If the abdominal organs supply the blood with a terrestrial nourishment, the thoracic supply it with an aërial, and the brain with an ethereal food. If the first-mentioned organs, by the urinary and intestinal passages, eliminate excrements and impurities, so the lungs by the trachea, and the brain through the sinuses, reject a subtler defilement. If the heart and blood-vessels are channels of a corporeal circulation, the brain and nerves, or spirit-vessels, are channels of a transcendent or spirituous circulation. If the contractility of the arteries and of muscular structures depends on the nervous system, it is because that system is itself eminently contractile, and impels forwards its contents in the most perfect manner. If the lungs have a respiratory rising and falling, and the heart a contraction and expansion, so the brain has an animatory movement, which embraces both the motions of the lower series. Thus every function is first to be traced to its essential form in the bosom of its own organ, and thence, through an ascending scale, to the brain, 'which is eminently muscle, and eminently gland; in a word, which is eminently the microcosm, when the body is regarded as a macrocosm.' (*Œcon. R. A.; Regn. Anim.*)

On the whole we may admit these works to be a grand consolidation of human knowledge;—an attempt to combine and re-organize the opinions of all the schools of medicine since the days of Hippocrates. The doctrines of the fluidists, of the mechanical and chemical physicians, and of the vitalists and solidists, as well as the methods of the dogmatists and empirics, and even the miscellaneous novelties of the present day, have each a proportion and a place in the catholic system of Swedenborg. His works however are a dead letter to the medical profession, or known only to its erudite members through the ignorant misstatements of Haller. (Haller's *Bibliotheca Anatomica*, tom. ii., pp. 328, 329, Tiguri, 1777.)

Swedenborg was in his fifty-eighth year when he published the last of the foregoing volumes, and from this period he assumed a new character, of which he gave the following account:—'I have been called to a holy office by the Lord, who most graciously manifested himself in person to me, his servant, in the year 1745, and opened my sight into the spiritual world, endowing me with the gift of conversing with spirits and angels.' However repulsive such statements are to the generality of mankind, they are not *à priori* objectionable to those who admit the inspiration of the seers and prophets of the Bible: after such an admission of the supernatural, each particular case of the kind becomes a simple question of evidence. The event above alluded to happened to Swedenborg in the middle of April, 1745, at an inn in London. The manner of its occurrence is recorded by M. Robsahm, director of the bank of Stockholm, who was a trusted friend of Swedenborg, and had the narration from him personally. (See Robsahm's *Memoiren*, in Tafel's *Swedenborg's Leben*, pp. 8 to 10, Tübingen, 1842.) From this period, Swedenborg entirely forsook the pursuit of science, nor does he once allude, in his works on theology, to his former scientific labours. He still however took part in the proceedings of the Diet, and in that of 1761 he is stated by Count Hopken to have presented the best memorial on the subject of finance.

He returned from London to Sweden in August, 1745, and immediately devoted himself to the study of Hebrew and the diligent perusal of the scriptures. He continued to discharge the duties of assessor of the Board of Mines till 1747, when he asked and obtained his majesty's permission to retire from it; adding also two other requests, which were granted—that he might enjoy as a pension the salary of the office; and that he might be allowed to decline the higher rank which was offered him on his retirement. The materials for the subsequent part of Swedenborg's biography are exceedingly scanty. He was now either actively engaged in writing his theological works, or was travelling in foreign countries to publish them. When he was at home he had a house in the environs of Stockholm, with a large garden, in which he took great delight. He frequently resided in Amsterdam and in London. The highest personages in Sweden testified to the consistency with which he maintained the assertion of his spiritual intercourse. On one or two occasions, they say, he gave proof of his professions. Baron Grimm, after describing him as 'a man not only distinguished by his honesty, but by his knowledge and intelligence,' says of one of these occurrences, 'This fact is confirmed by authorities so respectable, that it is impossible to deny it; but the question is, how to believe it.' (*Mém. Hist. Lit. et Anecdot.*, &c., par le Baron de Grimm, tom. iii., p. 56, ed. Lond., 1813.) The baron spoke of it precisely as he might have spoken of one of the miracles of the New Testament. Immanuel Kant sifted another of these stories to the bottom, and declared that 'Professor Schlegel had informed him that it could by no means be doubted;' and added, 'they set the assertion respecting Swedenborg's extraordinary gift beyond all possibility of doubt.' (*Darstellung des Lebens und Charakters Immanuel Kants*, Königsberg, 1804.) Swedenborg however laid no stress on such proofs, 'because,' said he, 'they compel only an external belief, but do not convince the internal.' During his latter years, Bishop Filenius and Dr. Ekebon instigated a prosecution against him in the consistory of Göttenburg, whence it was transferred to the diet. Dr. Ekebon denounced his doctrines as 'full of the most intolerable fundamental errors, seducing, heretical, and captious;' and stated furthermore, that he 'did not know Assessor Swedenborg's religious system, and would take no pains to come at the knowledge of it.' Swedenborg came out of these trials with safety, unaccused by the diet, and protected by the king. Towards Christmas, 1771, while in London, he had a stroke of the palsy, from which he never perfectly recovered. A report has been circulated that he recanted his claims during his last illness, but this is a mistake. M. Ferelius, minister of the Swedish Lutheran church in London, who visited him on his death-bed, and administered the sacrament to him, wrote as follows (the 31st March, 1780) to Professor Trätgard of Greifswalde 'I asked him if he thought he was going to die, and he answered in the affirmative: upon which I requested him since many believed that he had invented his new theological system merely to acquire a great name (which he had certainly obtained), to take this opportunity of proclaiming the real truth to the world, and to recant either wholly or in part what he had advanced; especially as his pretensions could now be of no further use to him. Upon this Swedenborg raised himself up in bed, and, placing his hand upon his breast, said with earnestness, "Everything that I have written is as true as that you now behold me: I might have said much more had it been permitted me. After death you will see all, and then we shall have much to say to each other on this subject."' (Ferelius, *Ueber Swedenborg's Ende*, in Tafel's *Leben*.) Swedenborg died at London, in Great Bath Street, Coldbath Fields, on the 29th of March, 1772, in the eighty-fifth year of his age. His body was buried in the Swedish church in Ratcliff Highway.

The following is a list of his theological works:—1, 'Arcana Coelestia,' 8 vols. 4to., London, 1749 to 1756; 2, 'An Account of the Last Judgment and the Destruction of Babylon;' 3, 'On Heaven and Hell;' 4, 'On the White Horse mentioned in the Apocalypse;' 5, 'On the Earths in the Universe;' 6, 'On the New Jerusalem and its Heavenly Doctrine,' 4to., London, 1758; 7, 'The Four leading Doctrines of the New Church—on the Lord, on the Holy Scriptures, on Life, and on Faith;' 8, 'A continuation of the Account of the Last Judgment;' 9, 'On the Divine Love and Wisdom,' 4to., Amsterdam, 1763; 10, 'On the Divine Providence,' 4to., Amst., 1764; 11, 'Apocalypse Revealed,' 4to., Amst., 1766; 12, 'Delights of Wisdom concerning Conjugial Love, and Pleasures of Insanity concerning Scortatory Love,' 4to., Amst., 1768; 13, 'On the Intercourse between the Soul and Body,' 4to., London, 1769; 14, 'A brief Exposition of the Doctrine of the New Church,' 4to., Amst., 1769; 15, 'True Christian Religion,' 4to., London, 1771. As a specimen of Swedenborg's interpretation of the Holy Scripture, the reader may consult the 'Apocalypse Revealed;' for a concise view of his alleged experiences, the 'Heaven and Hell' may be resorted to; for a view of that part of his system which relates to the creation and government of the universe, we recommend the perusal of the 'Divine Love' and 'Divine Providence;' for his doctrine concerning the relation of the sexes, and its eternal origin and perpetuity, and for his code of spiritual legislation on marriage and divorce, see the 'Conjugial Love,' one of the most remarkable of these works: finally, the student will find a compendium of the whole of the theology of the New Church in the 'True Christian Religion,' the last and perhaps the finest of the writings of Swedenborg. The whole of these works, originally published in Latin, have been translated into English, and some of them have passed through several editions both in England and in America. The translations are contained in about thirty octavo volumes.

Swedenborg's Theological MSS., which are preserved in the Royal Academy at Stockholm, are very voluminous. The following have been published:—'Coronis ad veram Christianam Religionem,' 4to., Lond., 1780; 'Apocalypsis Explicata,' 4 tom. 4to., Lond., 1785, 6, 8, 9; 'Index Rerum in Apocalypsi Revelatarum,' 1813; 'Index Verborum, &c. in Arcanis Cœlestibus,' 1815; 'Doctrina de Charitate,' 8vo., Lond., 1840; 'De Domino,' 8vo., Lond., 1840; 'Canones Novæ Ecclesiæ,' 8vo., Lond., 1840; 'Adversaria in Libros Veteris Testamenti,' fasc. i. and ii., Tübingen, 1840-41. Among his yet unpublished papers is that called his 'Diarium,' an unreserved record of his experiences, ranging over a period of sixteen years. The first two volumes of this extensive work are missing, but the third and largest is in the possession of the 'Society for Printing and Publishing the Writings of E. Swedenborg, instituted in London in 1810;' and whenever it is published, it may afford some data for that which is at present unattainable, a theological biography of the author.

Swedenborg did not lay claim to inspiration, but to an opening of his spiritual sight, and a rational instruction in spiritual things, which was granted, as he said, 'not for any merit of his,' but to enable him to convey to the world a real knowledge of the nature of heaven and hell, and thus of man's future existence. According to Swedenborg, heaven and hell are not in space, but they are internal and spiritual states, so that intromission into the spiritual world is only the opening of an interior consciousness. The outward face of the spiritual world resembles that of the natural world in every particular, and man's spiritual body appears precisely similar to his natural body; but the difference is, that all the objects of the spiritual world represent, and change with, the spiritual states of its inhabitants; the magnificent objects in the heavens being actually determined according to the good affections of the angels; and the terrible appearances in the hells being an outbirth of the evil and falsity of the infernals. Heaven and hell are from mankind, and all angels and devils have once been men, either on this or other planets, for all the planets are inhabited, since the human race, and the formation of heaven therefrom, is the final end of creation. The Satan and Devil of Holy Scripture is not a person, but a collective name of hell. The 'last judgment mentioned in the Gospels' does not mean the destruction of the world, which, like every divine work, has respect to infinity and eternity, and will endure for ever, but 'a judgment in the spiritual world, since all who die are gathered together there, and since it is man's *spirit* which is judged.' This judgment commences for every individual immediately after death. Judgment is carried into effect on a church when its charity is extinct, and faith alone remains, and such judgment is attended by a plenary separation of the good from the evil, that is, by a formation of new heavens and new hells, and followed by the institution on earth of a new church. The judgment on the first Christian church took place in the year 1757 (so Swedenborg informs us), and was witnessed by him in the spiritual world, after which commenced the descent from the new heaven of the new church and its doctrine, signified by the Apocalyptic New Jerusalem. The particulars of the faith of this church on the part of man are: 1, 'That there is one God; that there is a Divine Trinity in Him, and that He is the Lord God and Saviour Jesus Christ. 2, That saving faith consists in believing on Him. 3, That evil actions ought not to be done, because they are of the devil, and from the devil. 4, That good actions ought to be done, because they are of God and from God. 5, And that they should be done by man, *as of himself;* nevertheless under the belief that they are from the Lord, operating in him and by him. The two first particulars have relation to faith; the two next, to charity; and the last, to the conjunction of charity and faith, and thereby of the Lord and man.' Concerning the Word of God, Swedenborg taught that in its origin it is the divine truth itself, infinite in the Lord; that in proceeding through the three heavens, it is accommodated to the recipiency of the angels by successive veilings; that in the highest heaven it puts on an appearance accommodated to angelic affections, and is there read in its celestial sense; in the middle and lower heavens, it is clothed by forms adequate to the intelligence and knowledge of the angels there, and is read in its spiritual sense; and in the church, it is presented in a natural and historical form, which is adapted to the understandings of men on earth. This last form thus contains, and corresponds to, a spiritual and celestial form or meaning, which Swedenborg declares he was taught by the Lord in the spiritual world, and which he unfolded at length in his great work, the 'Arcana Cœlestia.' 'The Books of the Word,' says Swedenborg, 'are all those that have the internal sense; but those which have not the internal sense are not the Word. The Books of the Word in the Old Testament are the five Books of Moses; the Book of Joshua; the Book of Judges; the two Books of Samuel; the two Books of Kings; the Psalms; the Prophets Isaiah and Jeremiah; the Lamentations; the Prophets Ezekiel, Daniel, Hosea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, and Malachi. In the New Testament, Matthew, Mark, Luke, John, and the Apocalypse.' Although the writings of Paul and the other apostles are not in this list, and are described by Swedenborg, in a letter to Dr. Beyer, to be 'dogmatic (or doctrinal) writings merely, and not written in the style of the Word;' yet in the same letter he says, 'Nevertheless the Writings of the Apostles are to be regarded as excellent books, and to be held in the highest esteem, for they insist on the two essential articles of charity and faith in the same manner as the Lord himself has done in the Gospels and in the Apocalypse.' [SWEDENBORGIANS.]

Swedenborg was a methodical man, and laid down certain rules for the guidance of his life. These are found written in various parts of his MSS. as follows:—'1. Often to read and meditate on the word of God. 2. To submit everything to the will of Divine Providence. 3. To observe in everything a propriety of behaviour, and always to keep the con science clear. 4. To discharge with fidelity the functions of his employment and the duties of his office, and to render himself in all things useful to society.' On these precepts he formed his character. Count Hopken, prime minister of Sweden, says of him, 'I have not only known Swedenborg these two-and-forty years, but some time since frequented his company daily: I do not recollect to have ever known any man of more uniformly virtuous character.' Sandel says, 'He was the sincere friend of mankind, and, in his examination of the character of others, he was particularly desirous to discover in them this virtue, which he regarded as an infallible proof of many more. As a public functionary he was upright and just: he discharged his duty with great exactness, and neglected nothing but his own advancement. He lived in the reigns of many princes, and enjoyed the particular favour and kindness of them all. He enjoyed most excellent health, having scarcely ever experienced the slightest indisposition. Content within himself, and with his situation, his life was in all respects one of the happiest that ever fell to the lot of man.' Swedenborg was never married. He was about five feet nine inches high, rather thin, and of a brown complexion: his eyes were of a brownish-grey, nearly hazel, and somewhat small. He was never seen to laugh, but always had a cheerful smile on his countenance. 'Many would suppose,' says Ferelius, 'that assessor Swedenborg was a very eccentric person; but, on the contrary, he was very agreeable and easy in society, conversed on all the topics of the day, accommodated himself to his company, and never alluded to his principles unless he was questioned: in which case he answered freely, just as he wrote of them. But if he observed that any one put impertinent questions, or designed to trifle with him, he answered in such a manner that the querist was silenced without being satisfied.' (Ferelius in Tafel's *Leben.*)

(For further particulars the reader may consult Sandel's *Eulogium to the Memory of Swedenborg*, pronounced Oct. 7, 1772, translation, London, 1834; *Documents concerning the Life and Character of E. Swedenborg*, collected by Dr. I. F. I. Tafel, Tübingen, and edited in English by Rev. I. H. Smithson, London, 1841; *Life of Swedenborg, with an Account of his Writings*, by Hobart, Boston, U. S., 1831; Tafel's *Swedenborg's Leben*, now in the press; *The New Jerusalem Magazine*, 1790-91; F. Walden's *Assessor Svedenborg's Levnet, Adskillige Udtog af summes skrivter nogle blandede Tanker, tilligemed Svedenborg's System i kort udfog*, Kiobenhaven, 1806 and 1820; Lagerbring, *Sammandrag af Swea-Rikes Historia*, 8vo., Stockholm, 1778-80.)

SWEDENBORGIANS, the people who believe in the mission of Emanuel Swedenborg to promulgate the doctrines of the New Church, signified by the New Jerusalem in the Apocalypse. [SWEDENBORG.] In this country they may be divided into two portions, one of which forms the denomination known as such to the world; while the other portion remains without visible separation from the communion of the Established Church. The first public association of the Swedenborgians took place in 1788, in Great Eastcheap, London; since that time, societies have been formed in nearly all our large towns, until they now amount to between forty and fifty. These send delegates to an annual conference, which publishes the 'Intellectual Repository,' a periodical of thirty years standing, devoted to the cause. In the United States of America the members of the New Jerusalem Church are numerous and well organised; they have three distinct annual conventions, of which that for the Eastern States meets at Boston; that for the Southern, at Philadelphia; and that for the Western, at Cincinnati; and they publish four different Swedenborgian periodicals. In France the doctrines of Swedenborg have excited much attention, partly through the writings of his eloquent disciple Richer, of Nantes; and through the French translations of Swedenborg's works, which were executed by J. P. Moet, and published by John Augustus Tulk. In Germany, Swedenborg has long had isolated readers, of whom the most celebrated is the librarian to the king of Würtemberg, Dr. I. F. I. Tafel, known through Germany for his learned editions of the original works of Swedenborg, for his translations of the same, and for the elaborate works he has published in their defence. In Sweden, bishops and doctors of the Lutheran church have favoured the claims of Swedenborg: a writer (Haldane) on the state of religion there gives it as one sign 'of the pernicious spirit of the times,' that 'Swedenborgianism makes rapid progress among all classes of society.' Swedenborgianism has also taken deep root in several of the British Colonies. There is more than a suspicion that the initiators of the new Oxford theology (the editor of Froude's 'Remains,' and others) were acquainted with the early readers of Swedenborg; and that hence originally came their repudiation of the fundamental Protestant doctrine of justification by faith alone.

The non-separatist Swedenborgians comprise many members, and even clergymen, of the Church of England. The Rev. Thomas Hartley, rector of Winwick, in Northamptonshire, the Rev. John Clowes, rector of St. John's, Manchester, and the Rev. William Hill, are the first translators of the large works of Swedenborg. The chief works in English in recommendation and in defence of his doctrines are those of Clowes and Hindmarsh; Noble's 'Appeal in Behalf of the Doctrines of the New Church' and 'Plenary Inspiration of the Sacred Scriptures;' Clissold's 'Letter to the Archbishop of Dublin on the practical Nature of the Doctrines and alleged Revelations of Swedenborg,' and 'Illustrations of the End of the Church, as predicted in Matthew, c. xxiv., with Remarks on the Time of the End,' London, 1841. The Swedenborgians have several public institutions, the most flourishing of which is that entitled the 'Society for printing and publishing the Writings of Emanuel Swedenborg, instituted in London in 1810,' which annually prints and circulates a great number of his works.

There is also a London Missionary and Tract Society, and Tract Societies at Bath, Birmingham, Glasgow, and Manchester. That at Manchester circulates nearly a hundred thousand tracts in the year. There are two Liturgies in general use among the Swedenborgians: 1, The 'Book of Worship,' Boston, United States, embodying a very simple form of worship, consisting chiefly of passages from the Scripture, and chants from the Psalms; 2, The 'Liturgy of the New Church, prepared by order of the General Conference,' London, which is used throughout this country, and contains a more formal service than that adopted in America. From the latter we may conveniently borrow the twelve 'Articles of Faith,' 'condensed,' as they are, 'from the writings of Swedenborg, adopted by the General Conference, and recognised as a standard of Doctrine by the whole body of Swedenborgians.'

'The Articles of Faith of the New Church signified by the New Jerusalem in the Revelation, are these:—

'1, That Jehovah God, the creator and preserver of heaven and earth, is love itself and wisdom itself, or good itself and truth itself: that he is one both in essence and in person, in whom, nevertheless, is the Divine Trinity of Father, Son, and Holy Spirit, which are the essential divinity, the divine humanity, and the divine proceeding, answering to the soul, the body, and the operative energy in man; and that the Lord and Saviour Jesus Christ is that God.

'2, That Jehovah God himself descended from heaven, as divine truth, which is the Word, and took upon him human nature, for the purpose of removing from man the powers of hell, and restoring to order all things in the spiritual world, and all things in the church: that he removed from man the powers of hell, by combats against and victories over them; in which consisted the great work of redemption: that by the same acts, which were his temptations, the last of which was the passion of the cross, he united, in his humanity, divine truth to divine good, or divine wisdom to divine love, and so returned into his divinity in which he was from eternity, together with, and in, his glorified humanity; whence he for ever keeps the infernal powers in subjection to himself: and that all who believe in him, with the understanding, from the heart, and live accordingly, will be saved.

'3, That the Sacred Scripture, or Word of God, is divine truth itself, containing a spiritual sense heretofore unknown, whence it is divinely inspired and holy in every syllable; as well as a literal sense, which is the basis of its spiritual sense, and in which divine truth is in its fulness, its sanctity, and its power: thus that it is accommodated to the apprehension both of angels and men: that the spiritual and natural senses are united, by correspondences, like soul and body, every natural expression and image answering to, and including, a spiritual and divine idea; and thus that the Word is the medium of communication with heaven and of conjunction with the Lord.

'4, That the government of the Lord's divine love and wisdom is the divine providence; which is universal, exercised according to certain fixed laws of order, and extending to the minutest particulars of the life of all men, both of the good and of the evil: that in all its operations it has respect to what is infinite and eternal, and makes no account of things transitory but as they are subservient to eternal ends: thus, that it mainly consists, with man, in the connexion of things temporal with things eternal; for that the continual aim of the Lord, by his divine providence, is to join man to himself and himself to man, that he may be able to give him the felicities of eternal life: and that the laws of permission are also laws of the divine providence; since evil cannot be prevented without destroying the nature of man as an accountable agent; and because, also, it cannot be removed unless it be known, and cannot be known unless it appear· thus, that no evil is permitted but to prevent a greater; and all is overruled, by the Lord's divine providence, for the greatest possible good.

'5, That man is not life, but is only a recipient of life from the Lord, who, as he is love itself and wisdom itself, is also life itself; which life is communicated by influx to all in the spiritual world, whether belonging to heaven or to hell, and to all in the natural world; but is received differently by every one, according to his quality and consequent state of reception.

'6, That man, during his abode in the world, is, as to his spirit, in the midst between heaven and hell, acted upon by influences from both, and thus is kept in a state of spiritual equilibrium between good and evil; in consequence of which he enjoys free will, or freedom of choice, in spiritual things as well as in natural, and possesses the capacity of either turning himself to the Lord and his kingdom, or turning himself away from the Lord and connecting himself with the kingdom of darkness: and that, unless man had such freedom of choice, the Word would be of no use; the church would be a mere name; man would possess nothing by virtue of which he could be conjoined to the Lord; and the cause of evil would be chargeable on God himself.

'7, That man at this day is born into evil of all kinds, or with tendencies towards it: that, therefore, in order to his entering the kingdom of heaven, he must be regenerated or created anew; which great work is effected in a progressive manner, by the Lord alone, by charity and faith as mediums, during man's co-operation: tha as all men are redeemed, all are capable of being regenerated, and consequently saved, every one according to his state; and that the regenerate man is in communion with the angels of heaven, and the unregenerate with the spirits of hell: but that no one is condemned for hereditary evil, any further than as he makes it his own by actual life; whence all who die in infancy are saved, special means being provided by the Lord in the other life for that purpose.

'8, That repentance is the first beginning of the church in man; and that it consists in a man's examining himself, both in regard to his deeds and his intentions, in knowing and acknowledging his sins, confessing them before the Lord, supplicating him for aid, and beginning a new life: that, to this end, all evils, whether of affection, of thought, or of life, are to be abhorred and shunned as sins against God, and because they proceed from infernal spirits, who in the aggregate are called the Devil and Satan; and that good affections, good thoughts, and good actions are to be cherished and performed, because they are of God and from God: that these things are to be done by man as of himself; nevertheless, under the acknowledgment and belief that it is from the Lord, operating in him and by him: that so far as man shuns evils as sins, so far they are removed, remitted, or forgiven: so far also he does good, not from himself, but from the Lord; and in the same degree he loves truth, hath faith, and is a spiritual man: and that the Decalogue teaches what evils are sins.

'9, That charity, faith, and good works are unitedly necessary to man's salvation: since charity, without faith, is not spiritual, but natural; and faith, without charity, is not living, but dead; and both charity and faith, without good works, are merely mental and perishable things, because without use or fixedness: and that nothing of faith, of charity, or of good works is of man, but that all is of the Lord, and all the merit is his alone.

'10, That Baptism and the Holy Supper are sacraments of divine institution, and are to be permanently observed: baptism being an external medium of introduction into the church, and a sign representative of man's purification and regeneration; and the Holy Supper being an external medium, to those who receive it worthily, of introduction, as to spirit, into heaven, and of conjunction with the Lord; of which also it is a sign and seal.

'11, That immediately after death, which is only a putting off of the material body, never to be resumed, man rises again in a spiritual or substantial body, in which he continues to live to eternity: in heaven, if his ruling affections, and thence his life, have been good; and in hell, if his ruling affections, and thence his life, have been evil.

'12, That *now* is the time of the second advent of the Lord, which is a coming, not in person, but in the power and glory of his Holy Word: that it is attended, like his first coming, with the restoration to order of all things in the spiritual world, where the wonderful divine operation, commonly expected under the name of the Last Judgment, has in consequence been performed; and with the preparing of the way for a New Church on the earth,—the first Christian Church having spiritually come to its end or consummation, through evils of life and errors of doctrine, as foretold by the Lord in the Gospels: and that this New or Second Christian Church, which will be the Crown of all Churches, and will stand for ever, is what was representatively seen by John, when he beheld the holy city, New Jerusalem, descending from God out of heaven, prepared as a bride adorned for her husband.'

(For further particulars see *Reports of the Society for Printing and Publishing the Writings of the Hon. E. Swedenborg*, London, n. i. to xxxii. (1810 to 1841); *Reports of the London Missionary and Tract Society of the New Jerusalem Church*, n. i. to xxi. (1821 to 1841); *Minutes of the General Conference of the New Church, signified by the New Jerusalem in the Revelation*, 1789 to 1841; also Tafel's *Magazin für die wahre Christliche Religion*, pp. 1 to 70, Tübingen, 1841, which contains an elaborate account of all the Swedenborgian periodicals.)

SWEDISH TURNIP. [TURNIPS.]

SWEET BRIAR. [ROSA, p. 158.]

SWEET CALAMUS. Reference has been made from NARDUS and SCHŒNANTHUS to SPIKENARD, and to this article from SPIKENARD, because under this name two very different substances have been confounded in modern times, though they were known to be distinct by the antients. The aromatic which was of equal celebrity with Spikenard, mentioned by the same authors and procured from the same country, is described by Dioscorides under the name of κάλαμος ἀρωματικός. It is supposed by Sprengel and some authors that the Acorus Calamus of botanists is intended, which is possessed of slight aromatic properties, is common in European ditches, and is likewise found in India in mountainous situations. This is known to the Arabs by the name *wuj*, which appears to be a corruption of the Hindee *buch*, Sanscrit *vacha*, and has in the Arabian works the name *akoron* assigned as its Greek synonyme, no doubt intended for the ἄκορον of Dioscorides. Therefore there is no foundation for the opinion of Sprengel that this Acoron is the Iris pseudacorus of botanists.

Calamus aromaticus is described by Dioscorides immediately after σχοῖνος or σχῖνος, which is usually translated Juncus odoratus, and is acknowledged to be the Andropogon Schœnanthus of botanists, commonly known by the name of Lemon-Grass. This has also had the names of Camel's Hay, *palea de mecha*, &c. applied to it. Schœnanthus is evidently compounded of Schœnus and Anthos (ἄνθος, 'a flower'). Theophrastus treats of Calamos and Schœnos together, and states that they were found among the mountains of Libanus, on the shores of an extensive lake; but Burckhardt in such situations could only find rushes and reeds. It is possible therefore that a Syrian locality may have been assigned to drugs obtained from more distant countries by the route of the Euphrates, for Dioscorides says they are produced in India. By Hippocrates they are called κάλαμος εὐώδης and Σχοῖνος εὔοσμος, also κάλαμος σχοῖνος (Hipp., f. 5, p. 138, l. 17), evidently showing that if they agreed in properties, they had also some resemblance in nature. If we desire to find something similar to Schœnanthus, and possessed of still more aromatic properties, we have only to search in the genus to which this belongs, and we shall find several plants famous for their agreeable odour. The roots of Andropogon muricatum, commonly known in the shops of this country by the Tamul name *vitivayr*, and made into small bundles for brushing velvet, are remarkable for their fragrance: hence several essences are now prepared from them in Paris. The roots are also well known to Indians by the name of *Khuskhus*, being used throughout the Bengal Presidency for making tattees; these thatched screens being fitted to doors and windows, have water constantly sprinkled over them; the hot air in passing through becomes much cooled by the great evaporation, and enters the room both cool and refreshing, diffusing a delightful fragrance. The aroma here depends on the presence of a principle analogous to myrrh. But other species are still more fragrant, and secrete odorous volatile oil in sufficiently large quantities to be profitably distilled. Of these, Lemon-Grass, or Andropogon Schœnanthus, is the best known. The infusion of its leaves is often employed in India as a pleasant stomachic, and Lemon-Grass oil is probably distilled from them. A. Nardus? is another species, called Ginger, or Spice-Grass, by Ainslie, which is said by him to be common in the Courtallum Hills and the Indian Peninsula, where the natives occasionally prepare with it an essential oil useful in rheumatism, and use the infusion of its leaves as a stomachic. A. Iwarancusha is a species which comes near A. Schœnanthus in habit and taste. It skirts the bases of the mountains of north-west India, and was found by Dr. Blane and by Dr. Boyd about Hurdwar: it was considered by the former to be the spikenard of the antients. Dr. Royle also found it near Hurdwar, and in the upper parts of the Doab of the Ganges and Jumna rivers, and he states (*Illustr. Himal. Bot.*, p. 425) that it is there called *mirchiagund*, with *izkhir* given as its Arabic, and *iskhinos* as its Greek synonyme; and infers that it may have been the σχῖνος of the Greeks as well as A. Schœnanthus. But another species is still more extensively diffused, and still more remarkable for its very powerful and delightful fragrance. This is the species which yields the Grass-Oil of Central India, commonly called Oil of Spikenard. It extends southwards to between the Godavery and Nagpore, and northwards to the Delhi territory, but probably still farther north, as it delights in a dry and barren soil. In Central India, especially at Namur, Ellichpore, &c., a very delightful fragrant oil is distilled from this plant, which is highly valued in the East as a scent, being added to the finer expressed oils employed for anointing the hair or the bodies of the natives. It is also much esteemed as an external application in rheumatism, and has been introduced into practice in this country, and is highly valued by some, though unknown to the generality of practitioners. It has the advantage of diffusing an agreeable odour at the same time that it is efficaceous as a stimulant remedy. This or the preceding species extends into Afghanistan.

Sweet Cane, or Calamus, being described by Dioscorides immediately after σχῖνος, which is generally acknowledged to be Andropogon Schœnanthus, appears to Dr. Royle to belong to the same genus, and indeed to be the above far-famed species, as Calamus aromaticus is thought also to be the 'sweet cane' and the rich aromatic reed from 'a far country' of Scripture: he states there is no plant which more closely coincides in description with everything that is required, than the tall grass which yields the fragrant grass-oil of Central India, and which he has named Andropogon Calamus aromaticus. (*Illustr. Himal. Botany*, p. 425.)

SWELL. [ORGAN]

SWIETEN, GERARD VAN, was born at Leyden in 1700. He received his general education there and at Louvain, and studied medicine at Leyden under Boerhaave, of whom he soon became the favourite pupil, and by whose influence he was appointed to a professorship of medicine very soon after taking his diploma of doctor in 1725. His lectures were well attended, but objections were made against him on the ground of his being a Roman Catholic, and he was obliged to resign his chair. In 1745 Maria Theresa of Austria appointed him her first physician, and in this capacity he used his influence to establish a system of clinical instruction at Vienna, to rebuild the university, and accomplish many other important measures for the advancement of science. During eight years also he lectured on the 'Institutes' of Boerhaave. He died in 1772, and Maria Theresa, who, besides many other honours, had made him a baron of the empire, had a statue to his memory placed in the hall of the university.

Van Swieten was one of the few great physicians of his day, who, though he founded a school (and that one of the most important of the time), did not attempt to establish himself as the head of a sect. He was content to adopt the system of Boerhaave; in his commentaries on whose aphorisms he has embodied the results of a most extensive experience in clinical medicine, and has shown himself to have been a physician of great erudition and of some practical merit. The work is entitled 'Commentaria in Hermanni Boerhaavii Aphorismos de cognoscendis et curandis morbis:' it was first published at Leyden, in 5 volumes, 4to., between 1741 and 1772; and has since been repeatedly edited in Latin, English, French, and German. It consists of long commentaries, not only on each aphorism, but on every portion of each of them. To confirm their truth he introduces passages from the writers of all preceding times and countries, and relates numerous cases from his own and their practice. Van Swieten wrote treatises also on the diseases of armies, on epidemics, and on the structure and offices of arteries; but they are of little importance in comparison with his commentaries, and are now seldom referred to. He maintained also a long opposition against the practice of inoculating small-pox. (*Biographie Médicale.*)

SWIETE'NIA, a small genus of plants of the natural family Cedrelaceæ, named by Jacquin in honour of G. van Swieten. The genus Swietenia is characterised by having a small 4-5-cleft calyx; petals 4 to 5, deciduous; stamens 8 to 10, the filaments united together into a toothed tube, bearing the anthers on the inside; stigma peltate; ovary 5-celled, seated on a stipes; seeds winged. The species, though few in number, are found in hot parts of the world, form large trees, and yield valuable timber.

S. febrifuga of Roxburgh has been formed into a new genus SOYMIDA. S. Senegalensis has also been formed into a new genus, Khaya, and is the tree yielding African mahogany, which is brought to us from Sierra Leone. The timber, though hard, is liable to warp, but it is employed where a hard and cheap wood of large size is required, as for mangles. The negroes employ an infusion of the bark, which is very bitter, as a febrifuge. S. chloroxylon is a third species, which has been formed into a new genus, and is now Chloroxylon Swietenia, a native of the mountainous parts of the Circars in the East Indies. It is the tree yielding the beautiful East Indian satin-wood, which is of a deep yellow colour, close-grained, heavy, and durable. S. Chikrassee, now Chikrassia tabularis, is a fourth species, formed into a new genus. This is another Indian tree which is greatly admired for its beauty: the wood is very light coloured, close-grained, and most elegantly veined, and much employed for furniture and cabinet-work. The most important species however, and that which now nearly alone constitutes the genus, is Swietenia mahogany, a native of Campeachy and of the West Indies. It is a lofty branching tree with a large spreading head, and pinnate shining leaves. The timber, which is so well known from its extensive employment for furniture and cabinet-making, is of a reddish or yellowish-brown colour, of different degrees of brightness, much mottled and streaked, very little liable to shrink or warp, free from taste or smell, except when kept for some time, when it acquires an agreeable odour, from the exudation of a semi-resinous juice, which serves to preserve the wood from the attacks of insects. It does not appear to have been imported into this country before 1724. The quality of the wood varies much, according to the situations in which it grows: that which is produced on rocky soil and exposed situations is the best. Spanish mahogany is imported in logs of about 10 feet long, and from 20 to 26 inches square. From the elevated parts of the West Indies and from the Spanish Main the wood is close-grained, and of a darker colour than the Honduras mahogany. This is imported in logs of from 2 to 4 feet square, though both kinds are no doubt produced by the same tree. A few years ago the Messrs. Broadwood gave the large sum of 3000*l.* for three logs of mahogany, which were each about 15 feet long and 38 inches square. The wood was extremely beautiful, and capable of taking the highest polish.

SWIFT, JONATHAN, D.D., Dean of St. Patrick's cathedral, Dublin, was descended from an antient family which was originally settled in Yorkshire. His grandfather, the Rev. Thomas Swift, was vicar of Goodrich, in Herefordshire; he had ten sons, Godwin, Thomas, William, Dryden, Willoughby, Jonathan, Adam, and three others, of whom Godwin, William, Jonathan, and Adam settled in Ireland; he had also four daughters. Dryden was named after his mother, who was a near relation of Dryden the poet. Jonathan was the father of the dean of St. Patrick's; he married Abigail Erick, of an antient family in Leicestershire, but poor. He was bred to the law, and in 1665 was appointed steward of the King's Inns, Dublin. He died in 1667, leaving his widow in great poverty, with an infant daughter, and pregnant with the future dean of St. Patrick's.

Jonathan Swift was born in Dublin, November 30, 1667. When about a year old, he was carried to Whitehaven, in Cumberland, by his nurse, who went there to receive a legacy; he remained with her in that town nearly three years, and she had taught him to spell before he was taken back to his mother in Dublin. Mrs. Swift's means of support for herself and her two children were derived chiefly from her brother-in-law Godwin, who was a lawyer, and was supposed to be rich. Jonathan, when six years old, was sent to the school of Kilkenny, whence he was removed to Trinity College, Dublin, where he was received as a pensioner, April 24, 1682. The cost of his education and maintenance was defrayed by his uncle Godwin, who however supplied him with the means of subsistence in so niggardly and ungracious a manner, that Swift ever afterwards spoke of him with great asperity. Before Swift's education was completed, Godwin died, and it was then discovered that he had for some time been in embarrassed circumstances, the result of unsuccessful speculations. The charge of Swift's education now devolved chiefly upon his uncle William, of whom he always spoke with affectionate gratitude as 'the best of his relations;' not that he was much more liberally supplied with money than he had been by Godwin, for William also was in difficulties, but for the kindness with which it was bestowed. The degree of B.A. was conferred on Swift, February 15, 1785: this was done, as he himself says, *speciali gratiâ*, which, he informs us, was, in Trinity College, a discreditable intimation of scholastic insufficiency. Indeed there is abundant evidence that he had not only neglected the study of the school logic which was then required in order to qualify him for taking a degree, but that, after he had taken his degree, as well as before, his conduct generally was careless, irregular, and reckless, and that he incurred frequent penalties and censures. It is probable however that he had a scholarship in Trinity College, for he remained there till 1688, when, on the breaking out of the war in Ireland, he passed over into England, and travelled on foot to Leicester, where his mother had been residing for some years in a state of precarious dependence on her relations, one of whom was the wife of Sir William Temple, whose seat was Moor Park, near Farnham, in Surrey.

Swift, after residing some months with his mother, waited upon Sir William Temple, by whom he was received with kindness, and was admitted into his family. From this time Swift's careless and idle habits were entirely abandoned; he studied eight hours a day, and became useful to his patron as his private secretary. A surfeit of stone-fruit, to which Swift always ascribed the giddiness with which he was afterwards so severely afflicted, brought on an ill state of health, for the removal of which, after he had been about two years with Sir William, he went to Ireland, but soon returned. He was now treated with greater kindness than before: he occasionally attended King William, who was a frequent guest at Moor Park, in his walks in the garden, while Temple was laid up with the gout, and won so much on his majesty's favour, that he not only taught him how to cut asparagus in the Dutch manner, but offered to make him captain of a troop of horse, which however Swift declined. Sir William employed him to endeavour to persuade the king to consent to the bill for triennial parliaments, and Swift's vanity was much hurt when he found that his reasoning was not sufficiently strong to overcome the king's obstinacy.

Swift went to Oxford in 1692, and entered himself of Hart Hall, for the purpose of taking his degree of M.A., to which he was admitted on the 4th of July in that year, together with Thomas Swift (the son of his uncle Thomas), who had studied with Jonathan at Trinity College, Dublin, and was afterwards rector of Puttenham in Surrey. Some time after his return to Moor Park, finding that no provision was made for him beyond subsistence in Sir William's family, Swift became tired of his state of dependence, and in some degree dissatisfied with his patron. He made his complaint to Sir William, who then offered him a situation worth 100*l.* a year in the Rolls in Ireland, of which Sir William was Master. Swift declined the offer, and said he preferred going to Ireland and endeavouring to obtain preferment in the church. They were both displeased, and so parted. Swift went to Ireland, but was deeply mortified when he found that he could not obtain orders without certificate from Sir William, which he was therefore compelled to solicit from his offended patron. The certificate was given; Swift was admitted to deacon's orders, October 18, 1694, and to priest's orders, January 13, 1695. Soon afterwards Lord Capel, then lord-deputy of Ireland, bestowed upon him the prebend of Kilroot, in the diocese of Connor, worth about 100*l.* a year, whither he immediately went to perform the duties of a country clergyman.

Sir William Temple appears to have soon felt the want of Swift's services, and it was not long before he sent him a kind letter, with an invitation to return to Moor Park. Swift, on the other hand, however fond of independence, must have felt strongly the contrast between the dull life of a clergyman in a remote town in Ireland and the refined society of Moor Park. He did not hesitate long to accept Sir William's invitation; and having become acquainted with a learned and worthy curate in his neighbourhood, who had a family of eight children, and only 40*l.* a year, he rode to Dublin, resigned his prebend, and obtained a grant of it for his poor friend.

Swift, on his return to Moor Park in 1695, was treated by Sir William Temple rather as a friend than as a mere secretary, and they continued to live together till Sir William's death, January 27, 1698. Some time before his death, Temple had obtained from King William a promise that Swift should have a prebend of Canterbury or Westminster. Sir William also left him a legacy, with the task of editing his posthumous works, and any benefit which might arise from the publication of them.

During the early part of his residence at Moor Park, Swift wrote some Pindaric Odes, which he is said to have shown to Dryden, who, after having read them, said, 'Cousin Swift, you will never be a poet;' a remark which is supposed to have occasioned that feeling of dislike which Swift always manifested towards Dryden. These Odes are written in the style of the Pindaric Odes of Cowley, and are indeed bad imitations of a bad model. Swift also wrote, as he himself has stated, a great number of other things, nearly all of which he destroyed. During the latter part of his residence at Moor Park he wrote 'The Battle of the Books in St. James's Library,' in support of Sir William Temple, and in opposition to Dr. William Wotton and Dr. Bentley. A dispute had arisen in France as to the superiority of antient or of modern writers: the dispute passed over to England, and the cause of the moderns was supported by Wotton, in his 'Reflections on Antient and Modern Learning.' Temple took the part of the antients, but unfortunately praised the 'Epistles of Phalaris,' which Bentley, in an Appendix to the second edition of Wotton's 'Reflections,' proved to be spurious. Swift's work is a well-constructed allegory, abounding in wit and humour. It was not published however till after Sir William's death. Swift is supposed to have likewise finished about this time his 'Tale of a Tub,' a satirical allegory, in ridicule of the corruptions of the church of Rome and the errors of the dissenters, and in favour of the church of England, though not without an occasional touch at her faults also. This is one of his most laboured and most perfect works. Though he completed it at Moor Park, there is evidence that he had sketched it out roughly at Trinity College.

It was during Swift's second residence at Moor Park that the acquaintance commenced between him and Miss Esther Johnson, more generally known by the poetical name which he gave to her of *Stella* (the Star). Her father was a London merchant, according to Scott, or steward to Sir William Temple, according to Sheridan. He might have been both—unfortunate in business, and Sir William's steward afterwards. He died soon after Stella's birth. Her mother lived with Lady Gifford, Sir William Temple's sister, who, with Mrs. Johnson and her daughter, resided at this time at Moor Park. Miss Johnson was then about thirteen years of age, and Swift about thirty. He assisted in her education, which appears to have been little attended to previously, and she seems to have acquired a fondness for her tutor.

Swift however, some years previously to his acquaintance with Miss Johnson, had professed an attachment to Miss Jane Waryng, on whom he bestowed the title of *Varina*: she was the sister of a fellow-student at Trinity College, and Swift offered to marry her; but she was coy and cold, and gave a temporary refusal on the plea of ill health. By degrees, as Swift's passion abated, hers grew warmer, and she wrote to express her willingness to accept his former offer

Swift did not refuse to fulfil his promise, but in his reply laid down such conditions as to the duties of her who should become his wife. that no further correspondence took place between them.

After Sir William Temple's death Swift repaired to London, to superintend the publication of his patron's posthumous works, a task which he performed carefully, and prefixed a Life of Sir William and a dedication to the king; but, finding that the king took no notice of the Works, the dedication, or himself, he accepted an offer made to him by Lord Berkeley in 1699, who had just been appointed one of the lords justices of Ireland, to attend him there as his chaplain and private secretary. He acted as secretary till they arrived in Dublin, when a person of the name of Bush obtained the office for himself by representing to Lord Berkeley the unsuitableness of such an office to the character and duties of a clergyman. Lord Berkeley however, to compensate Swift for the loss of his office, promised that he should have the first good preferment in his gift that became vacant. To this arrangement Swift assented. The rich deanery of Derry was soon afterwards at Lord Berkeley's disposal, and Swift intimated to him that he expected him to keep his word. Lord Berkeley told him that Bush had obtained the promise of it for another, but, observing Swift's indignation, advised him to apply to Bush to see if the matter could not be arranged: he did so, when the secretary frankly told him that 1000*l*. had been offered for it, but that if he would put down the same sum he should have the preference. Swift, in a rage, exclaimed, 'God confound you both for a couple of scoundrels,' and immediately left the castle, intending to return no more. Lord Berkeley however was unwilling, if it could be avoided, to risk exposure: he therefore offered to him the rectory of Agher and the vicarages of Laracor and Rathbeggan, then vacant, in the diocese of Meath. Though not worth a third of the deanery, as they only amounted together to 230*l*. a year, Swift deemed it prudent to accept the livings: he still retained his office of chaplain, and continued to reside with the family till Lord Berkeley retired from the government of Ireland. The prebend of Dunlavin was bestowed upon him in 1700, which increased his income to between 350*l*. and 400*l*. a year. While he resided in Lord Berkeley's family he produced some of the first specimens of that original vein of humour on which, more perhaps than on any other of his rare talents, his reputation is founded: among these are 'The Humble Petition of Frances Harris,' and the 'Meditation on a Broomstick.'

About this time Swift's sister married a person of the name of Fenton. Swift had expressed himself strongly against this marriage, and when it took place, he was highly offended. Scott, on the authority of Theophilus Swift, says that Fenton was a worthless character, on the point of bankruptcy at the time, and that Swift afforded his sister the means of decent support in the destitution which her imprudence brought upon her.

In the year 1700, on the return of Lord Berkeley to England, Swift took possession of his living at Laracor. He performed his duties as a country clergyman with exemplary diligence, and expended a considerable sum in repairing the church. Some years afterwards he purchased for 250*l*. the tithes of the parish of Effernock near Trim, which he left by his will to the vicars of Laracor for the time being, as long as the present episcopal religion continues to be the established faith in Ireland; but if any other form of Christian religion becomes the established faith, he then directs that the profits as they come in shall be paid to the poor of the parish of Laracor.

Swift had not been long at Laracor when it was arranged between Miss Johnson and himself that she should come to reside in his neighbourhood. She had a small independence, about 1500*l*., of which 1000*l*. had been left to her as a legacy by Sir William Temple, since whose death she had resided with Mrs. Dingley, a relation of the Temple family, a widow of middle age, whose income was only about 25*l*. a year. Mrs. Johnson continued to reside with Lady Gifford. When Miss Johnson removed to Ireland she was accompanied by Mrs. Dingley; and the ostensible ground for leaving England on the part of both was that the rate of interest was much higher in Ireland: it was then 10 per cent. They took lodgings in the town of Trim, where they generally resided, except in Swift's absence, when they occupied the vicarage-house. Miss Johnson was then about eighteen years of age: her features were beautiful, her eyes and hair black, and her form symmetrical, though a little inclined to fullness. She was a woman of strong sense, though not highly educated, of agreeable conversation, and elegant manners.

Swift appears to have passed over to England at least once a year, and remained two or three months, chiefly in London, where he officiated as chaplain in Lord Berkeley's family, but generally paid a visit to his mother at Leicester. In 1701, during the first of these annual residences in England, he published his first political tract, 'A Discourse on the Contests and Dissentions between the Nobles and Commons at Athens and Rome.' It was intended to check the popular violence which had occasioned the impeachment of Lords Somers, Halifax, Oxford, and Portland for their share in the Partition Treaty. It was published anonymously, but attracted much attention.

On his second visit to England, in 1702, he avowed himself to be the author of this tract, and was immediately admitted into the society of the leading Whigs, Somers, Halifax, and Sunderland, and also into that of the leading wits, Addison, Steele, Arbuthnot, and others, who used then to assemble at Button's coffee-house.

In 1704 Swift published anonymously the 'Tale of a Tub,' together with 'The Battle of the Books.' The 'Tale of a Tub' was at the time generally supposed to be Swift's, and its wit was much admired, but it made him some powerful enemies by its imputed irreligious tendency.

In 1708 Swift was employed by the Irish prelates to solicit a remission of the first fruits for Ireland, which had already been granted in England. [BENEFICE.] His application was made to Lord Godolphin, but was unsuccessful. About this time there were two or three plans for Swift's preferment, but all of them were failures. He was to have accompanied Lord Berkeley as secretary of embassy to Vienna, but Lord Berkeley found himself too infirm to venture upon the employment: he was to have gone out to Virginia as a sort of metropolitan over the colonial clergy in America, but neither did this appointment take place; and he was promised Dr. South's prebend of Westminster, but South, though very old, continued to live for several years longer.

During the years 1708 and 1709 Swift published several tracts. 'An Argument against abolishing Christianity,' is a piece of grave irony; 'A Project for the Advancement of Religion,' was dedicated to Lady Berkeley, who was a woman of strict piety, highly respected by Swift: it is the only work to which he ever put his name: it made a strong impression on the religious classes, and was very favourably received by the public. In his 'Letter on the Sacramental Test' he opposed any relaxation of the restrictive laws against the Dissenters. In this opinion he differed strongly from the Whigs, and this difference seems to have been a principal cause of his soon afterwards joining the Tories. About this time he also published the 'Sentiments of a Church-of-England Man,' as well as some of his lighter pieces, especially the humorous attacks on Partridge the almanac-maker, which came out under the name of Isaac Bickerstaff. In 1710 Swift's mother died. 'If the way to heaven,' said he, 'be through piety, truth, justice, and charity, she is there.'

On the change of ministry in 1710 the hopes of the Irish prelates were again revived for a remission of the first-fruits; and Swift was again deputed, in conjunction with the bishops of Ossory and Killaloe, to solicit the boon. On the 1st of September, 1710, he left Ireland on this mission, but found, on his arrival in London, that the bishops, who had gone to England before him, had left that country without having done anything.

Swift now found himself courted by the leaders of both parties, with the exception of Godolphin, who treated him with such marked coldness that he vowed revenge, a vow which he performed on the 1st of October, by the publication of 'Sid Hamet's Rod.' Swift soon made up his mind to join the Tories, and on the 4th of October was introduced to Harley, then chancellor of the exchequer, by whom he was received with the most flattering kindness, and was introduced by him to St. John, who was then one of the secretaries of state. In a few days he received a promise that the first-fruits should be remitted, and immediately began to put his literary battery in action in the defence of his new friends.

During the time that Swift remained in London on this occasion he wrote a Journal, or diary, which was addressed is a series of letters to Miss Johnson and Mrs. Dingley, but obviously intended for the former. This Journal, written as it was chiefly in the morning and evening of each successive day of the most busy part of Swift's life, affords a picture as minute as it is evidently trustworthy of the events in which he was concerned and the thoughts which arose out of them.

'The Examiner,' a weekly periodical, had been begun by St. John, Prior, and others, in support of the new ministry. Thirteen numbers had been published with little effect, when it was taken up by Swift, November 10, 1710, and was continued by him till June 14, 1711, a period of seven months, when he resigned it into other hands. Every one of these papers was written by himself, besides several satirical pamphlets. He assailed his opponents not only as a body, but individually: the shafts of his satire were particularly directed against Wharton, Godolphin, Walpole, Sunderland, Cowper, and Marlborough. With surprising readiness and versatility, he assumed every shape suitable for the annoyance of his enemies or the support of his friends.

Harley, who, though he maintained the most friendly and confidential intercourse with Swift, seems not at that time to have properly appreciated his character or understood his views, sent him a note for 50*l*., which Swift indignantly returned, and obstinately refused his invitations till he had made an apology. After the attempt upon the life of Harley by the Marquis de Guiscard, he was created lord treasurer and earl of Oxford, in May, 1711, and offered to make Swift his chaplain, who refused this offer also. 'I will be no man's chaplain alive,' says he in his Journal. He evidently thought that his services and his merits deserved no worse a place than a bishopric. He continued, as long as he remained in England, to be treated, both in private and public, with the most flattering civility, especially by Lord Oxford, and also by St. John, who in July, 1712, was created lord Bolingbroke. He formed the society of Brothers, which consisted of sixteen persons of the highest rank and most distinguished talents among the Tories, of which society indeed he was the most active member.

It having become obvious that the existence of the Tory government depended upon making peace with France, Prior was sent to Paris to enter into a negotiation for that purpose, and Swift, in furtherance of the same object, wrote 'The Conduct of the Allies,' which was published anonymously, November 27, 1711, while the question of peace or war was under discussion in parliament. The sale of this tract was unprecedented at that time, four large editions having been exhausted in a week. It furnished the Tory members in the House of Commons with facts and arguments, while the Whigs in the Lords threatened to bring the author to the bar of the house. The effect upon the public mind was such as to produce a determined spirit of opposition to the war, proving, as it did, that the allies, the late Whig ministry, and especially the duke of Marlborough, were the only parties who had derived advantage from the expenditure of so much English blood and treasure.

The Peace of Utrecht was concluded May 5, 1713, and Swift undertook to write the history of it, but the progress and publication of the work were hindered by the growing dissention between Oxford and Bolingbroke. This work he afterwards expanded into the 'History of the Four last Years of Queen Anne's Reign,' but it was not published till 1758, some years after his death. The only work unconnected with politics which Swift produced during this busy period of his life, was his letter to the earl of Oxford, containing 'A Proposal for correcting, improving, and ascertaining the English Tongue,' an object which was to be accomplished by a society similar to that of the French Academy. Swift was very anxious to have this scheme carried into effect, but Oxford was too busy at that time to second his views, which indeed met with little favour from the public.

While Swift was thus assisting his friends, he obtained nothing for himself but empty honour, a species of reward which hardly any man ever valued less. He was too proud to make any direct solicitation; he was aware that Lord Oxford well knew what he expected, but he was not aware that he had a private and obstinate enemy in Queen Anne, who had been taught by Archbishop Sharp that the supposed author of the 'Tale of a Tub' was little, if at all, better than an infidel. He now felt that his situation was uncomfortably awkward, and began to anticipate that he might be allowed to return to Ireland neither higher in the church nor richer than he left it. He became impatient and restive. The bishopric of Hereford became vacant, and Oxford and Lady Masham, the queen's favourite, exerted themselves to obtain her consent to bestow it upon him, but the opposition of the duchess of Somerset, the queen's other favourite, whom Swift had libelled in his 'Windsor Prophecy,' frustrated their efforts. As soon as Swift knew that the bishopric had been given to another, he sent notice to Lord Oxford of his determination to retire. The ministry now saw, that unless something were done for him, they would lose his powerful aid, which had kept their enemies at bay, and had helped so effectively to keep themselves in possession of the government. Thus pressed, Oxford, with the concurrence of the duke of Ormond, proposed that Dr. Sterne should be removed to the bishopric of Dromore, in order to make room for Swift in the deanery of St. Patrick's. This they accomplished; and, with the view of retaining him in England, an effort was made by Oxford and Lady Masham to exchange the deanery for a Windsor prebend; but the queen's determination against this arrangement was not to be shaken. The warrant for the deanery of St. Patrick's was signed February 23, 1713, and early in June the same year Swift set out for Ireland to take possession.

In the early part of his Journal, Swift expresses a continual desire to return to Laracor and the society of his beloved Stella, but this feeling evidently becomes gradually weaker. The splendid society in which he moved, and the sort of homage with which he was treated, such as perhaps no other person of his rank ever received, had, long before his return to Ireland, taken strong possession of his heart; so that when he entered into the possession of his deanery, it was with feelings in the highest degree dissatisfied and desponding.

Swift was scarcely settled in his deanery when he received the most pressing invitations from the friends of the Tory administration to return to England, for the purpose of reconciling, if possible, Oxford and Bolingbroke, whose dissention endangered the very existence of the Tory government. He came over to England without delay, and soon afterwards published 'The Public Spirit of the Whigs,' a bitter attack on Steele as well as the party to which he belonged. In this pamphlet the Scotch were spoken of as 'a poor fierce northern people,' with several other offensive remarks, directed especially against the duke of Argyle. A prosecution was instituted against Barber the printer, which the ministers managed to set aside, but the Scotch peers went up in a body to complain to the queen of the indignity with which they had been treated.

Finding that Oxford and Bolingbroke could not be reconciled, Swift retired to the house of the Rev. Mr. Geary, Upper Letcombe, Berkshire, at the beginning of June, 1714. Here he wrote his 'Free Thoughts on the State of Public Affairs.' Bolingbroke was now about to supplant Oxford, and left no means untried to conciliate Swift. The queen, at Bolingbroke's earnest request, signed an order on the treasury for 1000*l*., which Swift had in vain endeavoured to obtain through Oxford, to relieve him from the debts, amounting to at least that sum, which he was obliged to incur on entering his deanery. This sum however he never received, the death of the queen having occurred before the order was presented for payment. At the same time Lady Masham wrote to him, conjuring him not to desert the queen, and Barber was commissioned by Bolingbroke to say that he would reconcile him to the duchess of Somerset. Almost the next post brought a letter from Lord Oxford, now dismissed and going alone to his seat in Herefordshire, requesting Swift to accompany him. His gratitude and his affection for Lord Oxford did not allow him to hesitate a moment in accepting the invitation of the disgraced minister, and he wrote immediately to Ireland to get an extension of his leave of absence, which was now nearly expired, to enable him to do so. Within three days the death of Queen Anne and the accession of George I. put an end to the power of the Tories. Lord Oxford was arrested and imprisoned, and Swift wrote to him with a touching earnestness to request that he might be permitted to attend him in his confinement. Lord Oxford however refused to accede to his request. Bolingbroke and Ormond fled to France, and Swift returned to Ireland.

Not long after Swift came to London to solicit the remission of the first-fruits, he was introduced to the acquaintance of Mrs. Vanhomrigh, the widow of Bartholomew Vanhomrigh, a Dutch merchant, who, at his death, had left to his widow a life interest in 16,000*l.*, which sum was afterwards to be divided equally among his children, two sons and two daughters. When Swift became intimate in this family, Miss Esther Vanhomrigh, the eldest daughter, was under twenty years of age, not remarkable for beauty, but well educated, lively, graceful, spirited, and, unfortunately for Swift, with a taste for reading. He became the director of her studies, and their friendly intercourse was continued till Miss Vanhomrigh made a declaration of affection for him, and proposed marriage. How that declaration was received is related in Swift's poem of 'Cadenus and Vanessa.' Cadenus is decanus (dean) by transposal of letters, and Vanessa is the poetical name which he gave to Miss Vanhomrigh. The proposal was declined; but Swift, from vanity or fondness, or both, had not firmness enough to relinquish their affectionate intercourse.

After his return to Ireland, Swift, conscious of his imprudence, endeavoured to limit, as much as possible, the correspondence between himself and Vanessa, probably expecting that her attachment would be diminished by absence; but hers was a deep and uncontrollable passion. She wrote to him frequently, and complained bitterly of his not replying to her letters. At length Mrs. Vanhomrigh died; her two sons died soon afterwards; and the circumstances of the two sisters being somewhat embarrassed by imprudent expenses, they resolved to retire to Ireland, where their father had left a small property near Cellbridge. Swift, in his diary, though he mentions occasionally his calling at Mrs. Vanhomrigh's, makes no allusion to her daughter. Notwithstanding this caution, obscure murmurs of the intercourse between Swift and Vanessa had reached Stella soon after its commencement. In 1714 Vanessa arrived in Dublin, to the annoyance of Swift and dread of Stella. Swift saw her very seldom: he introduced Dean Winter to her, a gentleman of fortune, as a suitor for her hand; and proposals of marriage were made to her by Dr. Price, afterwards bishop of Cashel; but both offers were rejected. Stella's jealousy at length became so restless, that Swift is said to have consented to their marriage, and the ceremony was performed in 1716, in the garden of the deanery, by the bishop of Clogher; and though Swift never acknowledged the marriage, and no change took place in their intercourse, the evidence, though imperfect, is such as to leave little doubt of the fact. At length, in 1717, Vanessa and her sister retired to Marley Abbey, near Cellbridge, where Swift does not appear to have visited them till 1720, when Vanessa's sister became dangerously ill: during that illness his visits were frequent, and were continued occasionally to Vanessa after her sister's death. Vanessa by degrees became more impatient, and at length wrote to Stella, to inquire into the nature of her connection with Swift. Stella, highly indignant, sent the letter to Swift, and immediately retired to the house of Mr. Ford, near Dublin. Swift, in a paroxysm of rage, rode instantly to Marley Abbey. Vanessa, on his entering the room, was struck dumb by that awful sternness which his countenance assumed when he was in anger, and to which she more than once alludes in her letters to him. He flung the letter on the table without saying a word, instantly left the house, and rode back to Dublin. Poor Vanessa sank under the blow. In a few weeks afterwards she died, in 1723, leaving her property to Dr. Berkeley, afterwards bishop of Cloyne, and to Mr. Marshal, one of the judges of the Irish court of Common Pleas. The poem of 'Cadenus and Vanessa' was published soon after Miss Vanhomrigh's death; but Berkeley is said to have destroyed the original correspondence: a full copy however remained in the possession of Mr. Marshall, and it was published for the first time (with the exception of one or two letters) in Scott's edition of Swift's Works.

Swift, in an agony of shame and remorse, retreated to some place in the south of Ireland, where he remained two months, without the place of his abode being known. On his return to Dublin, Stella was easily persuaded to forgive him. After their reconciliation, Stella continued to be the friend of Swift, the companion of his social hours, his comforter and patient attendant in sickness; and she presided at his table on public days: but they were never alone together; their union as husband and wife was merely nominal.

In 1720 Swift published 'A Proposal for the Universal Use of Irish Manufactures.' This honestly-meant tract was represented as a seditious libel: the printer was brought to trial: the verdict of the jury was 'Not guilty;' but Judge Whitshed kept them eleven hours, and sent them back nine times, till they reluctantly left the matter in his hands by a special verdict: the public indignation however was roused, and the government, by a 'nolle prosequi,' were obliged to relinquish the contest.

In 1723, there being a scarcity of copper coin in Ireland, George I. granted to William Wood a patent right to coin farthings and halfpence to the amount of 108,000*l.* The grant was made without consulting the lord-lieutenant or privy council of Ireland: it had been obtained by the influence of the duchess of Kendall, the king's mistress, who was to have a share of the profits. It was, in fact, an infamous job. The Irish parliament expressed their dislike to it by a remonstrance, of which no notice was taken, when a voice was heard which apparently arose from one of the trading classes: a letter was published signed 'M. B., drapier (draper), Dublin,' and was followed by five or six more. The effect of these letters is known. All Ireland was roused. No one would touch the contaminated coin. A reward of 300*l.* was offered for the discovery of the author of the Drapier's fourth letter. A bill against the printer was about to be presented to the grand jury, when the Dean addressed to them 'Some seasonable Advice;' and the memorable quotation from Scripture was circulated, 'And the people said unto Saul, shall Jonathan die, who hath wrought this great salvation in Israel? God forbid: as the Lord liveth, there shall not one hair of his head fall to the ground; for he hath wrought with God this day. So the people rescued Jonathan that he died not.' The grand jury wrote 'ignoramus' on the bill, and Judge Whitshed could only vent his rage by dismissing them. Ultimately the patent was withdrawn, and Wood was compensated by a grant of 3000*l.* yearly for twelve years.

Swift's popularity was now unbounded. The Drapier's head was painted on signs, engraved on copper-plates, struck on medals, woven on pocket-handkerchiefs. As if to shelter himself from this storm of public applause, he retired with Stella and Mrs. Dingley to Quilca, a country-house belonging to Dr. Sheridan, in a retired situation about seven miles from Kells, where he remained several months. He had the company of Dr. Sheridan and other friends, and produced several light pieces of humour, in which he was emulated by Sheridan, who followed him at no great distance. He also occupied himself in revising and completing the 'Travels into several remote Nations of the World, by Lemuel Gulliver.'

In 1726 Swift visited England again, for the first time since Queen Anne's death. Bolingbroke was now returned from exile. The Dean resided at Twickenham with Pope, but made frequent visits to Dawley, the residence of Bolingbroke. His other associates were chiefly Arbuthnot, Gay, and Lord Bathurst.

At this time the Prince of Wales, afterwards George II., and the Princess of Wales, afterwards Queen Caroline, kept a sort of court at Leicester House. The favourite of the princess was Mrs. Howard, afterwards countess of Suffolk. Pope, Gay, and Arbuthnot were frequent attendants at this court. Swift was introduced to the princess by Arbuthnot, at her own particular request. His visits afterwards were frequent, especially when she resided at Richmond, but always by special invitation from the princess.

In July, 1726, the Dean received letters informing him that Stella was in a state of dangerous illness. He hastened to Ireland, and was gratified, on his arrival in Dublin, to find that her health was better. He now made the world acquainted with the 'Travels of Gulliver.' The work was published in London, anonymously as usual, through the agency of his friend Charles Ford. Such was the interest and admiration which it excited, that the price of the first edition was raised before the second could be printed.

Stella being now in a tolerably good state of health, Swift, in March, 1727, paid his last visit to London. His reception by his friends and at Leicester House was as cordial as ever. After spending the summer with Pope at Twickenham, he contemplated a voyage to France for the benefit of his health, when the death of George I. seemed to open a new prospect to the friends of the princess of Wales. It was expected that Walpole's dismissal would have taken place forthwith; and the Dean, at the earnest request of his friends, especially of Mrs. Howard, who said that his going abroad at that time would look like disaffection, remained in England.

Swift was suffering under a severe attack of deafness, which seems generally to have been more or less combined with his other and worse complaint, vertigo, when he received information that Stella was again in danger. He left England suddenly, almost capriciously as it appeared to his friends, who had but an indistinct notion of his connection with Stella, and in October, 1727, landed in Dublin to find his companion on the brink of the grave. She died Jan. 28, 1728.

When Swift had somewhat recovered from this last and severest shock, he found Walpole still in power, and high in favour with the queen as well as the king. He now kept no terms with the court; he attacked Walpole especially, and the ministry generally, and did not spare even the king and queen. At the same time he applied himself vigorously to the affairs of Ireland: he published several tracts for the amelioration of the unhappy state of that country; and, with the same object in view, commenced a periodical publication, in conjunction with Dr. Sheridan, called 'The Intelligencer,' which however was soon dropped.

In 1728-9 the Dean spent about a year with Sir Arthur Acheson, at his seat of Gosford, in the north of Ireland; here he wrote several light pieces of poetry, which were intended for the amusement of the family and guests; among these was 'The Grand Question debated, whether Hamilton's Bawn should be turned into a Malthouse or a Barracks,' affording evidence that age had not in the least impaired those peculiar powers of humour which he had first displayed in the family of Lord Berkeley. In 1730 the Dean was a guest for six months in the house of Mr. Leslie at Market Hill, a small town at a short distance from Sir Arthur Acheson's. Near this town he intended to build a house, on ground to be leased from Sir Arthur, and which was to have been called Drapier's Hill; an intention however which he did not carry into effect.

In a satire upon the Dissenters, in 1733, the Dean had directed a few lines against 'the booby Bettesworth,' who was a serjeant-at-law and a member of the Irish parliament, and who, on reading the lines was so highly incensed that he drew a knife, and swore he would cut off the Dean's ears; he proceeded direct to the deanery with that intention, but as Swift was on a visit at Mr. Worrall's, Bettesworth went there, and requested to speak with the Dean alone, whom he addressed with great pomposity, 'Dr. Jonathan Swift, Dean of St. Patrick's, I am Serjeant Bettesworth.' 'Of what regiment?' asked Swift. An altercation ensued, which soon became so loud and violent, that the servants rushed into the room and turned Bettesworth into the street. To guard against any similar attack in future, the Dean's neighbours formed an association, for the purpose of watching the deanery and guarding the person of the Dean from violence.

In the year 1735 he supported the clergy in their claim of the tithe of pasturage, or agistment tithe, in opposition to the Irish House of Commons, and gave vent to his indignation against the obnoxious members in one of the last but most animated and pointed of his satires, 'The Legion Club.' The poem was hardly finished when he had one of the most intense and long-continued attacks of vertigo which he had ever suffered, and from which indeed he never thoroughly recovered.

In 1736 Swift opposed the primate Boulter's scheme for regulating the exchange with Ireland by diminishing the value of the gold coin in order to increase the quantity of silver; he spoke against it in public; he wrote ballads against it; and on the day when the proclamation of the government for carrying the measure into effect was read, the bells of the cathedral rang a muffled peal, and a black flag was seen to wave on the steeple.

Swift's public life may now be said to have closed. From 1708 to 1736 he had been actively, strenuously, and often dangerously busied in guiding by his pen the course of public affairs; but during the latter part of this period his infirmities and sufferings rapidly increased. In 1732 Bolingbroke had attempted to bring him to England by negotiating an exchange of his deanery for the living of Burfield in Berkshire, worth about 400*l.*, but it was too late; the sacrifice of dignity and income was greater than, at that period of his life, he was willing to submit to. He still continued to correspond with Bolingbroke, Pope, Gay, the Duchess of Queensberry, and Lady Betty Germain, by all of whom he was constantly pressed to come over to England; but as his attacks of deafness and giddiness became more frequent, more violent, and continued longer, he did not think it prudent to venture. Gay died in 1732, and Arbuthnot in 1734, and Bolingbroke went to France. With Pope he kept up an affectionate correspondence as long as he retained the power of expressing his thoughts upon paper. For several years before his mind gave way, he was hardly ever free from suffering, and never from the fear of it; and it was his custom to pray every morning that he might not live another day, and often when he parted at night with those friends who were dearest to him, after social hours spent at the deanery, he would say with a sigh, 'I hope I shall never see you again.'

In the intervals of his fits of giddiness his powers of judgment remained unimpaired, but his memory failed rapidly On the 26th of July, 1740, in a short note to Mrs. Whiteway, he says—'I have been very miserable all night, and to-day extremely deaf and full of pain. I cannot express the mortification I am under of body and mind. All I can say is, that I am not in torture, but I daily and hourly expect it. Pray let me know how your health is, and your family. I hardly understand one word I write. I am sure my days will be very few; few and miserable they must be. I am, for those few days, yours entirely, J. Swift. If I do not blunder, it is Saturday.'

In 1741 Swift's memory had almost failed, his understanding was much impaired, and he became subject to violent fits of passion, which soon terminated in furious lunacy. He was intrusted to the care of the Rev. Dr. Lyons, who was gratefully attached to him. He continued in this state till 1742, when, after a week of indescribable bodily suffering, he sank into a state of quiet idiotcy, in which he continued till the 19th of October, 1745, when he died as gently as if he had only fallen asleep. He was in his 78th year. The immediate cause of death, and probably of the giddiness which had so long afflicted him, was found to be water on the brain.

On the announcement of his death, the enthusiasm of Irish gratitude broke out as if there had been no interruption of his public services. The house was surrounded by a mournful crowd, who begged the most trifling article that had belonged to him to be treasured as a relic—'yea, begg'd a hair of him for memory.' He was buried, according to his own direction, in the great aisle of the cathedral, where there is a Latin inscription to his memory, written by himself:—'Hic depositum est corpus Jonathan Swift, S. T. D., hujus Ecclesiæ Cathedralis Decani, ubi sæva indignatio ulterius cor lacerare nequit. Abi, viator, et imitare, si poteris, strenuum pro virili libertatis vindicem. Obiit,' &c.

Swift left the bulk of his property, the savings of about thirty years of his life, to found and endow an hospital for lunatics and idiots. In 1735 he presented a memorial to the corporation of Dublin, praying that a piece of ground on Oxmantown Green might be assigned for the purpose, which was immediately assented to, but the site which he ultimately fixed on was in James Street, Dublin, near Steevens's Hospital. The funds which finally devolved upon the hospital amounted to about 10,000*l.*

For some years before his intellect failed, the general superintendence of the Dean's domestic affairs had been intrusted by him to Mrs. Whiteway, who was a daughter of his uncle Adam: she was a woman of property, of superior understanding, and elegant manners. She was not his housekeeper, as has been erroneously stated. His housekeeper was Mrs. Brent, who by a second marriage became Mrs. Ridgeway.

Swift in his youth was considered handsome: he was tall, muscular, and well-made; his complexion was dark, and his look heavy, but Pope says that his 'eyes, which were azure as the heavens, had an expression of peculiar acuteness.' His face was generally expressive of the stern decision of his character. He never laughed, and seldom smiled, and when he did smile it was

'As if he mock'd himself, and scorn'd his spirit,
That could be moved to smile at anything.'

In his person he was scrupulously clean; in his habits he was regular; he was a strict economist of time and money, and kept minute accounts of the expenditure of both; he used much exercise, both walking and riding; he drank wine daily, but never to excess; in eating he appears to have been somewhat of an epicure. In his disposition he was social; and when his company pleased him his conversation was delightful, abounding in anecdote, and rather distinguished for liveliness and humour than for seriousness. In repartee he was considered unrivalled. He had peculiarities of manner, which however were not constant and habitual, but generally arose from the indulgence of some occasional whim. From the time of his admission into Trinity College he had mixed much in society, generally of the best kind: he was an observer of society of a lower kind, but he never willingly mixed with it. He spoke in public with force and fluency.

The distinguishing feature of his character was pride—a complete consciousness and appreciation of the value of the power which he had acquired by a severe course of study and observation, combined as it was with a determination of purpose which no danger could intimidate, and which turned aside from no labour necessary to the accomplishment of his aims. He was thoroughly honest, but his honesty was often combined with a straightforward bluntness which was offensive to fastidiousness and vanity. In spite of the sternness of his character, which was often indeed more in appearance than reality, he was a man of deep feeling, devotedly attached to his friends, and active in promoting their interests; nor were his friends less attached to him.

There was much appearance of paradox in Swift's character, which often arose from his assuming, in speaking and writing, a character which did not belong to him. He hated hypocrisy, he hated the assumption of virtue, and he ran into the opposite extreme. Thus the levity of manner with which he censured the corruptions of Christianity induced many to suppose that he was not a Christian; and the tone of misanthropy which pervades many of his writings was ill suited to the real character of one who annually expended a third part of his income in well-directed charity; who, of the first 500*l.* which he had to spare, formed a loan-fund for the use, without interest, of poor tradesmen and others; who was a warm and steady friend, a liberal patron, and a kind master. He who always spoke of Ireland as a country hateful to him, was yet the firm, fearless, and constant assertor of her rights and protector of her liberties. Johnson speaks of his love of a shilling. Habits of strict economy have given many a man the appearance of loving a shilling who thinks nothing of giving away pounds. We have spoken of the use which he made of his money: in the obtaining of it he was no less free from sordidness. Of the numerous works which he published, most of which were extremely popular, it is doubtful if he ever received for any one a single shilling of direct remuneration. Pope obtained something for Swift's share of the 'Miscellanies,' but there is reason to suspect that he directed his friend, who did love a shilling, to keep the sum for his trouble.

Swift's conduct towards Stella and Vanessa is that part of his character of which least can be said by way of justification. We have given the details of that conduct briefly, and leave the reader to draw his own conclusions.

In his political principles he was rather a Whig than a Tory, but party, as a distinction which prevents the intercourse of individuals, he regarded with dislike and scorn. He approved of triennial parliaments, nay annual parliaments; he was the defender of popular rights, and frequently exposed himself to danger in defending them; he was a steady advocate of constitutional freedom. His hatred of tyranny was almost a passion. The oppression which he saw practised in Ireland was one chief cause of his dislike to living in that country. He was vexed to see the tame submission with which the Irish yielded to the tyranny of their rulers. He always spoke of his residence in Ireland as an exile, and, with intense bitterness of feeling, of himself as one condemned to die there 'like a poisoned rat in a hole.' The separation from his friends in England certainly contributed to produce this feeling.

In his religious principles he was a violent high-church bigot. He would admit of no toleration either of Roman Catholics or of Dissenters as a body, and Jews he classed with infidels. But he did not extend these intolerant principles to individuals. Probably he did not know that Bolingbroke was an infidel, but he did know that Pope was a Roman Catholic.

Swift's acquaintance with the Greek and Latin writers was extensive, but not profound. French he wrote and spoke with facility, and he understood Italian. He was well read in Chaucer and Milton, but never mentions Shakspere, and does not appear to have had a copy of his works. His acquaintance with English prose writers was chiefly among the historians, especially Clarendon.

Swift, almost beyond any other writer, is distinguished for originality. He was an observer for himself, and was disdainful of obligation for anything but such facts as were not within his reach. His modes of combining and comparing those facts, whether ludicrous or serious, were always his own.

As a prose writer, his style is distinguished by plainness, simplicity, and perspicuity; it is sometimes ungrammatical and often heavy, but is occasionally forcible and pointed. As to his numerous political tracts, when they had accomplished the end for which they were written, he cared no more about them; and most readers now care as little. He could hardly be said to be at all ambitious of the reputation of an author. His object in writing was to produce an effect upon the public, or to please his friends. The object once attained, he thought no more about the means by which it had been accomplished. His letters, of which a great number have been published, are excellent specimens of that species of composition: written, without any view to publication, either to keep up the intercourse of friendship or for purposes of business, they abound in practical good sense, clear, unaffected, unembellished, with occasional touches of wit and humour, such as appear to have arisen, without being sought for, in the writer's mind at the moment of writing. A few of his Sermons have been published; they are of the most plain and practical character.

As a party-writer, he used no arms but such as are considered fair in that species of warfare. He was not one of those who make false statements; he was no assailant of virtuous character. The vices and the faults of those public men to whom he was opposed were censured with unsparing severity, or covered with ridicule; but the men were such as Wharton and Wood and Bettesworth. Men of less objectionable character were touched more lightly.

Swift's permanent reputation as a prose writer is likely to depend, to a considerable extent, upon his humorous pieces, but chiefly upon his 'Gulliver's Travels.' For this satirical romance he derived hints from Lucian, Bergerac, and Rabelais; but he derived nothing more than hints. His claim to originality is unaffected by any resemblance which his romance bears to these sources. The style of the work is an admirable imitation of the plain, dry, and minute style of the old voyagers, such as Dampier; and the character of Gulliver himself, as a representative of this class, is never for a moment lost sight of. The work consists of four voyages. The Voyage to Lilliput is for the most part a satire on the manners and usages of the court of George I. The Voyage to Brobdignag is a more extended satire on the politics of Europe generally. These two voyages are indisputably the most delightful parts of the book; and are read by most readers with great pleasure as mere tales, with such admirable skill is an air of truth and reality thrown over the narrative. The Flying Island is a satire directed against speculative philosophy, especially mathematics. For this part of his task Swift was but poorly qualified, and, except that part which is aimed at projectors and quacks, the satire for the most part falls harmless. The fourth voyage, in which Gulliver gets among the Houyhnhnms and Yahoos, is an exaggerated satire on the vices of mankind. The fiction is in itself unnaturally impossible, and the details are sometimes disgustingly filthy.

Swift's poems are not, properly speaking, poetry, nor is Swift a poet; his imagination is not of the kind which produces poetry; it is not filled with the beauty and magnificence of nature, but with the petty details of artificial life; he is a satirist of the first class; as a poetical describer of manners, he has never been excelled; as a poetical humorist he almost stands alone; indeed the most delightful of his poems are those in which he expresses the notions and uses the language of some assumed character, as in 'Mrs. Harris's Petition.' In this species of humour he had no model, and, with the exception of Thomas Hood, no imitator has ever approached him. Of the general style of his poems, Dr. Johnson remarks that 'the diction is correct, the numbers are smooth, and the rhymes exact. There seldom occurs a hard-laboured expression or a redundant epithet. All his verses exemplify his own definition of a good style—they consist of proper words in proper places.'

(Scott's *Life and Works of Swift*, 19 vols. 8vo.; Sheridan's *Life of Swift;* Johnson's *Life of Swift;* Orrery's *Remarks on Swift.*)

SWIFT, DEANE, was the grandson of Godwin Swift, the eldest of the uncles of the dean of St. Patrick's. The Christian name of Deane was derived from his grandmother, daughter and heiress of Admiral Deane, who served the Commonwealth during the civil wars. He studied at

Trinity College, Dublin, and afterwards resided at Goodrich in Herefordshire. He married a daughter of Mrs. Whiteway by her first husband, the Rev. T. Harrison. Deane Swift wrote an 'Essay upon the Life, Character, and Writings of Dr. Jonathan Swift; interspersed with some occasional Animadversions upon the Remarks of a late critical Author, and upon the Observations of an anonymous Writer on these Remarks; to which is added that Sketch of Dr. Swift's Life, written by the Dr. himself, which was lately presented by the Author of this Essay to the University of Dublin,' Lond., 1755, 8vo. He also published 'The Works of Dr. Jonathan Swift, Dean of St. Patrick's, collected and revised by Deane Swift, Esq., of Goodrich in Herefordshire,' London, 1765, 12mo., about 20 vols. Deane Swift contributed a portion of correspondence to Nichols's edition of Swift's Works, 19 vols. 8vo. He died at Worcester, July 12, 1783.

SWIFT, THEOPHILUS, was the son of Deane Swift, and was born at Goodrich in Herefordshire. He wrote 'The Gamblers,' a poem, 4to.; 'The Temple of Folly,' in 4 cantos, Lond., 1787; 'Poetical Addresses to his Majesty,' 1788, 4to.; 'Letter to the King on the Conduct of Colonel Lennox,' 1789, 4to. His remarks in this letter gave offence to Colonel Lennox, who demanded satisfaction, and a duel was the consequence, in which Swift received a pistol wound. In the year 1790 a man lurked at night in the streets of London, and wounded females with a sharp instrument. He escaped detection for some time and the public called him 'The Monster.' A person of the name of Williams, an artificial-flower maker, was at length arrested, tried, found guilty, and sentenced to six months' imprisonment. Theophilus Swift seems to have thought that this man was innocent, and exerted himself, both at the trial and afterwards, to prove his innocence. He wrote a 'Vindication of Renwick Williams, commonly called the Monster,' Lond., 1790. Theophilus Swift wrote an 'Essay on the Rise and Progress of Rhyme,' which was printed in the 'Transactions' of the Irish Academy, vol. ix., 1801; and in 1811 he published at Dublin 'Mr. Swift's Correspondence with the Rev. Mr. Dobbin and his Family.' Scott's edition of Swift's Works contains several communications from Theophilus Swift. He inherited from his grandmother, Mrs. Whiteway, a considerable estate in the county of Limerick. He died in Ireland, in the summer of 1815.

(Scott's edition of Swift's *Works*; Watt's *Bibliotheca*, &c.)

SWIMMING. Huet, bishop of Avranches, in his 'Mémoires,' vol. i., p. 50, relates the following anecdote of himself:—'Being accustomed, like other boys, to bathe several times a day in the hot weather, it happened that I ventured into a stream without first trying its depth, and immediately sunk to the bottom: but being roused to the utmost exertion by the urgency of the danger, I struggled so hard with my hands and feet as to raise myself to the surface of the water; and having thus discovered that I possessed a faculty with which I was before unacquainted, I swam across a deep river on that very day.' The above passage is quoted by Bucke, in his 'Book of Human Character' (vol. ii., p. 279), with this additional remark:—'How many thousand men have been drowned in all parts of the world! Nine in ten of these might doubtless have been saved had they possessed the force of character here described; and the remark may be extended to many of the general affairs of life, since many of them depend on nothing more than the will.' This is no doubt very true, not only in the individual instance, but in other instances of swimming; as a principle however it must be regarded as most delusive and dangerous. For inasmuch as nine individuals out of ten do not possess the force of character described of bishop Huet, so will nine out of ten continue to be drowned if they get beyond their depth in the water without any previous knowledge of the art of swimming.

In London at this present time there are not above eight swimming-baths. Regular swimming-schools are established in Vienna, Münich, Breslau, Berlin, and Paris. But the English are not much inclined to swimming, even when the means are at hand. Probably not one in ten of all our sailors, both in the navy and merchant service, can swim. When a ship is wrecked within a hundred fathoms of the shore, and no boats or other assistance arrive, it is melancholy to observe how few even attempt to swim ashore, and those very few who do so are usually passengers. Familiarity with the element makes our sailors indifferent to it, and careless of consequences. Among the inhabitants of the metropolis those who can swim have acquired the art at watering-places, or at the Serpentine River in the summer season, instigated solely by the novelty and amusement. Very few in comparison attend the public baths, chiefly perhaps because they are not gratuitous.

Art of Swimming.—It is in the power of everybody to swim who possesses a moderate degree of health and activity. But all will not swim equally well, even with the same amount of practice. Some will learn quickly, others slowly, and some will always swim with far less effort than others. The quickness of acquirement depends upon natural aptitude and a correct method; the necessary degree of effort, after acquiring the art, depends upon the natural buoyancy of the individual's body, in which respect there are sometimes great differences. A very thin man of large bone may be a powerful swimmer for a short distance, but could not well relieve his efforts by floating, because floating would require continued efforts with a body so constituted. Those bodies which are best adapted to become fine swimmers are such as have a tendency to fatness with a good muscular development: they cover more surface. A very large and heavy head, very small hands and feet, and a very weak wrist, are all attended with proportionate difficulties. But any one who is tolerably healthy and active may in time become a very good swimmer, in spite of all physical difficulties. The only exception would be where an individual had lost a leg, in which case he could probably do little beyond floating, and rowing with his arms for some hundred fathoms; but a man who had only lost an arm might swim a very long way.

Method.—The only school for learning to swim is that of deep water; the only correct master is the frog. Man can never be more than an humble imitator of the frog, because the short, broad, buoyant body, broad webbed feet, light, flat, angular head, and (comparatively) immense length and strength of the legs (hind-legs), give him physical advantages which set all human competition at defiance. We can never expect to dart forward by a few strokes like the frog, but the method by which he does so is the only correct one for our acquiring the art of swimming. It is always to be borne in mind by the learner that the stroke which is to sustain and propel him must be compound, that is, the action of arms and legs simultaneously. It is observable that learners always waste their strength in wild struggles of the arms and legs alternately, in doing which they make a great splashing, kick their heels up behind, get their mouths full of water, and go down. Learners will often continue to act in this way during a whole summer season, though they bathe several times a week; indeed they will, in many instances, make no better progress for years. It is by the stroke made with the arms and legs at the same instant that the body is sustained and propelled. This stroke must not be made on the surface of the water, nor must the individual kick up his heels in the air behind him; the sweep of the arms and spurn of the legs must always be made under the water, and rather deeply so with the legs. It is advisable not to swim too straight and horizontal upon the water, as it will soon occasion pain in the back of the neck. The back should be kept hollow, slanting, and steady, never rising with the stroke, except as the whole body rises. The hands must on all occasions be kept in the shape of a cup or scoop, the fingers and thumb so close that the hands would hold water, as when people drink from a brook. The same closeness and hollowness should be preserved in the toes and shape of the feet, the toes being bent downwards or crooked. In making the stroke the palms of the hands are placed together and pushed straight forwards, like the keel of a boat's bows, about an inch under the water; at the same moment the knees are drawn up beneath the body, and widely. This is the first preparatory motion for making the stroke; it is in fact crouching, or rather a sort of squatting, to take your spring. The next motion is that of the hands, shaped like a scoop, with the thumb downwards, and sweeping back the water from you, with a wide sweep, like that of an oar, bringing the whole of the arm manfully into action from the shoulder; but at the same moment that this is done, the legs are thrown back, the feet vigorously pushing back the water beneath you, your entire effort of mind and body being that of making a spring forward. The hands are to be swept out as far as you can, and the effort to be relaxed only when both hands have been swept as far beyond a horizontal extension as you can effect without straining your shoulders and blade-bones

This motion of the arm and hands having been made, the action is instantly relaxed, the arms are bent, with the elbows drawn back till the ball of the thumb of each hand gently touches the ribs on both sides; and the hands being then again brought palm to palm together, are sent forward in a direct line (the tips of the two thumbs passing exactly under the centre of the chin) to repeat the stroke. In like manner, the motion of the legs and feet having been made, the action is instantly relaxed, and the legs are extended out straight, with the toes pointing gently downwards, till the knees are again drawn up, to repeat the stroke. The learner should understand that the principal propelling power is in the legs; the arms and hands he should chiefly consider as the means of sustaining his head above the surface. The power of propelling, as well as sustaining, by the action of the arms and hands, he will discover as he acquires proficiency. But as it is important to acquire the best method at the outset, so as to ensure the foundation of a good habit, he should make the sweep of the arms and hands describe as wide a semicircle as he can, while the extent of water acted upon by the legs is of still greater importance. At the moment when the hands pressed together are passing under the centre of the chin, the knees should be drawn up, by no means close under you, but as widely as you can, and with the heels as far apart as you can extend them without straining yourself, the toes being contracted (so as to render the sole concave) and turned outwards. This wide extension is most important, and one of the chief distinctions between a fine swimmer and others, because it is the object of the former to get as large a wedge of water between his legs as possible, so that when he spurns back the water with the hollowed soles of his feet, he may at the same time bring the whole inside surface of his legs to bear upon this wedge in the act of bringing his heels together. The propelling power of the soles of the feet is a trifle in comparison with that which is to be obtained by the creation of this wedge. The greatest amount of force is to be obtained from the inside and under part of the thighs; and this is one reason why thin men are not so well adapted to become fine swimmers as those whose limbs present a larger surface to act upon the water.

Confidence.—The use of corks, bladders, or life-preservers is certain to retard, if it does not almost destroy, the learner's confidence in the natural buoyancy of his body in the water. They are also bad supporters for those who wish to learn the real consequence of any particular action of a limb or motion of a part of the body in the water, because they cause you to bob about; and not only prevent you from doing what you intended, but often make you do the contrary. They teach you not to rely upon yourself, and should be regarded as opponents to the art of swimming. They are moreover very dangerous; for should they slip from their fastenings at the shoulders or round the waist, and entangle themselves round your feet, you will assuredly be drowned, unless somebody is at hand to extricate you. A good swimmer would have the greatest difficulty in saving himself if placed in such a predicament, not because his legs were fastened together, but from the disproportionate buoyancy thus given to his heels. He could not lie on his back and float for any length of time, as the weight of his head, in this case, would require continual efforts for its support; so that his only chance, if not assisted, would be that of suffering his head to be immersed while he employed all his efforts to tear off these disastrous supporters. The life-preserver is in itself a noble invention, but was never intended to be used by those who are learning to swim; for if you make use of the life-preserver, bladders, or corks, it is these which float, not you who swim. Entire confidence in the water is of course only to be obtained by acquiring such a proficiency in swimming as shall induce the feeling of a mastery over the element: a considerable degree of confidence however may be acquired from repeating a very simple experiment. Choose a spot for bathing where the bank is gently sloping, and wade in it till the water is breast-high. It is of no use unless the water is at least breast-high. Then turn round and face the shore or bank, and as the learner will thus be aware that his efforts are tending in a safe direction, he may plunge forwards and downwards without fear. The object of this experiment is to dive to the bottom and bring up some gravel, or a stone if the water be clear enough to see one. So far from sinking to the bottom in anything like a horizontal position of body being an easy matter, the learner will immediately discover that it is very difficult to get to the bottom with his hands, and bring up the gravel or stone. Another method of ascertaining the natural buoyancy of the body, and how little it really requires to sustain it on the surface of the water, is to take a couple of common boat-oars, place one under the back of the neck horizontally, and lifting up first one heel, then the other, place them across the other oar, extending the body stiffly at the same time. If you bend the body at all, as in a sitting posture, you will instantly sink; but so long as the body be kept straight, with the chest elevated, you cannot sink, and may lie there as long as you like. It is also a good plan, of a similar kind, to let a friend place one hand under the back of the head of a learner, who should then sink gently backwards upon the water, with his chest elevated and his legs extended straight, and he will find how very little he needs to support him. It is always to be borne in mind, however, that nobody can readily learn to swim who has a great antipathy to his head being frequently immersed, an occurrence quite unavoidable at first, and which must be considered as of no sort of consequence. The only real objection to it (for a few mouthfuls of water now and then can hurt no one who is in good health) is when it occasions the headache, as it does to rather a painful degree with some individuals when they have attained the age of manhood. For this reason, among many others, swimming should be learned in early youth.

Deep Water.—It is by no means advisable that a learner should enter any piece of water which is everywhere out of his depth, or contains unknown holes which are so; indeed it would be best not even to bathe where there is a shelving bank leading to water beyond the learner's depth, without a companion who can swim well. At the same time, it is of no use to attempt to learn in shallow water. All practice in shallow water is nearly certain to be futile, as it induces a foolish habit of self-deception. Youths will very often continue for two or three years to flatter themselves that they can swim, although they are accustomed every now and then to drop one leg, and touch the bottom with their toes. If they have accidentally got into deeper water, so as to be unable to do this, they instantly feel themselves in danger of being drowned, and splash and scramble back again in manifest alarm. The best depth for a learner is that of breast-high; but the water should not rise above the chest, or he will be unable to walk, or, perhaps, keep his feet. Should he, after making a few efforts to swim, accidentally get into water which rises as high as his chin, he must not hastily attempt to walk back; for no sooner would he lift one leg than the water would take the other from under him, which might confuse him: he must either plunge forwards boldly towards the less deep part of the water, slowly slide his feet along the bottom, or else dance his way out in slow and mincing steps, carefully keeping his arms and hands under the water to steady himself. No learner should enter the water without a companion who can swim well, or at all events is taller and stronger than himself.

General Pfuel's Method.—The method of teaching swimming, which was first introduced in the swimming-schools of Prussia, by General Pfuel, is, in all respects, excellent, and may be briefly described. The teacher stands on a platform on the edge of the water (the level borders of a river would be just as good) behind a strong oak rail, running horizontally to the extent of twenty or thirty feet, and about four feet high from the level of the platform or bank. The teacher holds a staff of about nine feet in length, to the top of which a rope is attached, which descends towards the water and is inserted in the ring of a belt, which belt is fixed under the arms of the learner, who lies along the water. The wooden rail thus becomes the fulcrum, and the staff a lever. It is managed with ease by one hand of the teacher, as the staff rests upon the rail, and also has the other end upon the ground. The learner is supported by the rope, which rises from the ring between his shoulders. He lies straight along the water, the arms being extended forwards, with the hands placed together, and the legs stretched out, with the heels touching each other, and the feet turned outwards, though the toes are crooked in. The teacher begins with the action of the legs. He says 'One!' and the pupil draws up his legs, keeping the knees as far apart as he easily can. The word 'Two!' is then given, and the pupil makes the stroke with both legs, striking out his legs so that the heels shall describe as large an angle as possible. At the word

Three!' he resumes his original position. When he can effect the motion properly in three divisions, he has to perform the same in two; but if he fail to extend his legs wide enough, he is again called upon to do the last two motions separately (as two and three), until he can give the wide stroke efficiently before returning to the first position. While the motion of the legs is being practised, the pupil must keep his arms extended forward in the water, and not allow them to sink. The motion of the hands is next taught in two divisions. The teacher says 'One!' and the pupil's hands, which were extended with the palms placed together, are separated, and laid about two inches under water, with the palms downwards, and the arms are extended until they form an angle of 90 degrees, or more, if it does not strain the back: the elbows are now bent, and the thumbs of the hands are brought under the chin. 'Two!' is the signal for stretching the hands forward to regain the first position. It is important to make the motions slowly at first, in order to secure the utmost width of stroke. When the motions of the hands and legs are properly performed separately, they are then united, and at the word 'One!' the first motion of the hands and legs is performed; at the word 'Two!' the second and third motions of the legs, and the second of the arms, are made. When the learner begins to be able to support himself, the teacher raises the lower part of his staff (resting against the rail), which thus lowers the top, and therefore slackens the rope; but instantly brings the staff into a more perpendicular position if he sees the pupil sinking. When he can swim ten strokes in succession, the staff is abandoned, and the master only holds the rope; when he can swim forty or fifty strokes, the rope is taken away, but the teacher always keeps near enough to reach him with a long pole. The pupil is not considered safe until he is able to swim for half an hour without resting or receiving assistance.

Turning in the Water.—The learner should regard his hands as two fins, and his feet as a double rudder, or (when his heels are close and his feet turned out) as a fish's tail. To give minute directions for the various positions of the hands would perhaps only confuse: it will be better to confine the remarks to a few general principles, and to making him aware of the means he possesses, the application of which he can only ascertain by practice in the water. He who can swim forwards, and would turn to the right or to the left, has merely to turn his head in the direction he would go, and narrow the sweep of the arm on that side to which he would turn, or back water with the hand on that side if he would turn rapidly. Nature will second his efforts far more efficiently than he expects. In like manner, if he would turn back, he has only to turn the palm of one hand outwards, and strike the water from him (which is nothing more than backing water with an oar), while his other arm sweeps inwards, as if embracing the water or taking an armfull of it towards his side, and round he goes in two or three motions. The legs will act as they ought of their own accord; but the act of turning back will be more rapidly effected if the legs be dropped, and the feet strike downwards: in short, if the position of the body be nearly perpendicular, as it will thus present so much less surface for resistance.

To Swim on the Back.—Sink backwards very softly on the water, inflating and elevating the chest at the same time, keeping the back hollow, and the head thrown back so that the eyes look up at the sky. The arms and hands should work under the water like oars, while the legs are drawn up and struck down into the water, both legs and both arms acting together. The action of the arms is not necessary for swimming on the back, except in learning, and they should be rested with the hands placed upon the thighs as soon as the learner can afford to dispense with the use of them. The causes of difficulty in acquiring this mode of swimming may, in nearly all cases, be reduced to two: the dropping of one leg towards the bottom in order to assist (as the learner intends) his support and progress by a jerk from the ground; and the bending of the body instead of keeping it quite straight, which bending is usually accompanied by raising the head with intent to look at the legs, in any of which processes the learner is certain to sink immediately.

To Float.—Having learned to swim on the back, it will not be difficult to acquire the art of floating. The chief principle is that of taking the right position. The learner should lie backwards very softly and very straight, the back hollowed, the chest elevated and inflated, and the head thrown well back till the water encircles the face. It is always to be recollected, be the water as deep as it may, that so long as the mouth, nose, and eyes are not immersed, the human body safely floats. The legs should remain perfectly straight and quiet; the palms of the hands should be turned downwards and gently beat down the water like fins. If the body begin to reel over on one side, the palm of the hand on this side has only to be turned outwards, and one or two gentle motions will restore the equilibrium.

Cautions.—The learner should avoid the practice of all ingenious antics and manœuvres, however curious and amusing, until he can swim well in the ordinary way, both on his belly and his back, and is able to rest himself by quiet floating. The practice of manœuvres, if successful, is certain to give young swimmers a false security, and should never be indulged in till they can accomplish the distance of at least a quarter of a mile without touching ground or receiving any other support. Never leap or plunge from a height without having first accomplished it by degrees of a foot at a time. One failure of the proper position and method will constitute a lesson of caution beyond the power of words to convey. Never remain long in the water upon an empty stomach, nor enter it immediately after a full meal. Never enter the water in a state of perspiration, nor when very cold, especially if recently heated. If you are subject to the cramp, never bathe out of the reach of assistance. When you rise after being immersed, breathe first out from the nostrils (to expel the water) before you take in your breath at the mouth. Avoid water which contains cold springs or beds of weeds. Whenever you attempt to save the life of a drowning person, be sure not to let him lay hold of you. Take a stick, if you can, and present one end to him. If you have no stick, approach him very cautiously from behind, and wait till you can firmly seize him with your left hand by the upper part of his right arm, and then keep at arm's length. If you cannot manage him your own way, dive and make your escape, or both will be lost. Return when he has become insensible.

SWINBURNE, HENRY, an English traveller, was born in May, 1752. He was the third son of Sir John Swinburne, Bart., of Capheaton, in the county of Northumberland, of an antient Roman Catholic family. He received his education at the monastic seminary of Lacelle, in France, where he made rapid progress in the study of antient and modern literature and in drawing. By the death of his eldest brother, he became possessed of an annuity and of a small estate at Hamsterley, in the county of Durham, and was thus placed in independent circumstances. He now set out on a tour, in which he visited Turin, Genoa, Florence, and other parts of Italy, improving himself on his route in the knowledge of works of art and in drawing. On his way home through Paris, he became acquainted with and married Miss Baker, daughter of the then solicitor-general of the West Indies, and, returning to England, resided with her some time at his estate at Hamsterley, where he amused himself with gardening and laying out grounds. He soon recommenced travelling, and reached Paris in March, 1774; in the autumn of the same year he proceeded to Bordeaux, and, after spending a year in the south of France, accompanied his friend Sir Thomas Gascoigne on a tour in Spain: they travelled along the coast from Barcelona to Cadiz, and thence through the interior to Madrid, Burgos, and Bayonne, where they arrived in June, 1776. At the close of this year Swinburne, in company with his wife, left Marseille for Naples. He remained in Italy till June, 1779, during which period, after staying a year at Naples, at the court of Ferdinand IV., he visited Sicily, Rome, Florence, and Turin, whence he returned to France. About this time he published an account of his Spanish tour in a series of letters, and spent the latter part of the year 1779 in England. The next year he travelled through France and Italy to Vienna, where he was received with much kindness by the empress Maria Theresa and her son Joseph II. He was again in England in 1781, and in 1783 set out for Paris to seek indemnity from the French government for the loss of his West India property, which had been devastated during the war. Through the favour of Marie Antoinette, he obtained in compensation a grant of land in the island of St. Vincent, the value of which was however much reduced on the cession of this island to Great Britain. In 1786 Swinburne again went to Paris, and returned in 1788.

After having long solicited a diplomatic appointment from the British government, he was appointed, in 1796, commissioner for the adjustment of the cartel then proposed for the exchange of prisoners-of-war between France and England. In the performance of this service great difficulties occurred from the refusal of the French to give up Sir Sidney Smith; and, after long and fruitless negotiations, Swinburne was finally recalled at the close of the year 1797. His latter years were saddened by the loss of his son, who was shipwrecked on his way to Jamaica, and by the diminution of his fortune, which induced him, in 1801, to accept the offices of vendue master in the island of Trinidad, and commissioner for the restoration of the Danish islands. After a few months' residence at Trinidad, Swinburne fell a victim to the climate, April 1, 1803.

His works are—'Travels through Spain in the Years 1775 and 1776,' London, 8vo., in a series of letters; 'Travels in the Two Sicilies in the Years 1777, 1778, 1779, and 1780;' and a Correspondence extending from the year 1774 to that of his death, edited by Charles White, Esq., under the title of the 'Courts of Europe at the close of the Last Century,' 2 vols. 8vo., London, 1841. This publication contains many curious details concerning the courts of Louis XV. and Louis XVI., and the most stirring periods of the French Revolution. Swinburne is a lively and sensible writer; he describes everything in an easy, unaffected, and sometimes forcible style; he is an attentive observer of national characteristics, and has selected with judgment such anecdotes and incidents as best illustrate the manners of different countries.

For his Life see a short notice in Nichols's *Literary Anecdotes*, vol. ix.; the Introduction to his *Courts of Europe*; and his Letters generally.

SWINDON. [WILTSHIRE.]

SWINE. [HOG; SUIDÆ.]

SWINEMÜNDE is a small but important town in the government of Stettin, in the kingdom of Prussia, in 53° 50′ N. lat. and 14° 12′ E. long. It is situated in the island of Usedom, at the mouth of the river Swine, which here falls into the Baltic. All ships to and from Stettin pass Swinemünde, and, till of late years, the entrance was obstructed by a bar, so that ships drawing more than seven feet water could not pass it; and large vessels were obliged to discharge part of their cargoes into lighters before they could proceed to Stettin; and those which were going to sea had to complete their cargoes after crossing the bar. To remedy this inconvenience, which was more and more felt as the trade of Stettin increased, it was resolved to construct two great moles, and thoroughly deepen the entrance. This great work was commenced in 1817, and happily completed in six years, so that now, as Hörschelmann states, the largest merchantmen can proceed direct to Stettin without unloading any part of their cargoes. Nearly 1000 ships annually enter the river. Swinemünde is a pleasant town, with nearly 4000 inhabitants, who are for the most part fishermen, pilots, and sailors. The pilots form a distinct guild under a commander: they have a watchtower on the coast, and are bound to look out for and announce the arrival of ships, as well as to bring them into the harbour. The town has a considerable trade, and many merchantmen are built here. It has become of late years a much frequented watering-place. (Müller's *Wörterbuch*; Cannabich; Stein, &c.)

SWINFORD. [STAFFORDSHIRE.]

SWITZERLAND (called in German, *Die Schweitz*; in French, *La Suisse*; and in Italian, *La Svizzera*), is situated between 45° 48′ and 47° 49′ N. lat., and between 5° 55′ and 10° 30′ E. long. France extends along its north-western border between Basel on the Rhine and Geneva on the Rhône. The boundary-line is partly formed by one of the ridges of the Jura Mountains, and partly by the course of the river Doubs, an affluent of the Rhône. At two places it is quite conventional. On the south of Switzerland are the continental possessions of the king of Sardinia and Austrian Lombardy. The boundary-line between Switzerland and the Sardinian states is marked by strong natural features, except at the western extremity, where the territories of the canton of Geneva are surrounded by Savoy. Farther east lies the Lake of Geneva, and towards its eastern recess, where a high range of the Alps terminates on the banks of the lake near S. Gingolph, the boundary-line runs southward along this high range, until it meets the northern extremity of the mountain-mass of Mont Blanc. From Mont Blanc it turns eastward and extends along the higher part of the Pennine Alps to Mount Rosa, where it trends to the north-east along the Lepontian Alps to the great mountain-knot which surrounds the St. Gothard Pass. From this mountain-knot it runs first southward along a range of mountains, and afterwards south-east over mountains and valleys to the Lago Maggiore. East of that lake the territories of Austria begin. The boundary here runs first southward to the south-western arm of the Lake of Lugano, the central portion of which lake belongs to Switzerland, whilst the south-western and north-eastern extremities belong to Austria. A tract of country which extends several miles south of the southern banks of the Lake of Lugano is included in Switzerland. On the north banks of the lake, about four miles east of the town of Lugano begins a mountain-range, which runs nearly due north, and separating the valleys of Misocco and Giacomo, forms the boundary: Misocco, to the west, belongs to Switzerland, and Giacomo, to the east, belongs to Austrian Lombardy. This mountain-range joins the principal chain of the Rhaetian Alps at the mountain-pass of Splügen. Along the last-mentioned chain the boundary extends only for a few miles; it then runs east of south along a lateral range, crosses the valley of Bregaglia a few miles above Chiavenna, and thus reaches the most southern of the three great chains of the Rhaetian Alps, which is known by the name of the Bernina range. It does not however exactly follow the water-shed along this range, for the valleys of Poschiavo and Münster, belonging to Switzerland, lie between the south declivities, and that of Livigno, which constitutes part of Lombardy, on the north side of the range. The valley of Münster borders on Tyrol, and from its southern extremity the boundary runs northward along an elevated chain of the Bernina range, and after crossing the valley of the river Inn, reaches the central chain of the Rhaetian Alps. It runs along this chain south-west until it meets that lateral chain which is called by the name of Rhaeticon, and which runs north-west between the Prätigau on the south-west, and the Montafoner valley on the north-east. The first belongs to Switzerland, and the second to Austria. The elevated mountains of the Rhäticon terminate on the banks of the Rhine north of Meyenfeld. The Rhine up to the place where it enters the Lake of Constance constitutes the boundary between Austria and Switzerland. On the north-east the Lake of Constance separates Switzerland from the kingdoms of Bavaria and Würtemberg. On the north of Switzerland extends the duchy of Baden, and the boundary is formed by the Rhine, except that at four places some territories belonging to Switzerland lie north of the river, and the town of Constance, which belongs to Baden, is on the south banks of the lake.

Switzerland extends a little more than 180 miles near 46° 30′ N. lat., where its length from west to east is greatest, and about 130 miles at 9° E. long., where it is widest. The area of Switzerland is about 16,000 square miles: it exceeds half the area of Scotland, including the islands, by 1414 square miles, and is nearly equal to twice the area of Wales. The surface of Switzerland presents a greater variety than most countries of Europe. The highest of its mountains, Mount Rosa, attains an elevation of 15,154 feet above the sea-level, while the surface of the Rhine at Basel is only 800 feet, and that of the Lago Maggiore, on the southern boundary, only 678 feet above the sea. The greater part of the country is mountainous. The ranges of the Alps and their numerous offsets extend over the southern and south-eastern districts, and occupy about one-half of Switzerland. Along its western boundary run the ridges of the Jura Mountains. The country between these two mountain-systems has, towards the south, the form of a plain, interspersed with isolated hills; and towards the north it is traversed by ridges or groups of hills of moderate elevation. Thus Switzerland is naturally divided into four regions: the Alps, the Plain, the Hilly Country, and the Jura Mountains.

The *Region of the Alps*, which is the most extensive, is divided from the Plain and Hilly Country by a line which begins on the north bank of the Lake of Geneva, at the town of Vevay, and running north by east passes over Mount Molesson, which may be considered as the most western summit connected with the Alps in these parts. It traverses the river Saane at Gruyère, north-east of Mount Molesson, and thence runs east by north to the western extremity of the lake of Thun. From the northern shores of the lake of Thun it runs again north by east to Mount Napf, which is on the boundary-line between the cantons of Bern and Luzern, near 47° N. lat. and 8° E. long. From Mount Napf it runs due east to the northern extremity of the lake of Luzern, and thence east by north, crossing the lake of Zug to Mount Hoch Ezel, which is near the most southern part of the lake of Zürich. From this point it follows the depression which runs east by south from the lake of Zürich through the valley of the Limmat, the lake of Wallenstadt, and the low ground which extends from the eastern extremity of the last-mentioned lake to Sargans and the banks of the Rhine. [RHINE, vol. xix., p. 459.] The whole country south of this line is occupied by the mountain-masses and chains of the Alps, and only a small portion of it is cultivable; a larger portion, which is on the upper declivities of the mountains, is available as pasture-ground.

The natural division of the Alps of Switzerland is formed by the immense mountain-knot which is on the west of the mountain-pass of the Saint Gothard, and surrounds the sources of the Rhône. A space exceeding 100 square miles rises above the snow-line, and is overtopped by numerous pointed summits, rising from 10,000 to 12,000 feet above the sea. The most remarkable of these summits are the Gallenstock, the Gletscherhorn, the Diechtenhorn, the Triftenstock, the Süstenhorn, and the Spitzliberg. From this mountain-knot a chain runs northward, and terminates at the narrow channel which connects the lake of Uri with that of Luzern. This chain contains several lofty summits, among which is the Titlis, 11,406 feet high, and the Urner Rothstock, 10,055 feet high. The chain which extends southward from the mountain-knot between Val Formazza on the west and Valle Maggia on the east does not contain any summit which rises above the snow-line, though several of them are between 6000 and 7000 feet high. From the western edge of the mountain-knot issue two ranges, of which the northern, called the Bernese Alps, runs west by south; and the southern, called the Lepontian Alps, runs south-west. Two other ranges branch off from the east side of the mountain-knot. The southern, which runs nearly east, is called the Rhaetian Alps, and near 9° 50′ E. long. divides into two ranges, of which the northern is called the Septimer Alps, and the southern the Bernina Alps. These two ranges however do not run east, but north-east, and extend beyond the boundary-line of Switzerland into Tyrol. The northern range, branching off from the mountain-knot of the Saint Gothard on the east, is also comprehended under the general name of the Rhaetian Alps, but has lately received the name of the Range of the Dödi, from its highest summit. It runs north-east, and terminates near the banks of the Rhine between 46° 40′ and 47° N. lat. These mountain-regions and the vallies enclosed between them differ considerably in their productive powers.

The valley of Wallis is enclosed by the two most elevated and widest ranges of the Alps, the Lepontian and Pennine Alps on the south, and the Bernese Alps on the north. The southern range runs from the great mountain-knot south-south-west, as far as the mountain-pass of the Simplon, a distance of about 30 miles, and so far it bears the name of the Lepontian Alps. This part of the range is not distinguished either by elevation or width. Its mean elevation is about 7500 feet, but several summits attain 10,000 feet. The width of the mountain-masses in general does not exceed 10 miles, for that is about the general distance between the inhabited places in Wallis and in Val Formazza. There are several glaciers, but none of them of great extent. Some of them descend to the vicinity of the Pass of the Simplon, over which the great road leads from Wallis to Italy.

This road, which is considered one of the most magnificent works of modern times, was made by the French government between 1800 and 1805. It connects the town of Briegg in Wallis with Domo d'Ossola, in the valley of the river Toce, or Tosa, in Piedmont, and is about 38 miles long. The width is about 9 yards, and its rise and fall only about 1¼ inch for every yard, so that it can easily be passed by carriages. It runs in most places between steep and nearly perpendicular rocks, and at six places tunnels or galleries have been made through the rock. The longest tunnel, which is below Gondo on the side of Italy, is nearly 500 feet long. These tunnels are generally 30 feet high, and at least as wide as the road itself. There are openings on the sides by which they receive the light. In several other places the road traverses precipices of great depth, by means of substantial bridges. The highest part of the road is 6576 feet above the sea-level: Briegg is 2334 feet, and Domo d'Ossola 1004 feet above the sea-level. At certain seasons the waters descend from the glaciers in rapid torrents, and frequently carry away the bridges; the road is also much damaged by the avalanches and masses of rocks which fall from the adjacent mountains. It is supposed that from 5000*l.* to 6000*l.* are annually required to keep it in repair.

West of the Pass of the Simplon are the Pennine Alps, which rise much higher, and occupy a much greater surface. The highest part of this range extends from the Pass of the Simplon, nearly due south, about twenty miles, to the enormous mountain-mass of Mount Rosa, where it turns west, and in that direction extends to the northern part of the mountain-mass of Mount Blanc. [BLANC, MOUNT.] With the exception of two or three passes not much exceeding the elevation of 8000 feet above the sea-level, the general elevation approaches to the height of 10,000 feet above the sea, and the higher part of this range, with the exception of the passes, is covered with snow all the year round. This elevated mountain-tract is of great extent. On its eastern edge are the summits of Monte Parabranco, Cima de Jazzi (13,840 feet high), and Mount Rosa (15,158 feet); and on its southern edge, Mount Cervin (14,764 feet), Mount Combin (14,126 feet), and Mount Velan (11,048 feet), and several other summits of equal elevation. Towards the east and south the mountains descend with a rapid declivity, and the valleys on that side in Piedmont are inhabited to the vicinity of the most elevated mass. But on the north the high masses extend many miles without falling below the snow-line, and are overtopped by many summits rising to the height of 12,000 feet above the sea. They terminate about six miles from the banks of the Rhône, which drains the valley of Wallis. A tract between the Simplon on the east and Mount Combin on the west, and measuring in that direction 30 miles, with an average breadth of 15 miles, is covered with snow, ice, and glaciers. These masses extend therefore over a surface of about 450 square miles, and this whole tract contains only two valleys which are inhabited. They are the valleys of Saas and S. Nicolai, and begin at the northern base of Mount Rosa, whence they extend northward, and uniting about 5 miles from the banks of the Rhône, are called the Valley of Visp. Between Mount Combin and the mountain-masses of Mount Blanc, a distance of about 12 miles in a straight line, the snow-covered portion of the range occupies a comparatively small area, and the inhabited places on both sides of the range are only four or five miles from one another.

The valley of the Rhône lies north of the mountain-region which has just been described. This river originates in the Rhône Glacier, an immense field of ice lying on the mountain-knot west of the Pass of St. Gothard, and south of the summit of the Gallenstock (12,023 feet). Where the river issues from under the ice, it is 4930 feet above the sea-level, or more than 500 feet higher than the summit of Ben Nevis. The upper part of its course, as far as Briegg, about 24 miles in length, is from north-east to south-west. Below Briegg it runs about 48 miles to Martigny, in a direction west by south. Near Martigny it forms a right angle, and the remainder of its course to its influx into the Lake of Geneva is to the east of north, and about 20 miles. The whole valley therefore is about 92 miles long. Its eastern portion, as far down as Briegg, varies between a quarter and half a mile in width. Below Briegg, and especially below the confluence of the Rhône with the Visp, which is the larger of the two rivers, the valley is from one to two miles wide, and in a few places the width is greater. Besides the valley of the Visp, the branches of which are inhabited to the distance of 18 miles from the river, several lateral valleys open into that of the Rhône, which are from a quarter to half a mile wide, and inhabited to the extent of six miles from the banks of the river. They occur in both the southern and northern mountain-chains, and thus the inhabited portion of this part of the country occupies about 12 miles in width. But between Sion and Martigny the unbroken mountain-masses approach the river, and the inhabited tract is not more than two or three miles wide. Below the great bend, the rocky masses of the Dent de Morcles on the east, and of the Dent du Midi on the west, approach so near to the river, that in several places there is hardly room enough for a road along the banks of the stream. About eight miles from its influx into the Lake of Geneva, the low tract along the banks of the river becomes two miles wide. It is a swampy tract, very little elevated above the level of the lake, which is about 1210 feet above the sea-level. The descent of the valley amounts to 3720 feet, but this alone will not account for the great diversity of climate between the higher and lower parts of it. Above Briegg the corn remains in the fields till the beginning of October, and it is reaped west of Sion in the month of June. The climate in the higher parts is cold, even in summer; whilst in the lower, at the same season, the thermometer frequently rises to 88° and 90°. This great difference can only be accounted for by the circumstance, that immense glaciers approach very near the inhabited places of the higher districts, whilst the lower portion of the valley is at a considerable distance from the ice-covered mountains, and immediately surrounded by high and nearly perpendicular rocks, which reflect the rays of the sun. Only the common grains and roots of northern Europe are cultivated above Briegg, and some fruit-trees do not grow: the lower districts produce maize; and the vine, almond, and fig-tree flourish.

On the northern side of the valley of the Rhône are the Bernese Alps, the most elevated edge of which is parallel to the course of the river. Their eastern extremity is formed by a ridge called the Grimsel, over which a mule-road leads from the valley of Hasli to that of the Rhône. The highest part of this road is 8300 feet above the level of the sea. To the west of the Grimsel and the valley of Hasli begins the largest continuous mass of ice and snow on the Alps. It extends on both sides of the highest edge of the range, and occupies from east to west, from the valley of Hasli to that of Kander, a space 30 miles long in a straight line, and from north to south a space of about 20 miles, occupying nearly the whole of the country between the lakes of Brienz and Thun and the valley of the Rhône. Its area is about 600 square miles. The outer edges of this region only are indented by three short valleys, which are inhabited. One of them, the valley of Lötsch, opens towards the south into the valley of the Rhône, and two open towards the north, into that of the Aar. The two last-mentioned are the valleys of Grindelwald and Lauterbrunnen, which are annually visited by many foreigners, as they offer the most easy access to the glaciers. From this immense lake of ice rise numerous summits, chiefly in the form of pyramids: along the highest portion of the region, from east to west, are the Finsteraarhorn (14,107 feet), the Mönch, or Monk (13,502 feet), the Jungfrau, or Virgin (13,621 feet), the Breithorn (12,462 feet), the Altels (12,172 feet), the Rinderhorn (11,683 feet), the Wildstrubel (10,980 feet), and between them several others hardly inferior in elevation. To the north of this series are other summits, among which the highest are the Eiger (12,922 feet), the Schreckhorn (13,444 feet), the Wetterhorn (12,220 feet), the Blumlis Alp (12,145 feet), and the Dolderhorn (11,920 feet). The Faulhorn, not far from the lake of Brienz, rises only to 8750 feet, but it is frequently ascended by travellers on account of the magnificent view which it offers of the numerous mountains and glaciers which lie to the south of it. At the western extremity of this region a road leads from the valley of the Kander to the valley of Lötsch in Wallis. It traverses the ridge called the Gemmi, and in its most elevated point rises 6446 feet above the sea. It is partly cut through rocks, and only practicable for beasts of burden.

The valley of the Kander separates this region from that which lies farther west, and in which the Alps rise above the snow-line only in a few places. The highest part of the mountains continues to run south-west, as far as the three-headed summit, called the Diablerets, or the Teufelshörner, which is nearly due north of the great bend of the Rhône and somewhat more than 12 miles from it. The passes over this chain vary between 3000 and 5000 feet in elevation, but some of the summits rise above the snow-line and attain more than 10,000 feet. The highest summits from east to west are the Gletscherhorn (10,393 feet), the Wildhorn (10,724 feet), the Arpelhorn (10,948 feet), and the Diablerets (10,447 feet). At the Diablerets the chain divides into two branches, one of which runs south-south-west and terminates on the banks of the Rhône, opposite the Dent du Midi, in high rocks, and the other extends westward towards the eastern extremity of the Lake of Geneva, and in approaching the lake turns gradually to the north and terminates in Mount Molesson (6577 feet). In the first of these two chains is Mount Möveran (9882 feet) and the Dent des Morcles (9567 feet), and in the second Mount Oldenhorn (10,362 feet). Though these summits and a few others rise above the snow-line, they occur at considerable distances from one another, and the glaciers which surround them are of comparatively small extent.

The country which extends north of this range, between the river Kander on the east and the Saane river on the west, and terminates in the parallel of the northern extremity of the Lake of Thun, is a mountainous country: but it does not appear that the summits which are always covered with snow are numerous; several of them attain an elevation of 8000 feet above the sea-level, and from 4000 to 5000 feet above their base. The form also of these mountains differs from that of the higher Alps, their summits not terminating in peaks or sharp ridges, but being rounded and rather flat at the top: the declivities are generally steep, though much less so than those of the higher mountains. In many places the higher parts of the ridges and groups are above the line of vegetation, but as the lower declivities are covered with fine grass, which supplies excellent pasture during the summer months, and with trees, this region contains a much greater portion of productive land than the other parts of the Alps, though the proportion which is cultivated is very small. It is eminently a country of pasture. The highest and most continuous ridge of mountains in this country is that which lies nearest to the preceding region, and extends to the west of the valley of the Kander, from the great range to the banks of the lake of Thun, where it terminates in Mount Niesen (7824 feet), whence it is called the Niesen range, though some of the summits rise 300 or 400 feet higher. Among the isolated summits is the Stockhorn, which is west of the lake of Thun, on the border of the mountain region: it is 7213 feet high, and is frequently visited by travellers on account of the extensive prospect from its summit.

The valley of Hasli, at the most southern extremity of which the river Aar originates in the Aar Glacier [RHINE, vol. xix., 459], lies between the largest fields of ice and snow, and extends in the form of a semicircle more than 20 miles to the influx of the Aar into the lake of Brienz. The climate is not so cold as might be supposed, because the glaciers do not approach the immediate vicinity of the valley, but are separated from it by lower mountains which form the declivities of the snow-covered masses. Though the valley in the upper parts is only between a quarter and half a mile wide, and in the lower between half a mile and a mile, several short valleys open into it from all sides, and the declivities of the mountains which enclose these lateral valleys, and those of the principal valley, contain rich pasture. The lower part of the valley is partly cultivated and partly meadow-ground. There are extensive plantations of walnut-trees. Along the northern banks of the lake of Brienz, the offsets of the Faulhorn rise with a steep acclivity, leaving little ground for cultivation and pasture: but to the north of the lake a hilly tract, partly cultivated and partly used as pasture-ground, intervenes between the lake and the mountains. The low and level tract which lies between the lakes of Brienz and Thun, and is about four miles long and two miles wide, is fertile, well cultivated, and has extensive plantations of walnut-trees. The climate is so temperate that the flowers blossom in the month of February. Along the northern banks of the lake of Thun the mountains approach close to the water; but as they are not high nor their sides precipitous, there is a considerable tract between them and the lake, which is used for the cultivation of grain, plantations of vines and trees, and as pasture-ground. There is a similar tract of greater extent on the south of the lake; and towards the western extremity of the lake the mountains disappear and the plain begins.

The country which extends north-east of the river Aar and the lakes of Brienz and Thun to the lake of Luzern, and eastward to the high range which runs northward from Mount Titlis to the strait which connects the lake of Uri with that of Luzern, is much less mountainous and broken than the region which is south of the lake of Thun. The lake of Brienz is 2060 feet above the sea-level, that of Thun 1875 feet, and the lake of Luzern 1434 feet; and consequently the mean elevation of this region can hardly be estimated at less than 2000 feet. The most elevated tract is north of the lake of Brienz, where the Rothhorn attains 7536 feet above the sea, the Tannhorn 6962 feet, and the

Hohgant 7352 feet. These summits may be considered as the most northern range of the Alps in this direction, for the numerous summits which are dispersed over the country north of them are generally isolated, and hardly attain an elevation which entitles them to the name of mountains in the vicinity of the high masses lying farther south. The highest of them, Mount Pilatus, south-west of the town of Luzern, is only 6904 feet above the sea-level; and Mount Napf, which is the north-western point of this region, is only 5277 feet. The surface of this country is a succession of ascents and descents, with very small tracts of level ground between them. Though the declivities cannot be called steep, they are too rapid to admit of the use of the plough, and hence nearly the whole of the country is pasture-ground, except that in the vicinity of the lake of Luzern large tracts are planted with walnut and chestnut trees.

We now pass to the eastern portion of the mountain-region. Along the eastern edge of the mountain-knot, west of the pass of St. Gothard, lies the valley of the Upper Reuss, of which a more minute description is given under RIVERS, vol. xx., p. 23. The upper part of the valley, or that of Ursern, is extremely cold, being in its lowest part 4644 feet above the sea-level; the lowest part, or the valley of Uri, has a very temperate climate, being little elevated above the surface of the lake of Luzern, or about 1500 feet above the sea. In the valley of Ursern the winter lasts eight months, and even during the remainder of the year a fire is constantly kept up. No grain is cultivated, but there are good pastures. The climate of the valley of Uri resembles that of Giornico, in the valley of Leventina, south of the Alps: the valley produces maize and other grain, and also peaches and chestnuts. The highest part of the mountain-road of the St. Gothard, which passes through this valley, is about 7100 feet above the sea.

The country between the valley of the Reuss and the lake of Luzern on the west, that of Wallenstadt on the north, and the valley of the Upper Rhine on the east and south, is probably the most broken portion of the mountain-region of the Alps in Switzerland. The valleys are extremely narrow, and the declivity of the surrounding mountains is exceedingly broken, and so steep that large tracts on the mountains' sides are bare of trees and bushes, and only a very small surface is fit for pasture. The upper part of the mountains consists either of sharp narrow ridges or of isolated summits, which generally constitute large masses with a very uneven surface. The mountains, though connected with one another by ridges, are not disposed in regular ranges, but scattered over the surface in the greatest disorder, except along the valley of the Rhine, where they form a tolerably continuous range. This range, the most northern of the three ranges comprehended under the name of the Rhaetian Alps, and now commonly called the range of the Dödi, is connected with the mountains which line the valley of the Aar on the east, and thence runs east-north-east over the Krispalt, the Oberalpenstock (10,873 feet), the Dödi (11,811 feet), the Kistenberg (11,068 feet), the Scheibe (10,000 feet), and the Graue Hörner (9338 feet), terminating near the Rhine, and on both sides of the deep and closed valley of the Tamina, in precipitous masses of rock. The glaciers on this chain are numerous, but with the exception of those which surround the Dödi and Kistenberg, they are not of great extent. In the country north of this range there is also a considerable number of single mountains, which rise above the snow-line, as the Windgellen (10,336 feet), the Scheerhorn (10,809 feet), the Clariden Alps (10,489), the three mountains of Glärnisch, of which the most elevated, Hoch Glärnisch, rises to 9509 feet, the Kärpfstock (8954 feet), and several others. But as these mountains are isolated, the glaciers are of small extent. The mountains are less elevated along the northern edge of this region, as the Mürtschenstock, which runs along the southern banks of the lake of Wallenstadt, and attains an elevation of 7750 feet above the sea-level. In proceeding north-west, the mountains decrease in elevation, and their declivities are much more gentle. North-west of a line drawn from the narrow strait which unites the lake of Uri to that of Luzern, to the western extremity of the lake of Wallenstadt, there is no mountain which is covered with snow all the year round, and only a few occur whose summits are above the region of trees. But though the declivities of the mountains are generally accessible to cattle, and supply pasture-ground, few places are cultivated. There are however some large tracts which are planted with vines and other fruit-trees, especially in the more mountainous part, where the peach-trees are very numerous. The narrow valleys of this tract have a temperate climate, and the winters last only two or three months.

The valley of the Upper Rhine extends along the Rhine from its source in Mount Badus [RHINE, vol. xix., p. 459] to its influx into the lake of Constance, or the Boden Sea. This valley is about 90 miles long: nearly one-half of that distance is from west-south-west to east-north-east, and the remainder is from south to north. The upper part of the valley is formed by a few basins of an oval form, from 3 to 4 miles long, and from 1½ to 2 miles wide. These basins are separated from one another by mountains, which generally come close to the banks of the river. The highest of these basins occurs near Trons, where the surface of the river is 2829 feet above the sea-level. That portion of the valley which lies above Trons is not cultivated, partly on account of the steep declivity of the mountains, and partly owing to the rigour of the climate: the winter lasts from eight to nine months. At Trons agriculture begins, but it is on a very moderate scale, as a part of the basin is covered with swamps. Lower down are the basins of Ilanz and of Reichenau, and then follows the basin of Chur, where the lower portion of the valley begins. This lower valley is divided into two parts by two mountains, the Fäscherberg on the east, and the Schollberg on the west, which come close up to the river north of Meyenfeld, near 47° 5′ N. lat. The southern district, called the Valley of Meyenfeld, descends gradually from about 1775 to 1600 feet. It is about 15 miles long, and varies in width from 2 to 3 miles: the whole of it is under cultivation, and it produces maize, wheat, and other grains; and near the base of the adjacent mountains there are vines and fruit-trees. The northern portion of the valley, called the Rheinthal, or Vale of the Rhine, is about 30 miles long, and from 3 to 6 wide; but only the smaller part of it, which extends along the western banks of the river, belongs to Switzerland: the low country east of the river, which is much wider, belongs to Austria. It is one of the best cultivated tracts in Switzerland, and produces very large quantities of maize and other grains. The vine and fruit-trees are abundant. Great quantities of cider are made and exported. The descent of the valley is from 1600 to 1340 feet above the sea-level.

The principal range of the Rhaetian Alps branches off to the east of the mountain-pass of St. Gothard, south of Mount Badus, and runs eastwards. It is less known than the other ranges of the Alps, and only a few of its numerous summits have been measured. A continuous range of mountains, of which however no summit seems to rise above the snow-line, extends 20 miles, to Piz (Peak) Valrhin, which attains an elevation of 10,960 feet, and is surrounded by extensive glaciers, which are the source of the Hinter-Rhein, the largest of the upper branches of the Rhine. Not far from it to the east is the Muschelhorn (10,234 feet); and between the roads leading over the St. Bernhardin and the Splügen is the Tambohorn (10,436 feet). The range continues eastward to the source of the Inn, where it turns to the north of north-east, in which direction it runs to the eastern frontier of Switzerland, and enters Tyrol. This last portion of the range is very high, and the snow along the crest is almost continuous. Some of the glaciers are extensive, especially as we approach the eastern boundary of Switzerland: the glacier which surrounds Mount Fermund, or the Iron Mountain, is calculated to cover nearly 100 square miles. From this immense field of ice and snow that range of mountains branches off which is called Rhäticon, and which runs north-west by west until it terminates on the Rhine with the Fäscherberg, north of Meyenfeld. The crest of this mountain-wall, which is about 10 miles wide and 30 miles long, is generally above the snow-line, and glaciers descend down its sides. The most elevated summit, the Scesa Plana, is 9818 feet above the sea-level. The Rhäticon divides Switzerland from Vorarlberg.

The country between the ranges just described and the valley of the Upper Rhine extends from the Piz Valrhin to the Rhäticon, more than 40 miles in length, and about 24 miles in width: it is filled with extensive mountain-masses, which are connected with the principal range by lower ridges. These lower ridges sometimes constitute ranges several miles long, rising above the snow-line, and covered with glaciers. Only a few of their summits have been measured, among which the Zaporthorn, north of Piz Valrhin, rises to 10,841 feet; and the Piz Beverius, on the west of the valley of the Hinter-Rhein, and south of Reichenau, to 8933 feet. The valleys which lie between these ranges and mountain-masses are very numerous, but they rarely exceed half a mile in width. The larger valleys are from west to east: the valley of Lugueza, which opens into the valley of the Rhine at Ilanz; that of the Hinter-Rhein, which terminates near Reichenau; and that of the Languart, called the Prätigau, which joins the valley of the Rhine above Meyenfeld, and extends along the southern declivity of the Rhäticon. Very little grain is cultivated in these valleys, but potatoes and other vegetables are grown. Fruit-trees do not succeed, except in the lower parts. Most of them however have excellent pasture-grounds on the Alps, and the level tracts are converted into artificial meadows, which are irrigated. The valley of the Hinter-Rhein is the longest: the great roads between Coir or Chur and Italy pass through it. A road leads from Chur to the village of Splügen, where it divides. The western road passes over the Bernhardin and leads to Bellinzona, in the canton of Tessin: the highest point of this road is 6961 feet above the sea. The eastern road traverses the Splügen and leads to Chiavenna, in the valley of Bregaglia, in the Austrian province of Sondrio: the highest part is 6715 feet above the sea. Both roads are passable for carriages, and a considerable traffic is carried on by them between the manufacturing districts in the northern parts of Switzerland and Italy.

The southern chain of the Rhaetian Alps, called the Bernina range, which name is derived from a mountain-pass over which a road leads from the valley of Engadin into Italy, runs parallel to the principal range from south-south-west to north-north-east: its southern extremity extends into Lombardy, and the northern into Tyrol. It appears to be as high as the principal range, for a great part of the most elevated ridges are always covered with snow, and contain numerous glaciers. The most elevated summit is said to be that called Monte dell' Oro, which stands south of, and not far from, the boundary-line of Switzerland, within the Austrian dominions. Between the Bernina range and the principal range of the Rhaetian Alps the beautiful pastoral valley of Engadin is enclosed. [ENGADIN.] On the southern declivity of the Bernina range only two valleys of some extent belong to Switzerland: the valley of Münster, which opens into the valley of the Adige at Glurns in Tyrol; and the valley of Poschiavo, which is 15 miles long, and opens into the valley of the Adda at Tirano, in the province of Sondrio. The valley of Poschiavo is a rich pastoral district, and derives considerable advantage from the road over the Bernina Pass, which runs through it. Large droves of cattle go by this road from the valley of Engadin to Italy.

Numerous rivers rise on the southern declivities of the Rhaetian Alps, between the great field of ice in which the Aar and Rhone originate, and flow southward: they all unite in the river Tessin or Ticino. The country drained by these rivers is called Italian Switzerland, because the Italian language is spoken by the inhabitants. It is traversed by several mountain-ranges, which run southward and occupy the greater part of its area. Many parts of these ranges rise above the line of trees and shrubs, but none of the summits attain the snow-line. Between the ranges there are several valleys of considerable extent: three largest are those of Misocco, Leventina, and Maggia. The largest is the valley of Leventina, of which a description is given under RIVERS (vol. xx., p. 23). Each of the other two valleys is about 25 miles long, and varies in width from 1 to 2 miles. All these valleys are very fertile. In their upper parts, which are about 3000 feet above the sea-level, very little grain is cultivated, and the inhabitants live on the produce of their herds In the middle parts of the valleys maize and other kinds of grain are grown, and vines and fruit-trees abound, especially the chestnut and walnut tree. The lower parts, whose climate approaches that of Italy, have considerable plantations of fig-trees and mulberry-trees. A considerable quantity of silk is annually collected in these valleys and sent to the manufacturing districts: no other part of Switzerland contains such extensive forests and such fine trees. The great road which traverses the mountain-pass of Saint Gothard runs through the valley of Leventina, and that which crosses the St. Bernhardin through the valley of Misocco. As the southern declivity of the Alps is very steep, these valleys are subject to very extensive and destructive inundations during heavy rains.

There is a considerable difference of climate between the southern and northern declivities of the Alps. On the declivity, which descends rapidly towards Italy, the snow-line occurs at the elevation of about 9000 feet: on the northern side it does not rise above 8000 feet above the sea. Rye and barley succeed on the northern declivity only in a few places in situations more than 3000 feet high: on the southern slope they are cultivated to 4000 and even 4500 feet: on the north, maize is grown to 1500 feet; and in some places even at a higher elevation: on the south it rises to nearly 3000 feet. Mulberry-trees are only found on the southern declivity, on which they ascend to nearly 2000 feet. On the north chestnut-trees cease at 2500 feet, but extend on the south to 3500 feet. Common fruit-trees succeed on the north to 3800 feet, and on the south nearly to 4000 feet above the sea. Potatoes, carrots, turnips, and cabbages are grown to the height of 5000 feet on the north. Full-grown trees are met with on the northern side to 4500, but on the southern up to 6000 feet.

Agriculture is not limited to the level tracts on the banks of the rivers in the larger valleys, but it extends over the lower parts of the declivities. The whole declivity of the mountains is naturally divided into four regions: the lower, the wooded, the alp or pasture, and the rocky region.

A steep ascent leads from the low and level tract of the valley to the *lower region*. This ascent is generally covered with trees or bushes. The surface of the lower region rises by a gentle slope for a considerable distance, occupying generally only one-eighth of the elevation of the mountain, and one-third of its area. The surface is covered with a thick layer of earth, which has been brought down from the more elevated parts, and has been prevented from descending lower by the gentle slope of the ground. The surface of this tract is rather undulating, and is only furrowed by the beds of the torrents which traverse it on their descent from the high regions. The cuts made by these torrents are deeper the nearer they approach the low tract on the valley. The greater part of this region is rather fertile, without wood, and fit for cultivation where the valley is not too much elevated above the sea. On this slope alone permanent habitations are found, and it is traversed by the roads which connect the villages or hamlets.

At the back of the lower region rises the *wooded region*, which, being very steep, is not adapted for cultivation. It occupies in height half the elevation of the mountain, but only one-third of its base in width. On an average, the angle at which it rises is 45°; and often more. In general it is covered with full-grown trees, which cannot be turned to profit because of the difficulty of bringing them down. The steepest parts of the rocks have no covering except lichens and mosses.

Above the wooded region is the *alp* or *pasture region*, which occupies in height only one-eighth of the declivity, and in width about one-sixth. The slope is much more rapid than that of the lower region, and its surface presents considerable inequalities. There are few trees on it, but some places are covered with low bushes, dwarf willows, and firs. It bears a rich turf and many plants, among which the Alpine rose (Rhododendron ferrugineum) is admired for the beauty of its flower. For three or four months in summer cattle pasture on this region, which is divided into regular portions, properly called *alps*. There are some brooks and small ponds, but in general water is not abundant, and it disappears during the dry weather in summer, and herdsmen are obliged to take the cattle lower down to water them. No part of this region is permanently inhabited, but there are many small huts of stones or wood in which the herdsmen pass the summer, while the cattle are on these pastures. In winter this region is covered with a thick layer of snow. Though the grass is very nourishing, it is short, and consequently a much greater space is required to feed an animal than on the less elevated region between the lake of Thun and that of Luzern.

The *rocky region*, which composes the crest of the mountain, is always destitute of vegetation. This region occupies about one-fourth of the height of the declivity, and one-sixth of its width. It is however of smaller dimensions, and sometimes it does not exist at all on mountains whose summits do not attain the highest line of vegetation. In such a case the crest of the mountain resembles the alp region.

The valleys which are above the size of ravines have a peculiar form. The smaller valleys consist of one basin, from 2 to 5 miles in length, and from one-eighth to a quarter of a mile in width. This basin is enclosed by rocky masses, in which the four regions are distinctly marked, and is connected with the valley, into which it opens by a very narrow gorge, frequently more than a mile in length, through which the rivulet which drains the basin runs, and which in most places is hardly wide enough to convey the water to the wider valley. The surface of the basin is sometimes a dead level; in other places it has a slight slope towards the stream. These basins at some remote period have apparently been filled with water, and formed lakes, and by some revolution the gorge has been opened, the water was drawn off, and the surface of the basin laid dry. Frequently a small lake is still found in the lowest part of the basin, and in others the lowest part of the basin is under water when rain or the melting of the snow increases the volume of water in the rivulet so that it cannot be carried off by the narrow gorge by which it issues from the basin. At some places it has been found necessary to make embankments along the rivulets to protect the fields against inundations. The larger valleys consist of from three to five of such basins, which rise like terraces one above the other towards the source of the river. Thus the Hinter-Rhein runs first for about six miles in a ravine, and then enters a basin, which is from one mile to two miles wide and about 24 miles long, and called the valley of the Rhinwald. The hamlet of Hinter-Rhein, which is near the place where the basin begins, is 5000 feet above the sea-level; but the village of Splügen, not far from its lower extremity, is only a little more than 3000 feet. About two miles below this village the valley is shut up by mountains, and between them the river runs for about three or four miles through a very narrow gorge, called the Rofflen, in which the road is made on the declivity of the adjacent mountains, there being not space enough for it along the banks of the river. Below the Rofflen is the second basin, called the valley of Schams, a fertile and beautiful valley of an oval form, about five miles long and two wide, which at its lower extremity is separated from the third basin by another narrow gorge similar to the Rofflen, and called Mala Via. The third basin is about six miles long and three wide, and called the valley of Domleschge: it is about 2000 feet above the sea-level, and at its lower extremity again closed by a short gorge, which is about 50 yards wide. Issuing from this gorge the Hinter-Rhein joins the Vorder-Rhein, and after this junction the valley of the river in two places is contracted to its very bed, first between Reichenau and Chur, and lower down below Meyenfeld. The soil of the basins generally consists of gravel and peat, which produces good grass, and consequently is used as meadows: it is rarely cultivated, even in those valleys which are less than 3000 feet above the sea-level. The brooks and rivers which drain the valleys traverse the basins generally with a gentle current, but in the gorges they form nearly a continuous rapid, which is frequently interrupted by cataracts.

It thus appears that the rivers of the mountain-region are not navigable, with the exception of the Rhine, which is navigated by river-barges from the town of Reichenau, where its two principal branches unite. But even if their course were not interrupted by cataracts, these rivers could hardly be navigated, owing to the great changes in the volume of water, which occur very suddenly. It frequently happens that in a few hours a river rises several feet and inundates the low tracts contiguous to its banks, and in a few hours it subsides again. These changes sometimes follow very rapidly. Small lakes are very numerous. A few of them occur in the basins of the valleys, but the greater number lie in the mountains, being enclosed by high walls of rocks. Some of them are at such an elevation as to be covered with ice all the year round. Larger lakes do not occur within the mountain-region, with the single exception of the Lake of Brienz, but several of considerable size are found along the outer edge of the region, so that the larger portion of the lake is enclosed by mountains, whilst the lower extremity is within the adjacent plain. Such are the lakes of Luzern and of Thun on the northern, and the Lake of Lugano and the Lago Maggiore on the southern side of the Alps. All Alpine lakes are deep; in some cases the depth is 100 fathoms. They contain few fish.

The *Hilly Region* extends over the north-eastern portion of Switzerland, and comprehends the country which is bounded on the east by the valley of the Rhine, or Rheinthal, on the north-east by the Boden See, or Lake of Constance, and on the north mostly by the course of the Rhine. On the west it is divided from the region of the Jura Mountains by the lower course of the Aar, between the mouth of that river and its confluence with the Reuss. The river Reuss and its tributary the Lorze, which issues from the Lake of Zug, separates the hilly region from the plain. The line dividing the hilly region from the Alps runs from the middle of the Lake of Zug to Mount Hoch Ezel, on the southern banks of the Lake of Zürich, and thence along the depression in which the lower course of the Linth and the Lake of Wallenstadt are situated, and which from that lake extends to the Rhine north of Sargans. This depression, which continues across the western district of the hilly region through the Lake of Zürich and the valley of the Limmat, terminates at the confluence of the last-mentioned river with the Aar. The length of this depression is nearly 70 miles, but half of this space is occupied by the lakes of Wallenstadt and of Zürich, the former of which is 10 miles long, and the latter nearly 24. The level tract which separates the two lakes, and that which lies between the Lake of Wallenstadt and the Rhine, are hardly more than 20 feet above the waters.

Part of the country enclosed by these boundaries is mountainous. This higher tract occupies the eastern portion of the hilly region, and may be divided from the lower country by a straight line drawn from the western extremity of the lake of Wallenstadt to the place where the Rhine enters the lake of Constance. On the northern side of the low and narrow tract between Sargans and the lake of Wallenstadt above noticed, the country rises with a steep ascent to an elevation of between 3000 and 4000 feet, which increases as we proceed westward, and on the northern shores of the lake of Wallenstadt it attains an elevation of 7000 feet above the sea-level. This continuous range, which extends along the northern banks of the lake and descends towards it with a steep declivity, is called the Kuhfirsten or Kurfirsten, and terminates on the west in the elevated summit of Mount Speer (6636 feet). It is about 4 miles wide. Its northern declivity is comparatively gentle. North of the eastern extremity of the lake of Wallenstadt, a lower ridge, called the Grabser Alpen, branches off towards the north and connects the Kuhfirsten with the mountain-group called the Alpstein, which from east to west extends about 10 miles, and whose lower offsets advance to the very shores of the lake of Constance, so that in length it exceeds 15 miles. Towards its southern border are the highest summits, of which the Säntis, or Hoch Säntis, attains an elevation of 8272 feet, and has a small glacier on the northern declivity of its summit. The Alte Mann, which stands east of it, is only about 200 feet lower. North of these summits are several others, rising from 4000 to 6000 feet, but at the distance of 6 miles from the lake of Constance they sink down to 4000 feet, and gradually decrease in height. This mountainous tract resembles very much the country north of the Dödi range, except that the valleys are somewhat wider; and as the mountains do not rise to such an elevation, and have less rapid slopes, the pasture-grounds on the upper declivities are more extensive. Very little grain is cultivated, but there are some fruit-trees and vines.

The remainder of this region can only be called hilly, and its surface is nothing but a succession of high swells with moderately gentle declivities and rounded or flat tops. These swells are sometimes several miles long. In several places round-topped summits rise upon their backs, which are usually more numerous and higher in the vicinity of the mountain-tract, and sink lower as we advance towards the north. None of these high hills exceed 4000 feet above the sea-level, though several rise 3000 feet above the sea, and about 1800 feet above their base. The highest summits are arranged in small chains, which in the western districts are between the river Thur and the lake of Zürich. The most eastern is called the Altmann chain, and divides the valleys of the rivers Thur and Toss. It contains the Schnebelhorn (3923 feet) and the Hörnli (3824 feet), and terminates on the banks of the Rhine opposite Eglisau with the Irchelberg. By means of the Töss-stock it is connected with the Kuhfirsten. The western ridge runs between the lakes of Zürich and Zug, and terminates with the Uetliberg (2850 feet), which stands a short distance west of Zürich. It contains the Schnabelberg (2760 feet) and the Albis (2921 feet). The Albis, which commands an extensive view over all the adjacent countries and the snow-capped mountains of the Finsteraarhorn region, has given its name to this ridge, which is called the Albis chain. This chain is connected on the south with other summits, which are offsets of the Dödi range, among which is the Rossberg, from which a large mass fell in 1806, and destroyed the village of Goldau. It rises to 5190 feet. South of the Rossberg, between the lakes of Zug and Luzern, stands the isolated summit of the Righi (Regina montium), which is much visited by travellers, and rises to 5916 feet. The two last-mentioned mountains are within the mountain-region. That portion of this region which lies between the lake of Constance and the course of the river Thur is comparatively level, as the hills rise to a very moderate elevation, and their slopes are so gradual that nearly the whole of them is cultivated. This is considered to be the most fertile tract in all Switzerland, especially that part between Arbon on the banks of the lake, and Stein on the Rhine, which presents a succession of cultivated fields, orchards, vineyards, and artificial meadows. Besides maize and all other sorts of grain cultivated north of the Alps, large quantities of hemp and flax are grown, which supply the material for the numerous manufactures here and in the neighbouring districts. Two crops of flax are frequently got in one season from a field. The plantations of fruit-trees are so extensive as to resemble forests, and the trees attain an uncommon size. In several places the meadows are irrigated. The soil of the remainder of this region is less fertile, though in general it is above mediocrity and well cultivated, but a larger portion of the surface is used as pasture and meadow land, as the higher parts of the chains of hills above mentioned are unfit for cultivation, but are used as pastures for six or seven months of the year. The country along the northern banks of the lake of Zürich is very little inferior to the tract along the lake of Constance. There are many small lakes in this hilly country, and they contain more fish than the Alpine lakes. The largest lakes of these are those of Wallenstadt and Zürich. The lake of Wallenstadt, the *Lacus Riparius* of the antients, is still called, in the language of the people of Graubündten, the lake of Ripa. It is 10 miles long, and nowhere exceeds two miles and a half in width. It partakes of the nature of the Alpine lakes, being very deep, in most places from 60 to 80 fathoms. Its northern shores are extremely steep, rocky, and high, and at the distance of barely a mile from them the Kuhfirsten range rises from 4000 to 5000 feet above the sea-level: on the south the shores are also rocky and steep, but less elevated, and the Mörtschenstock range attains its highest elevation at the distance of 2 or 3 miles from the lake: at the two extremities it is bordered by low tracts. The surface is 1424 feet above the sea-level. The lake of Zürich is about 24 miles long, and has the form of a section of a circle, the curvature being directed towards the south-south-west. Its mean width is less than 3 miles. It is divided by two projecting points into two sections, of which the eastern is called Ober See (Upper Lake): the surface is 1310 feet above the sea-level. Near its eastern extremity is a level tract of some extent, but, with this exception, the shores are surrounded by gently-sloping hills, covered with vineyards, orchards, and cultivated fields. In a few places it is stated to be 100 fathoms deep. The largest rivers of this region are the Thur and Limmat. The Thur rises in a valley which separates the Kuhfirsten range from the Alpstein mountains, and at first runs west, but turns gradually to the north. After a course of about 30 miles it makes a great bend to the east, and then flows westward to its confluence with the Rhine above Eglisau. Its whole course exceeds 65 miles. Nearly one-half of its course lies in a narrow but rich pastoral valley, the Toggenburg, between mountains, and the remainder of the course between moderate and well-cultivated or wooded hills. It is too rapid for navigation. The Limmat originates, under the name of the Linth, on the northern declivity of Mount Dödi, and traverses the mountain-region of that name in a northern direction, and in a very narrow valley until it meets the lake of Wallenstadt. Formerly it did not fall into the lake. It is subject to a very sudden and great increase of water, and it frequently inundated the low tract between the lakes of Wallenstadt and Zürich, and destroyed the crops of that fertile district. In 1821 a canal was made, by which the waters of the Linth are now carried to the lake of Wallenstadt, and another canal in the middle of the low tract, which is wide and deep enough to receive all the water from the lake of Wallenstadt and to carry it to the lake of Zürich. This canal is called the Linth canal. The river issuing from the western extremity of the lake of Zürich is called the Limmat. It runs about 18 miles in a west-north-west direction, until it falls into the Aar near Rain. The Limmat is navigated, but it can only be ascended by empty boats, on account of the rapidity of the current.

The *Plain* of Switzerland, which lies to the north-west of the mountain-region and to the west of the hilly-region, extends in the direction of north-east from the banks of the lake of Geneva to the lower course of the Reuss from Roth to its confluence with the Aar. The line which divides it from the mountain-region has already been described, and also that which separates it from the hilly-region. Its western border, with which it joins the Jura Mountains, is marked between the lakes of Geneva and Neuchâtel by a straight line beginning on the banks of the first-named lake at Rolle, and terminating on the last-mentioned at Yverdun. Farther north it is formed by the lake of Neuchâtel in all its length, and then by the river Thiele (Ziel), or the channel which carried the waters of that lake to the lake of Bienne, by the last-mentioned lake, and by the channel by which it discharges its waters into the Aar, which likewise bears the name of Thiele. The remainder of the western boundary of the plain is formed by the river Aar to its confluence with the Reuss, as the Aar flows along the base of the Jura Mountains in these parts. This plain is properly an immense valley, surrounded by mountains, and extending south-west and north-east more than 100 miles in length, with a width which varies between 20 and 30 miles. Its area probably exceeds 2500 square miles.

On the southern and western border of the plain are four considerable lakes: the lakes of Geneva, Neuchâtel, Morat, and Bienne, which are at different elevations above the sea-level: the lake of Geneva is 1228 feet above the sea, Morat is 1450 feet, Neuchâtel 1429 feet, and Bienne 1410 feet. As the lake of Neuchâtel is fully 200 feet higher than that of Geneva, we should expect to find that the waters originating between the two lakes would run to the lake of Geneva; but we really find that the watershed between these lakes is never more than 2 miles from the lake of Geneva, and that nearly the whole drainage runs to the lakes of Neuchâtel and Morat. This is effected by a high swell, which extends westward from the Dent de Jaman, the most western summit of the Alps in this part of Switzerland, to the lake of Geneva, between Montreux and Vevay. It proceeds westward along the lake, and close to its banks, to Ouchy, west of Lausanne. The rocky declivity with which it descends towards the lake is in many places between Vevay and Lausanne so steep, that the road between these two towns is cut in the rock. At Ouchy it recedes from the lake, and runs north-west towards the Jura Mountains; but it does not reach them, being divided from the mountains by a narrow depression, which occurs near the small town of Lasarras. This depression is chiefly covered with swamps, from which a small river, called Noson, runs northwards and joins the Orbe, which falls into the lake of Neuchâtel; whilst the Veiron, another small river originating in the same depression, flows southward to the lake of Neuchâtel. Two hundred years ago an attempt was made to cut a canal through this depression, and thus to unite the lake of Geneva with that of Neuchâtel; but this work was never completed. The high swell just noticed is called Mount Jorat. Though its southern declivity is very steep, it descends gradually towards the north, and its long slopes extend to the distance of 10 miles from the banks of the lake of Neuchâtel. Where it is crossed by the road leading from Lausanne to Moudon, near Chalet Gobet, its upper crest is 1810 feet above the lake of Geneva, or 3039 feet above the sea-level; but farther east, in the vicinity of the Alps, it rises to 3800 feet. The whole country between the lakes of Geneva and Neuchâtel, with the exception of the steep descent towards the lake of Geneva, presents a succession of round-backed hills or short ranges, sloping very gradually on all sides, and interspersed with open valleys, which frequently enlarge to small plains. The eminences decrease in elevation as they approach the lake of Neuchâtel, and the country on its banks can only be called undulating. There are few tracts which cannot be cultivated, and they are of small extent. The soil is rather fruitful, though not distinguished by fertility, and the whole country is either covered with corn-fields, on which maize, wheat, barley, &c. are grown, or with orchards or vineyards. The vineyards are very extensive on the lake of Geneva, and yield some good wine. The plantations of chestnut-trees are extensive, and almond-trees and fig-trees abound.

Another swell of high ground traverses the plain in a different direction. It is connected with the Jorat Mountains south-east of Moudon, and extends thence in a north-east by east direction to the town of Freyburg. From Freyburg it passes south of the town of Bern, where it declines more to the east, terminating at Mount Napf, which stands on the north-western border of the mountain-region. This swell rises about 1000 feet above its base, which may be 1500 feet above the sea-level: it contains a few summits; one of the highest of them is Mount Bütschel, south of the town of Bern, which rises to 3450 feet above the sea-level. On the spacious and level summit, and the gentle declivities of this swell, pastures and cultivated fields succeed one another, with orchards and vineyards. The beautiful and rich valley of the river Emmen extends as far north as the vicinity of the town of Burgdorf, which is within this swell.

The remainder of the plain has generally an undulating surface, the eminences rarely rising into hills, and most of the slopes being gentle. There occur also some level tracts, the largest of which is the low country between the lakes of Neuchâtel, Morat, and Bienne, which, when the rains have been very abundant, is overflowed. Within this portion of the plain only a few isolated summits occur, which rise from 1000 to 2000 feet above their base. The highest of them is the Bäutiger, north-east of Bern, which rises to 3438 feet. The soil is of moderate fertility, but when well cultivated it rewards the labour. It is mostly under the plough, and produces all kinds of grain, as well as hemp and flax. Vineyards are not extensive, and the wine is not of good quality; but other fruits, especially apples, pears, plums, walnuts, and cherries, are very abundant; and from the cherries kirschwasser is made. At the north-eastern extremity of this country is the Lindenberg, a moderate swell, about 500 feet above its base, which is remarkable for the horizontal line in which its crest runs for 20 miles, between Roth and Lenzburg: not an eminence is observed on it.

The principal river of the plain is the Aar [Rhine, vol. xix., p. 459], which here receives the Saane, Thiele or Ziel, Emmen, and Reuss. None of these affluents of the Aar are navigable, except the Thiele, which is navigated by river-barges and steam-boats to the lakes of Bienne and Neuchâtel. The largest lakes are those of Geneva [Leman, Lake, vol. xiii., p. 417], of Neuchâtel [Neuchatel, vol. xvi., p. 164], of Morat, and Bienne. The lake of Morat is nearly five miles long, and nearly one and a half wide: it receives the waters of the river Broye, which rises on Mount Jorat, and, after a course of 20 miles discharges its waters into the lake of Neuchâtel by a channel also called the Broye. As to the lake of Bienne, see Bienne, vol. iv., p. 390. These lakes abound in fish. In the north-eastern districts of the plain are several smaller lakes: the largest of them is that of Sempach, north-west of Luzern, which is about five miles long, but in no part more than a mile wide. It is 1695 feet above the sea-level, and 256 feet above the lake of Luzern, which shows that the country has a considerable rise between the two lakes.

The Fourth region of Switzerland is the Jura Mountains, which occupy the north-west part of the country, being divided from the plain by the line above mentioned, and extending along the boundary of France. This elevated region occupies about 150 miles in length, with a width of about 30 miles. Between Besançon in France and the lake of Neuchâtel it is 35 miles wide. It begins on the south on the banks of the Rhône, opposite Mount Vuache in Savoy, and at the place where the river runs underground, called Perte du Rhône: it extends thence in a north-east direction until it terminates on the banks of the rivers Aar and Rhine, where its branches fill up the peninsula formed by the lower course of the Aar and the Rhine from its confluence with that river to its great bend between Solothurn and Basel. About half of this region lies within France, where it occupies about one-half of the departments of Ain and Jura, and three-fourths of that of the Doubs. In Switzerland it extends over the western districts of the canton of Vaud, the whole area of that of Neuchâtel, the north-western districts of Bern, the greater parts of Solothurn and Basel, and a small portion of Aargau. Its south-eastern edge, which borders on the plain of Switzerland, runs in a slightly curved line. It is, properly speaking, an elevated table-land, whose surface declines gradually from east to west. It rises from the plain of Switzerland with a steep ascent to an elevation of 3000 feet, and at this elevation it is traversed in its length by many low chains, which divide the whole surface of the region into numerous longitudinal valleys. Many of these valleys are connected with one another by depressions, while others are entirely surrounded by hills, and the water which collects in them escapes by natural tunnels. On the low and narrow ridges which divide these valleys a few summits rise from 600 to 2000 feet above their base. The southern part of the table-land, which is entirely within France, is the most elevated, and its mean elevation above the sea may exceed 3500 feet. Here are the mountains called Reculet (5628 feet), Pré des Marmiers (5650 feet), and the Grands Colombiers (5565), which are the highest summits of the Jura Mountains. Within Switzerland are Mount Dole (5515 feet), and Mont Tendre (5522 feet), which lie west and north-west of the lake of Geneva, and Mont Chasseron (5223 feet), west of the lake of Neuchâtel, and Mont Chasseral (5211 feet) north-west of the lake of Bienne. Mont Terrible, which stands close to the great bend of the Doubs, and on the north-west edge of the Jura Mountains, attains only 2558 feet above the sea-level. But in the southern and central part of this region are several other summits which rise between 4000 and 5000 feet. This region, as far as it is within Switzerland, may be divided into three sections, the Southern, Central, and Northern districts.

The Southern district extends to the southern extremity of the lake of Neuchâtel, and forms a part of the canton of Vaud. In these parts the Jura Mountains do not rise abruptly from the plain, but a lower range, a kind of terrace of small width, lies between them, which is called La Côte, and in its southern parts is covered with vineyards, where the wine known under the name of La Côte is grown, between Geneva and Morges. Farther north are plantations of mulberry-trees for the use of silkworms. There are also numerous orchards, and in some parts the slopes are wooded. In the mountain-region itself there are two large and several smaller valleys. The two larger valleys are those of Joux and of Valorbe, and they may be considered as one valley, thirty miles long and about two miles wide. This valley is divided into two valleys by the summit called Dent de Vaulion, which rises to 4831 feet above the sea-level. The valley of Joux, or that south of this summit, is 3375 feet above the level of the sea. It is drained by the river Orbe, which in approaching the Dent de Vaulion enters the lake of Joux, which is five miles long and more than a mile wide. After leaving this lake the river forms a small lake, that of Brenet, on flowing from which it is precipitated into an opening at the foot of the Dent de Vaulion, from which it issues as a considerable stream on the north side of the mountain. Here begins the Valorbe, which extends to the town of Orbe, where the river leaves the mountains, at the foot of which it flows through the plain to its mouth, which is at the southern extremity of the lake of Neuchâtel. In the valley of Joux, which is more than 700 feet higher than Valorbe, only barley and oats are grown, and there are no trees, except a forest of fir-trees, in the southern portion of the valley, which belongs to France. The greater part of the valley is used as pasture and meadow ground. The valley called Valorbe contains fine forest-trees, and is generally well cultivated, except on the slopes of the surrounding mountains, which produce grass: all kinds of fruit-trees abound.

The central district of the Jura Mountains extends from the parallel of the southern extremity of the lake of Neuchâtel to the northern extremity of the lake of Bienne. It consists of numerous valleys, which are divided from one another by low ridges. The waters from several of them have apparently no outlet, but they sink into openings in the ground, by which they probably reach some watercourse that flows into one of the two lakes at the eastern base of the mountains. The whole region is destitute of trees, with the exception of the lower portion of the eastern slope, where there are extensive vineyards which produce good wine, and orchards. There are also mulberry-trees and some silk is cultivated. Here also, and in three large valleys which open towards the lakes, every kind of grain is grown, and agriculture is carried to a high degree of perfection. But the mountain-region itself, with its valleys and ridges, is in its natural state only covered with grass, and though the soil is dry, the pastures are rich and maintain large herds of cattle. The inhabitants of this district, as well as of the southern, are noted for their great manufacturing industry and their talent for invention In spite of many disadvantages, among which is the long winter, that lasts seven months, these districts are among the most populous in Europe, though every article of food is very dear, owing to the difficulty of transporting it from the lower country. Within the region nothing is cultivated except barley and oats, and these only to a small extent.

North of the parallel of the northern extremity of the lake of Bienne, the face of the country gradually undergoes a change. The steep south-eastern declivity of the region of the Jura mountains continues along the banks of the river Aar, and in the whole of its long extent from the lake of Bienne to the confluence of the Aar with the Rhine, a distance of 60 miles, it is only once interrupted by a valley. Though less elevated than farther to the south, it rises more than 1000 feet above its base, and has some summits, of which the Weissenstein, north-west of Solothurn (4616 feet), is perhaps the highest. As far as this mountain, the valleys extend longitudinally in the direction of the whole system, and resemble in some degree those of the central district. but they are partly covered with wood. North of the Weissenstein however the slope of the country is to the north, and the numerous valleys with which it is furrowed are transverse valleys. These valleys sink much lower, and the ridges which separate them from one another are wider and have more the form of ranges than in the central district. They have the advantage of a more fruitful soil, and a much more moderate climate. Though a large portion of this country is well adapted for the rearing of cattle and for dairies, the lower declivities and the level grounds in the valleys and depressions produce all kinds of grain. The orchards also are very extensive. The three principal valleys possess a considerable degree of fertility, especially that which is drained by the Ergoltz, in which Liestall, the capital of the country portion of Basel, is situated. Many of the mountains are covered with wood. At the northern extremity of this region, where the Rhine begins to flow northward, commences the plain of the Middle Rhine, which lies within France, and of which only a small district near Basel belongs to Switzerland.

Climate.—The climate of Switzerland presents great differences, which are not to be ascribed to the geographical position, as the most northern places are less than two degrees of latitude from the most southern. The differences are almost entirely the effect of the greater or less elevation above the sea-level. Some regions, of considerable extent, as about Mount Rosa and the Finsteraarhorn, rise above the line of perpetual congelation, and some of the inhabited valleys to 4000 feet above the level of the sea. On the mountain-passes which are traversed by the great commercial roads, as on the St. Gothard, Bernardin, and Splügen, there are human dwellings at an elevation of between 6000 and 7000 feet. On the other hand, the surface of the plain is only between 1300 and 1400 feet above the sea-level: some parts of the hilly region, especially those near the banks of the Rhine below the cataract of Schaffhausen, are less than 1000 feet high, and the Rhine at Basel sinks to 800 feet, and the surface of the Lago Maggiore even to 678 feet. That portion of the area which is always covered with snow and ice probably does not much exceed 2000 square miles; but an equal area, though free from snow for a few weeks in the year, is not habitable on account of the climate. Thus we may suppose that one-fourth of the area of Switzerland is useless to man by its too great elevation and the rigour of its climate. On the remaining 12,000 square miles there are 2,200,000 individuals, which gives more than 183 to each square mile; a very considerable population, when compared with that of Scotland, which, according to the census of 1841, does not contain more than 90 individuals to each square mile.

The climate of the lower districts is more temperate than that of most countries of Germany, and the valleys south of the Alps approach very near in climate to that of Lombardy. We possess a series of meteorological observations, carried on for several years at Bern (1900 feet above the sea-level), Zürich (1337 feet), Geneva (1298 feet), and the Hospice on the mountain-pass of St. Gothard (7089 feet). We have however no observations of this kind on any place south of the Alps. But as Milan is only a short distance south of the boundary-line of Switzerland, and even more elevated above the sea-level than the surface of the Lago Maggiore, we shall add the observations made at this place, as expressing with tolerable accuracy the climate of the countries surrounding the Lago Maggiore and the lake of Lugano. The following tables are taken from Kämtz's 'Lehrbuch der Meteorologie,' where they are given in degrees of the centigrade scale: they are here reduced to the scale of Fahrenheit.

Mean of the temperature for every month in the year in Milan, Geneva, Zürich, Bern, and the Hospice of St. Gothard:—

	Milan.	Geneva.	Zürich.	Bern.	St. Gothard.
January	+33·26°	+32·00°	+26·78°	+25·88°	+18·86°
February	38·30	35·06	34·16	32·36	16·70
March .	45·86	41·36	39·92	38·30	18·86
April .	54·68	48·00	45·50	45·14	27·14
May .	64·04	58·10	59·36	54·14	36 50
June .	70·70	63·14	61·52	58·10	42·98
July .	74·66	67·64	65·66	57·20	46 22
August .	73·58	65·66	65·30	61·16	45·68
September	66·56	60·44	57·10	56·12	40·46
October .	57·02	50·36	50·00	46·04	32·36
November	47·12	37 40	39·02	37·04	23·72
December	36·50	30·92	30·20	29·84	18·32

If we consider the three months in which the temperature is the lowest (December, January, and February) as the winter, and those in which it is the highest as the summer, we obtain for the four seasons the following result:—

	Milan.	Geneva.	Zürich.	Bern.	St. Gothard.
Winter .	36·03°	33·35°	30·34°	29·37°	17·94°
Spring .	54·88	50 17	47·25	45·88	27 48
Summer	73·10	66·10	64·15	58·78	45 71
Autumn	56·84	49·37	49·05	46 44	32·20

The mean annual temperature of London for the winter is 38·22°, for the spring 48·34°, for the summer 61·74°, and for the autumn 50·29°. [Vol. xiv., p. 110.] In comparing these results it is evident that at Bern the mean temperature of every season is lower than at London, and so is it also at Zürich, with the exception of the summer, which is higher by about two degrees and a half. At Geneva the spring and summer are hotter than at London, but the autumn and winter are colder. The mean annual temperature of these places is 55·18° for Milan, 49·50° for Geneva, 47·95° for Zürich, 45·12° for Bern, 30·10° for the Hospice on the St. Gothard, and 50·50° for London. Hence it appears that all these places, except Milan, have a lower annual temperature than London, and for Bern this difference amounts to more than five degrees. The mean annual temperature of the Hospice on the St. Gothard is lower than that of the North Cape by nearly two degrees, but the summer is nearly four degrees warmer: the other seasons are colder by some degrees than at the North Cape. [NORWAY, vol. xvi., p. 326.]

As to the second great constituent of climate, moisture, more recent and more exact observations have confirmed the general opinion, that on elevated and pointed mountain-ranges like the Alps a much greater quantity of rain descends than in lower and more level countries. The greatest quantity of rain falls on the southern declivity, where it annually amounts to 57·83 inches, whilst on the western side it is only 47·17 inches, and on the northern not more than 36·13. In the south-eastern parts of England it is only 24·50 inches. But the number of rainy days is greater in England than on the southern and western declivity of the Alps. In England 152 such days occur annually, whilst on the southern declivity of the Alps the number is only 148, and on the western hardly exceeds 100: on the northern however there are 159 rainy days. The greatest relative quantity of rain falls on the northern declivity in summer, amounting to 35 hundred parts, and on the west and south in autumn. On the west it amounts to 40 hundred parts, and on the south to 32. In some parts a great quantity of snow is experienced, especially on the central region of the Jura Mountains, where, according to the statement of Ebel, it accumulates to a depth of 30 feet.

(Ebel's *Handbuch für Reisende in der Schweitz*; Kasthöfer's *Voyage dans les Petits Cantons et le Pays des Grisons*; Rösch, 'Die Schweitzer Alpen,' in Berghaus's *Almanach* for 1841; Hoffmann, *Die Deutschland und seine Bewohner*; Berghaus, *Annalen der Erd- Völker- und Staatskunde.*)

Political Divisions of Switzerland.—The Swiss confederation as now constituted consists of twenty-two sovereign states called cantons. We give the population of each, and also the estimated area in French or Swiss leagues, according to Professor Guinand's 'Description de la Suisse,' Lausanne, 1839. The league in length is twenty-five to one degree of latitude, or rather more than 2¾ English miles:—

	French or Swiss Square Leagues.	Population.
Aargau	70	182,800
Appenzell	19	51,000
Basel or Basle	23	65,420
Bern	327	408,000
Freyburg or Fribourg	78	91,150
St. Gallen or St. Gall	104	159,000
Geneva	12	58,670
Glarus	31	29,350
Graubündten or Grisons	318	84,500
Luzern	73	124,500
Neuchâtel	36	58,600
Schaffhausen	17	31,125
Schwyz	31	40,650
Solothurn or Soleure	33	63,200
Thurgau	42	84,000
Ticino	146	114,000
Unterwalden	37	22,600
Uri	57 { apparently overstated }	13,500
Valais or Wallis	216	75,800
Vaud or Waat	155	183.600
Zug	10	15,320
Zürich	92	231,600
	1927	2,188,395

Of the above 2,188,395, constituting the whole population of Switzerland, according to recent returns laid before the diet, about three-fourths speak dialects of the German, which is the language used in the diet and by the federal authorities; about 450,000 speak French, or dialects of the French, called Patois, or Langue Romande. French is the written language as well as the spoken language of the educated classes of Geneva, Vaud, and Neuchâtel, and a part of Bern, Freyburg, and the Valais.

The inhabitants of the canton Ticino, and of some valleys of the Grisons, on the south side of the Alps, speak a dialect of the Italian resembling the Lombard; and one-half of the population of the Grisons speak the Romuntch and Ladin, which are peculiar dialects, apparently of old Italian origin, about the history and formation of which much has been written by Father Placidus à Specha, Planta, Conradi, and other native philologists. Stalder, in his 'Dialektologie,' gives specimens of the Romuntch and Ladin, as well as of the other Swiss dialects of Teutonic and French origin.

With regard to religion, more than three-fifths of the population of Switzerland follow the doctrines of the Reformation as promulgated by Zwingli, Bullinger, and other Swiss reformers, and contained in the Helvetic Confession of Faith, published in Latin, at Zürich, in 1566, and translated into French under the title of 'Confession de Foi Helvétique,' a late edition of which was published at Lausanne in 1834. There is however no obligatory uniformity among the Swiss congregations: there is no Swiss church, in the common sense of the word: in each of the reformed cantons the ecclesiastical affairs are regulated by a synod or assembly of the respective pastors or parish clergy, in which the antistes or doyen or oldest member presides, and it is attended in some cantons by a deputation of lay members of the executive. The synod meets at least once every year. All the cantons in which the doctrines of the Reformation are those of the majority, allow liberty of conscience and of worship to all Christian communions, whether Lutherans, Calvinists, of the Anglican church, Roman Catholics, or Moravians. Dissidents, or 'separatists,' as they are called, from the body of the reformed church have become numerous of late years in several cantons, and have their own chapels and worship. The Protestant or reformed cantons are—Aargau, Appenzell, Bern, Basle, Geneva, Glarus, Graubündten, Neuchâtel, Schaffhausen, Thurgau, Vaud, and Zürich: in all these cantons the Roman Catholics are in a minority, and in some a very small minority; but they enjoy equality of rights with their Protestant countrymen. In St. Gall the Protestants form the minority, being about two-fifths of the whole population; but liberty of conscience and political equality are secured by the constitution to the members of both communions. In Freyburg and Soleure the Protestants form a small minority, but they enjoy toleration and liberty of worship. Luzern, Zug, Schwyz, Uri, Unterwalden, the Valais, and Ticino are exclusively Roman Catholic: it is only of late years that a Protestant chapel has been allowed to be opened at Luzern: the other cantons do not admit of liberty of conscience; and if any natives should embrace the doctrines of the Reformation, they are still liable to severe penalties. In several Protestant cantons, till of late years, a citizen who changed his religion lost his citizenship, but was not otherwise molested.

Natural Productions.—Two-thirds of Switzerland do not produce corn enough for the consumption: this is particularly the case in the central and eastern cantons which lie in the highlands of the Alps. The cantons which produce most corn are Soleure, Bern, Freyburg, Aargau, Schaffhausen, Luzern, and Vaud. Kasthöfer of Bern, in his 'Voyage dans les Petits Cantons et les Alpes Rhétiennes,' states that buckwheat ripens at an elevation of 2200 feet above the sea, and in a southern exposure as high as 3000 feet. He also fixes the limits of the productive cultivation of maize, which is much attended to in eastern and southern Switzerland, at between 2000 and 2500 feet above the sea; and that of barley and rye at as high as 4000 feet, and still higher in peculiar situations. Potatoes are much cultivated in the highlands. Flax and hemp are also extensively grown: but the chief territorial wealth of the highlands, and indeed of the greater part of Switzerland, consists in its pastures and its cattle. There is nearly a million of head of horned cattle in summer, one-fourth of which consists of milch cows; and the produce of the dairy is reckoned annually at 25 millions of Swiss livres, or one million and a half sterling. The finest races of horned cattle are those of the Emmenthal and Simmenthal, in the canton of Bern, of Gruyères in that of Freyburg, of Schwyz, of Zug, of the Frickthal in the canton of Aargau, and of Appenzell. The sheep are mostly of inferior breed, and the wool is short and coarse. Goats are very numerous in the highlands; pigs are plentiful and fine.

The vine is extensively cultivated in the cantons of Vaud, Geneva, Neuchâtel, Zürich, Schaffhausen, Valais, Ticino, and parts of Aargau, Thurgau, St. Gall, and Basle. The wine of some districts, such as Cortailled, in the canton of Neuchâtel, La Vaux, in the canton of Vaud, the Rheinthal, in St. Gall, the Lower Valais, &c., is of a superior quality. In the highland cantons cider is made, as the country abounds with apple and pear trees. Indeed some cantons, such as Thurgau and Zug, and parts of Schwyz, Unterwalden, St. Gall, Appenzell, Zürich, Bern, and Luzern, are covered with fine orchards, and present the appearance of a forest of fruit-trees, apple, pear, plum, and cherry. Beer is made in or near most towns, though in general it is not of the best quality. Kirschwasser is distilled from the cherries, and is commonly used all over Switzerland. Carrots, beet, turnips, and other roots, as well as cabbages, are cultivated in almost every part of the country, and in some places as high as 5000 feet above the sea. Peas and beans are not so common. Mulberry-trees are planted and silk-worms reared in the canton of Ticino, and some valleys of Graubündten on the Italian side of the Alps. Chestnut-trees are found in sheltered situations; nut and walnut-trees are more generally diffused; olive-trees grow only in some favoured spots of the canton Ticino, where also the fig and peach trees bear abundantly, as well as in some parts of the lower Valais, where even pomegranates and almond-trees bear fruit. Walnut-oil is the common substitute for olive-oil north of the Alps.

The highlands of Switzerland abound with timber-trees, especially firs of various kinds, maple, beech, larch, birch, and oak trees. The greater part of the forests belong to the communes; the rest belong either to the respective cantons or state in which they are situated, or to private individuals, or to ecclesiastical communities. There are certain forests on the declivities of the high Alps which protect the valleys beneath from the avalanches, and are therefore carefully preserved; but the rest, especially those which are communal property, are subject to great waste, through injudicious cutting, the inroads of cattle, and especially of goats, and the ravages of storms. Most of the cottages and farm-houses are built of wood, and the same material is used for fuel, the annual consumption of which is enormous: a great quantity of timber is also exported to France and other countries. Some cantons are already experiencing a scarcity of wood, and they have begun to look out for coal. Coal-mines are now worked in the cantons of Freyburg, Vaud, Basle, and Thurgau, but the coal is mostly of inferior quality. Turf is used in Aargau and other cantons.

The Alps contain a rich and inexhaustible supply of summer pasture for the cattle and flocks of the greater part of

Switzerland. The pasture-land of the Jura Mountains is inferior to that of the Alps. A large proportion of land in the valleys and plains is kept as grass-fields, and mowed for winter fodder, an essential and rather dear article in a country so largely stocked with cattle. In the lowland cantons the grass-land is much better attended to, with respect to manuring, irrigating, and renewing than in the highlands. In the two cantons of Vaud and Neuchâtel the cultivation of the vine obtains the preference over the other branches of agriculture. In the mountain cantons the old grass-lands are never broken up.

Iron is found in the Jura; and there are furnaces and iron-works of some importance in the cantons of Vaud, Bern, Soleure, Basle, and Aargau, and likewise in Graubündten. In the Grisons there are mines of lead, zinc, and galena. Salt-springs abound in Switzerland, but they are generally neglected, except those of Bex in the canton of Vaud. [BEX.] Switzerland imports much salt from Germany and other countries.

The mineral-waters of Leuk in the Valais, of Baden and Schinznach in the Aargau, of Gurnighel near Bern, of Lavez, in the canton of Vaud, of Pfeffers, in the canton of St. Gall, and St. Moriz, in Graübundten, are all well known and much frequented by invalids during the summer season.

The lakes and rivers of Switzerland abound with fish, especially trout of various kinds. In the lakes of Geneva and Constance there are trout that weigh from 30 to 60 lbs. The salmon is found in the Rhine, the Aar, and the lake of Zürich; tench, carp, perch, eels, and crabs are found in most Swiss waters.

The game consists chiefly of chamois, hares, marmots, and partridges. Bears and wolves are hunted in the Alps and the Jura. Birds of prey of large dimensions are common in the mountains.

Trade and Manufactures.—Switzerland has been, at least in part, a manufacturing country for centuries. Manufactories of woollen and linen cloths existed at St. Gall and in the canton of Appenzell in the thirteenth century. At the same epoch Zürich manufactured and exported large quantities of silks and woollens. Silks, woollens, and linens were made at Basel in the sixteenth century; and Geneva manufactured at the same time silks, lace, jewellery, and cutlery. In the seventeenth century clocks and watches began to be manufactured in the mountains of Neuchâtel. These and other like branches of industry have had their vicissitudes: some have failed in certain localities and others have sprung up in their place; but Switzerland has never ceased to be a manufacturing country to a considerable extent ever since the thirteenth century, and the general amount of its manufacturing industry has greatly increased within the last century. About the middle of the eighteenth century cotton was introduced into the Swiss manufactories. In 1800 the first spinning-machine was established at St. Gall, and improved methods in weaving, bleaching, and dressing of cloth were soon after introduced. Notwithstanding spinning-machinery has been multiplied and improved in Switzerland, it appears that the cantons of Appenzell and St. Gall alone still take from England annually about one million pounds weight of cotton-yarns. The principal branches of Swiss manufacture at present are as follows:—

In the canton of Zürich the manufacture of silks, florentines, gros-de-Naples, taffetas, serges, levantines, silk handkerchiefs, and ribbons, gives employment to between 12,000 and 13,000 people. The total annual produce of the silk-manufacture of Zürich is reckoned at about seven millions and a half of florins, or about 600,000*l.* sterling. 'Rarely are there a number of looms at work collectively; almost all are to be found singly, or two together, seldom even three or four: in the common apartment of the family of the country-people one or two members of the family may be seen weaving and carrying on at the same time their household occupations, sometimes working in their gardens, &c. Other members of the family, even the children when released from school, assist in the winding of the silk, and it is this union of manufacturing with agricultural pursuits which has combined to promote the trade.' (Dr. Bowring's *Report on the Commerce and Manufactures of Switzerland.*) The cotton-manufactures of Zürich employ about 12,000 weavers, 5000 spinners, besides 4000 persons engaged in other trades connected with the cotton-manufacture. About 800,000 pieces of cotton are manufactured yearly. There are nineteen printing establishments, which employ about 1000 workmen, and print about 100,000 pieces of cloth yearly. Zürich and Winterthur and the villages along the banks of the lake are the principal seats of manufacturing industry. The other manufactures of Zürich, such as woollens and linens, which were once important, are now reduced to insignificance.

The canton of St. Gall, and that of Appenzell, which is enclosed by the former, constitute another important manufacturing district, especially of cotton goods. Appenzell alone has about 10,000 looms, and it is calculated that about 10,000 pieces of cloth of 16 ells in length are manufactured every week. Part of the workman's time is employed in household and field occupations, as at Zürich. Trogen and Herisau, in the Protestant rhode, or division, of Appenzell, are the chief manufacturing places. They make some very fine muslins, both plain and embroidered. St. Gall also manufactures muslins and prints in considerable quantities. The other manufactures of St. Gall are leather, linen, glass, and goldsmith-ware. A considerable foreign trade is carried on with Italy and Germany, and St. Gall has several substantial mercantile houses.

The city of Basel forms another emporium of trade and manufactures, principally of silk ribbons, silk thread, taffetas, and satins. There are from 3500 to 4000 looms in activity. The annual exportation of ribbons from Basel amounts to about ten million of francs, of which one-half is said to go to the United States, and the rest to Germany, Holland, Sweden, and other countries. The other branches of manufacture at Basel are leather, paper, and tobacco. Basel carries on considerable business with foreign countries, and has several wealthy banking firms and capitalists.

Schaffhausen has a manufactory of steel and files, which is in great repute; one of cotton-spinning, and one of cotton-prints. Schaffhausen is also a place of transit and depôt of Swiss goods exported to Germany, and German goods imported into Switzerland. The principal goods imported are Suabian woollen-stuffs and hides, salt from Würtemberg, cloths from Bohemia and Saxony, and Nürnberg manufactures. The Swiss send to Germany cheese, silk and cotton goods, and also wine, and kirschwasser; but the trade with Germany is now much checked by the heavy duties imposed by the commercial league.

At the opposite extremity of Switzerland, Geneva is a great mart of trade and industry. The manufactures of Geneva consist chiefly of watches, jewellery, and musical boxes. About 100,000 watches, mostly gold watches, are annually manufactured at Geneva. There are about 270 chefs d'atelier, or master manufacturers, and 1330 workmen employed in watch-making. In the jewellery manufacture there are 107 chefs d'atelier and 660 workmen; in works called 'mécanique,' such as musical boxes and musical watches, 53 chefs d'atelier, and 164 workmen. (Lerésche, *Dictionnaire Géographique et Statistique de la Suisse.*) The Geneva watches and musical-boxes are sold all over Europe, the Levant, America, and the north of Africa; the jewellery is sold mostly in Italy. From 8000 to 10,000 watches, of the average price of 10*l.* sterling each, are annually introduced, and most of them smuggled, into England. The jewellery sent from Geneva to England amounts to about 60,000*l.* annually. 'The watches of English manufacture do not come into competition with those of Swiss production, which are used for different purposes, and by a different class of persons. Notwithstanding all the risks and charges, the sale of Swiss watches is large, and it has not really injured the English watch-making trade. The English watches are far more solid in construction, fitter for service, and especially in countries where no good watchmakers are to be found, as the Swiss watches require delicate treatment. English watches therefore are sold to the purchaser who can pay a high price: the Swiss watches supply the classes to whom a costly watch is inaccessible.' (Dr. Bowring's *Report.*)

The other branches of manufacture at Geneva are cabinet work, sadlery, lithography and engraving, cutlery, fire-arms, enamels, &c. There are at Geneva many respectable mercantile houses, banking-houses, bill and stock brokers, and a number of capitalists, who invest their funds either in foreign stocks, or place them in mercantile houses, or employ them in discounting bills of exchange.

The manufactures of the canton of Neuchâtel are 1. the printing of cottons, the cloth being furnished chiefly from the Zürich looms. About 80,000 pieces are printed yearly, and are exported chiefly to Prussia, Holland, Belgium, and Italy. 2. Lace-making, which once occupied a great proportion of the female sex, but which has greatly declined. 3. Watch-making, which has greatly increased within the present century. From 100,000 to 120,000 watches are yearly manufactured in the canton of Neuchâtel, in the districts of Locle and La Chaux de Fond, among the highlands of the Jura. About one-third of the watches are gold, and the rest silver; the silver watches as low as from twenty to twenty-five francs apiece. The principal exports are to the United States of North America, to the Levant, to Prussia and other states of North Germany, and to Russia. Since the reduction of the duties, Neuchâtel and Geneva watches are introduced into France through the custom-house; formerly they were smuggled in great quantities. It is calculated that from 18,000 to 20,000 persons live by the manufactory of watches in the canton of Neuchâtel.

The canton of Thurgau has from 3000 to 3500 looms employed in weaving cotton-goods, several spinning-factories, several factories for cotton-printing in the neighbourhood of Frauenfeld, and also factories of linen, which branch however has much declined.

The small canton of Glarus manufactures a considerable quantity of cotton-goods, prints, and muslins.

Aargau manufactures cotton-cloth of all descriptions, white and coloured hankerchiefs, prints, stockings, and other hosiery, also silks and ribbons, and silks mixed with wool and cotton, linens, and cutlery.

The rest of the cantons of Switzerland cannot be considered as manufacturing countries, although most of them have some manufactures, but none of great importance, and only to supply their own wants. Bern manufactures good gunpowder. In the northern part of the canton, which formerly was subject to the bishop of Basle, there are iron-works and furnaces, and manufactories of arms. Silks are made at Gersau in the canton of Schwyz. The canton of Vaud has some iron-works, and also manufactories of cutlery, pottery, leather, &c. Soleure has furnaces and iron-works, glass-works, and manufactories of cottons and cotton-prints. Olten and Ballstall are the principal manufacturing places in the canton of Soleure.

The trade of Switzerland with foreign countries is founded upon the principle of free-trade and free-transit, though the surrounding countries, France, Austria, and the German league, do not act towards Switzerland upon the reciprocity system. But the manufactures of Switzerland have found a vent in distant countries, by passing through Germany and the Sardinian States to the various harbours of Holland or the Mediterranean. The French tariff is perhaps the hardest upon Swiss manufactures.

In the interior, between canton and canton, there are tolls and turnpikes which exact a very small duty, levied according to weight, on merchandise. There are also federal duties on imports at certain points of the frontiers, on the great lines leading into Switzerland, such as Basle, but they are neither high nor accompanied by inquisitorial examination.

Moral Character of the Inhabitants.—Switzerland is a country of various races, and this circumstance, as well as the difference of situation and climate, and of institutions, language, and religion, contribute to give distinct moral features to the various populations. Generally speaking, the western Swiss bear a certain affinity to their French neighbours of Burgundy and Franche Comté, being, like them, descended in great measure from the Burgundians, whose kingdom extended on both sides of the Jura; while the eastern and northern Swiss resemble their German neighbours of Suabia and Tyrol. The inhabitants of the central Alpine cantons have peculiar features, physical as well as moral, and they have remained more unmixed from foreign irruptions and immigrations than the rest. The inhabitant of the Alps, says J. Olivier, a Swiss contemporary writer, is strongly attached to his native locality, firm and tenacious even unto obstinacy, proud and single-minded; his feelings are deep and energetic; he is prone to enthusiasm, and to a kind of poetical abstraction. The inhabitants of the region of the Jura are more civilised, more developed, more industrious, more progressive. In politics, liberty in the Jura is of the modern kind, the offspring of reasoning and of speculation; in the Alps it is a natural and individual sentiment. The pastoral population of the Waldstätter have been free from time immemorial; they were free whilst the rest of Switzerland was cultivated by serfs. The plateau or table-land of Switzerland which lies between the two mountain-regions is the country of agriculture; it also contains the largest and wealthiest towns; it enjoys a greater degree of ease and comfort, and the inhabitants are more fond of material enjoyment; they are less shrewd and ingenious, more satisfied, and less anxious about lucre and accumulating wealth than the mountaineers of either the Jura or the Alps. The inhabitants of the mountain cantons are fond of money, which is scarce in their country, and travellers have complained of their grasping disposition, especially the innkeepers, muleteers, and guides. Gross cases of imposition, accompanied by rudeness, occur now and then, for which there is little chance of redress, as the local magistrates are connected with the innkeepers, or are innkeepers themselves, and the local courts in the small democracies of the Alps are not very scrupulous or just.

The inhabitants of the canton of Ticino and of the southern parts of Graubündten resemble in several respects their Lombard neighbours. The Protestant cantons, and even those districts of mixed cantons which are inhabited by Protestants, are generally speaking more industrious, more refined, more advanced in instruction than their Roman Catholic neighbours. This is an old distinction, which still exists: it has been repeatedly noticed by foreign as well as native writers; for whatever may be the cause or causes of it, the fact is undeniable, and it attracts the notice even of the passing traveller. It cannot be merely owing to the difference of soil and climate, as Freyburg is as much favoured by nature as its neighbours Bern and Vaud, and yet the contrast is striking in crossing the borders. Franscini, of the canton of Ticino, himself a Roman Catholic and a priest, admits the fact; and he attributes it to various causes: 1st, the much greater number of clerical persons who are supported by the people in the Roman Catholic cantons. The Protestants have one incumbent for each parish, and few coadjutors or curates. The Roman Catholic parishes are generally smaller, and therefore the incumbents are more numerous, besides a number of coadjutors and of chaplains attached to particular chapels, for several priests say mass in the same church: there are also the chapters of collegiate churches; and lastly, many convents, especially of mendicants, whose inmates are supported entirely by public contributions. In Protestant Switzerland there is upon an average one clergyman for every 700 inhabitants; in Roman Catholic Switzerland one for every 150. The Protestant population of Switzerland, which is three-fifths of the whole, comprises between 1600 and 1700 ecclesiastics; whilst the Roman Catholic two-fifths comprise 5200, besides about 2000 nuns. In several Roman Catholic cantons, especially the mountain cantons, the parish priest is poorly paid, and he adds to his pittance by fees and other contributions, which he exacts from his parishioners, sometimes, says Franscini, by working on their credulity. 2nd, The numerous convents, about sixty in all, several of which have large landed property, which, according to Franscini and Leresche, is ill administered and ill cultivated. The wealthiest convents in Switzerland are those of Einsiedlen in the canton of Schwyz, Muri and Wettingen in Aargau, and St. Urban in the canton of Luzern. The government of Aargau has lately attempted some economical reforms in the convents, especially those of Muri and Wettingen, which have each a property of about two millions and a half of Swiss livres, or about 150,000 pounds sterling, but it has met with great opposition, and the affair has been lately brought before the federal diet. 3. Education is, according to Franscini's statement, more neglected by the Roman Catholics than by the Protestants, especially in those branches which are connected with commerce and industry. 4. The Roman Catholics spend much money in building and ornamenting churches, having several altars or chapels in each of them, and a quantity of costly utensils, clerical dress, and appendages and votive offerings. Many of them also pay for dispensation from fasting during Lent, &c. 5. The Roman Catholics spend much time in church; many of them attend mass or vespers, or some other service every day: there are also processions, pilgrimages, and other practices, which, though not expressly commanded by their religion, are recommended as meritorious. 6. The Protestants abstain from work only on Sundays, but the Roman Catholics have between 20 and 25 other holidays in the course of the year, during which, not only do they not work, but their cattle and their mills remain inactive. Franscini, by multiplying these holidays by the number of persons able to work, calculates the total loss at about eight million days of labour in the year. At the same time these unproductive days occasion an additional expenditure, or rather waste, in eating and drinking; so that the loss becomes double. These abuses, Franscini observes in conclusion, do not belong to the essentials of religion: they are extraneous matters of discipline, which might be reformed. (Franscini, *Statistica della Svizzera*, lib. viii., c. 1 and 3.)

Notwithstanding the varieties of institutions, habits, and manners, the political life of the Swiss as an independent confederation of republican states for more than five centuries has given to the whole something of a national character, which distinguishes them from the subjects of the great European states which surround them. The Swiss in general are fond of their country, and feel proud of being Swiss. We find amongst all, both in the mountains and the plains, a frank bold bearing and gait, and freedom of sentiments which proclaim them as citizens of a free country. There is also a love of domestic comfort, propriety, and of the decencies of life, among all classes, and in a greater degree than is found among the corresponding classes in France or Italy. The difference in the appearance of the country and the houses, the superior cleanliness, tidiness, and care forcibly strike the traveller who crosses the Jura or the Alps into Switzerland. The feeling of order, the habit of reasoning and discriminating, the steady, slow perseverance, the disposition to grave and religious thoughts, the shrewdness and humour, distinct from cunning and wit, all which are qualities generally characteristic of the Teutonic nations, in great measure belong also to the Swiss, who are for the most part descended from Teutonic races. The Swiss are, generally speaking, warm-hearted and hospitable; they are kind to strangers, and their country can boast of having been in all times a land of refuge for the unfortunate and the persecuted. The Italian Protestants in the sixteenth century, the Valdenses, the French Protestants who were driven out of their country by the intolerance of Louis XIV. in the seventeenth—all found an hospitable reception in Switzerland. The Roman Catholic emigrants, priests and laymen, who escaped from France at the time of the great Revolution, found sympathy and assistance from the Swiss, both Roman Catholic and Protestant. In later times political emigrants of various countries, both in the time of Napoleon and since the restoration, have taken refuge in Switzerland, not without the risk on the part of that country of being involved in hostilities with powerful neighbouring states on account of the imprudent and guilty conduct of several of the refugees. In our own times subscriptions to the amount of nearly 800,000 francs were collected in Switzerland for the cause of Greek emancipation.

The Swiss have been always inclined to the military profession, and their political institutions, which require every young man to be drilled and to serve in the militia for a certain period, strengthen this propensity. Most cantons of Switzerland have for centuries furnished, and some still continue to furnish, regiments for the service of foreign powers. This practice has been much animadverted upon, especially of late years, by men who have not made a sufficient discrimination between encouraging foreign enlistment and merely tolerating it as an unavoidable evil. Much declamation has been mixed up with the subject, about Swiss republicans being mercenaries in the service of foreign despots, without considering that men who enlist for money trouble themselves little about forms of government, their motive being either to get a better living than they have at home, or a love of adventure and a wish to see foreign lands. As long as there are powers that will pay foreigners who enlist in their service, there will be people, not only in Switzerland, but in other countries too, ready to serve them. Switzerland is not the only country in which the practice of enlisting volunteers for the service of foreign states has been in use; the difference is, that in Switzerland several of the cantonal governments were parties to the bargain, and derived a profit from it, whilst other European governments have either forbidden the practice, without however succeeding in preventing it altogether, or have connived at it. In a country like Switzerland, from whence hundreds emigrate every year to America and other distant countries, foreign enlistment is not perhaps so very objectionable a practice. It has been said by the apologists of the Swiss system of foreign recruiting, that the interference of the cantonal governments in a practice which they could not possibly have prevented (for it is well known that in spite of formal prohibitions, in the times of Louis XII. and Francis I., thousands of Swiss went to join the French armies in Italy whilst as many went to serve the opposite party), was in reality beneficial to the men, inasmuch as it secured to them the fulfilment of their agreement, whilst the cantons retained the right of recalling their respective regiments in case of an emergency at home, or in case of the agreement not being fulfilled. On the other hand, there has been considerable misconception abroad upon this subject: the cantonal governments have been represented as selling their countrymen like cattle, while the truth is that the men were not sold, but enlisted of their own accord for a certain period, and they received the bounty money. Still the practice of foreign recruiting was formerly very extensive, and was too much encouraged by the cantonal governments not to be liable to abuse and corruption.

At present, most cantons have forbidden foreign recruiting, and the Swiss have regular regiments only in the service of the pope and the king of Naples. Formerly they had about 15,000 men in the service of the kings of France, about half that number in the service of Holland, besides several regiments in Spain, in Piedmont, and at Naples. Those cantons from which the respective regiments were drawn received an annual subsidy from the state for whose service they were recruited. The regiments were raised by the colonels, who were proprietors of their respective corps. The agreement of each regiment was for a certain number of years, after which the officers retired on full pay for the rest of their lives. The fidelity of the Swiss soldiers to their colours was proved in the two French revolutions of our own times.

According to the present internal military system of Switzerland, every able-bodied man from the age of eighteen to fifty is considered as belonging to the militia of his canton, and as liable to be called out by his cantonal government. In each canton however the militia is divided into three classes: 1. The federal contingent, which is the number of soldiers which, by the federal compact, each canton is bound to furnish in proportion to its population when called upon by the federal government, in case of either foreign war or internal disturbance. The contingent consists of the youngest and ablest, and generally unmarried men, chiefly from the age of twenty to twenty-eight. In every canton the contingent is called out once a year for a week or a fortnight for field-exercise. In some cantons the men are encamped during that time, and perform regular camp duty. The contingent is formed into battalions of infantry, with a proportion of artillerymen, waggon-train, and pioneers. When the contingent is called out, it receives regular pay. The united contingents of all the cantons amount to about 33,750 men, 27,000 of which are infantry of the line, 2000 carabineers or riflemen, about 3000 artillery and waggon-train, 730 cavalry, and the rest pioneers, pontoon-men, &c. The cavalry is small, because it has been supposed that on a ground like that of the greater part of Switzerland there is not much occasion or opportunity for its use. 2. The reserve consists of an equal number of men, distributed nearly in the same proportions as in the contingent. It consists of men who have done their duty for several years in the contingent, and it is liable to be called out in cases of urgency, on the summons of the federal government. As a last resource for the defence of the country, the *levée en masse*, called 'landsturm,' includes all men who are able to bear arms. A small proportion of the contingent are called upon by turns to do local duty in their respective canton as guards, patroles, &c. Several cantons have also a small body of gendarmes, or armed policemen, regularly enlisted and paid. The men, both of the contingent and the reserve, are mostly armed and accoutred at their own expense, or, if too poor, are supplied with arms by their respective cantons.

There is for all Switzerland a 'federal military commission' appointed by the diet, and renewed every three years: it consists of a president and four members, who are field-officers. Their duty is to inspect the contingent and reserve of the various cantons by turns, as well as the military schools existing in several cantons, and make their reports to the diet on their condition and efficiency, and to suggest improvements. There is a school for the artillery and engineers of the whole confederation at Thun, in the canton of Bern, in which about 40 officers and 180 non-commissioned officers and men are instructed in the scientific part of their profession. The expenses are defrayed by the federal fund. This fund is supplied out of a small duty levied by the federal government on certain imports, and from other sources. Every canton is also bound to pay, in proportion to its population and wealth, a quota in money for the ordinary federal expenditure, and for the support of the troops when called into active service by the federal government.

Education and Instruction.—Elementary instruction has been greatly ameliorated of late years in many of the Swiss cantons. Those which have made most improvement in this respect are Zürich, Basle, Schaffhausen, Neuchâtel, Geneva, and Vaud, in which the number of pupils of the elementary or communal schools forms about one-sixth of the whole population. The cantons which are most behind in this respect are Uri, Schwyz, Unterwalden, Appenzell interior, the Grisons, Ticino, and the Valais. Many parishes have no school: the parish priest gives some sort of instruction to the children, but it is neither regular nor sufficient, and the number of illiterate persons is very great.

At Basle, Geneva, and other towns, Sunday-schools have been established for the children of the poor. At Bern and other places are schools for the artisans who are in want of useful information in their respective trades, who cannot attend the day-schools.

The cantons of Vaud, Aargau, Schaffhausen, Zürich, Luzern, Soleure, Grisons, and some others, have schools for making schoolmasters. In most places, especially in the country communes, the schoolmasters are miserably paid. The best paid are perhaps those of the cantons of Zürich, Aargau, and Vaud, but the utmost which they receive as salary seems to be 250 Swiss livres, or 15 pounds sterling, per annum.

The secondary or gymnasial instruction is given in the gymnasia, which exist in most of the head towns of cantons, besides secondary or grammar schools in most of the other towns. There is however a great difference among them as to the method of instruction. In some the old system is followed: Latin, rhetoric, and little more, are taught. In others, such as Zürich, Basle, Bern, Vaud, Geneva, Neuchâtel, Aargau, Appenzell exterior, Schaffhausen, the secondary schools are divided into literary schools, for those who are intended for the higher walks of life, and not literary, or 'Real-schulen,' and schools of arts, for the others. Modern languages, drawing, history, geography, natural history, rural economy, and music are taught in most of them. The Grisons have a good 'cantonal school,' or lyceum, at Coire, but some prejudice, says Franscini, exists against it among the Roman Catholic part of the population. Among private institutions that of Fellenberg, at Hofwyl, holds the first rank. [Hofwyl.]

Physical education, which is generally sadly neglected in all schools, a neglect the effects of which are felt through after-life, and mar the prospects of many a man, has begun to be attended to in some of the Swiss cantons. Gymnastic exercises, riding, and swimming, are taught in the schools of Bern, St. Gall, Glarus, and some others. Pedestrian excursions in the Alps are a frequent pastime in the summer holidays.

With regard to scientific instruction, there are in Switzerland the universities of Basle and Zürich, and the academies of Geneva, Bern, and Lausanne, in which degrees of divinity, and law, and arts are granted.

There are public libraries at Zürich, Bern, Basle, Soleure, Luzern, St. Gall, Aarau, Lausanne, and Geneva. Subscription libraries exist in all the Protestant cantons, as well as in that of Luzern. About thirty newspapers and reviews, weekly, monthly, or quarterly, are published in Switzerland.

With regard to the fine arts, Switzerland has had several good painters, especially landscape painters and engravers. The canton of Ticino has produced several distinguished architects and sculptors. Poetry has not been much cultivated; Albert Haller, Solomon Gessner, Bodmer, Lavater, and Salis, are the principal names. In the physical sciences Switzerland can boast of Albert Haller, the Bernouillis, Zimmerman, Tissot, Saussure, Euler, Charles Bonnet, Pictet, De Candolle, and others. Among literary men, properly so called, John Müller, J. J. Rousseau, Sismondi, Bonstetten, Dumont, Madame de Staël, and Father Soave, a native of the canton of Ticino, are well-known names; but Swiss writers are registered in the literary biography of the country in whose language they have written: thus those of Lausanne, Neuchâtel, and Geneva are ranked among French writers; those of the German cantons among the German, and those of the canton Ticino among Italian writers.

The principal associations for learning or scientific purposes are—the Helvetic Society, established in 1763; the Swiss Society of Public Utility, established in 1820; the Helvetic Society of Natural History, established in 1815; the Annual Helvetic Great Concert, the Society of Zoffingen, the Military Society, the Society of Physicians and Surgeons, and some others.

Savings'-banks and insurance societies are now pretty numerous in Switzerland. Hospitals for the infirm poor exist in every town, and some of them are richly endowed. The indigent receive assistance from the funds of the commune to which they belong. It is therefore of great importance for every man to be inscribed as freeman of a commune. There are also numerous local charities and subscriptions for the poor. But there is a class of poor who seem to be considered as outcasts; they are called 'Heimathlosen,' or people without a domicile, and who are rejected by all the cantons: they are people descended from individuals who lost their civil rights in their respective cantons, either in consequence of change of religion, or of misdemeanors for which they were sentenced to banishment, or of illegal marriages, or, lastly, from foreigners settled in Switzerland who did not purchase their citizenship. The stigma thus cast upon their fathers descends upon the children unto the last generation, and they have no right to assistance. These 'Heimathlosen' have become a real plague to Switzerland: they are vagrants, mendicants, hucksters, pilferers, and often robbers, like the gipsies of other countries. The subject has been discussed in the Federal Diet of late years, and several cantons have offered to come to an arrangement for distributing these individuals among the cantons, and restoring them to society.

(Franscini, *Statistica della Svizzera*; Leresche, *Dictionnaire Géographique-Statistique de la Suisse*; Ebel, *Manuel du Voyageur en Suisse*, volume 1st, which contains an ample alphabetical list of the distinguished men that Switzerland has produced, as well as catalogues of writers who have illustrated the various cantons.)

History of Switzerland.—The greater part of modern Switzerland was known in the Roman time by the name of the country of the Helvetii. The Helvetii were a Celtic or Gaulish people, and are mentioned by Cæsar (*Bel.*, *Gall.*, i.) as one of the most warlike and powerful nations of Celtic Gaul. Cæsar says that they were divided into four pagi, or tribes, of which he names two, the pagus Tigurinus, and the Urbigenus or Verbigenus. The modern towns of Zürich and Orbes are supposed to have derived their names from those two pagi. The eastern part of Switzerland, or the present Grisons country, was called Rhætia by the Romans, and was inhabited by a different race of men, who are said to have been descended from the Etruscans.

The Helvetians appear for the first time in history about 110 B.C. The Tigurini having joined the Cimbri in their invasion of Gaul, the Roman consul L. Cassius was sent with an army against them. He met the forces of the Tigurini some say near the Arar or Saone, according to others near the eastern bank of the Leman lake; but he was defeated and killed, together with his legate Piso, and most of his men. The rest made a capitulation, by which they were allowed to return home, after passing under the yoke. (Livy, *Epitome*, 65; Cæsar, *Bell. Gall.*, i., 7, 12.) About half a century later the great body of the Helvetians resolved to migrate with their families into the more fertile regions of Gaul. They burnt their towns and villages, and passed through the country of the Sequani until they reached the Arar, when they were opposed and defeated by Cæsar near Bibracte with great slaughter. [Cæsar, Caius Julius.] The survivors, about one-third of the original number, were allowed to return to their country, and were henceforth in the condition of allies and tributaries of Rome. After the total conquest of Gaul, the Romans sent colonies into the country of the Helvetians; but it appears by Tacitus (*Hist.*, i. 67) that the Helvetians retained the right of keeping garrison in some of their own strongholds, and it was the rapacity of the 21st legion, which appropriated to its own use certain moneys destined to pay the Helvetian garrison, that was the first cause of the fatal insurrection of A.D. 69. After the legions of Germany had proclaimed Vitellius, and Cæcina, one of his legates, was marching with a strong force towards Italy, the Helvetians, who were not yet acquainted with the events at Rome and the murder of Galba, intercepted letters which were written in the name of the legions of Germany to the legions of Pannonia, and which invited the latter to join Vitellius, and they arrested the centurion and his escort as guilty of treason against Galba. Upon this Cæcina, who had just entered the territory of the Helvetii, on his way to Italy, devastated the country, destroyed the Thermæ Helveticæ (modern Baden, in Aargau), and advanced against the main body of the Helvetians, who were in arms, and had chosen a certain Claudius Severus for their leader. At the same time he sent orders to the troops stationed in Rhætia to march upon the rear of the Helvetians, whilst he attacked them in front. The Rhætians had been long subject to Rome, having been conquered by Drusus under Augustus. The Helvetians made no stand against the Roman veterans, and they were massacred without mercy. Some escaped to the mountains, where they were hunted by the Thracian and German auxiliaries, and by bodies of Rhætian light troops, who seem to have willingly turned their arms against their Helvetian neighbours. Those who escaped death were sold as slaves. The town of Aventicum, one of the first in Helvetia, sent messengers to Cæcina, with an offer to surrender; but Cæcina sentenced the principal inhabitants to death, and one Julius Alpinus among the rest. His daughter, Julia Alpinula, a priestess of the goddess Aventia, the local deity, in vain interceded with Cæcina for her father: he was executed, and she does not seem to have long survived her parent. A sepulchral inscription in Latin, found many centuries after among the ruins of Aventicum, revealed this affecting episode. It is to this purport:—'Here I, Julia Alpinula, lie buried, the unhappy offspring of an unhappy father. A priestess of the goddess Aventia, I could not succeed in rescuing my father from a violent death: he was doomed by fate to an untimely end. I have lived twenty-three years.' After this execution, Cæcina marched on towards Italy, referring the people of Aventicum to Vitellius himself, who would pronounce upon their doom. The Helvetian envoys, at the head of whom was one Claudius Cossus, being admitted into the camp of Vitellius, were assailed by the outcries of the soldiers, who demanded the destruction of the whole people. Vitellius himself looked stern and threatening, so that, says Tacitus (*Hist.*, i. 69), it were difficult to say whether the emperor or the soldiers appeared most merciless. Claudius Cossus, a man known for his eloquence, avoided all oratorical attempts at excusing the past; but by the display of his grief and fears and humiliation, he turned the hearts of the soldiers, who now entreated the emperor to forgive the Helvetians, and forgiveness at last was granted. And now the tide of war rolled on towards the plains of Italy, and the Helvetians were left to recover from their calamities. Vespasian, who succeeded Vitellius, had lived when a boy at Aventicum with his father Sabinus, who went thither as a publicanus, and had died there. After Vespasianus became emperor, he remembered Aventicum, and embellished and enlarged that town. Nothing particular occurred in Helvetia till the beginning of the fifth century of our æra. During this long period the Roman language, Roman habits and manners, became prevalent throughout Helvetia, though it is supposed that the more central valleys and Alpine recesses retained a sort of rude independence, as Roman stations have been traced forming a line at the foot of the high Alps, which seem to have extended from the lake of Wallenstadt to that of the Waldstätter, where Luzern now is, and from thence to the highlands of Bern, as if to guard the open country against the irruptions of the mountaineers.

At the breaking up of the Western Empire, the Burgundians, a tribe from the shores of the Baltic, were the first to form a permanent settlement in Western Switzerland, between the Jura, the Leman lake, and the river Aar, and Gebena, or Geneva, became the occasional residence of their kings. [BURGUNDIANS.] Meantime the ALEMANNI, a wilder and more barbarous race than the Burgundians, occupied the banks of the Rhine as far as Eastern Helvetia, until being defeated by Clovis, king of the Franks, at Tolbiacum, near Cologne, A.D. 496, the Franks became masters of the country which the Alemanni had occupied, including a great part of Helvetia. The mountainous district of Rhætia was seized upon by the Goths from Italy, under King Theodoric. The old natives of Helvetia themselves became by turns subjects or serfs of these various masters: being no longer a nation, their very name became obliterated, and they were included in the general appellation of Romans, by which the northern conquerors designated the inhabitants of the countries once subject to Rome. About A.D. 534, the Franks, having overpowered the kingdom of the Burgundians, became masters of all Helvetia, and soon after, at the breaking up of the Gothic kingdom of Italy, they occupied Rhætia also. The Burgundians however, on submitting to the Franks, made conditions for themselves, by which they remained as a distinct nation, retaining their laws, usages, and privileges: the king of the Franks assumed the additional title of king of Burgundy. Several governors, with the title of Duke or President, were appointed by the Merovingian kings of the Franks to govern the various divisions of Helvetia. That part of the country which belonged to the kingdom of Burgundy was called Transjurane Burgundy, the country between the Aar and the Rhine was called Alemannia, and Rhætia formed another distinct division. When the Frankish empire became divided into several kingdoms, Transjurane Burgundy formed part of the kingdom of Orleans, while the rest of Helvetia was attached to the kingdom of Austrasia or of Metz.

Christianity does not seem to have been introduced into Helvetia at a very early period, especially into Eastern Helvetia. The Burgundian part became converted to Christianity soon after the establishment of the Burgundian kingdom, towards the end of the fifth century. The Alemanni of Eastern Helvetia remained much longer in the condition of hunters and shepherds, and in the rude heathenism of their Teutonic ancestors. Towards the beginning of the seventh century, the Irish monk Columbanus, with some of his disciples, came from France to preach the Gospel to the Alemanni of Helvetia, and as they made progress among them, they broke the images of their god Wodan, and built chapels in various parts of the country. This was the origin of the afterwards celebrated churches and abbeys of St. Gall, Disentis, Seckingen, Glarus or St. Hilarius, St. Leodegav of Luzern, and the Münster of Zürich. The pious monks taught also the rude natives to cultivate the soil, to sow corn, to plant the vine, and other useful arts.

Under the weak successors of Charlemagne, the feudal system was thoroughly established in Helvetia, as well as in the other parts of the Frankish monarchy. The counts or governors made themselves hereditary; they became suzerains of their respective districts, of which they were before only magistrates; they took possession of the crown lands, and received the fees of the crown tenants, who became vassals of the local lord. The abbeys and monasteries likewise had their own vassals, many of whom, being originally small proprietors of allodial property, preferred placing themselves under the protection of the church.

When the Frankish empire became divided among the successors of Louis le Débonnaire, A.D. 840, German or Eastern Helvetia fell to the share of Louis of Bavaria, and continued afterwards attached to that part of the German empire called the duchy of Suabia. Burgundian Helvetia fell to the lot of Lotharius, or Lothar, who had the title of emperor and king of Italy. [BOURGOGNE.]

The chief events in the history of Switzerland may be conveniently given in the form of a chronological table:—

A.D. 889. Rudolf, count of Transjurane Burgundy, and son of Conrad, count of Paris, in the midst of the general confusion which prevailed after the deposition of the emperor Charles the Fat, convokes at St. Maurice in the Valais the bishops and lay lords of his government, and is proclaimed by them king of Upper Burgundy; he is also acknowledged as such at a general diet held by the emperor Arnoul at Regensburg, A.D. 890. This new kingdom of Burgundy lasts till 1016, when Rudolf III., called 'Ignavus,' being at variance with his vassals, and having no male issue, makes over his kingdom to the emperor Henry II., and thus all Helvetia becomes annexed to the German empire.

A.D 1097. Berthold of Zähringen, a great Suabian lord, is made by the emperor Henry IV. 'kastvogt,' or warden, of the town and district of Zürich and other places in Eastern Helvetia, and afterwards his son Conrad of Zäringen is made landgraf of Burgundy.

1152. Frederic of Hohenstauffen appoints Berthold IV. of Zähringen imperial warden of the bishoprics of Lausanne, Geneva, and Sion. The administration of the House of Zäringen over the greater part of Helvetia is wise and prosperous.

1178. Berthold IV. of Zähringen builds Freyburg.

1191. Berthold V. encloses the town of Bern.

1318. Berthold dies without male issue, and the House of Zähringen becomes extinct.

1218. Frederic II. gives imperial charters to the towns of Bern, Soleure, Basel, and Schaffhausen. The principal lords in Helvetia are the counts of Savoy in the south, the counts of Gruyère and of Neuchâtel in the west, and the counts of Toggenburg and Kyburg in the north.

1264. Rudolf of Habsburg by various inheritances becomes one of the most powerful lords in Helvetia.

1273. Rudolf is elected emperor. He favours the independence of the towns. [HABSBURG, THE HOUSE OF.]

1291. Death of Rudolf. His son Albert attacks Bern and Zürich, but is repulsed. He aims at annexing the free towns and districts of Helvetia to the patrimony of the House of Habsburg.

1300. The three Waldstätter, or forest cantons, Schwyz, Uri, and Unterwalden, which had been for ages free communities under the protection of the empire, refuse to acknowledge Albert as their duke. The appeal to their imperial franchises, and demand imperial vogten, or judges, to be sent to them to administer justice, and not ducal ones, as Albert wished.

1304. Albert sends them for imperial vogten two noblemen who were devoted to him, Gessler and Beringar, who commit all kinds of oppression.

1307. Three leading men in the Waldstätter, Werner Stauffacher of Schwyz, Walter Furst of Uri, and Arnold von Melchthal in Unterwalden, conspire to free their country from the tyranny of Albert's vogten. They meet on the Rütli, and take an oath to that effect. William Tell kills Gessler. [TELL, WILLIAM.]

January, 1308. The insurrection breaks out throughout the Waldstätter, Albert's officers are driven away, and their castles razed without effusion of blood.

May, 1308. Albert, whilst preparing to march against the Waldstätter, is murdered by his own nephew John of Habsburg, whose patrimony he detained. [ALBERT I., duke of Austria.]

1315 (November). Leopold, son of Albert, defeated at Morgarten by the people of the Waldstätter, who begin to be called by the general name of Schwyzers.

1315 (December). Federal pact of Brunnen, among the three Waldstätter.

1318. Frederic, duke of Austria, makes a truce with the Waldstätter.

1332. The town of Luzern, which had been subject to the House of Habsburg, joins the confederation of the Waldstätter as the fourth canton.

1339. League of the feudal nobles against Bern. They are defeated at Laupen by the Bernese militia, under Rudolf von Erlach.

1351. Zürich and Glarus join the confederation as the fifth and sixth cantons, and the Zürichers defeat Duke Albert of Austria.

1352. The town of Zug, belonging to the Duke of Austria, being besieged by the Swiss, agrees to join the confederation as the sixth canton, and Bern joins the confederation as the eighth canton. A federal Diet of deputies from the eight cantons is appointed.

1375. Enguerrand de Coucy, a French noble, with an army of adventurers, French and English, called Guglers, invades Switzerland, and is defeated by the Bernese at Frauenbrunnen.

1386. Leopold II. of Austria marches an army against Luzern, and is defeated and killed at Sempach, on the 9th of July.

1388. The Austrians invade Glarus, and are defeated at Näfels.

1389. Truce of twenty years between Austria and the Swiss.

1393. The Sempacher brief, or resolutions concerning military discipline, agreed to in a Diet of the eight cantons held at Sempach.

Meantime Bern and Zürich extend their territories by purchase from the neighbouring lords.

1405. Luzern purchases of the Duke of Austria his seignorial rights over the Entlibuch and other districts.

1403-8. Revolt of the district of Appenzell against the abbot of St. Gall.

1415. Frederic of Austria is excommunicated by the council of Constance, and put under the ban of the empire. The emperor Sigismund invites the Swiss cantons to seize the territories of the House of Austria. They invade the Aargau, which they divide among themselves. Origin of the subject bailiwicks.

1418-22. The people of the Waldstätter invade the Val Levantina and other valleys south of the Alps, which they constitute subject bailiwicks.

1422. The Valais revolts against the lord of Raron, and becomes an independent state allied to the Swiss cantons. About the same time the people of Rhætia revolt against the feudal lords.

1424. The Graubund ('Grey league') formed at Trons gives its name to the whole of Rhætia. [GRAUBUNDTEN.]

1436. Death of the last count of Toggenburg; disputes about his inheritance. Civil war between Zürich and the other cantons.

1444. Siege of Zürich by the confederates. A large force of mercenaries under the Dauphin (afterwards Louis XI.) attack Basel. Battle of St. Jacob. The Dauphin makes peace with the Swiss.

1446. Peace between Zürich and the other cantons.

1452. A fresh war between Austria and the cantons. Austria loses Rapperschwyl, Freyburg, and Thurgau. Duke Sigismund of Austria mortgages to Zürich the town of Winterthur, his last remaining possession in Helvetia.

1457. Mühlhausen, an imperial town of Alsace, forms an alliance with the Swiss.

1475. War between the Swiss cantons and Charles le Téméraire, duke of Burgundy.

1476 (March). Battle of Granson; the Burgundians are defeated.

—— (June). Battle of Morat; total defeat of Charles.

1478. Battle of Giornico, in which the Swiss defeat the troops of Milan.

1481. Dissensions among the cantons. Congress of Stanz. Nicholas von Flue, a pious hermit, restores union. Soleure and Freyburg admitted as cantons. Convention of Stanz, a standing federal law.

1495. The emperor Maximilian I. attempts to enforce the ordinances of the Imperial chamber upon the Swiss as lieges to the empire, and he commands them to furnish a contingent of troops for his war against France. The Swiss refuse, and allege their previous treaties with France.

1499. War between Maximilian and the Swiss. The Imperial troops being defeated near Bregenz, at Frastenz, and other places on the borders of the Tyrol, and also at Dornach near Basel, Maximilian makes peace with the cantons. This was the last war which the Swiss had to sustain for their independence.

1501. Basel and Schaffhausen are received into the confederation as two additional cantons.

1513. Appenzell is also admitted, and completes the number of thirteen cantons composing the Helvetic or Swiss confederation, which existed till the French revolutionary invasion of 1798. The 'socii,' or states associated to the confederation with vote in the diet, were the abbot of St. Gall, and the free cities of St. Gall, Mühlhausen, and Biel, or Bienne. The allies without vote were Geneva, Neuchâtel, the Valais, and the Grisons.

1511-1522. Swiss troops engaged in the wars of Italy as auxiliaries of the Sforza, dukes of Milan, and of the popes, against the French. Battle of Novara won by the Swiss. Battle of Marignano; the Swiss make a good retreat, after sustaining a great loss of men, and making a great slaughter of the French. Battle of La Bicocca, April, 1522, won by the Swiss, who, in concert with the troops of Charles V., drive the French out of Lombardy.

1518. Sale of the indulgences in Switzerland, opposed by Zwingli.

1519. Zwingli, Bullinger, and other Swiss reformers enter into a controversy with the church of Rome. [ZWINGLI.]

1523. Zürich adopts the doctrines of the Reformation.

1528. Bern, after several conferences, issues an edict of reformation consisting of thirteen articles. The towns of St. Gall, Bienne, and Mühlhausen adopt the reformation.

1530. Basel and Schaffhausen proclaim the reformation; Glarus and Appenzell remain divided between the two communions.

Farel preaches the Reformation in Western Switzerland. Neuchâtel adopts his doctrines.

1531. War between the Roman Catholic and the reformed cantons on the subject of the election of a new abbot of St. Gall. The troops of the reformed cantons are de feated at Cappel with great loss. Zwingli, who attended as chaplain, is among the killed. Peace of Baar, on the principle of reciprocal non-interference.

1532. Helvetic confession of faith proclaimed by a synod held at Bern.

1533. Farel preaches the Reformation at Geneva.

1535. Bern, as an ally of Geneva, makes war against the duke of Savoy, who claimed supremacy over the latter town.

1536. Bern takes the Pays de Vaud from the duke of Savoy.

1537. John Calvin goes to preach at Geneva.

1538. Calvin and Farel expelled from Geneva. [CALVIN, JOHN.]

1541. Calvin is recalled. The Reformation adopted at Geneva.

1564. Treaty of Lausanne between Bern and Emmanuel Philibert, duke of Savoy. Bern retains the Pays de Vaud.

1602. Charles Emmanuel, duke of Savoy, attempts to surprise Geneva by escalade, and is repulsed with loss.

1603. New treaty between Geneva and Bern on one side, and the duke of Savoy on the other. The duke acknowledges the independence of Geneva.

1618. Beginning of the religious disturbances in the Valtellina, subject to the Grisons.

1620. Massacre of the Protestants in Valtellina.

1621. The Austrians invade the Grisons.

1624. The French come to the assistance of the Grisons, and drive away the Austrians.

1628. The Austrians again invade the Grisons country, and two years after they withdraw.

1639. End of the war of the Grisons.

1648. The emperor acknowledges, in the treaty of Westphalia, the Swiss Confederation as an independent state in Europe.

1653. Peasants' war in Switzerland; the insurgents are defeated.

1653. Second war of religion in Switzerland. Battle of Willmergen; the Protestants defeated. Peace made.

1582-83. A number of French Protestants persecuted by Louis XIV. take refuge in Switzerland. Most of the Waldenses of Piedmont emigrate to Switzerland, to avoid the persecution of the duke of Savoy.

1710. The district of Toggenburg revolts against the abbot of St. Gall, and is supported by the Reformed Cantons.

1712. Third and last war of religion in Switzerland. The Bernese defeat the troops of Luzern and the Waldstätter at Willmergen. The Roman Catholic cantons sue for peace, which is concluded at Aarau, in August, 1712.

1713-92. A period of peace for Switzerland, with the exception of some local disturbances at Bern, Freyburg, and Geneva.

1792. Massacre of the Swiss guards at Paris. The other Swiss regiments in the French service return home.

1793. The French invade the territory of the bishop of Basel, and annex it to their new republic. They also foment an insurrection at Geneva, which is followed by massacre and confiscation.

1795. The French executive Directory begins to annoy the Swiss Confederation. It encourages the disaffected in the Pays de Vaud against Bern, and the disaffected in general all over Switzerland.

1797. General Bonaparte seizes upon Valtellina, Chiavenna, and Bormio, which were subject to the Grisons, and annexes them to the Cisalpine republic. In the mean time another body of French troops occupies the free town of Bienne, an ally of the Swiss. The agents of the Directory assume an imperious tone towards the Confederation, and demand the expulsion of Mr. Wickham, the English envoy, and of the French emigrants.

1798. Democratic revolution at Basel. Insurrection in the Aargau. The French agents take the insurgents under their protection. Diet held at Aarau, the last of the old Confederation. The French general Ménard, with 15,000 men, enters the Pays de Vaud, and proclaims its independence. An affray takes place between the Bernese and the French outposts, which is followed by a declaration of war by the Directory against Bern. In March the French general Brune attacks the Bernese troops, and is repulsed at Laupen. At the same time another French army attacks the Bernese corps under General Von Erlach, who is defeated. The French enter Bern. Erlach is murdered by his mutinous soldiers. The French seize on all public property at Bern. The French spread all over Switzerland, exact heavy contributions, and change the government of the country. The Forest cantons refuse to submit; the French attack them, and are repulsed at Rothenthurm by Aloys Reding. In September a large French force under Schauenburg invades the district of Nidwalden, or Lower Unterwalden, the inhabitants of which make a desperate resistance, and most of them are massacred, including many women. Their villages are burnt.

1799. The Austrians and Russians enter Switzerland, and drive the French from the central cantons. Massena defeats the Russians at Zürich in September. Suvorov enters Switzerland from Italy by the St. Gothard, but is obliged to retire into the Grisons country. General confusion in Switzerland.

1801. Peace of Luneville; the French evacuate Switzerland. A new federal constitution is proclaimed, but rejected.

1802. Bonaparte, first consul of France, offers his mediation to the Swiss. Conferences at Paris. The Act of Mediation is framed and accepted, constituting Switzerland into nineteen cantons, upon an equal footing, under the protection of France. The Valais, Geneva, Neuchâtel, and other districts are annexed to France.

1813. After the battle of Leipzig the allied troops pass through Switzerland on their way to France. The allied sovereigns refuse to recognise Napoleon's Act of Mediation, and recommend a new federal pact for the future political constitution of Switzerland.

1815. The Allied Powers at the Congress of Vienna acknowledge the independence of Switzerland within its former limits. New confederation of twenty-two sovereign cantons. A federal diet to assemble at least once a year, by turns at Bern, Zürich, and Luzern, to discuss all matters internal and external concerning the general interest of the Confederation. The Diet has power to declare war, make peace, and form alliances with foreign powers, in which cases a majority of three-fourths is required. It also appoints envoys and consuls to foreign states. No canton is allowed to take up arms against another, but all serious differences between one canton and another must be referred to the Diet. In cases of serious disturbances within any one canton, the Diet acts the part of mediator, and prevents violence by means of military occupation if necessary. Each canton has a single vote in the Diet. Measures are carried by a simple majority. The deputies of the respective cantons give their vote according to the instruction which they receive from their constituents. The Diet before closing its session gives directions to the executive council of the canton in which it is assembled for that year, and which is styled the Vorort, or directing canton, to carry into execution its resolutions, and otherwise to provide for the well-being of the confederation during the time that the Diet is not assembled. The Vorort is assisted in its duties by a federal chancery, consisting of a chancellor and a secretary, both of whom are appointed by the Diet. In urgent cases, or simply on the demand of five cantons, the Vorort convokes an extraordinary diet.

1830-31. Most of the larger cantons, whose representation was based upon the principle of property, effect a change by which universal suffrage is established. The proposed change finds a strong opposition in Basel, in consequence of which the town separates itself from the country districts, which form themselves into a separate republic, or half canton. Neuchâtel, after some bloodshed, retains its old constitution under the king of Prussia, who is prince of Neuchâtel. Geneva retains its constitution with a small property qualification for electors. The Forest cantons retain their pure democratic form, with general assemblies of the whole male population. Attempts are made by the radical party to change the federal pact, which are resisted by the majority of the cantons, and especially by the Forest cantons.

1834-36. Disturbances in several parts of Switzerland, caused by the Polish and other political refugees, who attempt to effect revolutions in Savoy and other neighbouring states. Angry diplomatic notes from the foreign powers to the diet, which at last directs the expulsion of those refugees who had been guilty of revolutionary attempts, and other acts endangering the neutrality and tranquillity of Switzerland.

For the history of Switzerland during the middle ages, Johann Müller's *Geschichte der Schweizerischen Eidgenossenschaft* is the best work. A spirited French translation of it, with valuable notes and a continuation down to our own times, by Professors Monnard of Lausanne and Vulliemin of Basel, has been in course of publication of late years at Paris and Geneva; *Histoire de la Confédération Suisse*, par Jean de Müller, R. G. Blozheim, et J. J. Hottinger, traduite de l'Allemand, et continuée jusqu' à nos jours, par Ch. Monnard et L. Vulliemin. In English a compendious *History of Switzerland*, by A. Vieusseux, has been published by the Society for the Diffusion of Useful Knowledge, 8vo., 1840, with ample references to the original sources.

SWORD-FISH. [Xiphias.]

SWORDS. *Greek Swords.* The earliest and fullest information on the subject of the Greek swords is in the poems of Homer. With him the *ξίφος*, *ἄορ*, and *φάσγανον* are synonymous terms: the *μάχαιρα* is a large knife suspended near the *ξίφος* (*Il.*, iii. 271) for the purpose of cutting anything; the *ξίφος* is called *μελάνδετον*, a term not very satisfactorily explained, and *ἀργυρόηλον*, or studded with silver, an epithet relating probably to the handle (*κώπη*), which is said to be of silver: the scabbard, *κολεὸς*, in later writers called *θήκη* (*Od.*, viii. 404), is covered with ivory.

At a later period coins, vases, and other antient monuments, exhibit the form of the Greek sword, which was a short cut-and-thrust blade, diminishing gradually from hilt to point. The manner of using it is very clearly shown on a silver coin of the Locri Opuntii, where a Greek warrior is represented fighting. [Locris.]

Varieties in the form of the blade and handle are occasionally to be met with on vases. (Millin, *Vases Antiques*, pl. 26 and 56.) The *ϑήκη*, or scabbard, sometimes terminates in a knob, the *μύκης* probably of Herodotus (iii. 64). We have only scanty and incidental notices of the sword in Greek writers after the time of Homer. C. Nepos (*Iphicrates*, c. i.) records that that general introduced a longer sword among the Athenian infantry. Xenophon (*De Re Eques.*, xii.) prefers the *μάχαιρα* to the *ξίφος* for cavalry, because their position on horseback he considers more favourable for the cutting than thrusting: in this passage *μάχαιρα* is used synonymously with *κοπίς*, which leads us to suppose it to have been made at that time only for cutting. In later writers the terms *μάχαιρα* and *ξίφος* are used indiscriminately. (Polyb., iii. 114.)

The Greek sword was worn on the left side, suspended by a belt, generally from the shoulder, as in the figure of Meleager on the coins of Ætolia, but occasionally by a girdle round the waist. (Millingen, *Vases Inédites*, xxxvii.) On a vase in Millingen (pl. 23) it is slung more forward, so that the hilt is in the middle of the breast. The material of the Greek blade was generally bronze; in later times, iron.

Roman Swords.—The Roman sword was called 'ensis,' 'gladius,' and 'mucro' (though 'mucro' originally meant the point of the sword only; its edge, 'acies;' its handle, 'capulus;' its scabbard, 'vagina.' Polybius gives an accurate description of the Roman sword used in his day, which had the Iberian short cut-and-thrust blade of finely-tempered steel: this had been substituted for the old Roman sword at the time of the war with Hannibal (lib. vi.; also *Fragm.*, xiv., where he speaks of the admirable temper of the Celtiberian blades). The form of the sword continued from his time till that of the later emperors apparently unchanged. Montfaucon (*Antiquités*, vii.) states that the blades of those on the column of Marcus Aurelius and the arch of Severus are more pointed than on the column of Trajan, and that they became shorter in the time of Constantine the Great and Theodosius. Stewechius (*Comment.* in Vegetium, p. 64, Vesal., 1670) speaks of a larger kind of sword, 'spatha,' under the later emperors. There seems to be no distinction in size or shape between the swords of the infantry and cavalry on Trajan's column and other similar monuments. The Roman sword was worn on the right side. Montfaucon notices three exceptions to this general practice on the arch of Septimius Severus; and the spathæ already mentioned are said to be worn on the left side. The parazonium appears to have been the insigne or sword of office of a military tribune. (Martial, xiv. 29; Raderus, *Comment.*, in loc.; and Pitisc., *Lexicon Antiq. Roman.*)

Other Antient Swords.—For the swords of other nations of antiquity, see Wilkinson's 'Antient Egyptians;' for the *ἀκινάκης*, or Persian sword, and that of other Eastern people, Leake, 'Athens,' ii., pp. 22-5-6, new edit.; the sculptures at Persepolis, engraved in Sir R. Porter's 'Travels;' and for the swords of the Gauls, Livy, xxii. 46; and more fully Diodorus, v. 30.

In the British Museum are four antient bronze swords, three of which have cut-and-thrust blades, varying in length from 10 to 25 inches, and in breadth from 1½ to 2 inches Another, which was purchased at the sale of the late bishop of Lichfield's antiquities, and considered to be Etruscan, is bound with gold wire round the handle, and is about 13 inches long. In Montfaucon (*Antiq.*, vii.) are engravings of three, two of which, as he states, measured a foot and a half (French), and the other 30 inches in length. In the 'Museo Borbonico,' vol. v., pl. xxxix., is an engraving of one having two rings on its scabbard, which is of wood, covered with plates of metal, and studded with brass: a handle of another is finished with an eagle's head. (See the description of the plate, where a passage from Heliodorus, *Æthiopica*, lib. ii., 11, is quoted in illustration.)

Two others are engraved in the same work, iv. 44, one of which has a handle full of holes to receive studs (*ἧλα*), Compare Virgil's 'Stellatus Iaspide Fulva,' iv. 26.

Varieties, such as the harpa or the sword of the Amazons (Millingen, *Vases Antiques*, vi.), are mythological, and a description of them has consequently no place in an historical account of the sword.

SWORDS, MANUFACTURE OF. So little is known respecting the early history of the manufacture of arms in England, that Hutton and Hunter, in their accounts of the two great seats of the British hardware manufacture, Birmingham and Sheffield, have been compelled to rest upon mere conjecture respecting it. Hunter states that we have no direct information respecting the manufacture of arms at Sheffield, and that all the articles enumerated in the ordinances for the government of the cutlers of Hallamshire, and in the later acts of incorporation, are instruments of peace; yet he considers it probable that weapons of offence were early fabricated by the cutlers of Sheffield, as well as other articles of steel. Holland, in the work referred to at the end of this article, gives a representation of two men grinding a sword-blade, copied from a MS. psalter, written about the time of King Stephen, which is preserved in the library of Trinity College, Cambridge, and which probably represents the usual construction of grinding machinery at that time. The grindstone is mounted upon a horizontal axis, which one man turns by means of a crank, and the sword, which is straight and pointed, is pressed down upon its periphery by the other man, who sits on a beam above the level of the stone, so that his weight may be conveniently thrown upon the sword, to press it firmly against the stone. The same author observes that it appears, from old drawings, that in those early times the blades of swords were placed upon a bench or board, and *furbished*, or polished, by hand, instead of having that operation performed, as at present, upon a wheel covered with leather and emery.

But while there can be no doubt of the extensive manufacture of swords in England at an early period, the blades made in Spain and Italy, and more especially those brought from the East, bore the pre-eminence. The swords of Toledo, which are still celebrated, were sought after on account of their admirable temper, in the time of the Moors, and even under the Romans. It has been supposed that they are indebted for their valuable qualities to some peculiar property in the water of the Tagus, which is used in tempering them; and the author of 'A Year in Spain,' cited by Holland, corroborates this supposition by stating that, in the early period of the French invasion, the manufactory was removed to Seville, where the national junta then was, but it was found that the swords manufactured on the banks of the Guadalquivir were very inferior to those which the same workmen had made at Toledo. In the time of the crusades, and down to a much later period, Milan supplied swords of excellent quality in large numbers; but, celebrated as these and the Spanish blades deservedly were, those from the East were still more highly prized, and enormous sums were often given for them. 'These Oriental sabres,' observes Mr. Holland, 'which are invariably regarded by their possessors as being of great antiquity, are presumed to have been made at Damascus in Syria, Ispahan in Persia, or Cairo in Egypt, at none of which places, if we may credit recent visitors, is the manufacture of steel articles carried on at present.' [But see Damascus, vol. viii., p. 296.] He proceeds to say, 'Of all the sabres however, the fame of which has reached this country, those of Damascus are by far the most noted, most persons having heard of them, though very few indeed have seen them, and fewer still have been the instances in which the blades themselves have confirmed those strange stories about their temper which are so generally circulated, and received among persons who know but little of the nature of steel. The characteristics ascribed to the real Damascus blades are, extraordinary keenness of edge, great flexibility of substance, a singular grain and fleckiness always observable upon the surface, and a peculiar musky odour given out by any friction of the blade, either by bending or otherwise.' This writer conceives that their quality, undoubtedly excellent as it must be, has been greatly exaggerated, and that the extraordinary powers of execution attributed to Damascus blades are, in a great measure, dependent upon the strength and dexterity of the user. A gentleman who purchased one of these sabres in the East Indies for a thousand piastres, informed Mr. Holland that, although it was very flexible, and bore a fine keen edge, it could not be safely bent to more than 45° from a straight line, and it was not nearly so sharp as a razor; yet, when wielded by a skilful hand, it would cut through a thick roll of sail-cloth without apparent difficulty; a feat, it is added, which could not be performed with an ordinary sword, nor by the (Damascus) sabre itself, in an ordinary hand, though the swordsman who tried it could, it appears, do nearly the same thing with a good European blade.

About the year 1689 an attempt was made to improve and extend the sword manufacture of England by the incorporation of a company of sword-cutlers for making hollow sword-blades in Cumberland and the adjacent counties. The company was empowered to purchase lands, to erect mills, and to employ a great number of German artificers; yet the project failed. Anderson (*Hist. of Commerce*, vol. ii., p. 587) states that the first patentees assigned their rights to a company of merchants in London, who, apparently to the neglect of the original objects of the association, purchased forfeited estates in Ireland to the value of 20,000*l.* per annum. These were subsequently sold off, and the corporation was broken up.

Owing, apparently, to the parsimony of the manufacturers, which led them to use inferior materials, and to employ unskilful workmen, English sword-blades fell into very ill repute during the eighteenth century; so much so, indeed, that an English officer would not trust his life to the hazard of the probable failure of a sword of native manufacture. In 1783 the sword-sellers of London, in consequence of the very bad quality of English blades, petitioned the lords of the treasury for permission to import German swords free of duty; and this circumstance, by attracting public attention forcibly to the low state of this branch of British cutlery, led to very important improvements. A full account of the proceeding is given in Gill's 'Technological Repository,' in a paper entitled 'Recollections of the late Thomas Gill,' by his son, the editor of that work. From this we find that Lord Surrey (afterwards the fourteenth duke of Norfolk) wrote to Mr. Eyre of Sheffield, on the 1st of October, 1783, informing him of the petition alluded to, and requesting such information from any Sheffield manufacturer as would enable him to remove the disgraceful imputation thrown by it upon English ingenuity. Mr. Eyre communicated an extract of the letter to the late Mr. Gill, of Birmingham, and he, in the month of December following, memorialized the lords of the treasury, stating that he could make sword-blades equal to those of Germany, and requesting a fair comparison. Circumstances delayed the public trial which he desired; but in 1786, the East India Company requiring 10,000 horsemen's swords, divided their orders indiscriminately among English and German manufacturers. Owing to the exertions of Mr. Gill, by whom some of these swords were made, a comparative trial was appointed, and every sword sent in was submitted to a machine recommended by Matthew Boulton of Soho, in which the temper was tried by forcing it into a curve, so as to reduce its length from thirty-six inches to twenty-nine inches and a half. The result was that 2650 of Mr. Gill's swords bore the test, and only 4 were rejected, while of the German swords 1400 were received and 28 rejected; the proportionate number of defective blades sent by the German manufacturers being 13 to 1, as compared with those of Mr. Gill. The extremely low state of the British sword-manufacture at that time is sufficiently testified by the fact that of the blades sent by other English cutlers, 2700 were received and 1084 rejected, the proportion being rather more than two bad to five good blades. In addition to the above-mentioned test, Mr. Gill tried his swords by striking them flatways upon a slab of cast-iron, and edgeways upon a cylinder of wrought-iron, sometimes a piece of a gun-barrel, which they often cut through. They were so tough, although formed of cast-steel, that, after cutting a gun-barrel asunder, Gill would frequently wind the blade round it like a riband, after which it would recover its original straightness, excepting at the point. So completely did he establish the fame of his swords, that even German officers applied to him for them; nor was his attention devoted solely to the excellence of their temper, for he also made many improvements in the ornamenting of swords by blueing, gilding, and embossing.

The process of manufacturing swords at Birmingham has been described by Holland, from whose work the following particulars are derived. The material of which the blade is wrought should be cast steel of the very best quality, and wrought with the greatest care. Of this material, besides the quantity prepared at Birmingham, much is obtained from Sheffield in the form of bars, called sword-moulds. These bars are heated in the fire, and drawn out upon an anvil by two workmen with hammers, giving alternate strokes. When the blade is required to be concave upon the sides, or to have a reeded back, or some similar ornament, it is hammered between steel bosses or *swages*. The blade is then hardened by heating it in the fire until it becomes worm-red, and dipping it, point downwards, in a tub of cold water. It is tempered by drawing it through the fire several times until the surface exhibits a bluish oxidation, which takes place at a temperature of about 550° Fahr. The sword is then *set* to the required shape by placing it on a sort of fork upon the anvil, and wrenching it by means of tongs in the direction required to correct any degree of warping which it may have contracted during the hardening. The grinding is performed upon a stone with either a flat or fluted surface, according to the kind of blade; and as the uniformity of the temper is impaired by this process, it is subsequently restored by a slight heating, after which the blade is glazed with emery, and, if the instrument be a fine one, with *crocus martis*, after the manner of a razor-blade. The sword is then ready for the hilt or handle, the various kinds of which it is needless to enumerate.

Among the tests to which sword-blades are subjected in order to prove their flexibility and elasticity, is that of bending them into a curve by pressing the side of the blade against six or eight pegs or stout nails driven into a board, in such a manner that, when in contact with all the pegs, the middle of the blade may be bent six or seven inches from a straight line drawn between the point and the hilt. A further test is applied by an apparatus consisting of a vertical pillar rising from a board. The point of the sabre is placed upon the board at the foot of the upright pillar, and the hilt is then pressed down until the middle of the blade bends away from the upright piece to the required degree; the amount of curvature being shown by a peg which projects horizontally from the pillar, about midway between the top and the bottom. The temper is also proved by striking the blade smartly upon a table on both sides, and by severe strokes with the back and edge upon a block. Mr. Inglis, in his 'Spain in 1830,' vol. i., p. 396, describes the trials to which sword-blades are subjected at the celebrated manufactory of Toledo. Each sword is there thrust against a plate in the wall, and so bent into an arc forming at least three parts of a circle, and then struck edgeways upon a leaden table with all the force which can be given by a powerful man holding it with both hands. The polishing, according to the same authority, is performed upon a wheel of walnut-wood.

Many plans have been tried for imitating the peculiar waved appearance of Damascus blades, which is commonly called *damasking*. Dr. Ure has noticed some of these in his 'Dictionary of Arts,' art. 'Damascus Blades.' He observes that the Oriental processes have never been satisfactorily described, although several methods have been devised in Europe for imitating the Eastern fabrics. Of these he states, without referring to the original authority, that MM. Clouet and Hachette have pointed out three methods of attaining the desired object. The first, which is stated to be still pursued by some French cutlers, consists in scoopng out with a graving-tool the faces of a piece of stuff composed of thin plates of steel of different kinds; and by a subsequent operation filling up the hollows, and bringing them to a level with the external faces, upon which they form a figured appearance. The second is called the method of *torsion*, and is, according to the same authority, more generally employed at present. It consists in forming a bundle of rods or strips of steel, which are welded together into a well-wrought bar, which is twisted several times about its axis. It is repeatedly forged, and twisted alternately; after which it is slit longitudinally, and the two halves are welded with their outer sides together. The surfaces of such a bar have a curious waved or watered appearance, owing to the inter-twisting of the several rods of which it is composed. The third, or *mosaic* method, consists in preparing a bar in the way last described, then cutting it into short pieces, and forming them into a faggot; taking care in welding them together to preserve the sections of each piece at the surface of the blade. 'The blades of Clouet,' observes Dr. Ure, 'independently of their excellent quality, their flexibility, and extreme elasticity, have this advantage over the Oriental blades, that they exhibit in the very substance of the metal designs, letters, inscriptions, and, generally speaking, all kinds of figures which had been delineated beforehand.'

An opinion which has been very often repeated is that Damascus blades are formed by some peculiar union of iron and steel; and, be this as it may, the experiments published some years since at Milan, by Professor Crivelli, show that sword-blades of excellent quality may be produced by such a combination. A notice of his work on the manufacture of Damascus blades was published in the 'Allgemeine Militär-Zeitung,' and thence transferred to the English 'United Service Journal,' for June, 1830, p. 749. According to his method, a bar of malleable steel, of about an inch and a half in breadth and one-eighth of an inch in thickness, is to be bound round with iron-wire, at intervals of one-third of an inch. The iron and steel are then to be incorporated by welding, and repeated additions of iron-wire are to be applied and incorporated in the same way. The compound bar thus formed is then stretched and divided into shorter lengths, which are subsequently wrought into the required form, ground, and tempered. By filing semicircular grooves into both sides of the blade, and again subjecting it to the hammer, a beautiful damasked appearance is produced; and the figures or waterings are rendered visible by washing the blades with a menstruum of aquafortis and vinegar, so as to corrode the surface slightly. According to the account referred to, the swords made in this way are of extraordinary tenacity, and are not very much more expensive than those in common use. The process is said to have been practised successfully in Austria and Prussia.

Another way of explaining the variegated appearance of Damascus blades is that of M. Bréant, examiner-general of the assays at the royal mint in Paris, whose experiments are noticed more fully by Holland and Dr. Ure than they can be in this place. He supposes that the oriental damask is not a mixture of steel and iron, but simply cast-steel charged with a superabundance of carbon; so that, by slow cooling, two distinct combinations are formed, the first being simply steel, and the second a mixture of steel with the excess of carbon, forming a carburetted steel or cast-iron. These two compounds form a kind of crystallized surface, which, by washing with acidulated water, assumes a damasked appearance; the parts consisting of pure steel becoming black, while the carburetted steel remains white.

Besides the numerous contrivances for producing the variegated appearance of Damascus blades, ingenious processes are resorted to for ornamenting sword-blades by etching and embossing, and by inlaying them with gold and silver wire, an art to which the name of *damaskeening* is sometimes applied. In the most perfect way of executing this kind of ornament, the design is deeply engraved upon the steel, the lines or notches being cut of a slightly dove-tailed form, or wider at the bottom than at the top, and a thick wire of gold or silver is forced into the incisions, the form of which enables them to hold it firmly.

(Holland's 'Treatise on Manufactures in Metal,' in Lardner's *Cabinet Cyclopædia*, vol. i., chap. 14, and vol. ii., chap. 4; Dr. Ure's *Dictionary of Arts*, &c.; Gill's *Technological Repository*, vol. vi., p. 12, &c.)

SY'BARIS (Σύβαρις), a Greek city in Lucania, in southern Italy. It was situated between two rivers, the Crathis, now called Crati, and the Sybaris, which at present is called Coscile, Coscilello, or Siburi. It was a colony founded about the year B.C. 720, by Achaians and Troezenians. (Aristotle, *Polit.*, v. ii., p. 156, ed. Göttling.; Strabo, vi., p. 244.) Strabo, without mentioning the Troezenians, calls it an Achaian colony founded by Iseliceus. In consequence of the fertility of the district, this colony soon increased in wealth and power; for at the time of its greatest prosperity, that is, about two hundred years after its foundation, it had, according to Strabo, acquired the dominion over four neighbouring tribes, had twenty-five subject towns, the city itself occupied a space of fifty stadia in circumference, and the Sybarites were enabled to send an army of 300,000 men into the field, a number which does not by any means appear so unreasonable as some modern writers have thought. (Strabo; Diodorus Sic., xii. 9.) Sybaris itself also became the mother of other colonies, such as Posidonia, and carried on a considerable commerce, especially with Miletus in Asia Minor. But the prosperity of Sybaris had a pernicious influence on the people, and within the short period of two hundred and ten years that Sybaris existed, the effeminacy and the luxury of the inhabitants were carried to such a pitch, that the name Sybarite became proverbial and synonymous with a voluptuous person. Many curious particulars in illustration of their effeminate character are mentioned in Athenaeus, which it would be difficult to believe if they were not reported on the authority of Aristotle, Timaeus, and Phylarchus. Thus it is stated, among other things, that it was forbidden by law to carry on within the city any trade or craft which made a noise, or might possibly disturb the citizens in their sleep; and for the same reason no person was allowed to keep cocks. (Athenaeus, xii., p. 518, &c.) The arts which contributed to the enjoyment of life were prized most highly; and those who distinguished themselves as inventors in this line were considered benefactors to the nation. A Sybarite of the name of Smindyrides is called by Herodotus the most luxurious man that ever lived; and it is said that when he went to Sicyon to sue for the daughter of Cleisthenes, he was accompanied by one thousand cooks and fowlers. (Herodotus, vi. 27; Athenaeus, xii., pp. 511 and 541; compare Perizonius on Aelian, *Var. Hist.*, ix. 24.)

It is probable that all we read about the effeminacy of the Sybarites applies only to the ruling aristocracy. The government appears to have always been in the hands of the aristocracy, which, as the words of Aristotle seem to suggest, consisted of the Troezenians, while the Achaians, who in numbers far exceeded the Troezenians, formed the commonalty. These two parties were engaged in a continual struggle, which at last, when it broke out into a civil war, led to the total destruction of Sybaris. About the year B.C. 510, Telys, who himself belonged to the nobles, and who is called by some writers king, by others tyrant, and by others again a demagogue of Sybaris, placed himself at the head of the popular party. (Herodotus, v. 44; Athenaeus, xii., p. 521; Diodorus, as above.) He wished to gratify some personal animosity against the nobles, and excited the people against them so much, that an insurrection broke out, in which the people drove the aristocrats, to the number of five hundred, out of the city, and divided their property among themselves. The exiles fled to Croton, and implored the protection of the Crotoniatae. Telys sent a haughty message to Croton, requiring the citizens either to surrender the fugitives or to prepare for war. The Crotoniatae, it is said, on the advice of Pythagoras, resisted the demand of the Sybarites, and accepted the challenge. Sybaris sent out an army of 300,000 men, while Croton could muster no more than 100,000, under the command of Milo, the celebrated athlete, to whose prowess alone Diodorus absurdly ascribes the victory of the Crotoniatae. The Crotoniatae are said to have been supported by Dorieus of Sparta; and according to another tradition, by Callias of Sybaris, a seer who had forsaken his own countrymen because several omens had happened which were unfavourable to the Sybarites. (Herodotus, v. 44; Phylarchus ap. Athen., xii., p. 521.) The victory of the Crotoniatae was complete, and the reaction at Sybaris, described by Heraclides Ponticus (Athen., xii., p. 512), in which Telys and his principal partisans were murdered at the altars of the gods, probably took place after the battle with the Crotoniatae, as it would otherwise have rendered the war altogether unnecessary. The conquerors advanced towards Sybaris: the city was taken, sacked, and razed to the ground, and most of the inhabitants put to the sword. The river Crathis was turned through the ruins to obliterate every trace of its former greatness (510 B.C.) Within seventy days Sybaris, from one of the most flourishing cities in Italy, became a heap of ruins. The whole population of Miletus mourned over the fate of the Sybarites. A few of the former inhabitants of Sybaris, who survived the fate of their native city, still clung to the spot; and fifty-eight years later, some Thessalian adventurers having arrived there, the town was rebuilt; but after it had existed for five years it was again destroyed by the Crotoniatae. Its inhabitants now solicited the aid of Athens and Sparta; but the former alone sent them ten ships under Lampon and Xenocrates, and on the advice of an oracle these Athenians, with whom was Herodotus the historian, and Lysias the orator, together with many other Greeks and the remnant of the Sybarites, founded, in B.C. 444, the colony of Thurii, a little to the south of the site of Sybaris. In this new colony the Sybarites wished to form a kind of aristocracy, and claimed privileges which their fellow-settlers were unwilling to allow them. The consequence was that in the ensuing struggle all the remaining Sybarites were destroyed.

The site of the antient Sybaris is at present unknown, but it is generally supposed to have been situated near the modern Torre Brodognato or Terra Nuova.

SYCAMORE. [ACER.]

SYDENHAM, THOMAS, one of the most distinguished of English physicians, was the son of a country gentleman at Winford Eagle in Dorsetshire. He was born there in 1624, and was admitted a commoner of Magdalen Hall, Oxford, in 1642. The occupation of that city as a garrison by Charles I. interrupted his studies for a time; but he returned to Magdalen Hall when Oxford was given up to the parliamentary forces, and in 1648 he took the degree of bachelor of physic.

It has been stated that Sydenham served for some time in the royal army during the commotions of the civil war; but this assertion rests on no good authority, and all Sydenham's connections belonged to the republican party. His elder brother William was a colonel in the parliamentary army, and rose during the commonwealth to the highest posts. It was also through the interest of his party that Sydenham obtained, about 1648, a fellowship of All Souls' College, in the place of a person who had been ejected for his royalist opinions. He pursued his studies at Oxford for some years, and is said by the famous French surgeon Desault to have visited Montpellier, where there was a medical school, which then enjoyed a very high reputation. Subsequently he quitted Oxford; and having taken the degree of doctor of medicine at Cambridge, he became a licentiate of the College of Physicians, and settled in London.

He soon rose to the top of his profession, and, between the years 1660 and 1670, had a more extensive practice than any other physician. This success must have been entirely due to himself, for, from some cause of which we are ignorant, the College of Physicians, as a body, were hostile to him; while his known relations to the republican party would cut off court patronage or favour. After suffering for many years from the gout, he died on the 29th December, 1689, at his house in Pall Mall, and was buried in the aisle of St. James's Church, Westminster.

In 1666 Sydenham published his first work, which consisted of observations upon fevers. An enlarged edition of this treatise appeared under a new name in the year 1675. This second edition contained his remarks on the small-pox and on other eruptive fevers, and is remarkable not only for the singularly accurate description of symptoms, but also for the recommendation of a practice directly opposed to the heating and stimulating plan of treatment which then universally prevailed. Remarks on the epidemic diseases of London from 1675 to 1680; a treatise on dropsy and on the gout; and a tract on the rise of a new fever, were his principal other publications.

From the nature of their subjects, we cannot here enter upon an examination of these works; but it is worth while, in the case of a man who acquired such high eminence as Sydenham, to inquire what were the causes to which he owed his great celebrity. He was not a learned man, and his works, written by him originally in English, were translated into Latin before publication by his friends Dr. Mapletoft and Mr. Havers. He constructed no brilliant theory, and indeed was not always consistent in following that which he adopted. Were we to reckon Sydenham among the followers of any particular school, it would be among those of the chemical physicians, who sought for the causes of disease in a supposed fermentation and chemical decomposition of the fluids of the body. Sydenham's method of treating small-pox however, though so great an improvement on the practice which then prevailed, was in opposition to the theory which he had embraced. But his chief merit consists not so much in his method of treatment, which is not unfrequently defective, as in his singular talent for observation. The pictures which he has drawn of diseases are so accurate, that in many instances it would not be possible to improve upon them. He betook himself to carefully noting the symptoms of disease, and the encouragement of his friend Locke assured him that his was the right method of seeking for truth. This it is which constitutes his merit, that, in an age of brilliant theories, he applied himself to questioning Nature herself; justly thinking that though 'the practice of physic may seem to flow from hypotheses, yet, if the hypotheses are solid and true, they in some measure owe their origin to practice.' By treading in this path Sydenham has gained a name which will last; while many, his superiors in learning, perhaps his equals in genius, are forgotten, or remembered only as instances of the misapplication of great gifts to little purpose.

Further particulars concerning Sydenham may be found in Hutchinson's 'Biographia Medica,' vol. ii., p. 430; in the Life prefixed to the English translation of his works by Dr. Swan; and in a volume of the 'Family Library,' entitled 'Lives of British Physicians;' but a good biography of him is still a desideratum. His works have passed through various editions, both in this country and on the Continent. The edition entitled 'Opera Medica,' published at Geneva, in two volumes, 4to., in 1716, is preferable to the English editions. The translation of his works by Dr. Swan is well executed; the best edition of it is that of Dr. Wallis, in 2 vols. 8vo., published in 1789.

SYDENHAM, FLOYER, born in 1710, was educated at Wadham College, Oxford, and took the degree of M.A. in 1734. Having undertaken the laborious and unproductive task of translating Plato into English, he issued proposals for publishing his work by subscription in 1759, accompanied by a 'Synopsis, or General View of the Works of Plato.' The subscribers were few; and some, it is said, failed in their engagements; and after a life of labour and want, he died in old age (April 1, 1787), imprisoned for a debt contracted at the eating-house which he frequented. Melancholy as was his end, it was honoured in its results; for in consequence, 'one of the members of a club at the Prince of Wales Coffee-house proposed that it should adopt as its object some means to prevent similar afflictions, and to assist deserving authors and their families in distress;' and this was the origin of that valuable charitable institution, the Literary Fund, from an account published by which the above quotation is taken. Sydenham is therein characterised as 'a man revered for his knowledge, and beloved for the candour of his temper and gentleness of his manners.'

Between 1759 and 1780 Sydenham published translations of the Io, Greater and Lesser Hippias, Banquet, Rivals, Meno, First and Second Alcibiades, and Philebus, with notes: these are collected in three quarto volumes. These versions were afterwards included by Thomas Taylor in his complete translation of Plato, 1804, revised, and with a selection of the notes. Taylor complains, while paying tribute to Sydenham's natural powers, that from early prejudices, and the pressure of distress, he was unequal to the reception and explanation of 'Plato's more sublime tenets. His translation however of other parts, which are not so abstruse, is excellent. In these he not only presents his reader faithfully with the matter, but likewise with the genuine manner of Plato.' (*Introduction.*)

Sydenham's other works are, 'A Dissertation on the Doctrine of Heraclitus, so far as it is mentioned or alluded to by Plato,' 1775; 'Onomasticon Theologicum, or an Essay on the Divine Names, according to the Platonic Philosophy.'

SYDNEY, the capital of New South Wales, is on the east coast of Australia, in the county of Cumberland: the town is situated on the south side of the beautiful bay called Port Jackson, in 33° 55′ S. lat. and 151° 25′ E. long.

The east coast of Australia, north and south of the entrance to Port Jackson, consists of sandstone cliffs rising precipitously from the water's edge to the height of 200 or 300 feet. On approaching the coast from the east, the line of perpendicular cliffs appears to be continuous; but, on coming nearer, an opening is perceived between two lofty headlands, which are called the North Head and the South Head. Within these headlands, a point of land called Middle Head stretches out from the south side of the bay in such a manner as to protect it completely from the easterly winds and the swell of the Pacific. After passing round Middle Head a capacious bay is seen, which extends in a westerly direction about fifteen miles from the coast, the width varying from about a mile to three miles, with excellent anchorage for the largest vessels. This is Port Jackson, a natural harbour, the finest perhaps in the world. Along the north and south shores of Port Jackson there are numerous coves, or inlets, and there are several islands in it. The north shore is rather high, very rocky, and thickly covered with a dark and stunted vegetation; houses are seen here and there on the margin, each with its small verdant inclosure. The south shore offers more pleasing scenes, cottages on the sandy beach behind South Head, promontories crowned with handsome mansions, surrounded by groves and lawns: on approaching Sydney numerous buildings are seen, inhabited by the civil officers of the colony; the government-house, several windmills on the high ridges near the town, and forts and batteries, completed or in progress, are conspicuous objects. Port Jackson at the entrance is about three-quarters of a mile wide, but it soon spreads out to about three miles. At Sydney the width is a mile and a half. There is a lighthouse on South Head, called Macquarrie Tower, which is visible thirty miles at sea; and not far from it is a signal-station, whence telegraphic communications are made to Sydney of the approach of vessels towards the coast. Fifteen miles inland, at the head of the bay there is a creek, seven or eight miles long, and navigable for boats of 12 or 15 tons burthen. At the head of this creek is the town of Parramatta, and the creek itself is called Parramatta River, from a small but constant stream which flows into it.

Sydney is about seven miles from South Head, on the south shore, and is built partly on the west side of Sydney Cove, but chiefly on the low ground behind two rocky promontories, which are separated by three inlets, Farm Cove, Sydney Cove, and Darling Harbour, or Cockle Bay. Previous to the arrival of Governor Macquarrie in 1810, Sydney was little better than an irregular village of houses, cottages, and bark-covered huts, built by each proprietor in such a situation and in such a manner as suited his convenience. Macquarrie however laid down a plan for the construction of the town, according to which the greater part of it is now built; the principal streets run inland to the south, and are crossed at right angles by others which terminate on the west at the shore of Darling Harbour. The Government House and Government Domain limit the extension of the town to the east and north-east: it extends to the south, from Dawes's Battery to the burial-grounds, nearly three miles. Sydney Cove reaches only a short distance inland: there are two forts at the entrance, Macquarrie Fort at the point of the east promontory, and Dawes's Battery on the ridge of the west promontory. Darling Harbour is much more extensive than Sydney Cove, running inland to the south some distance beyond the town. A finer situation for a large mercantile city can hardly be imagined. The water is deep, the shores are precipitous, and the wharfs so situated that cargoes can be hoisted from the holds of the largest ships up to the floors of the warehouses.

The houses in the principal streets are generally two stories high, but many are three; some are built of brick, some of sandstone, and some are of wood. Many of the shops are fitted up with plate-glass windows, chandeliers, and other decorations, in the most costly style of London or Paris. The side-pavements for foot-passengers are made with small stones, not with flags, but asphalte has been introduced, and is extending.

There are no public buildings in Sydney which particularly merit notice for their architecture. The Government House is beautifully situated on the east side of Sydney Cove: the building has become large by additions, but is of the plainest and simplest kind. The Commissariat Store is an extensive stone building, into which the largest ships may discharge their cargoes. The Military Hospital stands conspicuously on the summit of the high ground between Sydney Cove and Darling Harbour. St. Philip's church, built in 1798, is the oldest in the town. St. James's church is a large but plain brick building, with a lofty and rather handsome spire. St. Andrew's church was building at the latter end of 1841, and is probably now completed. The Roman Catholic chapel, in Hyde Park, is a Gothic edifice of hewn stone, and the most handsome structure in Sydney. The Scotch church is a plain building of freestone, with a square belfry tower. The Independent chapel is also plain, but commodious. The Court House is a large brick building. The Council Chambers, and the Colonial Hospital, near them, occupy a conspicuous situation. The Convict Barracks is a large and commodious structure. A new barracks is building, the cost of which is estimated at 200,000*l.* Sydney College is in Hyde Park. The buildings of the Australian College, which were constructed by the mechanics who accompanied the Rev. Dr. Lang from Scotland, form a splendid row of houses, on the plan of the New Town of Edinburgh. The Asylum for the Aged and Infirm is an extensive building, and there is also a Lunatic Asylum. The market-place consists of four oblong buildings, and is a very convenient structure. Besides this market, which is towards the centre of the town, there is a corn-market and a cattle-market at the south end of the town. All the markets are abundantly supplied. The Royal Victoria Theatre, built in 1840-41, is about the size of the English Opera-house in London.

The population of Sydney, according to the census of June, 1833, was 16,232; consisting of 9813 males, of whom 1855 were convicts, and 6419 females, of whom 885 were convicts. At the beginning of January, 1888, the population had risen to 20,000. The latest census, which we extract from the New Zealand Journal of November 13, 1841, is as follows:—

Born in the colony	7,000
Arrived free	17,332
Others free	3,356
Ticket-of-leave holders	207
Convicts in government employ	1,018
Convicts in private service	1,060
	29,973

From January 1, 1841, to November 30, 1841, there were introduced into New South Wales 16,612 emigrants by government aid. They were taken out in 89 ships of the largest class, from 450 to 1000 tons burthen; of these, 55 landed their passengers at Sydney, and 34 at Port Phillip. In addition to these bounty-emigrants, there were about 2000 others who had no aid, making an addition to the population of New South Wales in eleven months of 19,000. The sum expended by the colonial government in the introduction of these emigrants into the colony was 276,682*l.* In 1833 the number of houses in Sydney was 1800; in October, 1841, the number was 4593, of which 3457 were of stone or brick, and 1136 of wood. Of these houses 102 were uninhabited, and 77 unfinished. The average number of inhabitants to a house was rather more than 6½. Thus in the eight years from 1833 to 1841 the increase of the population of Sydney was 13,741, and the increase in the number of houses in the same period was 2793.

Building-ground in the principal streets of Sydney is enormously dear. House-rent also is exceedingly high.

In 1839 the commerce of Sydney employed 50,000 tons of British shipping, navigated by 3000 seamen; and there were 150 vessels belonging to Sydney, worth 300,000*l.*

In 1833 the mills at Sydney for grinding and dressing grain amounted to 17, namely, 4 worked by steam, 3 by water, 1 by horse-power, and 9 windmills. There were 2 distilleries and 8 breweries. Of manufactories there were 4 soap and candles, 1 hats, 7 coarse woollens, 2 tobacco and snuff, 1 rope, 4 coach, 2 starch, 5 tanneries, and 2 sawing-mills. At Canterbury, 4½ miles from Sydney, a large manufactory for the refining of sugar was erecting in 1841, and is probably now finished. It is calculated to refine ten tons of sugar per day. The reservoir for the supply of the two large steam-boilers holds 9000 gallons of water.

The wages of mechanics average from 5*s.* to 8*s.* a day; and all trades required in house building and furnishing are in great and constant demand. Provisions and fruit are abundant, and at reasonable prices: beef and mutton, according to the season, from 4*d.* to 6*d.* per lb.; pork, 9*d.*; veal, 10*d.*; 2-lb. wheaten loaf, 4*d.*; butter, 2*s.* 3*d.* per lb.; potatoes, 2*d.* per lb., or 14*s.* per cwt.; maize, 5*s.* 6*d.* per bushel; wheat, 9*s.*; English barley, 7*s.* 6*d.*; flour, 22*s.* per cwt.; eggs, 1*s.* 6*d.* per dozen; fowls, 5*s.* a couple; Port

Arthur coals, 16*s.* a ton. Fish is chiefly brought from Botany Bay overland in carts, a distance of seven miles.

In September, 1841, the assets of the Bank of Australasia were 763,673*l.*, the liabilities 342,444*l.*; Commercial Bank, assets 536,599*l.*, liabilities 271,804*l.*; Union Bank, assets 574,915*l.*, liabilities 216,779*l.*; Sydney Banking Company, assets 197,075*l.*, liabilities 42,109*l.*; New South Wales Bank, assets 462,530*l.*, liabilities 255,903*l.*; Bank of Australia, assets 415,047*l.*, liabilities 180,345*l.* The liabilities of these banks consist of notes in circulation, bills, and cash deposited; the assets, of bullion, coin, &c. There is also a savings-bank at Sydney. A mutual insurance company was established in 1840, which, in the year ending August, 1841, had insured property to the amount of 750,725*l.*, the premium received having been 5244*l.*

Sydney is the great emporium of literature for Australia and the neighbouring islands. There are eight newspapers published in the town: one, the Sydney Herald, daily; the rest are mostly thrice and twice a week. The Colonial Society, for concentrating information on colonial subjects, had, in December, 1841, 807 members; the receipts for 1840 were 2361*l.*, the expenditure 1909*l.* There is a flourishing Mechanics' Institute called the School of Arts.

Of scholastic institutions there are the Sydney College, with about 120 scholars, and the Australian College, with about 70. The latter was founded by the Rev. Dr. Lang, in 1833, by means of a loan of 3500*l.* from the colonial government, but only 1800*l.* of the subscription money had been paid up in October, 1841. In 1833 there were in Sydney six free-schools supported by the government, with 450 scholars educated on the Madras system, and there was a female school of industry supported by voluntary contributions, with 22 scholars.

Steam-boats ply daily between Sydney and Hunter's River, and two steam-boats leave Sydney every Sunday morning for Parramatta.

Sydney, being the seat of the colonial government of Eastern Australia, is the residence of the governor, and here the legislative council holds its sittings. It is also the seat of the supreme court of justice and of the police court.

The distance of Sydney from Plymouth by the Cape of Good Hope is about 13,000 miles.

In 1787 the British government had determined to form an establishment in Australia, in order 'to empty the gaols and houses of correction; to transplant the criminals to a place where, by labour, with moral and religious instruction, their conduct may be reformed; to afford at the same time an asylum for free emigrants; and to provide a present relief and future benefit to the mother-country.' With these objects in view Captain Arthur Phillip, of the royal navy, sailed from Portsmouth, May 13, 1787, with 11 ships, intending to settle the colony at Botany Bay, where he arrived January 20, 1788. Botany Bay however was found to be by no means an eligible harbour, being open to the easterly winds, which whenever they blow violently roll in a heavy sea from the Pacific; besides that the land which Sir Joseph Banks had represented as a series of beautiful meadows was found to be nothing but swamps and sand. Captain Phillip sailed immediately in search of a more suitable place of settlement, and fixed in a few days on the locality of the shores of Sydney Cove in the bay of Port Jackson. Port Jackson is said to have derived its name from a sailor of the name of Jackson who first discovered the entrance between the two headlands, and the name of Sydney is stated to have been given to the new town in honour of Lord Sydney, who was a lord of the admiralty (some say, a secretary of state) at the time when Captain Phillip settled the colony on its present site.

(Lang's *History of New South Wales;* Jameson's *New Zealand, South Australia, and New South Wales*, 1842; Wentworth's *Description of New South Wales;* Breton's *Excursions in New South Wales; Sydney Herald*, up to December 23, 1841, &c.)

SYE'NE. [EGYPT.]

SYLBURG (Latinized **SYLBURGIUS**), **FREDERIC**, was born in 1536, in the village of Wetter, near Marburg, whence he generally calls himself Fredericus Sylburgius Veterensis. His father was a farmer in middling circumstances; but the son received a good education, and during the time he spent at the university of Jena, he chiefly devoted himself to the study of Greek under Rhodomannus. After the completion of his academical course, he had the management of several public schools, first that of Lich, in the county of Solms, and then that of Neuhaus, near Worms. But he had no particular liking for the business of teaching, and his occupation took up all the time which he wished to devote to literary labours. Accordingly he gave up his post, and entered into a connection with the printer Andrew Wechel, of Frankfurt on the Main, for whose establishment Sylburg undertook to edit Greek works. He continued at Frankfurt until 1591, when he went to Heidelberg, and formed a similar connection with the printer Hieronymus Commelin. In both places Sylburg, who had the superintendence of the printing of all Greek works, as well as the preparation of them, performed these duties with the utmost accuracy, and showed an extraordinary critical talent in the notes which accompanied almost all his editions. He thus gained great celebrity, and the landgrave of Hessen munificently rewarded him with an annual pension from the funds of the university of Marburg. Further particulars of his life are not known. He died at Heidelberg, on the 16th of February, 1596, as is stated on his tomb-stone, which still exists at Heidelberg.

Sylburg was one of the most eminent and most industrious Greek scholars of the sixteenth century, and the greatest men of the age, such as Casaubon and De Thou, entertained a profound admiration for him. He was a worthy contemporary of Henry Stephens, whose Thesaurus of the Greek language contains many articles by Sylburg. The editions of Greek writers by Sylburg are still very valuable, and in critical accuracy they are not inferior to those of Stephens, although they are not so beautifully printed. Some of his editions have never yet been excelled. His first publications were new editions of some elementary Greek grammars which were then generally used. In 1583 he published, at Frankfurt, in one volume, folio, his edition of Pausanias, with notes by himself and Xylander, and an improved reprint of the Latin translation by Romulus Amaseus. It also contains a dissertation by Sylburg, 'De Grammaticis Pausaniae Anomalis.' The whole was reprinted in 1613. Between 1584 and 1587 he published at Frankfurt a complete edition of Aristotle, in 11 parts, or 5 vols. 4to. This edition only contains the Greek text with the various readings, and is still the best and most correct edition of all Aristotle's works. In 1585 he edited four discourses of Isocrates (ad Demonicum, ad Nicoclem, Nicocles, contra Sophistas), Frankfurt, in 8vo. The year following there appeared by him the first complete edition of the works of Dionysius of Halicarnassus, Frankf., 2 vols. folio. It contains the improved Latin translation of the Roman Antiquities by Gelenius, with very useful notes and indices. This edition has never yet been surpassed: it was reprinted, but very incorrectly, at Leipzig, 1691, 2 vols. folio. From 1588 to 1590, he published, at Frankfort, in 3 vols. folio, the valuable collection of antient writers on the history of Rome, under the title 'Romanae Historiae Scriptores, Latini et Graeci, addita variantis scripturae notatione et notis.' Vol. i. contains the Fasti Capitolini, Messala Corvinus, L. Florus, Velleius Paterculus, S. Aurelius Victor, S. Rufus, Eutropius, Cassiodorus, Jornandes, and Julius Exsuperantius. Vol. ii. contains Suetonius, the Scriptores Historiae Augustae, Ammianus Marcellinus, Pomponius Laetus, J. Bapt. Egnatius, Ausonii Epigrammata in Cæsares, Romanorum Imperatorum Catalogus, and Romanae Urbis Descriptio. Vol. iii. contains the Scriptores Graeci Minores Historiae Romanae, that is, the Fasti Consulares (Greek and Latin), Paeanius, Xiphilinus, Herodian, Zosimus, Julian's Cæsars, Olympiodorus, and extracts from Suidas. In 1590 he published, at Frankfurt, in 4to., the work of the grammarian Apollonius 'De Syntaxi, seu Constructione Orationis.' The last work that he published in the establishment of Wechel was a collection of some Greek gnomic poets, 'Epicae Elegiacaeque Minorum Poetarum Gnomae, Graece et Latine,' Frankf., 1591, 8vo. A second and much improved collection appeared at Heidelberg in the year of Sylburg's death. All the subsequent editions of Sylburg were published in the printing establishment of Commelin at Heidelberg. In 1592 he edited, in 1 vol. folio, the commentary on the Apocalypse, by Andreas Cretensis, in Latin and Greek; and in the same year he published the editio princeps of the Greek text of the work of Theodoretus, entitled 'Remedia contra Morbos Graecos,' with the Latin translation of Zenobius Acciajuoli, and notes by himself. In 1592 he also edited the complete works of Clemens of Alexandria, with notes, folio; and in 1595, in folio, all the works of Justin the Martyr. This edition is founded upon that by Robert Stephens in 1551, but Sylburg improved the text, and added very useful notes: it is still the standard edition. In 1594 he edited the 'Etymologicum Magnum,' in folio, with notes and a very useful index. The year after he edited 'Saracenica, sive Collectio Scriptorum de Rebus ac Religione Turcarum, Graece et Latine,' in 8vo. Among other less important writers, it contains a refutation of Mohammedanism by Euthymius Zigabenus, and a Life of Mohammed by an anonymous Greek writer. Sylburg, on his death, left in MS. a considerable number of materials which he had collected for an edition of Herodotus, and which were afterwards made use of by Jungermann in his edition of Herodotus, Frankfurt, 1608, folio.

(J. G. Jung, *Vita Frederici Sylburgii*, Berleburg, 1745, 8vo.)

SYLFIELLEN. [SWEDEN.]

SYLHET. [SILHET.]

SYLLA. [SULLA.]

SYLLABLE (συλλαβή). A syllable consists of one or more elementary sounds of a language uttered in one emission of voice. The pronoun *I* is an example of a syllable consisting of but one elementary sound; and the syllable *strange* is an example consisting of several elementary sounds articulated (joined) together. Words which consist of one syllable are termed monosyllabic; those consisting of two are termed disyllabic; those of three, trisyllabic; and those of more than three are indefinitely termed polysyllabic.

Spoken language is a system of audible signs for the expression of thought, and written language is a system of signs to express spoken language, so that written language is two removes from thought. Syllables, both as words and as parts of words, belong both to spoken and written language.

In a pronounced syllable two distinct things are observable: viz., 1st, its elementary structure; and, 2nd, the musical properties of the voice, consisting of those distinctions of sound which are described under the general terms pitch, loudness, and quality. Thus in the pronoun *I* we observe the elementary structure to be the diphthongal vowel *I*, as heard in the word *isle* [STAMMER]; and we observe also whether the syllable be said or sung, that is, whether the condition of voice belongs to speech or to song; an accurate observer also perceives the precise degree of pitch and loudness and the character of the quality of voice.

The time which a syllable occupies in pronunciation is termed its quantity. In solemn and stately discourse the quantities of syllables are extended beyond their ordinary length; while in rapid colloquy they are somewhat shortened. The ordinary quantity of a syllable, when neither extended nor protracted, is the sum total of the quantities of its constituent elementary sounds: thus the quantity of the syllable *nine* is the sum total of the quantities of its elementary sounds *n*, *i*, of isle, and *n*.

It would occupy much space to describe the operations of the causes which limit and determine the quantities of syllables. Those causes are, the singleness of the vocal emission, and the elementary structure of the syllable. The elementary sounds and their chief modes of succession in English syllables are described in the article STAMMER.

Syllables are of various lengths, from an extremely short to a very long quantity, as in the examples *it, hot, out, long, length, strength*, which form an increasing series.

In words of more than one syllable, one of them is always made more conspicuous to the ear than the other, by what is termed stress or accent. Stress is produced either by an abrupt percussion of voice, as in the word *pepper*, or by an extended quantity on a swelling loudness of voice, as in the word *amaze*. The stressed syllable of a word is invariably that which receives the modification of voice expressive of sense and feeling, called emphasis.

The metrical arrangement of language depends on the quantity and stress of syllables [PROSODY], both of which are inherent; while the pitch, loudness, and quality of voice in which the syllables are uttered are accidental, and belong to the thought and feeling of the speaker. [ELOCUTION.]

Prosodians commonly classify syllables into long, short, and common. Mr. Herries examines their elemental structure in relation to their capacity for extension, which is an important practical consideration.* His remarks may be generalized by stating that when syllables end with extensible elements, they admit of greater extension throughout, than those syllables which are terminated by inextensible elements.

The late Mr. Thelwall carried this inquiry farther by considering the structure of syllables in relation to the smoothness, harshness, vivacity, &c. of the sound of language, and that not in a vain effort

'To make the sound an echo to the sense,'

but simply to bring them in harmony. His illustrations were taken from Shakspere, Milton, and Dryden. To enter upon this subject would occupy more space than can be allotted to it in a work of this nature.

Dividing words into syllables is a different operation according to the object in view, thus: 1, When a word is pronounced in widely separated syllables, to enable a child to appreciate each, as in uttering the word *provided*, thus, *pro-vi-ded*, by which means a child readily apprehends each successive syllable of the word; 2, When a word is analysed into its component parts, in order to exhibit its etymology, and thus lead to a clear apprehension of its signification, as a whole from knowing that of its parts, as in dividing the word *thermometer*, thus, *thermo-meter;* 3, To divide a word into its syllables, to enable another to write it with correctness, as the word *barometer*, thus, *ba-ro-me-ter*.

The correct use of the alphabet in writing words is termed orthography, and is an important part of grammar. [ORTHOGRAPHY.]

The division of written words into syllables is an attempt to exhibit the audible syllables to the eye, and is attended with many difficulties, as the varied divisions in the several dictionaries manifest. Those who seek further information may consult with advantage the principles of pronunciation prefixed to Walker's 'Pronouncing Dictionary;' Herries's 'Elements of Speech;' Thelwall's 'Essay introductory to his Illustrations of English Rhythmus;' Roe's 'Elements of Rhythm;' and Chapman's 'Music and Melody of the English language.'

SYLLIS, Savigny's name for a genus of Dorsibranchiate Annelids, which have tentacles unequal in number, and articulated in chaplets, as well as the upper cirrhi of their feet, which are very simple and have only one packet of bristles (soies).

Example, *Syllis monilaris.* [ANNELIDA; DORSIBRANCHIATA.]

SYLLOGISM (συλλογίσμος). The object and character of logic are explained under the word ORGANON; the present article is devoted to the formal part of the science, which consists entirely in the treatment of the syllogism, and the reduction of fallacy to rules of detection. Every sentence in which different assertions are combined to produce another and a final assertion, is either a syllogism, a collection of syllogisms, or a mass of words without meaning and when we separate the constituent assertions, and write the whole under the forms of logic, we are not thereby ceasing to consider the sentence which contains those assertions, or, as many fancy, dealing with a new species of ratiocination. All that is called reasoning, and which cannot be made syllogistic, is not reasoning at all; and all which cannot easily be made syllogistic, is obscure: for the syllogism is the simple form in which the act of reasoning is an act of intuition.

Aristotle defines syllogism thus: 'Syllogism is speech or language in which certain things being assumed, something different from what is assumed results by virtue of the assumption; and, by virtue of the assumption, I mean it results through the assumption; and, by through the assumption, I mean that no external term is required in order to there being a necessary result.' (*Analyt. Prior.*, i. 1.)

So easy indeed is the deduction, when the premises are properly disposed as preparatory to a syllogism, that many persons doubt the utility of the syllogism altogether. With these we are not now arguing: we shall only observe that he must be fortunate in the clearness of his mind, who, knowing the logical mode, is never obliged to have recourse to it to destroy ambiguity or heighten evidence; and particularly so in his opponents, who, in verbal or written controversy, never finds it necessary to employ it in trying their arguments. The syllogism is the instrument of self-examination, and the weapon of last resort in dispute: and a bad syllogism, with one of the premises implied only, and not expressed, is the first resource of fallacy; which last is sometimes even allowed to remain unrefuted, by neglect of placing it in a logical form. To bring forward the suppressed premiss is the visible destruction of every argument which is logically bad. As an instance, take the following in a letter from Cardan to Tartalea: 'Neither am I moved with envy, *for* if you are either equal to, or less than myself, I have no cause for it; and, if you be greater in this art, I ought to endeavour to equal you, and not to speak evil of you.' This is meant for reasoning, and there are two syllogisms with suppressed premises, or rather two sorites (a term presently explained), with a suppressed premiss in each. In one case Cardan assumes that he does not envy Tartalea because he *need* not; in the other, that he does not because he *ought* to do otherwise: if he meant to assume and assert that he never did anything which he had no need to do, and always did everything which he ought to do, his reasoning is logical: but if he would have hesitated to make these assertions, he was then writing fallacy. In justice to Cardan's logic however, it is but fair to say that he was not the man to hesitate at either assertion. [CARDAN.]

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* 'The Elements of Speech,' by John Herries, A.M., London, 1773, 8vo., pp. 260.

Every sentence in which the conclusion is a necessary consequence of previous assertions contained in that same sentence, is a syllogism, provided that the conclusion be obtained from two distinct assertions, and two only. Thus 'Some As are Bs, for every B is A,' is not a syllogism, though logically true [CONVERSE]. Every assertion may be reduced to one of four forms, the universal affirmative, the universal negative, the particular affirmative, and the particular negative. From these, by combination, all syllogisms are derived; and the laws of combination, and the manner of expressing them, constituted that branch of science which is now often turned into ridicule, particularly as to its notation, and the strange and uncouth words by which the species of syllogisms were denoted. The following letters always signify the several species of propositions:—

A, the universal affirmative; every X is Y.
E, the universal negative; no X is Y.
I, the particular affirmative; some Xs are Ys.
O, the particular negative; some Xs are not Ys.

Since every conclusion must be drawn from the comparison of two things with a third, a syllogism consists of two propositions, in each of which the same term occurs compared with another: this term is called the *middle term.* Thus in

Every Y is X,
Every Z is Y,
Therefore Every Z is X,

Y, the subject of the first assertion, and the predicate of the second, is the middle term. The two first assertions are the *premises*, the third is the *conclusion.* The predicate of the conclusion is called the *major term;* the subject of the conclusion, the *minor term:* and the major or minor premiss is that which contains the major or minor term of the conclusion. The major premiss is always written first.

The order of the terms in the premises and conclusion must be either

I.	II.	III.	IV.
YX	XY	YX	XY
ZY	ZY	YZ	YZ
ZX	ZX	ZX	ZX;

and these are called the four *figures.* The three first are in Aristotle, the fourth was by tradition ascribed to Galen, and was called Galenic. In the first figure the middle term is the subject of the major, and the predicate of the minor; in the second, the predicate of both; in the third, the subject of both; in the fourth, the predicate of the minor and the subject of the major. Every particular case of a figure is called a *mood;* and since either of the premises may be either of the four species of propositions, A, E, I, O, it follows that there are sixteen moods in each figure, or sixty-four possible moods in all. But of these, many are inconclusive, and many moods which admit of conclusion in one figure do not in another. Thus the mood in the example above is AA, and if we apply it in the four figures, we have:—

Every Y is X	Every X is Y	Every Y is X	Every X is Y
Every Z is Y	Every Z is Y	Every Y is Z	Every Y is Z.

The first has a conclusion; every Z is X. The second has none; that is, for anything to the contrary contained in the premises, we may either say every Z is X, no Z is X, some Zs are Xs, or some Zs are not Xs. It also admits every X is Z, but here Z is the major term, and not X; and it is of the first figure, with the premises transposed, and not of the fourth. The third admits a conclusion; some Zs are Xs. The fourth also admits a conclusion; some Zs are Xs. Consequently the first figure has a syllogism AAA, the third and fourth have AAI.

If all the sixty-four cases be examined (a most useful exercise) it will be found that the following syllogisms are valid. We arrange them first by figures, then by moods.

First figure; AAA, EAE, AII, EIO.
Second figure; EAE, AEE, EIO, AOO.
Third figure; AAI, IAI, AII, EAO, OAO, EIO.
Fourth figure; AAI, AEE, IAI, EAO, EIO.

The following is the statement by moods:—

$(AA)A_1I_3I_4$, $(AE)E_2E_4$, $(AI)I_1I_3$, $(AO)O_2$
$(EA)E_1E_2O_3O_4$, $(EI)O_1O_2O_3O_4$.
$(IA)I_3I_4$,
$(OA)O_3$

Here, for instance, we express by $(IA)I_3I_4$ that the mood IA never proves anything but I, and that only in the third and fourth figures. From the preceding we may collect that—

As to figures: any proposition may be proved in the first; none but negatives in the second; none but particulars in the third; and everything but the universal affirmative in the fourth.

As to moods: from premises both negative or both particular, no conclusion follows: where one premiss is negative, the conclusion is negative; and where one premiss is particular, the conclusion is particular.

In order to remember the figures certain words have been long used by writers on logic, which make a grotesque appearance; but if the reader will tolerate them till we have gone through an example of each syllogism, he shall see that those who made them were at least as good wits as those who laugh at them. The magic words of the fourth figure are different in different writers; we have taken those used by Dr. Whateley.

First figure; Barbara, Celarent, Darii, Ferio.
Second figure; Cesare, Camestres, Festino, Baroko.
Third figure; Darapti, Disamis, Datisi, Felapton, Bokardo, Feriso.
Fourth figure; Bramantip, Camenes, Dimaris, Fesapo, Fresison.

Thus the vowels AAA are seen in *Barbara*, AII in *Datisi*. The following are instances of each form, with an example which may easily be reduced to the form.

First figure.

Barbara. Every Y is X, every Z is Y, therefore every Z is X. *Example.* They must, as men, have faults: or all men have faults, these persons are men, therefore these persons have faults; strictly, all men *are* persons having faults, &c.

Celarent. No Y is X, every Z is Y, therefore no Z is X. *Ex.* Those who bribe should not, any more than other lawbreakers, be exempt from punishment.

Darii. Every Y is X, some Zs are Ys, therefore some Zs are Xs. *Ex.* Exploded doctrines are sometimes true, because capable of proof.

Ferio. No Y is X, some Zs are Ys, therefore some Zs are not Xs. *Ex.* Some of the earlier principles of science are not well appreciated for want of attention to the usual modes of operation of the mind.

Second Figure.

Cesare. No X is Y, every Z is Y, therefore no Z is X. *Example.* The presence of horns in this species, and their absence in the other, is a complete distinction between the two.

Camestres. Every X is Y, no Z is Y, therefore no Z is X. The last example will do: this mood is only a consequence of the convention by which the major premiss is to be written first, and of the convertibility [CONVERSE] of the universal negative proposition.

Festino. No X is Y, some Zs are Ys, therefore some Zs are not Xs. *Ex.* Persons who pretend to form an opinion on philosophical subjects are oftentimes incapable of doing it properly, from want of acquaintance with the exact sciences. This example is given purposely, as falling more naturally into another figure, though capable of expression in this.

Baroko. Every X is Y, some Zs are not Ys, therefore some Zs are not Xs. *Ex.* None but the industrious can succeed, so that there must be many failures.

Third figure.

Darapti.—Every Y is X, every Y is Z, therefore some Zs are Xs. *Ex.* Politics and literature are not necessarily incompatible, for many persons can be named who have cultivated both.

Disamis.—Some Ys are Xs, every Y is Z, therefore some Zs are Xs. *Ex.* Many things inexpedient, because wrong, are apparently useful.

Datisi.—Every Y is X, some Ys are Zs, therefore some Zs are Xs. The last example will do for this also.

Felapton.—No Y is X, every Y is Z, therefore some Zs are not Xs. *Ex.* There are organized bodies to whose existence air is necessary, and which have no locomotive power, as plants, for instance.

Bokardo.—Some Ys are not Xs, every Y is Z, therefore some Zs are not Xs. *Ex.* Even industry does not always succeed, for men of great research have been mistaken.

Feriso.—No Y is X, some Ys are Zs, therefore some Zs are not Xs. *Ex.* It is not true that all who gave evidence were present, for A, B, C, &c. were many miles off.

Fourth figure.

Bramantip.—Every X is Y, every Y is Z, therefore some Zs are Xs. *Ex.* Among repulsive things are the sciences themselves, for they are all difficult.

Camenes.—Every X is Y, no Y is Z, therefore no Z is X. *Ex.* No perfect being can be man, for all men are subject to decay, the unfailing mark of imperfection. This example would do very well as one of the most common species of fallacy, that in which the middle term is used in different senses, so that there is in fact no middle (or *common* middle) term. We have seen this argument used somewhere, 'perfect being' meaning '*morally* perfect being,' and 'imperfection' including *physical* as well as *moral* imperfection.

Dimaris.—Some Xs are Ys, every Y is Z, therefore some Zs are Xs. *Ex.* Some writers who repeat themselves are amusing, for every prolix writer does it, and the most attractive books are not always the shortest.

Fesapo.—No X is Y, every Y is Z, therefore some Zs are not Xs. *Ex.* Some things which are not much written about are not worth learning; not that this circumstance is otherwise an index, except in this manner, that all really useful learning has its opponents, and it is only where there is opposition that much discussion ever takes place. Here is a good instance of the case in which the premises both yield the conclusion, and explain the sense in which it is to be taken: the preceding is no syllogism unless the 'writing about' the subject in the conclusion mean writing about not the subject itself, but whether it be useful or not.

Fresison.—No X is Y, some Ys are Zs, therefore some Zs are not Xs. *Ex.* Some things which are cried up can hardly be relics of antiquity, for they are valueless. Here is an instance of an argument which, logically undeniable, may be disputable as to the *matter*. One of the premises is 'no relic of antiquity is valueless,' which many may be found to deny.

Some other forms have been given, but they are only some of the preceding with the premises transposed, and which therefore do not obey the conventional rule relative to the precedence of the major premiss: as, for instance, one named *Baralipton* (AAI, the last syllable being only a termination) which we may mention particularly, inasmuch as this word has been very often quoted as a specimen of logical terms. It runs as follows:—Every Y is X, every Z is Y, therefore some Xs are Zs. Transpose the premises, and we have the first syllogism of the fourth figure.

Of all the four figures the first is the most natural, and every mood of the other three can be reduced to one of the first, in one of the following ways. It will be seen that every name in the last three figures begins with one of the initial letters of the first, and thus it is pointed out to which mood of the first figure each is reducible. Thus Cesare, Camestres, and Camenes are those which are reducible to Celarent of the first figure.

The other significant letters of the descriptive words are *m, s, p, k,* wherever they occur. By *m* it is implied that the premises are to be transposed; by *s* that the premiss marked by its preceding vowel is to be converted, whence *s* follows only E and I [CONVERSE]; by *p* that the conversion is to be made in a limited manner, or *per accidens* [CONVERSE]; and by *k* that the reduction is made by what is called the *reductio ad impossibile*, a term which we now explain. It means that the syllogism can be replaced by one in the first figure, which proves, not the truth of the conclusion, but the falsehood of its contradictory. [CONTRARY AND CONTRADICTORY.] For example, take the syllogism *Baroko*, or

Every X is Y,
Some Zs are not Ys,
Therefore Some Zs are not Xs.

If the conclusion be denied, it must be by affirming that Every Z is X. Let this be so, then we must have the syllogism *Barbara* as follows:—

Every X is Y,
Every Z is X,
Therefore Every Z is Y.

But, by hypothesis, some Zs are not Ys, whence this conclusion contradicts one of the admitted premises, or must be false. One, then, of the premises which gives it must be false; but since Every X is Y is supposed true, it must be Every Z is X, which is false, or Some Zs are not Xs, which is true. This is a specimen of the persevering determination of the older logicians to make everything reducible to the first figure.

It appears then that few words have ever been invented which have really so much meaning as the now despised appellations of syllogisms. Take, for example, *Disamis* every letter is a sentence. D means that the mood of the first figure into which this can be reduced is Darii; I, that the major premiss is a particular affirmative proposition; S, that the reduction requires the major premiss to be simply converted; A, that the minor is a universal affirmative; M, that the reduction requires the transposition of the premises; I, that the conclusion is a particular affirmative; S, that the conclusion must be simply converted. We thus change

DISAMIS.		DARII.
Some Ys are Xs,		Every Y is Z,
Every Y is Z,	into	Some Xs are Ys,
Some Zs are Xs,		Some Xs are Zs.

A *proper* mood was one in which one of the premises spoke of a single subject, as in 'All Frenchmen talk French, Pierre is a Frenchman, therefore Pierre talks French.' There was much discussion as to whether such a proposition as 'Pierre is a Frenchman' was a universal affirmative or not, it being obvious on all sides that, whether or no, it would have in deduction all the properties of a universal affirmative.

An *enthymeme* is a syllogism in which one premiss is obviously implied, and is the form in which argument is commonly given. For example, 'He isn't here; I don't see him,' implies that the speaker would affirm himself certain of seeing him if he were there, and is an enthymeme which, with the suppressed premiss restored, makes the following syllogism:—

Fig. 2.	A	All that is here	is seen by me.
Camestres.	E	He	is not seen by me.
Therefore	E	He	is not here.

The *sorites* is a collection of *Barbara* syllogisms, in which the suppressed conclusion of the first is a premiss of the second, that of the second a premiss of the third, and so on; as in A is B, B is C, C is D, D is E, therefore A is E. Here are three syllogisms, namely,

A is B	A is C	A is D
B is C	C is D	D is E
A is C	A is D	A is E

Various attempts were made to classify the manners in which common argument is to be expressed syllogistically. The only difficulty is to reduce the expressions to the pure form of simple assertion or negation. An oblique syllogism was one in which one of the oblique cases enters the premises in such a manner as to vitiate the purity of the form. For instance,

The thoughts of man govern his actions,
John is a man,
Therefore John's thoughts govern his actions.

As it stands, this is not strictly a syllogism, and some less idiomatic expressions must be adopted before it can be turned into one. As,

(Every man) is { a being whose thoughts govern his actions,
John is a man,
Therefore John is a being, &c.

The same thing occurs in a *modal syllogism*, which is one in which some modifying expression gives more or less of force to one or both premises. As

Probably Every Y is X,
Every Z is Y,
Therefore Probably Every Z is X.

If we consider both matter and form, we have here merely a syllogism in which one premiss is only probable. [PROBABILITY, p. 28.] But, considering form only, the perfect deduction may be made as follows:—

Every Y is { a thing which is more likely than not to be X,
Every Z is Y, therefore every Z is [a thing, &c.]

The *inductive* syllogism is merely one in which one of the premises is proved by induction, or by separate proof of every instance: as when the Ys are known to be A, B, and C, and no more, and Every Y is X is shown by proving separately that A is X, B is X, C is X. There is nothing peculiar to the syllogism here. [INDUCTION.]

The *hypothetical* syllogism (so called) is one in which the truth of one proposition is stated to depend solely on that of another; so that the first can be affirmed as soon as the second is known to be true, or the second can be denied as soon as the first is known to be false. Thus,

If A be B, C is D,
But A is B, therefore C is D.
Or, If A be B, C is D,
But C is not D, therefore A is not B.

Whenever a proof is complete, except in one proposition—when, for example, we have fully made out that C is D, except only in this that the proposition 'A is B' is not yet proved, the first member of the hypothetical syllogism lays down the state of the argument. When all that will prove a proposition is true, the proposition itself is true, whence there is only need to affirm the one doubtful premiss, to make the conclusion a logical consequence. Again, when a proposition is false, some part of any logical proof must be deniable: hence there is only need to deny the conclusion in order to make the one doubtful premiss logically deniable.

The *conditional* syllogism is reducible to an hypothetical one. It is when, under certain circumstances, the first member affirms a proposition, as in Wherever A is B, C is D.

The *dilemma* is a double or other compound syllogism, in which two or more contradictory propositions form each a conclusion with other propositions, so that from those other propositions necessarily follows one or other of the conclusions: because of contradictory propositions one must be true. It is not therefore a syllogism, but a collection of them. For example, 'He must either have been for, against, or neuter: if for, he was unjust; if neuter, he was mean; if against, he was false: therefore he must have been either unjust, mean, or false.' This presumes the existence of a premiss for each conclusion; as for example, that the cause is that of oppression, that he is so circumstanced that nothing but fear or favour could prevent him from taking part with the right, and that he has pledged himself to the wrong.

The rules of syllogism may be briefly condensed as follows:—

1. One at least of the premises must be affirmative, and one at least universal; 2, the middle term must enter universally in one of the premises; and 3, the conclusion must not speak of any term in a wider sense than it was spoken of in the premiss in which it entered. A term universally spoken of is either the subject of a universal affirmative, or the predicate of any negative.

The first rule is derived from observation, but might be demonstrated. The second is seen thus: if the middle term were not universally spoken of in one premiss, there might be in reality no middle term, or nothing with which to compare the major and minor term. Thus if we attempt to infer anything from Every X is Y, some Ys are not Zs, we merely see that all the Xs are so many of the Ys, or make up a part of the Ys. Some of the Ys (another portion, it may be) are not Zs, so that the common term does not exist, or may not exist. The third rule is obvious, for no more can be made of any assertion than it contains, and an argument which asserts something about every X from premises which only mention some Xs, must be illogical.

The various species of fallacies must consist either in the introduction of unproved propositions, or an illogical use of those which are proved. We do not feel it necessary to extend this article by entering into the usual classification of them.

SYLVE'RIUS, son of Bishop Hormisdas, and a native of Campania, succeeded Agapetus as bishop of Rome, A.D. 535. Theodatus, the Gothic king of Italy, is said to have influenced his election. Soon after, Belisarius came with an army sent by the emperor Justinian, defeated the Goths, and took possession of Rome. Vigilius, a deacon of Rome, intrigued with the court of Constantinople to have Sylverius deposed, on the pretence that he favoured the Goths, and Sylverius was accordingly seized by order of Justinian, and sent into exile to Patara, A.D. 537, where he soon after died, and Vigilius was put in his place. (Platina and Panvinio, *Le Vite dei Pontefici*.)

SYLVESTER I. succeeded Melchiades as bishop of Rome, A.D. 314. The Christian church was now in the ascendant throughout the Western world, under the protection of the emperor Constantine. By Constantine's orders a council was assembled at Arelatum (Arles), A.D. 314, at which some deputies of the bishop of Rome were present, and in which the Donatists were condemned. [DONATISTS.] But the principal event of Sylvester's pontificate was the great council of Nicæa, A.D. 325, which defined the articles of the Christian faith, and also determined the order of the hierarchy in the various provinces of the empire. The bishop of Rome was thereby made primate over the sees of the provinces styled Suburbicariæ, which, under the new distribution of the empire made by Constantine, were placed under the jurisdiction of the Vicarius Urbis, or imperial vicar of Rome. Sylvester did not repair to the council, but sent thither two presbyters as his deputies, Vitus and Vincentius, who do not appear to have had any particular distinction or post of honour in the assembly. [POPE.] The story of the donation made by Constantine to Pope Sylvester of temporal jurisdiction over the suburbicarian provinces is now universally rejected as apocryphal; it may have originated from the church chroniclers confounding the temporal with the spiritual jurisdictions.

Constantine made a short residence at Rome in Sylvester's time, A.D. 326, but soon left it, being, it seems, dissatisfied with his reception by the people. [CONSTANTINUS, FLAVIUS VALERIUS.] The papal historians speak of numerous churches raised and endowed by Constantine at or near Rome. [LATERAN.]

Sylvester died A.D. 335, and was succeeded by Marcus. His supposed epistles and decretals are now considered apocryphal. (Platina and Panvinio, *Vite dei Pontefici*; Walch, *History of the Popes*.)

SYLVESTER II. [GERBERT.]

SYLVESTER, styled III., Antipope, was proclaimed pope by a faction in Rome in opposition to Benedict VIII., A.D. 1013; but after a few weeks a fresh tumult in Rome drove away Sylvester, and reinstated Benedict.

SY'LVIA. [SYLVIADÆ.]

SY'LVIADÆ, Mr. Vigors's name for a family of *Dentirostres*, the second tribe of his order INSESSORES.

Mr. Vigors remarks that the *Sylviadæ*, the *Warblers* of our British ornithologists, assimilated as they are to the MERULIDÆ in the sweetness and compass of their vocal power, are separated from that family chiefly by their more delicate structure and more subulate bill. That portion of the Linnean *Motacilla*, or rather of the *Sylvia* of Latha he observes, which Bechstein has separated from the gen under the title of *Accentor*, in conjunction with that whic embraces *Sylvia luscinia* [NIGHTINGALE], appears to be the group most nearly approaching the *Thrushes* by the comparative strength of its formation. Here also, perhaps, he thinks we may find the *Hylophilus*, Temm., of the New World, and the IORA, Horsf., of the East, to be united by their stronger bills. Hence, he continues, a number intervening groups (among which BRACHYPTERYX, and that which includes *Sylvia rubecola*, the *Redbreast*, are specially noticed by him) conduct the inquirer by their gradually lessening bill and more slender form to those birds in which the delicate body, the tapering legs, and the gracile and subulate bill point out their typical supremacy in the family. To these latter groups he considers *Melizophilus*, Leach, the *Dartford Warbler*, and *Malurus*, Vieill., the representative of *Sylvia* in Australasia (in both of which the bill deviates from that of the conterminous genera in the culmen being somewhat arched), nearly allied, and also the **Wrens** (*Troglodytes* and *Regulus*, Cuv.). To these he makes succeed a number of groups whose lengthened *tarsi* indicate that their natural station is on the ground, such as *Budytes*, Cuv.; the true *Motacilla* of authors; and *Enicurus*, Temm.; and here he would add *Megalurus*, Horsf., and *Anthus*, Bechst., which unite, in his opinion, the *Dentirostres* with the *Conirostres*, by means of the larks, **Alauda** of authors. [Larks.] Mr. Vigors then states that *Saxicola*, Bechst., is nearly allied to the larks in its terrestrial habits and general conformation; but which, by its increasing bill, brings us round to the earlier groups of the present family, and thence to the *Merulidæ*, with the section *Saxicoles*, of which it is, he thinks, nearly connected. The circular disposition by which the extremes of different families may be brought into contact with each other, explains, in his view of the case, the manner in which the genus *Saxicola*, the section of *Merles Saxicoles*, the genus *Myiothera*, and the more delicate forms of *Thamnophilus*, all birds decidedly approaching each other, yet belonging to the different families of *Sylviadæ*, *Merulidæ*, and *Laniadæ*, still preserve their union, and are brought together into a conterminous assemblage.

The true *Wrens* display, in his opinion, so close a similarity in their general appearance and habits to *Parus*, Linn., the *Titmouse*, that we may at once acknowledge the affinity between the latter family and the **Pipridæ**, upon which family he enters by the **Titmice**. (*Linn. Trans.*, vol. xiv.)

Mr. Swainson also places the *Sylviadæ* in the dentirostral order. 'The chief peculiarity,' says that zoologist, 'which runs through this numerous family, is the very small size and delicate structure of its individuals. Excepting the humming-birds, we find among these elegant little creatures the smallest birds in the creation. The diminutive golden-crests, the nightingale, the white-throat, and the wood-wren, are all well-known examples of genuine warblers, familiar to the British naturalist. The groups of this extensive family, spread over all the habitable regions of the globe, are destined to perform an important part in the economy of nature: to them appears intrusted the subjugation of those innumerable minute insects which lurk within the buds, the foliage, or the flowers of plants; and thus protected, escape that destruction from swallows to which they are only exposed during flight. The diminutive size of such insects renders them unfit for the nourishment of the thrushes and the larger insectivorous birds, while their number and variety only become apparent when the boughs are shaken and their retreat disturbed. How enormous then would be their multiplication, had not nature provided other races of beings to check their increase? No birds appear more perfectly adapted for this purpose than are the warblers.' Mr. Swainson then notices their arrival, for the most part, on the first appearance of spring, when the insect-world is called into life and activity by the renewal of vegetation; and their departure towards autumn, when the insect-hosts diminish, and consequently no longer require the agency of these little birds to keep their numbers within due bounds. He remarks, that as different localities are assigned to different tribes of insects, so a similar diversity of haunts is allotted to the various groups of warblers. Thus the gold-crests and wood-warblers (*Sylvianæ*) confine themselves principally to the higher trees, where they search for winged insects among the leaves, or capture them, like the flycatchers, when attempting to escape. The reed-warblers and the nightingales (*Philomelinæ*) haunt, he observes, the vicinity of waters or the more dense foliage of hedges, for insects peculiar to such situations. The stonechats (*Saxicolinæ*), on the contrary, prefer, he remarks, dry commons and wide extended plains, feeding on insects appropriated to those localities; while those insects which affect humid and wet places are the chosen food of the wagtails and titlarks (*Motacillinæ*); and, lastly, he points out that the *Parianæ*, or titmice, search assiduously among the buds and tender shoots of trees, thus destroying a multitude of hidden enemies to vegetation.

Mr. Swainson thus arranges this family, 'marked by peculiarities of habit no less than by a variation of structure applied to such habits:'—

Circles.	Sylviadæ, or *Warblers*.	Subfamilies
1. *Typical.*	Bill very slender, compressed; lateral toes equal.	Sylvianæ.
2. *Subtypical.*	Bill and general structure more robust.	Philomelinæ
3. *Aberrant.*	Bill depressed at its base; legs lengthened; strong.	Saxicolinæ.
	Claws lengthened, and but slightly curved; live upon the ground.	Motacillinæ
	Bill strong, almost entire; hinder toe and claw large.	Parianæ.

Of this group the *Motacillinæ*, in Mr. Swainson's opinion, form the most aberrant division. Purely insectivorous, they are, he remarks, well exemplified by the four common and well-known species distributed through this country and Europe generally. 'They live,' says Mr. Swainson, 'almost entirely upon the ground, where alone they seek their food, which consists entirely of insects: damp meadows, and the sides of standing or running waters, are the favourite haunts of these birds; and they run with such celerity, that, in this respect, as well as in their general black and white plumage, they can only be compared to the plovers.' He considers them, in fact, as collectively representing the tenuirostral type of the perchers; or, what is the same, the grallatorial type among birds. [Wagtails.]

Mr. Swainson enters among the *Parianæ*, or tits, by the American genus *Seiurus* [Titmice]; and among the true warblers (*Sylvianæ*) by the genus *Culicivora*, comprising the gnat-snappers. He then treats of the *Philomelinæ*, or nightingale warblers, and concludes his inquiry by an examination of the fifth 'or grallatorial genus,' the *Saxicolinæ*. [Warblers.]

The union of all these subfamilies is, in Mr. Swainson's view of the case, effected by the *Gryllivoræ*, a genus of *Saxicolinæ* uniting to *Enicurus*, which stands at the confines of the wagtails (*Motacillinæ*).

The following genera are comprised under this family, according to Mr. Swainson's arrangement:—

Sylviadæ.

Family Character.—Size universally small. Bill very slender, distinctly notched. Feet formed for walking, perching, or climbing. Tarsus slender, lengthened. Sw.)

Subfam. *Saxicolinæ*, Stonechats.

Subfamily Character.—Bill depressed at the base: gape with diverging bristles. Feet lengthened. Tail rather short. Head large.

Genera:—*Gryllivora*, Sw.; *Thamnobia*, Sw.; *Saxicola*, Bechst.; *Erythaca*, Bechst. (*Robins*) (with the subgenera *Erythaca*, Sw., and *Sialia*, Sw.); *Petroica*, Sw.

Subfam. *Philomelinæ*, Nightingales.

Subfamily Character.—General structure larger and more robust than the typical warblers. Feet formed for perching.

Genera:—*Phœnicura*, Sw. (*Redstarts*); *Philomela*, Antiq. (*Nightingales*); *Curruca*, Bechst.; *Bradypetus*, Sw.; *Agrobates*, Sw.

Subfam. *Sylvianæ*, True Warblers.

Subfamily Character.—Size very small. Structure weak. Bill very slender, straight, and with the under mandible much thinner than the upper. (Sw.)

Genera:—*Orthotomus*, Horsf.; *Malurus*, Vieill. (with the subgenera *Hemipteryx*, Sw.; *Drymoica*, Sw.; *Melizophilus*, Leach; *Malurus*, Vieill.); *Sylvia*, Lath. (with the subgenera *Sylvia*, *Acanthiza*, Horsf. and Vigors; *Regulus*, Ray; and *Cyanotis*, Sw.); *Culicivora*, Sw.; *Praticola*, Sw.

Subfam. *Parianæ*, Titmice.

Subfamily Character.—Bill either entire or very slightly notched, more or less conic. Tarsus never shorter than the hind-toe, which is large and strong. Lateral toes unequal. (Sw.)

Genera:—*Setophaga*, Sw.; *Sylvicola*, Sw. (with the subgenera *Dumecola*, Sw.; *Sylvicola*, Sw.; *Vermivora*, Sw.; *Mniotilta*, Vieill.; *Zosterops*, Horsf. and Vigors); *Parus*, Linn. (with the subgenera *Ægithina*, Vieill.; *Ægithalus*, Vig.; *Parus*, Linn.; *Parisoma*, Sw.; and *Hylophilus*, Temm.); *Accentor*, Bechst. (with the subgenus *Seiurus*, Sw.); *Trichas*, Sw.

Subfam. *Motacillinæ*, Wagtails.

Subfamily Character.—Bill lengthened; very straight and slender. Legs long, formed for walking. The hind-toe much longer than the rest. Wings pointed. Tail narrow, and much lengthened. (Sw.)

Genera:—*Lessonia*, Sw.; *Budytes*, Cuv.; *Motacilla*, Linn.; *Enicurus*, Temm.; *Anthus*, Bechst.

The family stands between the *Merulidæ* and the *Ampelidæ*. (*Classification of Birds.*)

The *Calamoherpinæ*, *Sylvinæ*, *Saxicolinæ*, *Motacillinæ*, *Parinæ*, and *Sylvicolinæ* are arranged by the Prince of Canino under his family of *Turdidæ*. [MERULIDÆ.]

Mr. G. R. Gray makes the *Sylviadæ* the first family of his third tribe (*Dentirostres*) of *Insessores*, with the following subfamilies:—

1. *Malurinæ*.

Genera:—*Orthotomus*, Horsf. (Edela, Less.); *Prinia*, Horsf.; *Drymoica*, Sw. (*Sylvia*, Lath.); *Cyanotis*, Sw. (*Sylvia*, Vieill., *Tachuris*, D'Orb.); *Regulus*, Gray; *Bradypterus*, Sw. (*Sylvia*, Vieill., *Cysticola*, Less.); *Apalis*, Sw.; *Praticola*, Sw. (*Calamanthus*, Gould, *Anthus*, Vig. and Horsf.); *Cysticola*, Less. (*Salicaria?* Gould, *Sylvia*, Temm.); *Melizophilus*, Leach (*Motacilla*, Gm.); *Hemipteryx*, Sw. (*Sylvia*, Vieill., *Cysticola*, Less.); *Stipiturus*, Less. (*Drymoica*, Sw., *Sylvia*, Lath., *Malurus*, Temm.); *Malurus*, Vieill. (*Motacilla*, Gm.); *Cincloramphus*, Gould (*Megalurus*, Vig. and Horsf.); *Sphenura*, Licht. (*Turdus*, Lath., *Malurus*, Temm.); *Megalurus*, Horsf. (*Malurus*, Reinw.); *Yuhina*, Hodgs. With reference to *Yuhina*, Mr. Gray remarks that it is the same perhaps as the preceding genus.

2. *Sylviinæ*.

Genera:—*Cettia*, Bonap. (*Sylvia*, Marm., *Salicaria?* Gould); *Pseudo-Luscinia*, Bonap. (*Sylvia*, Savi.); *Locustella*, Ray (*Sylvia*, Lath., *Salicaria*, Selby, *Calamoherpe*, Brehm, *Curruca*, Sw., *Arundinaceus*, Less.); *Calamodyta*, Bonap. (*Sylvia*, Temm., *Arundinaceus*, Less.); *Acrocephalus*, Naum. (*Calamoherpe*, Boie, *Motacilla*, Linn., *Salicaria*, Selby, *Curruca*, Sw., *Arundinaceus*, Less.); *Hippolais*, Brehm (*Asilus*, Bechst., *Arundinaceus*, Less., *Motacilla*, Linn.); *Regulus*, Ray (*Motacilla*, Linn.); *Phyllopneuste*, Mey. (*Sylvia*, Lath., *Phylloscopus*, Boie, *Asilus*, Briss., *Trochilus*, Lafr.); *Sylvia*, Lath. (*Philomela*, Sw.); *Curruca*, Briss. (*Motacilla*, Gm., *Sylvia*, Lath.); *Nisoria*, Bonap. (*Curruca*, Brehm, *Philomela*, Sw.); *Luscinia*, Briss. (*Philomela*, Sw., *Daulias*, Boie, *Motacilla*, Gm., *Sylvia*, Lath.).

3. *Saxicolinæ*.

Genera:—*Copsychus*, Wagl. (*Gracula*, Gm., *Gryllivora*, Sw., *Cercotrichas*, Boie, *Lalage* (Boie), Sundev., *Kittacincla*, Gould, *Notodela*, Less.); *Ruticilla*, Ray (*Ficedula*, Bechst., *Phænicura*, Sw., *Motacilla*, Linn.); *Cyanecula*, Briss. (*Pandicilla*, Bl., *Motacilla*, Linn., *Sylvia*, Lath.); *Calliope*, Gould (*Accentor*, Temm., *Motacilla*, Linn., *Turdus*, Gm.); *Orocetes*, G. R. Gray (*Phænicura*, Vig., *Petrophila*, Sw.); *Rubecula*, Briss. (*Dandalus*, Boie, *Erythaca*, Sw., *Motacilla*, Linn.); *Sialia*, Sw. (*Sylvia*, Lath.); *Petroica*, Sw. (*Muscicapa*, Gm.); *Origma*, Gould (*Muscicapa*, Lewin., *Saxicola*, Vig. and Horsf.); *Ædon*, Boie (*Erythropygia*, Smith, *Arundinaceus*, Less., *Salicaria*, Gould, *Agrobates*, Sw.); *Thamnobia*, Sw. (Sylvia), *Bessonornis*, Smith; *Campicola*, Sw. (*Sylvia*, Lath., *Saxicola*, Temm.); *Vitiflora*, Briss. (*Œnanthe*, Vieill., *Saxicola*, Bechst., *Motacilla*, Linn.); *Rubetra*, Briss. (*Motacilla*, Linn., *Saxicola*, Bechst.).

4. *Accentorinæ*.

Genera:—*Accentor*, Bechst. (*Motacilla*, Gm.); *Enicocichla*, G. R. Gray (*Seiurus*, Sw., *Turdus*, Will.); *Trichas*, Sw. (*Turdus*, Linn.); *Sericornis*, Gould (*Acanthiza*, Vig. and Horsf.); *Acanthiza*, Vig. and Horsf.; *Ptilopus*, Gould; *Symmorphus*, Gould; *Iora*, Horsf. (*Motacilla*, Linn.).

5. *Parinæ*.

Genera:—*Ægithalus*, Vig. (*Remiz*, Cuv., *Pendulinus*, Brehm., *Parus*, Linn.); *Melanochlora*, Less. (*Parus*, Lafr.); *Parus*, Linn.; *Suthora*, Hodgs.; *Minla*, Hodgs.; *Mesia*, Hodgs.; *Bahila*, Hodgs.; *Siva*, Hodgs.; *Megistina*, Vieill. (*Parus*, Gm.); *Tyrannulus*, Vieill. (*Pipra*, Spix. *Sylvia*, Lath.); *Sphenostoma*, Gould; *Calamophilus*, Leach (*Mystacinus*, Boie, *Parus*, Linn.); *Megistura*, Leach (*Orites*, Mœhr, *Paroides*, Brehm, *Parus*, Linn.); *Parisoma*, Sw. (*Sylvia*, Vieill.); *Psaltria*, Temm.; *Ægithina*, Vieill.; *Hylophilus*, Temm.

6. *Sylvicoünæ*.

Genera:—*Sylviparus*, Burt; *Dumecola*, Sw.; *Sylvicola*, Sw. (*Parus*, Linn., *Sylvia*, Lath., *Chloris*, Boie, *Parula*, Bonap.); ———? (*Wilsonia*, Bonap., *Muscicapa*, Wils., *Setophaga*, Sw.); *Vermivora*, Sw. (*Ficedula*, Briss., *Sylvia*, Lath.); *Mniotilta*, Vieill (*Oxyglossus*, Sw., *Sylvia*, Lath., *Sylvicola*, Jardine); *Zosterops*, Vig. and Horsf. (*Sylvia*, Sw.).

7. *Motacillinæ*. Motacilla, Linn.

Genera:—*Muscisaxicola*, D'Orb. (*Lessonia*, Sw., *Ptionura*, Gould); *Motacilla*, Linn.; *Budytes*, Cuv. (*Motacilla*, Linn.); *Enicurus*, Temm. (*Motacilla*, Linn.; *Turdus*, Vieill.); *Grallina*, Vieill. (*Tanypus*, Oppel.); *Ephthianura*, Gould (*Acanthiza*, J. and S.); *Anthus*, Bechst.; *Corydalla*, Vig. (*Anthus*, Vieill.).

Of these names, *Petrophila* and *Wilsonia* are terms employed in botany.

The *Sylviadæ*, in Mr. G. R. Gray's arrangement, are followed by the *Turdidæ*. (*List of the Genera of Birds.*)

SYLVICAPRA, Mr. Ogilby's name for a genus of RUMINANTS, placed by him in the family *Bovidæ* [OX], with the following

Generic character:—*Horns* in the male only. *Maxillary glandules* oblong. *Interdigital fossæ* small. *Inguinal follicles* none. *Teats* four.

Type, *Sylvicapra mergens* (*Antilope mergens*). [ANTELOPE, vol. ii., p. 81.]

SYLVI'COLA. [SYLVIADÆ.]

SYLVIPARUS, Mr. Burton's name for a genus of birds combining the characters of *Sylvia*, *Regulus*, and *Parus* in the wing, tail, and bill.

Generic Character.—*Bill* very small, very short, compressed, except at the base; mandibles equal, the upper one a little arcuated at the tip; nostrils covered with setaceous bristles. *Feet* as in the genus *Parus*. *Wings* rather long, extending nearly to the end of the tail; first quill rather short; second, third, and fourth equal, and the longest, the fifth, rather smaller than those, and the sixth equalling the first. *Tail* moderate, equal.

Example, *Sylviparus modestus*.

Description.—Body above brownish-green, below greenish-white; quills and tail-feathers brown; the external pogoniæ ciliated with yellowish-green. Bill and feet black. Total length four inches.

Locality.—The Himalaya Mountains. (*Zool. Proc.*, 1835.) [SYLVIADÆ.]

SY'LVIUS, ÆNEAS. [PIUS II.]

SYMBOLS and NOTATION. The word symbol (from the Greek 'sýmbolon,' σύμβολον) means 'that which is taken with,' and a symbol is a mark which is always attached to some one particular meaning. Notation (*nota*, a known mark) is the method of selecting and assigning meaning to symbols, and the theory of notation (if it yet deserve the name) includes the consideration and choice of symbols, with the formation of rules of selection, so as to take the symbols which are best adapted for the purpose.

This subject might be treated in a very wide manner, for all marks with understood meanings are symbols, from written words to direction-posts. A picture is a symbol, the force of which lies in the resemblance to its object, and many of the earliest symbols must have been pictorial. It is obvious that a general treatment of the subject would hardly be within the power of any one person, and that its extent would be enormous, though it would be desirable to have it discussed in a more general form than has yet been attained, in order that its different parts may receive aid from the rest. Symbols are to the progress of civilization precisely what mechanism is to that of the arts,—not a moving force, perfectly dead in themselves, but capable of being made the medium by which the power is conveyed to its destination, and adapted to its object. They are the instruments of our first thoughts and the originators of new ones. The process by which the earliest symbols called out a yet higher intelligence than that which produced them, which last was again employed in perfecting the symbols themselves, and so on alternately, exactly resembles what has taken place in the mechanical arts. The earliest and rudest tools were first employed to make better ones; and every improvement in the use of force has found one of its best applications in the construction of machinery itself.

We propose in this article to treat particularly of mathematical notation, which, like language, has grown up without much looking to, at the dictates of convenience and with the sanction of the majority. Resemblance, real or fancied, has been the first guide, and analogy has succeeded.

Signs are of two kinds,—1st, Those which spring up and are found in existence, but cannot be traced to their origin; 2ndly, Those of which we know either the origin, or the speech of introduction, or both. Those of the first kind pass into the second as inquiry advances. [ALPHABET.] In our present subject we have mostly to deal with the second class.

Mathematical marks or signs differ from those of written language in being almost entirely of the purely abbreviative character, since it is possible that any formula might be expressed in words at length. We say possible, because it is barely so, not meaning thereby to imply that the mathematical sciences could ever have flourished under a system of expressions in words. A well-understood collection of notions, however extensive, becomes simple as a matter of conception by use and habit, and thus becomes a convenient resting-point for the mind and a suitable basis for new combinations of ideas. Now it is the characteristic of the advance of human knowledge that the mind never grapples at once with all that is contained in the notions under use for the time being, but only with some abstraction derived from a previous result, or some particular quality of that result. Hence no symbol which should contain the representative of every idea which occurred in the previous operations would ever be necessary; and more than this, it would even be pernicious from its complexity, as also from its suggesting details which are not required. That generalization, or rather abstraction, which is the distinctive character of the civilized language as compared with the savage (though the latter is not wholly without it), must be the ruling process of mathematical notation, as it is of the advance of spoken language; and in this point of view the connection of our subject with speech presents more analogies and gives more instruction than its comparison with the written signs of speech. The latter is a bounded subject. When once it is agreed how the different modifications of sound shall be represented, written language follows immediately; nor do the infinite modes of using words require any modification of the method of writing them. In our modern works for instance, it would be difficult to find many artifices of notation with which to compare the never-ceasing varieties of mathematical signs. In mentioning the marks of punctuation and reference, the italics for emphatic words, and the varieties of print by which notes are distinguished from text, &c., we have almost exhausted the list.

The greatest purposes of notation seem to be answered when the reader or learner can tell what is meant, first, with the utmost certainty, secondly, with sufficient facility; it being always understood that the second must be abandoned when it clashes with the first. Too much abbreviation may create confusion and doubt as to the meaning; too little may give the meaning with certainty, but not with more certainty than might have been more easily attained. Thus the old algebraists, in using A *quadratum* for A multiplied by A, in their transition from words at length to simple notation, used ten symbols where two only are requisite; and those who first adopted the symbol A A lost no certainty, and gained materially in simplicity. The successors of these again, who employed AA, AAA, AAAA, &c., to stand for the successive powers of A, were surpassed in the same manner by those who adopted A^2, A^3, A^4, &c. Beyond this it is obvious the notation cannot go in simplicity. The symbol which is to represent '*n* As multiplied together' must suggest all three components of the preceding phrase—namely, *n* and A, and multiplied together. In A^n, the *n* and A are obvious, and the position of the letters is the symbol of multiplication; but, on the other hand, those who teach the beginner to signify by A^2 the square described on the line A purchase simplicity at the expense of certainty. The same mathematical phrase with them stands for two different things, connected indeed, but of more dangerous consequence from that very connection; for where similarities exist the reader should not be made to convert them into identities. It is of as much importance to impress the distinction of the things signified, as the analogy of their properties.

Certainty, then, and the greatest facility of obtaining it, seem to be the main points of good notation; and this is true with respect to the learner of all that has gone before. Grant that the mathematical sciences are never to advance further, and many alterations might be made, and many new practices adopted, which would give facility in acquiring the past, without any introduction of obscurity. But the future must also be thought of; and no scheme will merit approbation which enlightens one end of the avenue at the expense of the other. Notation influences discovery by the suggestions which it makes: hence it is desirable that its suggestions should be as many, as plain, and as true, as it is possible. Here we are on quite a different ground: reason is the builder and settler, but imagination is the discoverer; and it might turn out that a notation which suggests many and obvious new ideas, though some of them should be fallacious, would be preferable in its consequences to another of less suggesting power, but more honest in its indications. And while we speak of positive suggestion, it must not be forgotten that a notation may be faulty in occupying the part of the symbol which properly belongs to the extension of another notation. The latter is thus deprived of its natural direction of growth; and must find its way elsewhere, to the injury perhaps of some other part of the symbol. In throwing together a few rules, previously to a little description of the present state of mathematical notation, we do not pretend to have exhausted the list of cautions which the subject requires. It is to be remembered that the language of the exact sciences, instead of being, as should be the case, a separate subject, is hardly ever treated at all, and then only in connexion with some isolated parts of the system. With the exception of an article by Mr. Babbage, in the Edinburgh Encyclopædia, we do not know of anything written in modern times on notation in general. Much may be collected, having notation for its specific object, from the writings of Arbogast, Babbage, Carnot, Cauchy, J. Herschel, and Peacock; writers who all have considered it necessary, when proposing a new symbol or modification of a symbol, to assign some reason for the proposal. In general, however, it is the practice to adopt or reject notation without giving any justification of the course pursued. If it could be rendered necessary, by the force of opinion, that every author should, in making a new symbol, explain the grounds, firstly, of his departure from established usage, secondly, of his choice from among the different methods which would most obviously present themselves,—two distinct advantages would result. In the first place, we should in most cases retain that which exists, until something was to be gained by altering it: in the second, research and ingenuity would have a call into action which does not now exist. We hardly need mention a thing so well known to the mathematician as that the progress of his science now depends more than at any previous time upon the protection of established notation, when good, and the introduction of nothing which is of an opposite character. We should rather say the rate of progress; for, however bad may be the immediate consequences of narrow and ignorant views in this respect, they cannot be permanent. The language of the exact sciences is in a continual state of wholesome fermentation, which throws up and rejects all that is incongruous, obstructive, and even useless. Had it been otherwise, it is impossible that the joint labours of three centuries and many countries, of men differing in language, views, studies, and habits, could have produced so compact and consistent a whole, as, with some defects (though no two persons agree precisely what they are), the present structure of mathematical language must be admitted to present.

The following rules and cautions, with respect to notation, are drawn from observation of the present state just alluded to.

1. Distinctions must be such only as are necessary, and they must be sufficient. For instance, in so simple a matter as the use of capitals or small letters, whatever may guide the inquirer to adopt either in one case should lead him to the same in another, unless some useful distinction can be made by the change. Thus a writer who in one instance uses a capital letter to denote a complicated function of small letters (which is a very desirable mode), will in another part of the same question employ a small letter for a similar purpose, thus nullifying an association of ideas which perspicuity would desire to be retained. If such a course were necessary in the first case, it is still more so in the second. It is not often that the second part of this rule is infringed; so small an addition makes a sufficient distinction, that the principal danger which arises is that of the same notative difference occurring in two varied senses in *different* problems.

The tendency to error is rather towards over-distinction than the contrary. It is surprising how little practice enables the beginner in mathematics to remember that so slight a difference as that of a and a' implies two totally different numbers, neither having any necessary connexion with the other. The older mathematicians [ACCENT] overdid the use of distinctions in their uniform adoption of different and unconnected letters, and forgot resemblances.

2. The simplicity of notative distinctions must bear some proportion to that of the real differences they are meant to represent. Distinctions of the first and easiest order of simplicity are comparatively few; the complications of ideas of which they are the elements of representation are many, and varied to infinity. There is no better proof of skill than the adaptation of simple forms to simple notions, with a graduated and ascending application of the more complicated of the former to the more complicated of the latter. But some writers remind us in their mathematical language of that awkward mixture of long and short words to which the idiom of our language frequently compels them in their written explanations of the formulæ. For example, if there be two words of more frequent occurrence than any others, they are *numerator* and *denominator*; the parts of a fraction cannot be described under nine syllables. A mathematician will have occasion to write and speak these words ten thousand times, for every occasion on which he will have to use the word *cusp*, of four letters. A comparatively rare idea, used in an isolated subject, can be expressed in one syllable, while the never-ending notions of the parts of a fraction require nine: this he cannot help; but it is in his power to avoid the same sort of inversion in his notation.

3. Pictorial or descriptive notation is preferable to any other, when it can be obtained by simple symbols. Many instances occur in astronomy, and the use of the initial letters of words may be cited as a class of examples: as in f for force, v for velocity, &c.

4. Legitimate associations which have become permanent must not be destroyed, even to gain an advantage. The reason is, that the loss of facility in reading established works generally more than compensates for the advantage of the proposed notation; besides which, it seldom happens that the desired object absolutely requires an invasion of established forms. For instance, perhaps the most uniform of all the notations of the higher mathematics is the use of the letter d to signify an increment which is either infinitely small, or may be made as nearly so as we please. A few Cambridge writers have of late years chosen to make a purely arbitrary change, and to signify by dy, dz, &c., not increments, but limiting ratios of increments: and students trained in these works must learn a new language before they can read Euler, Lagrange, Laplace, and a host of others. Thus $d_x y$ has been made to stand for $dy : dx$, and the old association connected with dy has (in the works spoken of) been destroyed. Now if the letter D had been employed instead, the only harm would have been that the student would have had to learn a new language before he communicated with the greatest mathematicians; as it is, many will have to form a new language out of the materials of the old one, which is a much harder task.

5. Analogies should not be destroyed, unless false: for true analogy has been frequently the parent of discovery, and always of clearness. Thus the real analogy of $\Sigma\phi x\Delta x$ and $\int\phi x dx$ was lost to the eye by the use of $\int_x \phi x$ to signify the latter; an innovation which preceded the one last-mentioned, and has obtained more approbation in this country. The notation used by Fourier to express a definite integral, $\int_a^b \phi x dx$, will certainly prevent the spread of the one just alluded to; though this last itself is chargeable with breach of analogy: for $\int^2 \phi x dx^2$, $\int^3 \phi x dx^3$, &c., ought to represent the successive integrals of $\int \phi x dx$. Fortunately, however, the symbols $(\int dx)^2 \phi x$, $(\int dx)^3 \phi x$, &c., may represent these successive integrals; and thus the two notations may be combined. For instance, $(\int_0^x dx)^4 \phi x$ represents the fourth integral of ϕx, each integration being made from 0 to x.

6. False analogies should never be introduced; and, above all, the incorrect analogies which custom and idiom produce in language should not be perpetuated in notation. It is becoming rather common to make editions of Euclid which are called *symbolical*, and which supply signs in the place of many words. To this, if properly done, there cannot be any objection in point of correctness: nor can we take any serious exception to the use of $\sqsubset$AB to stand for the square on AB, to $\|^r$ for parallel, $<$ for angle, $\perp^r$ for perpendicular, &c. But when we come to AB.BC for the rectangle on AB and BC, AB^2 for the square on AB, we feel the case to be entirely altered. These are already arithmetical symbols: it is bad enough that the word *square* should have both an arithmetical and a geometrical meaning, and causes plenty of confusion: a good notation, if it cannot help in avoiding this confusion, should at least not make it worse. At the same time, with regard to symbolic geometry, we feel some repugnance to introduce it into the elements, from observing that all the best writers seem to feel with one accord that pure reasoning is best expressed in words at length. If it be desirable that a student should be trained to drop reasoning, except as connecting process with process, and to think of process alone in the intervening time, it is also most requisite that he should have a corrective of certain bad habits which the greatest caution will hardly hinder from springing up while he is thus engaged. Arithmetic and algebra amply answer the first end; and geometry, in the manner of Euclid, is the correcting process. Will symbolic geometry do as well? We will not answer positively, but we must say we doubt it.

7. Notation may be modified for mere work in a manner which cannot be admitted in the expression of results which are to be reflected upon. The mathematical inquirer must learn to substitute, for his own private and momentary use, abbreviations which could not be tolerated in the final expression of results. Work may sometimes be made much shorter, and the tendency to error materially diminished, by attention to this suggestion.

For example, the complexity of the symbols,

$$\frac{dz}{dx},\ \frac{dz}{dy},\ \frac{d^2z}{dx^2},\ \frac{d^2z}{dx\,dy},\ \frac{d^2z}{dy^2},$$

greatly impedes the operations connected with problems in solid geometry: the letters p, q, r, s, t, which are often substituted for them, make us lose sight of the connection which exists between the meanings. But the symbols

$$z_x,\ z_y,\ z_{xx},\ z_{xy},\ z_{yy},$$

are not long nor complicated enough to partake much of the disadvantage of the complete symbols, while they are entirely free from that of the isolated letters.

8. In preparing mathematical writings for the press, some attention should be paid to the saving of room. In formulæ which stand out from the text, this is not of so much consequence; but in the text itself a great deal of space is often unnecessarily lost. For example, it is indispensable in formulæ to write a fraction, such as $\frac{a}{b}$, in the manner in which it here appears: but if this be done in the text, a line is lost; and, generally speaking, $a : b$, or $a \div b$, would do as well in mere explanation. Also, in printing, redundancies which are tolerated in writing, should be avoided, such as $\sqrt{\overline{7}}$, where $\sqrt{7}$ would do as well.

9. Strange and unusual symbols should be avoided, unless there be necessity for a very unusual number of symbols. The use of *script* letters, such as $\mathscr{A}$, $\mathscr{B}$, &c., or old English letters, as $\mathfrak{A}$, $\mathfrak{B}$, $\mathfrak{a}$, $\mathfrak{b}$, &c., except in very peculiar circumstances, is barbarous. A little attention to the development of the resources of established notation will prevent the necessity of having recourse to such alphabets. Nor is it wise to adopt those distinctions in print which are not easily copied in writing, or which it is then difficult to preserve: such as the use of A and *A*, &c. in different senses; even the distinction of Roman and Italic small letters, a and *a*, &c., should be sparingly introduced.

10. Among the worst of barbarisms is that of introducing symbols which are quite new in mathematical, but perfectly understood in common, language. Writers have borrowed from the Germans the abbreviation n! to signify 1 . 2 . 3 ... $(n-1)n$, which gives their pages the appearance of expressing surprise and admiration that 2, 3, 4, &c. should be found in mathematical results.

The subject of mathematical printing has never been methodically treated, and many details are left to the compositor which should be attended to by the mathematician. Until some mathematician shall turn printer, or some printer mathematician, it is hardly to be hoped that this subject will be properly treated.

The elements of mathematical notation are as follows:—

1. The capitals of the Roman alphabet, and the small letters of the Italic. The small Roman letters and the Italic capitals are rarely used, and should be kept in reserve for rare occasions.

2. The small letters of the Greek alphabet and such capitals as are distinguishable from the corresponding Roman ones, as Δ, Φ, Ψ.

3. The Arabic numerals, and occasionally the Roman ones.

Of all these there should be three different sizes in a good mathematical press, and the different sorts should bear a much better proportion to one another than is usual. The Greek letters seldom set properly with the Roman ones, and few indeed are the instances in which such symbols as

$$a^{x^x} \qquad \epsilon^{(1+t)^2}$$

are, as they ought to be, good copies of the manner in which they are written. The handwriting of a bad writer is frequently more intelligible to the mathematical eye than the product of the press. Among the faults to which the compositor is naturally subject, and which frequently remain uncorrected by the author, is that of placing blanks or spaces in the manner in which he would do in ordinary matter, by which he is allowed to separate symbols which are in such close connection that absolute junction would not be undesirable. For instance, $\cos\ \theta$ for $\cos\theta$, $(a\ b+c\ d)$ for $(ab+cd)$. As a general rule, the manuscript should be imitated.

4. Accents, superfixed and suffixed, as in a'' $a_{''}$. These are generally continued, when they become too numerous, by Roman numerals, as in $a_{'}$, $a_{''}$, $a_{'''}$, a_{iv}, a_{v}, a_{vi}, &c.

5. The signs $+$ $-$ $\times$ $\div$: $\surd$, and the line which separates the numerator from the denominator. Of these there are generally not sizes enough, particularly as to the sign $-$. It frequently happens that such an expression as $(x-1)(x-2)(x-3)$&c. overruns a line very inconveniently, when the use of a shorter negative sign, as in $(x\text{-}1)(x\text{-}2)(x\text{-}3)$ would avoid such a circumstance altogether. Between the division line of a fraction and the numerator and denominator unsightly spaces very often occur, as in

$$\frac{a+b}{\quad\;\; c+d \quad\;\;} \text{ instead of } \frac{a+b}{c+d}.$$

6. The integral sign $\int$ with its limits expressed, as in $\int_a^b$ the symbols of nothing and infinity, 0 and ∞.

7. Brackets, parentheses, &c. [ ], ( ), { }, &c. These are often not properly accommodated to the size of the intervening expressions, particularly in thickness.

8. The signs of equality, &c., $=$, $<$ $>$.

9. Occasionally, but rarely, a bar or a dot is used over a letter, as $\bar{a}$ or $\dot{a}$. In some works, accents and letters are placed on the left of a symbol, as in ${}'a$, ${}^{x}a$, ${}_{x}a$. This however should be avoided, as it is difficult to tell to which letter the symbol belongs; and there are ample means of expression in what has been already described.

There are no general rules laid down for the use of notation: a few hints however may be collected from the practice of the best writers of recent times.

1. When a letter is to be often used, it should be, if possible, a small letter, not a capital. The latter species is generally used for functions of small letters.

2. The letters d, Δ, δ, and D, are appropriated for operations of the differential calculus, and should hardly ever be used in any other sense.

3. When co-ordinates are used, the letters x, y, z, must be reserved to signify them; x, y, z, and ξ, η, ζ, may be used if different species be required, and if x', y', z', &c. or $x_{'}$, $y_{'}$, $z_{'}$, &c. should not be judged convenient.

4. When functional symbols are wanted, the letters ϕ, ψ, χ, F, f, Φ, Ψ, should be first reserved for them; afterwards ϖ, ω, $\daleth$, sometimes π, ζ, μ, ν.

5. The letter π is, by universal consent, appropriated to 3·14159...., and ϵ (by the French e) to 2·71828....; Γ to the functional symbol for 1.2.3. n.

6. When many operations of differentiation occur, superfixed accents should be avoided in any other sense than that of differentiation.

7. When exponents are wanted to aid in signifying operations, the powers should be carefully distinguished. Thus, in a process in which $\sin^{-1}x$ is used for the angle whose sine is x, the square, cube, &c. of $\sin x$ should not be $\sin^2 x$, $\sin^3 x$, &c., but $(\sin x)^2$, $(\sin x)$, &c. Some writers would have the latter notation employed in all cases; but this is, we think, asking a little too much.

8. Greek letters are generally used for angles, and Italic letters for lines, in geometry. To this rule it is desirable to adhere as far as possible, but it cannot be made universal.

9. Suffixed numerals are generally the particular values of some function. Thus a_v means a function of v, of which the values for $v=0$, $v=1$, &c. are a_0, a_1, &c.

10. As to the radical sign, $\sqrt{a}$, $\sqrt[3]{a}$, &c. do not generally mean any one of the square roots, cube roots, &c. of a, but the simple arithmetical root. The indeterminate root is usually denoted by the exponent. Thus $a\pm\sqrt{b}$ may be necessary, but $a\pm b^{\frac{1}{2}}$ has a superfluity.

11. The same letters should be used, as far as possible, in the same sense throughout any one work; and some preceding good writer should be followed. As a general rule, those only are entitled to invent new symbols who cannot express the results of their own investigations without them.

The writer who is most universally acknowledged to be a good guide in the matter of notation is Lagrange. This subject is of great importance; but fortunately it is pretty certain that no really bad symbol, or system of symbols, can permanently prevail. Mathematical language, as already observed, is, and always has been, in a state of gentle fermentation, which throws up and rejects all that cannot assimilate with the rest. A received system may check, but cannot ultimately hinder, discovery: the latter, when it comes, points out from what symbolic error it was so long in arriving, and suggests the proper remedy.

For the progress of mathematical language, see TRANSCENDENTAL: see also SYMMETRY.

SYMA. [KINGFISHERS.]

SYMINGTON. [STEAM CARRIAGE, vol. xxii., p. 487; STEAM-VESSEL, vol. xxii., p. 496.]

SYMMACHUS THE SAMARITAN, so called because he was a native of Samaria, and at first also of the Samaritan religion. He afterwards became a Jew, and then a Christian of the sect of the Ebionites. The time in which he lived is not quite certain, though it is probable that it was in the reign of the emperor Septimius Severus, about A.D. 200.

Although subsequently to the Septuagint two other Greek translations of the Old Testament had been made by Aquila and Theodotion, Symmachus undertook the same task again. His translation differed in many points from those of his predecessors, but it was held in high esteem, and is often referred to by subsequent writers: it is especially praised for the perspicuity and elegance of the style. Symmachus himself published a second and improved edition of it. We only possess a few fragments of this translation, which are printed, together with those of Aquila and Theodotion, in the collections of Morinus Drusius and Montfaucon. Symmachus also wrote a Commentary on the Gospel of St. Matthew, in which he is said to have endeavoured to establish the dogmas of the Ebionites, and also to have attacked Matthew's genealogy of Christ.

(Fabricius, *Biblioth. Graeca*, iii., p. 695, &c.; Schöll, *Geschichte der Griech. Lit.*, ii., p. 301, &c.)

Among the scholiasts on the comic poet Aristophanes there is one whose name was Symmachus; some specimens of his scholia are extant. (Fabricius, *Biblioth. Graeca*, ii., p. 374, n. cc.)

SYMMACHUS, QUINTUS AURELIUS, the son of L. Aurelius Avianus Symmachus, who was a man of great worth, and in A.D. 365 was prefect of the city of Rome. (Ammian. Marc., xvii. 2; Symmach., *Epist.* i. 38.) The time when his son Q. Aurelius Symmachus was born is uncertain; some would place it as early as the year 314, which is scarcely credible. As he belonged to one of the most illustrious Roman families, his education was conducted with the greatest care. He was instructed in rhetoric by a Gaul, whose name is not known. (Symmach., *Epist.* ix. 86.) In A.D. 370 he was proconsul of Africa, and fourteen years later, A.D. 384, he was prefect of the city, and in 391 consul with Tatianus. The time of his death is uncertain, though it is evident from his writings that he was alive in A.D. 404.

Symmachus was a man of ability and character, and during the difficult and dangerous situations into which he was thrown by the events of the time, he showed a degree of honesty and prudence which are rarely met with in the history of those times. He was one of the last great bulwarks of paganism, and exerted all his powers to prevent its overthrow, especially during the period of his prætorship of the city. We still possess an address of his to the emperors Valentinianus, Theodosius, and Arcadius (Symmach., *Epist.* x. 61), in which he endeavours to persuade the emperors not to remove the altar of victory from the curia Romana. However, his exertions were fruitless, and his address was refuted by St. Ambrose. His assertion that the Christian religion was the cause of the decline of the empire provoked many Christians of his own and of subsequent times to refute the charge. His partiality for paganism and its superstitions arose from his general attachment to the institutions of his forefathers, and his sincerity in this respect was acknowledged even by his adversaries. During the greater part of his life he was actively engaged in various branches of the administration, but he devoted to study all his leisure time, which he spent in retirement in some of his numerous country seats.

There is extant a collection of letters by him, which was made and published by his son, Q. Flavius Memmius Symmachus, who was prefect of the city in A.D. 415, after the death of his father. The collection consists of ten books; much care has evidently been spent upon the style, and, like all the letter-writers of that time, he took the letters of the younger Pliny as his model. The style is concise and animated, but is far from the natural and beautiful simplicity which characterises the letters written in the better period of Roman history. Yet the letters of Symmachus, especially those of the tenth book, which give a full account of the manner in which he discharged his duties as prefect of Rome, and also contain the above-mentioned address to the emperors, are of peculiar interest in regard to the history, constitution, and administration of the Roman empire. Many points connected with these subjects and with the history of the Roman law would be entirely unintelligible to us without these letters. Symmachus also distinguished himself as an orator, but his orations are lost, with the exception of some fragments. A. Mai discovered fragments of eight orations of Symmachus in a palimpsest of the Ambrosian library at Milan, which he published under the title 'Q. Aurelii Symmachi Octo Orationum ineditarum partes. Invenit notisque declaravit A. Mai,' Mediolani, 1815, 8vo. (Reprinted at Frankfurt, 1816, in 8vo.) Afterwards some other fragments of the orations of Symmachus were discovered in a palimpsest of the Vatican library, which are printed in an appendix to 'Juris Civilis Antejustinianei Reliquiæ ineditae,' &c., cura A. Mai, Romae, 1823, 8vo. These fragments were again increased by Peyron with some new ones from a MS. now at Turin. They are printed in his 'Annotationes ad Inventarium Bibliothecae Bobbionensis,' p. 182, &c. The style of these orations is on the whole the same as that of the letters, and they are equally valuable as historical documents for the history of the empire during the time of Symmachus.

The first edition of the letters of Symmachus appeared at Strasburg in 1510, 4to. This edition however contains only 317 letters, whereas all the subsequent editions contain 965. A complete edition was published at Basel in 1549, 8vo. After this there followed three other important editions: one by Juretus, Paris, 1580, and a second edition, 1604, 4to., with notes; the second by Jac. Lectius, Geneva, 1587, and reprinted 1599, 8vo.; it contains the notes of Juretus with some by Lectius. The third and best edition is that by C. Scioppius, Moguntiae, 1608, 4to. Other editions are that of Philip Pareus, Neapoli Nemetum, 1617 and 1628; reprinted at Frankfurt, 1642, 8vo., and that of Leyden, 1653, in 12mo.

(*Symmachi Vita*, by J. Gothofredus, in the edition of Pareus; Heyne, *Opusc. Acad.*, vi., p. 15, &c.; J. Gurlitt, *Susiana in Symmachum*, Hamburg, 1818, 4to.; Fabricius, *Biblioth. Lat.*, iii., p. 204, &c.; A. Mai, in the introduction to his edition of the Orations of Symmachus.)

Besides the three persons of the name of Symmachus mentioned above, there are several others of the same name who lived about or after the time of the one whose name is at the head of this article. L. Aurelius Symmachus was consul in A.D. 330, together with Gallicanus: another of precisely the same name was consul with Aetius, in A.D. 446. Q. Aurelius Memmius Symmachus, perhaps a grandson of the letter-writer and orator Symmachus, was consul in A.D. 485, and was the father of Rusticiana, the second wife of Boethius. (Alcimus Avitus, *Epist.* 31; Ennodius, vii. 25.) His grandson Q. Aurelius Anicius Symmachus was consul with Boethius, the son of the great Boethius, in A.D. 522.

Besides these there are several Latin writers of the name of Symmachus, of whom however nothing is known: 1. Symmachus, the author of an historical work consisting of several books. Jornandes, in his work 'De Rebus Geticis' (c. 15, &c.), quotes a long extract from the fifth book, which relates to the history of the emperor Maximinus. 2. Several poets of the name of Symmachus: one is simply called Symmachus, another Q. Aurelius Symmachus, and a third L. Aurelius Avianus Symmachus. Several epigrams of these poets are still extant.

(Burmann, *Anthol. Lat.*, ii. 143; H. Meyer, *Antholog. Veter. Latin. Epigrammatum et Poemat.*, i., p. 105, &c.)

SY'MMACHUS, a native of Sardinia, and a deacon, was elected bishop of Rome, by part of the clergy, A.D. 498, after the death of Anastasius II., whilst another part of the clergy, supported by several senators, elected a priest called Laurentius. The matter was referred to Theodoric, king of Italy, who decided in favour of Symmachus. The schism however continued for several years, and in the year 500 the partisans of Laurentius rose in arms, and a great tumult took place at Rome, in which much blood was shed, and the virgins consecrated to God were violated. At last Theodoric came to Rome, and convoked a council, A.D. 502, known in church history by the name of 'Concilium Palmare,' in which Symmachus cleared himself of several charges of licentiousness and rapacity, and was confirmed in his see.

Symmachus is said to have condemned the Manichæans, and burnt their books at Rome. He wrote an apologetic treatise, in which he repelled several insinuations against his doctrines, which were put forth by Anastasius I., emperor of the East, and at the same time censured that emperor for the part he had taken in favour of Acacius, the late patriarch of Constantinople, who had opposed the decrees of the council of Chalcedon. Trasmund, king of the Vandals, in Africa, having exiled to Sardinia several African bishops, Symmachus sent them assistance from Rome. Symmachus also repaired and embellished many churches at Rome, founded hospitals, and ransomed many slaves. He died in 514, and was succeeded by Hormisdas.

(Platina and Panvinio, *Vite dei Pontefici*; Bossi, *Storia d'Italia.*)

SYMMETRY, SYMMETRICAL (Mathematics). These terms are now applied to order and regularity of any kind, but this is not their mathematical meaning. Euclid first used the word 'summetros' (σύμμετρος) to signify *commensurable*, and this well known Latin word is in fact merely the literal translation of the Greek: two magnitudes then were symmetrical which admitted of a common measure. In later times, and those comparatively recent, the word was adopted both in geometry and algebra in different senses.

Since symmetrical applies in its etymology to two magnitudes which can be measured together (by the same magnitude), the term would, as to space-magnitudes, naturally apply to those which may be made to coincide. But the term *equal* had occupied this ground; and when, in Euclid, the word equal, which was originally defined in the manner just expressed, had degenerated into signifying equality of area only, the term SIMILAR entered to express sameness of form, so that figures having perfect capability of coincidence, or the same both in size and form, were called equal and similar. The word symmetrical was therefore not wanted, and was finally introduced to signify that obvious relation of equal and similar figures which refers to their position merely, and consists in their corresponding portions being similarly placed on *different sides* of the same straight line; so that coincidence cannot be procured without turning one figure round that straight line. Suppose for instance the front of a building to be *symmetrical*: draw a vertical line through the middle of the elevation, and the two lateral portions are equal and similar, as Euclid uses those words. But they are more than equal and similar; they are symmetrical: the right-hand side stands in the right-hand portion of space, with respect to the dividing line, and in exactly the same manner as the left-hand side stands in the left-hand portion of space. If the architect were to preserve equality and similarity, without symmetry, he would make two left sides, or two right sides, to his building, but not one right and one left. In the letter W there is a want of symmetry, but not in O: to make W symmetrical both the inner lines should be thin, and both the outer ones thick.

Euclid assumes the power of turning a plane round, so as to apply the faces of two figures to one another, in such manner that, after the application, the spectator must be supposed to see through the paper or other imaginary substance of which his plane is the surface. He has then no occasion to consider symmetricality; that is, figures being equal and similar, no cases can arise in which it makes any difference of demonstration whether they are symmetrical or not. When he comes to solid figures, he assumes a postulate in the garb of a definition, which dispenses him from the consideration of symmetry: namely, that solid figures consisting of the same number of equal planes, similarly placed, are equal. He seems to imagine that such solids must evidently be capable of being made to occupy the same space, which, though true as to quantity of space, is not true as to its disposition. Two solids may be equal in every respect, and yet it may be impossible (and precisely on account of their symmetry) to make one occupy the space previously occupied by the other. The two hands furnish an instance: they give the idea of equality (of size), similarity (of form), and symmetry (of disposition). Yet they cannot be made to occupy the same space, so as for instance to fit exactly the same glove; and a sculptor who should cast both hands from the same mould, would be detected immediately as having given his figure two right hands or two left hands. Again, suppose two solids, irregular pyramids for instance, composed of planes similar and equal, each of one to one of the other. Let coincidence be attempted geometrically: the two bases must of course be made to coincide. If then the two vertices fall on the same side of the common base, the figures will coincide altogether; but if the two vertices fall on opposite sides of the bases, absolute coincidence is impossible. Legendre proposed to call such solids by the name of *symmetrical*, in doing which he introduced the term of common life in an appropriate manner.

In algebra, a function is said to be symmetrical with respect to any two letters when it would undergo no change if these letters were interchanged, or if each were made to take the place of the other. Thus

$$x^3 + a^2x + ab + b^2x$$

is symmetrical with respect to a and b; interchange would give

$$x^3 + b^2x + ba + a^2x,$$

the same as before. But this expression is not symmetrical with respect to a and x, for interchange would here give

$$a^3 + x^2a + xb + b^2a.$$

An expression is symmetrical with respect to any number of letters when any two of them whatsoever may be interchanged without alteration of the function. Thus $a^2b+ba^2+a^2c+ca^2+b^2c+bc^2$ is symmetrical with respect to a, b, and c. It is not sufficient that certain contemporaneous changes should be practicable without producing alteration: *any two* must be interchangeable, the rest remaining. Thus $a^2b+b^2c+c^2a$ is unaltered if a become b, b become c, and c become a, at the same time, but it is not symmetrical: for if a and b only be interchanged, it becomes $b^2a+a^2c+c^2b$, or is altered.

Attention to *symmetry* is of the utmost consequence in mathematical notation. Here the word means that quantities which in any manner have a common relation should have something common in the symbols of notation; and analogy is perhaps a better word than symmetry. Suppose, for instance, we had taken, for the equation of a SURFACE OF THE SECOND DEGREE, $ax^2+by^2+cz^2+dxy+exz+fyz+gx+hy+kz+l=0$. Our formulæ would have been confused masses of letters, no set of which would have presented any similarity, or have easily remained in the memory. But in the article cited there is no set of formulæ of which more than one need be remembered; the others must be suggested by it.

SYMMORPHUS, the name given to a new genus of birds by Mr. Gould, who seems to be uncertain as to the family in which it should be placed.

Generic Character.—*Bill* rather short, tumid; the upper mandible slightly notched at the tip; the culmen and commissure subarcuate; the nostrils basal, oval, and nearly hidden by the frontal feathers. *Wings* moderate; first quill shorter than the second by one-half; third, fourth, and fifth longest and nearly equal. *Tail* moderate, the external tail-feather on each side shorter than the rest by one-fourth. *Tarsi* and *feet* moderate, the former scutellated anteriorly; the posterior toe with its claw shorter than the middle one, the two lateral toes unequal, the inner shortest.

Example, *Symmorphus leucopygus*.

Description.—The lore blackish-brown; the supra-ocular line fawn-white; the top of the head, nape, and back intensely rufous-brown; shoulders, tips of the greater wing-coverts, rump, throat, and body below white obscurely margined with chestnut; four middle tail-feathers brown, ashy-white at the tips, the three external ones on each side form the base half-way down brown, the rest white. Bill and feet black. Total length 7⅜ inches.

Locality.—New South Wales. (*Zool. Proc.*, 1837.)

SYMPATHETIC NERVES. [NERVE AND NERVOUS SYSTEM.]

SYMPATHETIC SOUNDS. The purposes of the reference made to this article from ÆOLIAN HARP have been answered in HARMONICS. These harmonics are the sympathetic sounds alluded to. The term was also applied to sounds produced in one instrument by sounding another close to it. [ACOUSTICS, p. 90.] When one instrument is made to sound close to another, not only are the vibrations of the latter felt, as in the experiment alluded to, but sometimes heard. This, which was once attributed to sympathy, is now of course explained by the communication of motion from one instrument to the other through the medium of the intervening air. [VIBRATION.]

SYMPATHY. [NERVE AND NERVOUS SYSTEM.]

SYMPHONY (*σύν, with*, and *φωνή, sound*), a term very differently understood at different periods of musical history. Some writers, according to Zarlino (Parte 3za, cap. lxxix.), have considered it as an instrument of the lyre kind. Others have thought it a sort of drum. If an instrument, that it was used as an accompaniment—most probably to the voice—the word in its original signification leads us naturally to conjecture.

With the moderns, Symphony, or *Sinfonia*, signifies a musical composition for a full band of instruments, and, up to the latter part of the last century, the word was synonymous with overture; symphonies, and among these several of Haydn's early ones, having been called overtures. Even at the present day the overture in the composer's score of an Italian opera is usually termed *Sinfonia*. The modern symphony generally consists of four movements: a brilliant allegro, which is commonly preceded by a slow introduction; an expressive adagio or andante; a minuet with its trio; and a finale. Instead of the minuet, what is called a *Scherzo*, a short, animated, sportive movement, is sometimes substituted. But composers are not restricted by any rule regarding the number of movements. Mozart's second symphony in D has but three, besides the slow introduction; while Beethoven's Pastoral and Choral symphonies may be said to comprise six or more.

Symphony is a term also applied to the instrumental introductions, terminations, &c. of vocal compositions; and these are sometimes called ritornels, from the French *ritournelle*, or the Italian *ritornello*.

SYMPHORICARPOS (from *συμφόρεω*, to bring together, and *καρπός*, fruit), or **SYMPHORIA**, the name of a genus of plants belonging to the natural order Caprifoliaceæ. The tube of the calyx is globose, with a small limb, and 4-5-toothed; corolla funnel-shaped, 4-5-lobed; stamens 5; ovary 4-celled with simple style and semiglobose stigma, the fertile cells containing one ovule, sterile ones several; fruit a berry, having 4 cells, 2 of which contain single seeds and 2 are empty. The species are natives of North and South America. They are elegant, bushy, oppositely-branched shrubs with oval entire leaves, small white or rose-coloured flowers with short pedicels, seated on one or many-flowered peduncles, and furnished with two bracts.

S. vulgaris, common St. Peter's-wort: flowers disposed in axillary, capitate clusters, and seated on very short pedicels. It is a native of Pennsylvania, the Carolinas, and Virginia, in sandy dry districts. It bears red cup-shaped berries, which are about the size of a hempseed, and ripen in winter. It grows to the height of from 3 to 6 feet, and flowers in August and September.

S. racemosus, Snow-berry: flowers disposed in loose, often leafy, interrupted racemes; corolla bearded internally; stamens and style included. It is a native of North America, and grows on the banks of the Missouri, in Upper Canada, and on the north-west coast at Paget's and Nootka sounds. This is a very handsome shrub, and was introduced into our gardens in 1817, since which time it has become very common. It has rose-coloured flowers, with entire leaves glaucous beneath. The fruit is about the size of a small cherry, and quite white, remaining on the tree after the leaves have dropped off, and giving it a very beautiful appearance. It throws up very numerous suckers, and on this account may be troublesome in small gardens; but for shrubberies it is a very desirable plant, as bees are very fond of its flowers, and game will feed on its berries. It blossoms from July to September.

S. Occidentalis, Wolf-berry, Western St. Peter's-wort: flowers in spikes, dense, terminal, axillary, and drooping; style and stamens protruded. It is a native of British North America, and is abundant about the Saskatchevan and Red River. It is a shrub from 4 to 6 feet high, and has the same general characters as the last, but has not yet been cultivated in Great Britain.

S. microphyllus and *S. glaucescens*, the remaining species, are natives of Mexico. All the species are easily cultivated, and grow in any common garden-soil. They may be best propagated by cuttings, which may be planted in either spring or autumn.

SYMPHYNO'TA. [NAIADES, vol. xvi., p. 66.]

SY'MPHYTUM (from *σύμφυτον*, a name for a plant employed by Pliny and Dioscorides), the name of a genus of plants belonging to the natural order Boraginaceæ. It has a 5-parted calyx; a cylindrical-campanulate corolla, the throat of which is furnished with 6 subulate, vaulted processes which connive to form a cone: 4 1-celled ovate nuts fixed at the base of the calyx, imperforate. The species are rough herbaceous plants with broad leaves and terminal twin racemes of flowers. They are natives chiefly of Europe and Asia.

S. officinalis, common Comfrey: fusiform-branched roots; branched stem, leaves decurrent, the upper ones lanceolate, the lower ovato-lanceolate, scabrous above and hairy beneath; limb of the corolla 3-toothed, with the teeth recurved; the anthers twice the length of the filament. It is an inhabitant of the banks of rivers and streams and watery places throughout Europe. 'Comfrey root,' Woodville observes, 'abounds in a tasteless mucilage like that of the marsh-mallow; and being more easily obtained, it ought not to be omitted in lists of medicinal plants. Such medicines are useful in irritations of the throat, intestines, and, above all, the bladder.' The flowers are of a yellowish-white colour. A variety not uncommon in Scotland and the Continent has bluish-purple flowers, red before expansion: it was called by Sibthorp *S. patens*. *S. Bohemium* is also a variety of this species. It has red or reddish-purple flowers.

S. tuberosum, tuberous-rooted Comfrey: rhizoma oblique, thickened by scales, furnished with short branches; leaves partly decurrent, upper ones elliptical, lower ones ovate; corolla tubulose, funnel-shaped, 5-toothed; teeth recurved. This plant is not so stiff and hairy as the last. It is a native of Germany, Austria, France, Spain, and Italy. It has also been found in Scotland, near Edinburgh, and in Durham in England. Its flowers are of a yellowish-white colour, and appear in April and May.

S. asperrimum, rough Comfrey: stems branched, covered with tubercles; leaves ovate, heart-shaped, pointed, running into petioles, hairy above, strigose beneath, upper ones opposite, subsessile; calyx tuberculated, acute; limb of corolla campanulate. It is a native of the Caucasus and grows on the banks of streams and rivulets. It is a tall plant, very rough, with handsome flowers, which are red before expansion, and afterwards blue.

There are several other species. They are all hardy plants, and are well adapted for border-flowers in gardens, or for woods and shrubberies, as they will flourish under the shade of trees and shrubs. They will grow in almost any soil, and may be readily increased by dividing their roots in the spring.

SYMPLECTES, Mr. Swainson's name for a subgenus of the genus *Ploceus*. [FRINGILLIDÆ; WEAVER-BIRDS.]

SYMPLECTOME'REA. [FORAMINIFERA.] N.B.—M. Dujardin's name for the class is *Rhizopoda*.

SY'MPLOCOS (from *συμπλοκή*, a knitting together), the name of a genus of plants belonging to the natural order Styraceæ. This genus was made the type of a natural order, Symplocineæ, by D. Don, which contained only this example. It has a 3-parted half-inferior calyx; rotate monopetalous 5-10-parted corolla, imbricate in æstivation; indefinite stamens inserted in the lobe of the corolla, with the filaments cuspidate at the apex, and polyadelphous at the base, erect anthers bursting longitudinally; 3-5-celled ovary with 4 ovules in each cell. The fruit is a fleshy drupe, containing a 3-5-celled nut; the cells containing but one seed, which has an inverted embryo lying in albumen, and a superior radicle. The species are trees, having alternate, either entire or serrated, leaves without stipules, and turning yellow in drying. The flowers are axillary, sessile, or pedunculate, few, of a white or scarlet colour, and supplied with bracteas at their base. Upwards of 30 species have been described. They all possess an astringent principle in their leaves, and some are used in dyeing.

S. Alstonia, Alston's Symplocos, is the *Alstonia theæformis* of Linnæus, and was named after Charles Alston, professor of botany in the University of Edinburgh. The plant is glabrous in every part, and has shining coriaceous roundish-elliptic or oblong leaves, obtuse, rounded at the base, and obscurely crenated at the apex; sessile flowers arranged in threes and fours. It is a native of New Granada, near Santa Fé de Bogota, and Popayan.

S. tinctoria, Dyer's Symplocos, Sweet-leaf, Yellow-leaf: leaves oblong or lanceolate-ovate, serrated, glaucous, shining; flowers axillary, 8 or 16, together. This plant is the *Hopea tinctoria* of Linnæus, and is a native of the Carolinas in the United States of America.

S. racemosa, racemose-flowered Symplocos: leaves oblong, glabrous, serrated; flowers arranged in racemes, mostly axillary; nut of fruit 3-celled. This plant is a native of Burdwar and Midnapore, in Bengal. It is used extensively by the natives as a dye, which is of a red colour.

The nuts of *S. spicata* are very hard, and resemble a little fluted pitcher. This plant is a native of Silhet.

In their cultivation they grow best in a soil composed of a mixture of loam, sand, and peat; and are best propagated by cuttings, which grow freely in sand under a hand-glass.

SYMPTOM (*σύμπτωμα*, an incident, or coincidence) is any change in the appearance or functions of the body different from those which occur in health, and perceptible to the senses either of the patient or his physician. Symptoms must not be confounded with signs of disease. The observation of facts by means of our senses renders us acquainted with symptoms, but it is by medical reasoning thereupon that we deduce signs. A patient often knows his own symptoms, but is nevertheless ignorant of the disease under which he labours.

The signs of disease are inferences drawn by the mind from the observation of symptoms. The most striking symptoms often furnish only accessory signs, while the most obscure are the signs characteristic of the disease. Violent pain in the head not unfrequently attends inflammation of the lungs, but is a symptom of very small importance, while slight pain in the side, or a streak of blood in the expectoration, furnishes a very valuable sign, and helps to disclose the nature of the affection.

Symptoms are best divided into the *essential*, which are peculiar to certain diseases, the *accidental*, produced by some circumstance of unusual occurrence, and the *common*, which are met with alike in various complaints.

That part of medicine which treats of symptoms is called Symptomatology: Semeiology is the name applied to the investigation of the signs of disease, and of their comparative value.

SYNAGOGUE (*Συναγωγή*), a word which primarily signifies any assembly or congregation, but came, like the word 'church,' to be applied, among the Jews, to places where any assemblies, especially those for the worship of God, met, or were convened. In the later Hebrew, such places were called בֵּית כְּנֶסֶת, 'house of assembly.' There is no trace of synagogues among the Israelites prior to the Babylonish captivity, nor, in express terms, until a long time after. It is collected however that the origin of such establishments may be referred to that period. Being then debarred from their customary religious observances, they were accustomed to assemble on the Sabbath-day, to hear portions of the law read and expounded; and those who ultimately returned from exile kept up this custom in Palestine. (*Nehem.*, viii. 18.) These assemblies or meetings became in due time fixed to certain places, and a regular order was observed in them. They existed considerably earlier among the Jews settled in foreign parts than in their own country, where we do not find them until the time of the Asmonæan princes; but after their introduction they increased rapidly. The synagogues appear to have been originally erected outside the towns, in the fields, usually near waters, for the convenience of ablution; but they were soon introduced into the towns, and were usually on the most elevated spots. In large towns there were several, and the Jewish writers affirm that there were 480 in Jerusalem. The assemblages were at first confined to the Sabbath-days and festivals, but were latterly extended to the second and fifth days of the week (Mondays and Thursdays). The services consisted chiefly in prayer, and in the reading and exposition of the sacred books. At first the readings were confined to the law, but were at length made to comprehend portions of the prophets, psalms, and other books. The whole concluded with a prayer and benediction, to which the congregation responded 'Amen.'

It seems to have been the custom for a synagogue not to be opened in any place where ten men could not be found of sufficient leisure to attend to its affairs. Where no separate building existed, a room in some private house was the place of meeting. There are no antient indications that the synagogues had any peculiar form; but each of them had a kind of altar or table, at which the volume of the law was read; and at the east end was an ark or chest in which that volume was kept. The seats were so disposed that the face of the people was turned towards this sacred repository and towards the elders, who alone sat with their backs to the ark, and their faces to the people. The synagogues were used not only for worship, but for holding local courts of justice, which had cognizance of petty offences requiring no higher punishment than stripes, which were inflicted on the spot. (*Matt.*, x. 17; *Luke*, xii. 11; *Acts*, xxii. 19.) The affairs of the synagogue were under the direction of several officers: the chief of them was the archisynagogus (*ἀρχισυναγωγός*), or 'ruler of the synagogue,' who regulated its affairs, and without whose leave no one could read or preach. (*Mark*, v. 22; *Luke*, xiii. 14.) Next to him was the officer called שְׁלִיחַ צִבּוּר 'Sheliach tzibbor,' or 'angel (messenger) of the church,' who prayed in behalf of the congregation. The חַזָּן 'Chazan,' who is the reader in modern synagogues, appears to have been the 'minister' (*Luke*, iv. 20) who had charge of the sacred books. As it appears from *Acts*, xiii. 15, that there were several archisynagogi, it is probable that they answered to the committee of elders, by whom the synagogues are at the present time managed.

With some necessary modifications, the antient usages are still maintained in the modern synagogues. The highest ground that can be conveniently appropriated is still chosen for the site of a synagogue. In this part of the world it extends east and west, with the entrance, or principal entrance, in the west, that as the people enter, and as they sit, their faces may be turned towards the land of Canaan. The altar or desk is on a raised platform surrounded by a wooden rail, and large enough to contain several persons: the women do not mingle with the men, but have a separate part or gallery (if there be one), where a wooden lattice screens them from observation. The men keep their heads covered in the synagogues.

The first synagogue in England of which we have historical knowledge is that which, in the reign of William Rufus, existed at Oxford, where the Jews were then numerous; but it is likely that they had one then or before in London also, as the fact that their only burial-place in England was in the spot now called Jewin Street, indicates that this was their principal seat. Early in the reign of Henry III. the Jews ventured to build in London a synagogue, which surpassed all the churches of that city in stateliness; and this occasioned its being taken from them, and consecrated to the Blessed Virgin. Later in the same reign they lost another synagogue, which they had erected in the Old Jewry, on the complaint of the Friars Penitent in the neighbourhood, that they could not consecrate the elements in quiet on account of their 'howlings.' So late as the reign of George II. the only synagogues allowed in England were the two in London, one for the Portuguese Jews in Bevis Marks, and the other for the German Jews, in Duke's Place. But this restriction has long been withdrawn, and there are now seven or eight synagogues in London, and one in most of the seaport towns.

(Vitringa, *De Synagoga* and *Archisynagogus*; Lewis, *Origines Hebrææ*; Tovey's *Anglia Judaica*; Allen's *Modern Judaism*.)

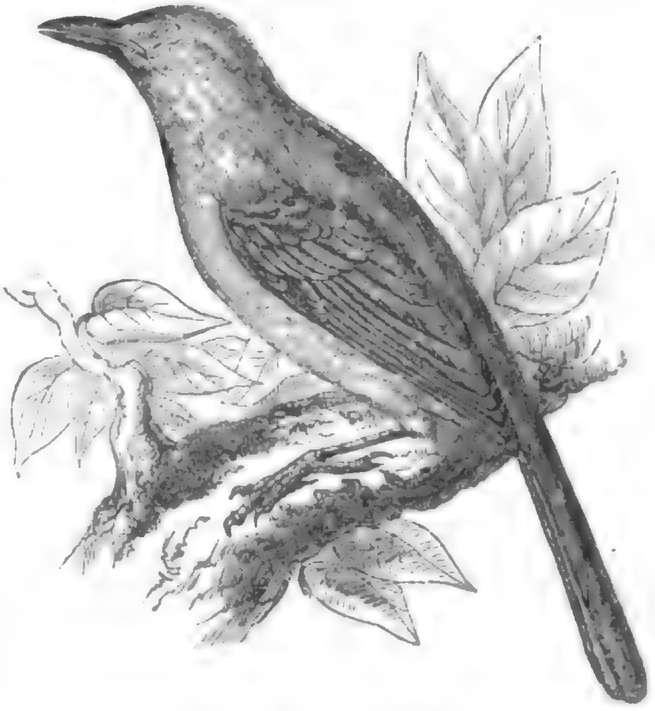
SYNALLAXIS, M. Vieillot's name for a genus of birds, placed by Mr. Swainson in the family of *Certhiadæ*.

Generic Character.—**Bill** short, rather strong, straight; both mandibles of equal thickness, entire, and much compressed; the margins of the upper mandible inflexed beyond the nostrils. Frontal feathers rather rigid. *Wings* very short, and much rounded; the primaries scarcely exceeding the tertials. *Tail* broad, more or less lengthened, and either graduated or cuneated; the webs soft and loose, but the shafts rather rigid; the tips lanceolate. *Feet* very large. Tarsus lengthened. Middle toe longer than the hinder; lateral toes equal. Claws slender, acute, and but slightly curved; the three anterior rather small. (Sw.)

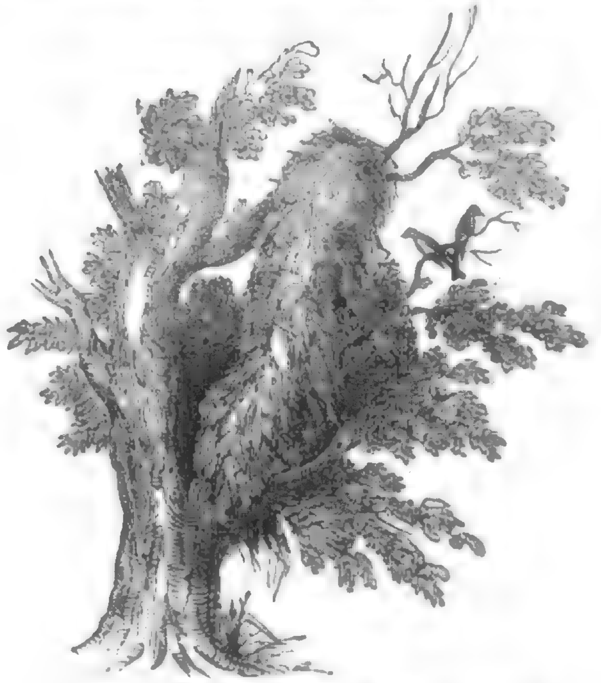
Example, *Synallaxis garrulus.*

Description.—Brown, beneath whitish, feathers on the front of the head rigid, pointed, and rufous; lines before and behind the eye whitish; tail moderate, rounded.

Habits, &c.—Mr. Swainson, whose description this is, has given a very good figure of this bird under the name of *Malurus garrulus*, in the first series of his *Zoological Illustrations*. It is remarkable, he observes, for its very singular nest, which is so large as to form a feature in the woodland scenery of Bahia, the only part of Brazil where he observed it. He describes the nest as built in low trees, formed externally of dried sticks, without any neatness, usually three or four feet long, and resembling at a distance a thick twist of bean-stalks thrown in the branches by accident. Sometimes, he says, two of these nests appear as if joined together, and there is an opening on the side, besides one at the top. He further states that the sexes are generally seen near the nest, uttering a shrill, incessant, monotonous chirp, particularly in the morning and evening, adding (and we respect him for it) that he never could bring himself to tear one of these nests to pieces, merely for the purpose of seeing its construction.



Synallaxis garrulus (reduced from Mr. Swainson's figure).



Nest in tree (after the same).

SYNCELLUS (σύγκελλος), a Greek word equivalent to *concellaneus* in Latin, and meaning a person who inhabits the same chamber (*cella*) with another, was used by the Christians of the early and middle ages as the name of an ecclesiastical dignity. The Syncellus was constantly with the patriarch, metropolitan, or bishop, as an inspector of his life and manners. The successors to the patriarchs and metropolitans were very often chosen from the Syncelli. Their rank was very high, and at one time they even claimed precedence over the metropolitans. Their number was considerable, till by a constitution of Heraclius the greatest number allowed in one church was two.

The chief of the Syncelli was called Protosyncellus πρωτοσύγκελλος), and the president of their assemblies was called πρωτοπρόεδρος τῶν πρωτοσυγκέλλων.

The suffragan bishops [Bishop] were also called Syncelli.

(Du Cange, *Glossar. Med. et Inf. Latin.*, s. v. 'Syncellus;' *Glossar. Med. et Inf. Graecit.*, s. v. Σύγκελλος.)

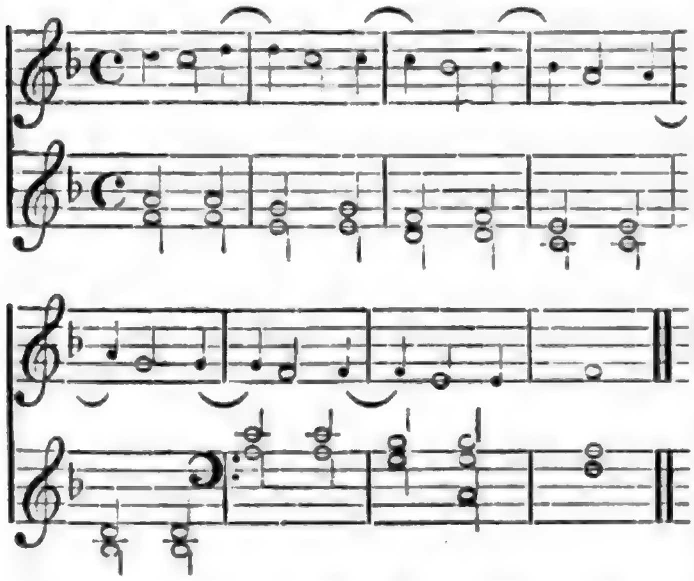
SYNCELLUS, GEORGE (Γεώργιος Σύγκελλος) was a monk and abbot at the end of the eighth and the beginning of the ninth century after Christ. His surname was given him from his being the *Syncellus* of Tarasius, patriarch of Constantinople, who died in the year 806 A.D. George Syncellus died about the year 800.

His 'Chronography' (ἐκλογὴ χρονογραφίας) is a history of the world, arranged in chronological order, from the creation to the reign of Diocletian. The intention of the writer was to include the whole period down to 800 A.D. It is little more than a copy of the 'Chronicon' of Eusebius.

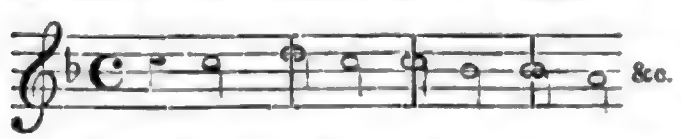
It was published from a MS. in the royal library at Paris, which was obtained at Corinth in 1507, by Jac. Goar, in a folio volume, containing the Greek text, a Latin version, and notes, together with the 'Breviarium' of Nicephorus, Paris, 1652, reprinted at Venice, 1729. It is also contained in the Bonn collection of the Byzantine writers, in which it forms, with 'Nicephorus,' two volumes, edited by W. Dindorf, from two important MSS. at Paris, 1829. The Chronography of Syncellus was continued by Theophanes from 285 to 813 A.D. Among the MSS. of the Royal Library at Paris are fragments of other historical works ascribed to Syncellus.

(Fabricius, *Biblioth. Græc.*, vii., p. 457, ed. Harles; Schoell, *Geschichte der Griech. Lit.*, iii., p. 253.)

SYNCOPATION, in Music, is when the first half of a note begins on the unaccented or weak part of a bar, and the other half is continued and terminates on the accented or strong part. [Accent, *in Music.*] Example:—



In this example the upper part, or melody, consists in fact of a succession of syncopating minims; but the bar dividing the alternate ones, they can only be written as two crotchets bound together; though formerly the bar was, in most cases, made to cut the note in two. Example:—



Syncopated notes are, by some writers, called *driving notes*.

SY'NCOPE (συγκοπή, literally a cutting in pieces, a sudden failure of power or strength), fainting. A sudden impairment or complete loss of sensation and voluntary motion, with great diminution or almost total abolition of the heart's action and of the function of respiration.

Fainting sometimes occurs quite suddenly, but is usually ushered in by certain premonitory symptoms. These are a sense of languor and uneasiness, confusion of the mind, oppression at the chest, dimness of sight, ringing in the ears, partial cold sweats, paleness of the face, and coldness of the extremities. These continue for some time, and then either pass away, or are followed by swooning, a state of complete faintness, during which the pulse is altogether imperceptible at the wrist, and respiration nearly ceases. When a fainting fit comes on suddenly and without any warning, it is usually more profound than when it has been preceded by the symptoms just enumerated. Recovery from fainting is frequently attended with palpitation of the heart, and sensations more distressing than those which ushered in the attack. The duration of a fainting fit seldom exceeds a few minutes or even seconds, but instances are on record of persons continuing in a swoon for many hours.

The immediate cause of fainting is in all instances some interruption to the due transmission of blood to the brain. Various circumstances however, both moral and physical, interfere with the circulation, either through the medium of the nervous system, or by acting directly on the heart itself. Persons swoon from any violent and sudden moral emotion, as terror, grief, disappointment, or even excessive joy. The sight of blood or of any object which excites disgust occasions some persons to faint, as do various impressions on the senses, whether painful or otherwise. Very susceptible individuals have been known to faint on perceiving the odour of certain flowers, and unpleasant smells still more frequently cause faintness. Long watching or over exertion, blows on the pit of the stomach, swinging, and rotatory motions are some among many of the conditions which occasion fainting by their action on the nervous system. The abstraction of a large quantity of blood probably has a more immediate action on the heart; and to the disturbance of the circulation must be attributed those fainting fits which sometimes occur in the course of diseases of the heart. The sudden transition from a horizontal to a sitting posture when persons are very weak or have lost a large quantity of blood probably acts in both ways at once; and fainting sometimes takes place from other causes, such as heated rooms, &c., of which we cannot well explain the action.

Fainting may be confounded with apoplexy or asphyxia; and if it continues for an unusually long time, the person may be supposed to be dead. A little attention however will prevent our mistaking an apoplectic person, who breathes loudly and with a snoring noise, for a person in a swoon, whose respiration is gentle, and almost imperceptible, and whose pulse either cannot be felt at all, or is at any rate extremely weak. Asphyxia is a state of suspended animation, brought on by some cause interfering directly with respiration: it is marked by tumor and lividity of the face, while the face of a person in a fainting-fit is pale and sunken. The continuance of respiration and of the heart's action, though very feebly, the temperature of the body, and the absence of all stiffness of the limbs, would sufficiently distinguish syncope from death; but it must be very unusual for fainting to continue for a few minutes without there appearing some evident sign of life.

In the treatment of a person who has fainted, the first point is to place him in the recumbent posture; and in the case of fainting after blood-letting, nothing more is in general required. Exposure to the cool air, sprinkling cold water on the face, and friction of the limbs, may be employed if the fit continues; and a small quantity of æther or sal-volatile may be given as soon as the person can swallow. The horizontal posture should be preserved until recovery is complete.

For the prevention of fainting-fits in those who are subject to their frequent recurrence, various treatment must be necessary, according to the nature of the cause producing them. Slight fainting-fits recurring frequently are a common forerunner of epilepsy.

SYNDA'CTYLES, or **SYNDACTYLOUS BIRDS**, a group comprehending those birds which have the external toe nearly as long as the middle one, and united to it as far as the penultimate articulation. This group contains the bee-eaters (*Merops*, Linn.), the motmots (*Prionites*, Ill.), the king-fishers (*Alcedo*, Linn.), the todies (*Todus*, Linn.), and the hornbills (*Buceros*, Linn.).

SYNDIC comes from the Greek 'syndicos' (σύνδικος). The Greek word Syndicos originally signified one who aided another in a matter before a court of justice, and hence it came to signify generally an advocate, one who maintained another's cause before a court of justice. Syndicos also signified at Athens one who was appointed by the state to attend to its interests in any matter in dispute between Athens and another state: thus Æschines was elected their Syndicus by the Athenians in a matter relating to the temple at Delos. (Demosthen. Περὶ Στεφάνου, c. 42.) There were also functionaries at Athens called Syndici, who were appointed, after the establishment of the tyranny of the Thirty, to decide on cases of confiscated property. The word Syndicus passed into the Latin language. It often occurs in the 'Digest' in the sense of an attorney or agent for a university or corporate body: in this sense it is used as synonymous with Actor by Gaius. (*Dig.* 3, tit. 4, s. 1.) In the middle ages also the word Syndicus was in common use, and was frequently given to the agent or factor appointed by corporate bodies to manage their common affairs, and especially to represent them in courts of law. Thus, in the year 1203, the university of Paris sought and obtained permission from Pope Innocent III. to appoint an officer for such purposes with this name. (Bulaei *Hist. Univ. Paris.*, iii. 23; Crevier, *Hist. de l'Univ. de Paris*, i. 284.) Crevier, in various places, designates the syndic of the university, or of the faculty of arts, by the equivalent names of procureur, agent, greffier (iii. 230; iv. 309; v. 459). In the same sense most of the other corporate bodies in Paris and other French towns used to have their syndics; and the syndic was also the usual name for the solicitor to the community, or town-clerk, in the towns of Languedoc and Provence. The clergy, in like manner, had their Syndics Généraux, Syndics Diocésains, and Syndics Provinciaux; and Syndics, or agents resident at Paris, were also appointed by most of the religious orders. (*Encyclopédie*, and Richelet, *ad verb.*) The functions of the different syndics however varied considerably; some were mere agents or solicitors, others were representatives of their corporations in a higher sense, sometimes acting as their presidents, and deciding causes, instead of merely conducting them. The syndics in some places were much the same description of functionaries that were elsewhere called Scabini or Echevins, a species of town-councillors or magistrates. At Marseilles, in the fourteenth century, four magistrates were elected every year to manage the military affairs of the city, who were designated Syndici de Guerra. (Ducange, *Gloss. Med. et Infim. Latin.*, *ad verb.*) The four chief magistrates of the city of Geneva, also annually elected, used to be called Syndics. Among the Burdegalenses (or people of the district of which Bordeaux is the capital), the office of Syndic, supposed to have meant originally the defender of a military post, became in course of time an hereditary title of nobility: thus, in Froissart, and other chroniclers of the fourteenth century, we read of the Syndic, or Soudic (in Latin, Soldicus), d'Estrades, and the Soudic, or Soudich, or sometimes Soudan (as if the word had become confounded with the Arabic *Sultan*), de la Trau, or de Trau, or de Trabe, or de Laitrau. In more recent times, when Louis XIV., in 1701, directed the establishment of chambers of commerce in the principal towns of France, the merchants and other persons composing them were appointed to be called Syndics du Commerce, or Syndics de la Chambre de Commerce. For the significations of the various old words derived from or connected with Syndicus (otherwise Sindicus, Scindicus, Scyndicus, Sindictus), such as Syndicare, Syndecari, Sindicamentum, Sindicatio, Syndicatus, Syndicator, Subsyndicus, Syndicaria (-ae), the reader is referred to Ducange, *Gloss. M. et I. L.*, vi. 928-931; and *Supplem.*, iii. 932. We shall merely mention that the French have the verb 'syndiquer,' for to judge or censure, as we formerly said 'to syndicate' in the same sense.

SYNE'SIUS (Συνέσιος), a Christian philosopher of the school of the New Platonists, was born at Cyrene, in Africa, of a high family, in the year 378 A.D. He studied at Alexandria mathematics and philosophy under Hypatia, and at the same time gave attention to poetry and eloquence. When only in his nineteenth year he was sent by his fellow-citizens at the head of an embassy to Constantinople, to present a golden crown to the emperor Arcadius, to whom he addressed a very suitable oration, which is still extant. At this period he was a heathen, but he was soon after converted to Christianity and baptized by Theophilus, bishop of Alexandria. He still however retained his fondness for the New Platonic philosophy; and partly for this reason, partly from unwillingness to be separated from his wife, he long resisted the desire of Theophilus to consecrate him to a bishopric. At last he yielded, and became bishop of Ptolemais, in the year 410. The time of his death is not known, but it was probably before 431, since in this year his brother Euoptius appeared at the council of Ephesus, as his successor in the bishopric of Ptolemais.

Synesius was one of the most remarkable men of his age, though certainly more eminent as a philosopher than as a Christian. His writings are in a pleasing style, sometimes rising to eloquence. With a peculiarly clear statement of the most abstract philosophical opinions, he mingled interesting illustrations from the early historians, fabulists, and poets.

The following are his chief works:—1. The Oration to Arcadius, mentioned above, 'On Royalty' (περὶ βασιλείας). 2. 'Dion, or on Self-discipline' (Δίων, ἢ περὶ τῆς καθ' ἑαυτὸν διαγωγῆς). 3. 'The Praise of Baldness' (φαλάκρας ἐγκώμιον), a witty imitation of Dion Chrysostom's 'Praise of Hair.' 4. 'An Egyptian Fable, or, On Forethought' (Αἰγύπτιος, ἢ περὶ προνοίας), an application of the fable of Osiris and Typhon to the then state of the Roman empire. 5. 'On Dreams' (περὶ ἐνυπνίων). 6. 'A Discourse to Paeonius concerning a Present' (πρὸς παιόνιον ὑπὲρ τοῦ δώρου λόγος). The present was an astrolabe, and the discourse recommended the study of astronomy. 7. One hundred and fifty-five letters. Some of these letters are free and interesting epistles to his friends, and others, on matters of business, contain much information of great value to the church historian. 8. 'Ten Hymns,' formed of a most singular mixture of Christian truths, poetic images, and New Platonic dreams. 9. Four epigrams in the 'Greek Anthology' are ascribed to Synesius.

A complete edition of the works of Synesius, in Greek and Latin, was published by Petau, Paris, 1612, fol., reprinted in 1631, 1633, and 1640. There are several later editions of portions of his works.

(Fabricius, *Bibl. Graec.*, viii., p. 221, old edition; ix., p. 198, Harles; Schöll, *Geschichte der Griech. Lit.*, iii., p. 365.)

There was another philosopher of the same name, of whom nothing more is known than that he was the author of a commentary on Democritus, which is printed in Fabricius, *Bibliotheca Graeca*, vol. viii., p. 233, old edition.

(Schöll, iii., p. 445.)

SYNESIUS (Συνέσιος), a Greek medical writer, of whom nothing is known except that a treatise on Fever goes under his name: his date also is rather uncertain. Sprengel places him in the reign of the emperor Manuel (A.D. 1143-1180), apparently because he supposed the 'Zádu 'l-Mosáfer,' or 'Viaticum Peregrinantis,' of Abú Jafer Ahmed Ben Ibrahím Ben Abú Chalid Ibnu 'l-Jezzar to have been written at the end of the eleventh century after Christ. As however Ibnu 'l-Jezzar died about the year (A.H. 395) A.D. 1004 (Wüstenfeld, *Gesch. der Arab. Aerzte*, Götting., 1840), Synesius, who translated his work into Greek, under the title Ἐφόδια τοῦ Ἀποδημοῦντος, may have lived much earlier than Sprengel places him; and this is the more probable if it be true that his translation was of service to Constantinus Afer, who died about A.D. 1087 (Choulant, *Handb. der Bücherk. für die Aeltere Medicin*, Leipzig, 1841), in composing his 'Viaticum Peregrinantium.' The treatise of Synesius is apparently part of his translation of Ibnu 'l-Jezzar's work, the whole of which, in seven books, is said to be still in existence in manuscript in the royal library at Paris. Reiske compared it with the original Arabic, and found it a very exact translation, with some few exceptions, as, for instance, in p. 136, where Synesius has made some additions to the Arabic text. In two passages we find the Arabic word added to his translation in Greek characters, viz. p. 76, *ἐντιχε, an-nat'ho, sweat*; and p. 120, *ἐλμουθιλλεθ, al-muthelleth, a tertian fever.* Sprengel remarks (*Hist. de la Méd.*) that his theory of fever is taken entirely from Galen; and that the symptoms of a fever produced by continual grief are well described (p. 30); he approves also of his moral treatment of febrile affections (p. 58). The means of cure mentioned by Synesius are in conformity with the habits and natural productions of Arabia. He constantly recommends water, sugar, and oil of roses; his purgative medicines are prunes, myrobalans, and cassia; he also exhibits camphor internally (p. 240). The most curious part of the work is the description of the small-pox, which he calls *φλυκταίνουσα λοιμική*, and which he distinguishes from the measles, or *ἑτέρα λεπτὴ καὶ πυκνὴ λοιμική*. Synesius is the first Greek author who notices these two diseases; but all the details that he mentions concerning them are taken from the treatise by Rhazes on the same subject. [Rhazes.] The work was edited by J. St. Bernard, Amstel. and Ludg. Bat., 8vo., 1749, with the title, 'Synesius de Febribus, quem nunc primum ex Codice MS. Biblioth. Lugd. Batav. edidit, vertit, notisque illustravit J. St. B.; accedit Viatici, Constantino Africano Interprete, libri vii. pars.' The six first chapters are inserted in the Venice collection of writers 'De Febribus,' 1576, fol.; the two last are in the first volume of the *Opera* of Constantinus Afer, Basil., 1536, fol.

SYNETHE'RES, or **SYNÆTHERES**. [Porcupines, vol. xviii., p. 416.]

SYRNIUM, Savigny's name for a subgenus of owls.

Example, *Syrnium Aluco*, the well-known brown owl, tawny-owl, ivy-owl, or wood-owl of these islands. [Strigidæ.]

SYNGNATHA, according to Dr. Leach, the second order of the class *Myriapoda*, comprising the species of that class which were by Linnæus included under the head *Scolopendra*.

This order is divided by Latreille into two sections: the species of the first have only fifteen pairs of legs; and the body, when viewed from above, presents less segments than when viewed from beneath. In the second section there are at least twenty-one pairs of legs, and the segments are of the same size and number both above and beneath. Dr. Leach also divides the present order into two sections or families, to which he applies the names *Scolopendridæ* and *Geophilidæ*, which he characterises as follows:—the first (*Scolopendridæ*), by having each segment of the body provided with two legs, and the hinder legs distinctly longer than the others. To this family belongs the *Scolopendra forficata* of Linnæus, a species found commonly under stones, &c. in this country and other parts of Europe. According to the author last mentioned, this species constitutes the type of his genus *Lithobius*, distinguished by the antennæ being composed of forty or more joints, the two first of which are the largest; the under lip is broadly notched in front, and has the margin much denticulated; the eyes are granulated; the legs are fifteen on each side. The genus *Cryptops* of Leach, of which a species (*C. hortensis*) is found in gardens in Devonshire, has about seventeen joints to the antennæ; the under lip is not denticulated, and it is scarcely emarginated in front; the legs are twenty-one on each side, and the first joint of the hinder legs is spineless; the eyes are indistinct.

In the family *Geophilidæ* the legs are very numerous, and the hinder legs are not distinctly longer than the others. The species of the genus *Geophilus* (Leach) have upwards of forty legs, the antennæ have fourteen joints. Several species are found in England; they live in the ground and under stones. The *Scolopendra electrica* of Linnæus belongs to this genus.

SYNOD, a Greek word, Σύνοδος (literally, 'a coming together'), adopted by the Saxons, sometimes used for an assembly of any kind, but much more commonly for an assembly gathered for ecclesiastical purposes, and more particularly for an assembly of bishops or presbyters deputed by various churches or branches of the universal church to meet at an appointed place, there to deliberate on points of doctrine or other matters relating to the regulation and welfare of the church. These synods are also called councils.

In the history of the church we meet with many councils; but some are of far higher dignity and consequence than others. The highest are those which were held in the early centuries of the church, and have been approved and termed *œcumenical* by almost the whole body of professing Christians. Of these there have been only six. Some however of the councils of inferior authority are regarded as œcumenical by certain portions of the church.

By œcumenical is meant, representative of all the different branches of the church established throughout the habitable world (*οἰκουμένη*). It is not however implied thereby that bishops from all Christian sees must be present at a synod in order to constitute it œcumenical, for the whole body of bishops were never present at any council that has been hitherto held; but if the Christian world consent then or afterwards to its decree, its œcumenicity is considered as established.

The Apostolical council held at Jerusalem on the question of legal observances is regarded as a model and kind of Scripture authority for such assemblies. All the Apostles were not there, but their decisions were admitted by the body of Christians generally.

The six œcumenical councils are the following, and it is commonly understood that since the Apostolic Council these are the only councils whose decrees have been generally admitted by the church:—1, the Synod of 318 bishops at Nice in Bithynia, A.D. 325; 2, the Synod of 150 bishops at Constantinople, A.D. 381; 3, the Synod of 200 bishops at Ephesus, A.D. 451; 4, the Synod of 630 bishops at Chalcedon, A.D. 451; 5, the Synod of 165 bishops at Constantinople, A.D. 553; 6, the Synod of 170 bishops at Constantinople, A.D. 680. The Eastern church regards another Synod as œcumenical, that at Nice, under Irene, A.D. 787; and the Western (Roman Catholic) church contends that several others are entitled to be so regarded, but it is not agreed what is the number.

The Protestant churches admit of the first four only as being properly œcumenical: but they virtually include the fifth and sixth as supplementary to the third and fourth, and not condemning any new heresies.

A brief notice of each of the six great councils follows:—

(1) The Council of Nice. This was assembled by order of the emperor Constantine to determine the Arian controversy. By its decree it anathematized the doctrine of Arius. This decree was generally approved, and confirmed by subsequent councils.

(2) The first council of Constantinople. This was assembled by the emperor Theodosius the Elder, to appease the troubles of the East. It anathematized the heresy of Macedonius, who denied the divinity of the Holy Ghost. Its decree was sanctioned by the subsequent synod of Chalcedon.

(3) The Council of Ephesus was assembled by Theodosius the younger, to determine the controversy raised by Nestorius, bishop of Constantinople, who declaimed against the title θεοτόκος, which Christians had long applied to the mother of Jesus Christ. The Nestorian doctrine was condemned by the Council of Ephesus, whose judgment was subsequently confirmed, like that of the first Constantinopolitan synod, by

(4) The Council of Chalcedon, which was assembled by the emperor Marcian. Besides ratifying the creeds of the three preceding councils, it condemned the Eutychian or Monophysite heresy, namely that which maintained that there was only one nature in Christ after the incarnation. Some of the churches in Egypt and Palestine retained the Eutychian heresy notwithstanding.

(5) The Second Council of Constantinople was assembled by Justinian. It condemned certain writings which favoured the Nestorian opinions.

(6) The Third Council of Constantinople was assembled by the emperor Constantine Pogonatus, to terminate the divisions caused by the dogmas of the Monothelites, who held that after the union of Christ's divine and human nature, there remained in him but one will and operation. In its decree condemnatory of this error, the synod published a definition of the faith, in which they acknowledged the five preceding œcumenical councils.

Of the other more remarkable councils, the following brief tabular statement may suffice:—

Councils before the separation of the Eastern and Western Churches.

Place of Assembly.	A.D.	By whom called.	Decrees.
Sardica . .	347	Constans and Constantius	Re-established in their sees the bishops who had been dispossessed by the Arians.
Ariminum .	360	Constantius	Altered the wording of the Nicene creed at the instigation of the Arians.

Place of Assembly.	A.D.	By whom called.	Decrees.
Ephesus .	449	Theodosius	Absolved the heretic Eutyches from censure, and deposed Flavianus, who had condemned him.
Constantinople	754	Constantine Copronymus	Condemned the use of images and pictures in churches.
Nice . .	787	Irene	Reversed the condemnation.
Constantinople	869	Basil	Deposed Photius, patriarch of Constantinople.
Constantinople	879	Basil	Restored Photius.

Councils held in the Western Church, chiefly after A.D. 1054, *when the patriarchs of Rome and Constantinople separated from communion.*

Place of Assembly.	A.D.	By whom called.	Decrees.
First Lateran	1123	Calixtus II.	Confirmed the agreement between the emperor and pope about the investiture of prelates.
Second Lateran	1139	Innocent II.	Condemned the Manichæan heresy.
Third Lateran	1179	Alexander III.	Regulated the election of the pontiffs.
Fourth Lateran	1215	Innocent III.	Published a Confession of Faith condemnatory of the Manichæan heresy.
Lyon . .	1245	Innocent IV.	Deposed the emperor Frederick.
Lyon . .	1274	Gregory X.	Defined that the Holy Ghost proceeds from the Father and the Son.
Constance .	1414	John XXIII.	Condemned the errors of Wickliffe and Huss, and approved the administration of the Eucharist in one kind only.
Basle . .	1431	Martin	Declared the superiority of a general council over the pope.
Florence .	1437	Eugenius IV.	Asserted purgatory; and that the Roman pontiff is head over the whole church.
Trent	1545 to 1563	Different popes	In reference to the Protestant heresies.

High authority is claimed by Roman Catholic writers for the last-named council, which they contend ought to be regarded as œcumenical. This is strongly controverted by Protestant writers.

Very few synods or councils have been held in the Protestant churches. By far the most remarkable is that of Dordrecht or Dort, which was assembled in the reign of our king James I. Its professed object was to compose the differences existing between the Calvinian and Arminian parties in the Protestant church. The former prevailed.

Some hold that there is a peculiar superintendence exercised over these assemblies besides that ordinary superintendence which God maintains in the affairs of men: others look upon these assemblies as being to be placed in the same category with other assemblies of fallible men, in which human infirmities and passions enter, and the judgment is ultimately affected by all the ordinary accidents to which the divisions of large assemblies of human beings are liable.

The doctrine of the Church of England respecting councils may be seen in the Twenty-first Article.

Lists, very full and perhaps complete, of the several councils which have been held, may be found in many treatises on chronology, particularly the 'Tablettes Chronologiques,' of M. Dufresnoy; and in 'L'Art de Vérifier les Dates.'

SYNODIC, SYNODIC REVOLUTION (σύνοδος, conjunction of paths). The synodic revolution of two bodies which move round a common centre is that portion of one or more actual revolutions in which they go through all their possible relative positions. The simplest instance which can be given is that of the two hands of a watch: the absolute revolution of the minute hand is made in one hour, that of the hour hand in twelve hours; but the synodic revolution of the two hands is the interval which elapses between any time at which they are together, and the next time at which the same thing takes place.

Every phenomenon which depends upon the relative position of two revolving bodies cannot complete all its phases in less than a synodic revolution. Thus, in the case of the sun and moon, the total disappearance of the latter which takes place when they are nearest in the heavens, cannot take place again until they are again at their nearest, that is, until the moon has not only completed the circuit of the heavens, but has further progressed until she overtakes the sun. The actual revolution of the moon is not an object of interest, except to those who watch her progress among the fixed stars: the phases which are visible to all the world depend solely on her motion relatively to that of the sun. Those who would make a common watch tell time in a manner resembling the indications of luni-solar phenomena must rub out the marks of minutes and hours from the dial-plate, and choose for an interval of measurement that which elapses between successive conjunctions of the minute and hour hands.

If the two revolutions be made in the same direction, and if T and t be their respective times, T being the greater, the time of the synodic revolution is

$$\frac{\mathrm{T}t}{\mathrm{T}-t}$$

For, if x be the time of a synodic revolution, the portion of an actual revolution which the quicker has gained upon the slower is

$$\frac{x}{t}-\frac{x}{\mathrm{T}};$$

but by hypothesis this is a whole revolution, since the synodic period is nothing but the time in which the quicker gains a whole revolution upon the slower. Equate the last formula to unity, and the resulting value of x is the first formula. But if the two revolutions be made in opposite directions, the synodic revolution is made in the time

$$\frac{\mathrm{T}t}{\mathrm{T}+t}.$$

Thus in the case of the hands of a watch, $\mathrm{T}=12^{\mathrm{h}}$, $t=1^{\mathrm{h}}$; and $\frac{12}{11}$ of an hour, or $1^{\mathrm{h}}\ 5^{\mathrm{m}}\ \frac{5}{11}$, is the interval of two conjunctions of the two hands.

To find roughly the synodic period of the sun and moon, let us take the sun's actual revolution at 365¼ days, and the moon's at 27¼ days. We have then

$$\frac{365\frac{1}{4}\times 27\frac{1}{4}}{365\frac{1}{4}-27\frac{1}{4}}=29\tfrac{1}{2}\text{ days nearly.}$$

SYNOI'CUM, a genus of Ascidians, thus defined by M. de Blainville:—

Generic Character.—Body more or less cylindrical, vertical, or horizontal, adhering by the cephalic extremity, and united together by the sides of their external envelope, so as to constitute a common mass, which is a little diversiform and fixed; the two apertures of each composing animal hidden at the bottom of a more or less deep cavity, and having only a single external orifice, furnished ordinarily with six tentaculiform papillæ.

M. de Blainville thus divides the genus:—

A. Species united into a convex rounded mass. (*Polyclinum*, Lam.; *Aplidium*, Sav.)

Example, *Synoicum Ficus*.

B. Species in which the horizontal bodies unite together in a mammillated crust.

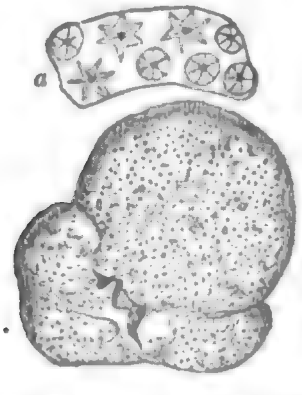
Example, *Synoicum subgelatinosum*.

C. Species in which the vertical bodies also unite together in a crust. (*Didermum*, Sav.)

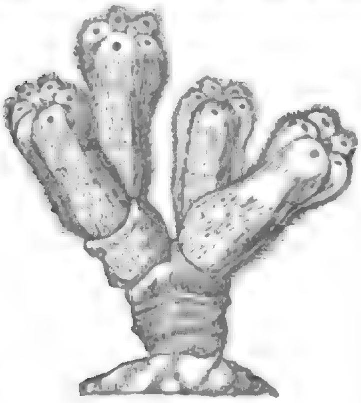
Example, *Synoicum fungosum*.

D. Species in which the very long vertical bodies unite

together in a species of cylinder, having only a single external orifice common to all the individuals.



Synoicum Ficus. *a*, a portion highly magnified.



Synoicum turgens.

M. de Blainville remarks that this genus, although very closely approximated to Botryllus, is really very distinct from it, in consequence of the manner in which the apertures of each composing animal terminate in a common cavity, with a single external orifice. He adds that it contains no more species than the genera above proposed, and that they appear all to belong to our seas. (*Malacologie.*)

SYNONYME (*συνώνυμος*). It will appear from the following definition, by Aristotle (*Categ.*, c. i), that this word was not used by him in the same sense in which it is used now: 'Those words are Homonyma (*ὁμώνυμα*) in which only the name is common, but the definition (λόγος) of the substance (*οὐσία*) with reference to the name is different; for instance, we call "animal" both man and the painting of a man, in which cases only the name is common; but the definition of the thing with reference to the name is different; for if a man explains what is meant by each being "animal," he will give a separate definition for each: those words are synonymes (*συνώνυμα*) in which both the name is common, and the definition of the substance with reference to the name is the same; for instance, both man and ox are "animal;" for both are called by a common name, and the definition of the substance is the same; for if a man gives a definition of each, what is meant by each being animal, he will give the same definition.'

At present the word synonyme is applied to different words, which mean, or are supposed to mean, the same thing: as valor, courage; virtue, goodness; vice, wickedness. Though words are often considered to be synonymous, it is probable that very few words in the same language really are synonymous. If we compare two languages, we may find synonymes; thus the words for man, horse, dog, &c., taken in any number of languages, may be considered synonymous. Words belonging to the same language may also be synonymous, where the language has received additions from various other languages, among which additions there may be terms which are synonymous (in the modern sense) with native terms of the language into which they are introduced. Thus in English there may be Saxon terms which are, or rather once were, synonymous with other terms which have been introduced into the English immediately from the Latin, or through the medium of the Italian and the French. It is said 'once were,' because though such words may have been synonymous originally, and introduced by writers for the sake of variety or harmony, or to avoid repetition of the same word, it rarely happens that such words continue to have their original meaning.

SYNO'VIA, or joint-oil, is the name applied to the fluid by which the joints of the bodies of animals are lubricated. It is separated from the blood which circulates in the vessels immediately surrounding the joint. These form a very close capillary network in the tissue which bounds the cavity of the joint, and which, when it can be separated in a distinct layer, is termed the synovial membrane. [Articulation.] Synovia is a pale yellow viscous fluid, which, when rubbed between the fingers, is peculiarly slippery, without being in any degree oily. In the horse, it was found by John (whose analysis is confirmed by those of several other chemists) to consist of

Water	92·8
Albumen	6·4
Uncoagulable animal matter, with carbonate and hydro-chlorate of soda	0·6
Phosphate of lime	0·15
Traces of ammoniacal salts and of phosphate of soda	·05
	100·

Its quantity is in direct proportion to the size of the joint, and is always sufficient to keep the articular surfaces smooth and slippery, and to fill up those recesses in the joint into which the adjacent soft tissues do not exactly fit.

SYNTAX. [Language; Organon.]

SYNTAXIS. [System, Ptolemaic.]

SYNTEA. [Silhet.]

SY'NTHESIS (σὺν and θέσις, putting together). In the article Analysis we have stated the manner in which the terms synthesis and analysis are usually applied in mathematical language: the following remarks on the connexion of these terms will not be out of place in the present article.

Synthesis teaches by construction; analysis, by the undoing, as it were, the parts of a previous construction. If the construction of a watch were actually shown, and its capability to fulfil the object of the maker inferred from the consideration of the necessary connexion of the parts (not merely proved by experiment from the going), this would be a synthetical explanation. But if, the actual performance of the machine having been first contemplated, its structure were then to be examined, by pulling it gradually to pieces, and properly inferring the effect of each removal, this would be an analytical examination.

We doubt very much whether pure analysis or pure synthesis exists in large quantities in an unmixed state in any science whatsoever. The chemist, for example, may apply the terms technically, and so far properly enough, to actual physical composition and resolution: but taking his processes as acts of the mind, it will be found that his synthesis is often a result of previous analysis, and his analysis always contains synthesis. To a learner, in all sciences, everything is synthesis; he cannot make one step for himself except by experience of problems similar to the one on which he is to try his own powers.

In the exact sciences there is something like analysis, but much intermingled with synthetical processes. M. Charles (*Encyc. Méth.*, 'Synthèse') says there is hardly such a thing as analysis, properly so called, in mathematics; and, using the word analysis in the strict sense, we should agree with him, and add that, except for learners, there is as little of pure synthesis. Generalization and abstraction, the application of that which has been found effective in the species to all other cases of the genus, and the separation of that which appears at first peculiar, but on further examination turns out to be only peculiar because a mode of thought capable of wide application has been incidentally mixed up with those which *are* essential to the problem in question—are two of the most powerful instruments of mathematics. But to which do these belong, to synthesis or to analysis? If every separation of ideas be analysis, the latter process may have that name; if every farther application of that which has once succeeded be synthesis, the former may be also. But the strict use of these terms would not allow of either extension; and if we be right in saying this, it unquestionably follows that pure analysis and synthesis, far from being the only instruments of the exact sciences, are not even the most prominent ones. When Newton, having discovered the law of the binomial theorem for positive integers, proceeded to try and verify the application of that law to fractions, it would be hard to make his process either analytical or synthetical, or a compound of both, except by such extension of the terms as would destroy their distinctive use.

Under the general notion that all inquiry which proceeds in a reverse order is analysis, and that all which may be dignified by that name is sound mathematical reasoning, much fallacy has been introduced into the elements of mathematics, the effects of which are only beginning to disappear. The process is as follows:—assume a problem to be solved; proceed to separate the known from the unknown, or in any manner to make that which is unknown capable of being compared with the known; the result when obtained is the solution of the problem: such is the language held. But it was forgotten that the assumption of the possibility of solving the problem *was an assumption;* and that the conclusion should have been, not 'This is the solution of the problem,' but 'If the problem have a solution, it must be this.' To illustrate the faulty method by an example, suppose a beginner in algebra, with a competent knowledge of arithmetic, and without any absurd pre-definition of negative quantities, has the following question proposed: 'Given $3x-11=5x-15$; required the value of x.' He is told to proceed thus:—

$$\begin{array}{rl} & \textit{Let } 3x-11=5x-15 \\ \text{Add } 15-3x \text{ to both sides} & 15-11=5x-3x \\ \text{or} & 4=2x \\ \text{or} & 2=x \\ \textit{Therefore} & x=2 \text{ is the value required.} \end{array}$$

Now the fact is, tnat the equation proposed is impossible to such a student: all that is proved is that *if* there be a solution, it is $x=2$; but when he is told to try whether $x=2$ is a solution, he finds $3\times 2-11$, an operation which cannot be performed, at the first step. Of the same nature is the assumption which was till lately part of most proofs of Taylor's theorem, namely, that $\phi(x+h)$ can always be expanded in integer powers of h: and the consequence was that most works on the differential calculus were defaced by a subsequent admission that a proposition previously declared universal was not universal; and students received a practical caution to append 'errors excepted' to every Q.E.D.

As these blots are gradually removed, so does the surface of the higher mathematics become more and more synthetical in all the elementary parts. Gradually generalization opens the road of analysis in the antient sense: when the student has step by step arrived at the power of comprehending that view of algebra which defines or interprets -1 and $\sqrt{-1}$ with rigor, he can then set out with the theorem that every equation has a solution. And in the same manner, when the complete meaning of a differential co-efficient (for every index of differentiation) is fully settled, such preliminaries may be obtainable as will enable the higher student to ground his approach to Taylor's theorem on such a form of expansion as will not afterwards 'fail.'

In the meanwhile there is a view of the higher mathematics, which will render the common term *analysis*, as applied to them, appropriate enough. The farther we proceed the greater is the power of taking out the reverse process in which analysis was defined to consist from the domain of the hypothetical syllogism, and placing it in that of rigorous deduction: the consequent increase of the power of pure analysis, or at least of that proceeding which most resembles it, may suggest the application of the term as descriptive at least of the ultimate tendency of all progress, though not of a result as yet entirely obtained.

SY'NTIPAS. This is the title of a collection of stories, written in Greek, and bearing the name of Michael Andreopulus, but the collection is evidently translated from an Oriental work. It is hardly necessary to remark that the Eastern collections of moral stories are usually so told as to grow one out of the other, in a manner of which we have an instance in the 'Arabian Nights;' but a much better example in a work not so popularly known, the English translation of the fables commonly known as those of Pilpay. It is, perhaps, not so generally known, however, that many of our best European fictions, as well single stories as whole collections, may be traced from Europe to Arabia, and from Arabia to India, and that the Indian form of the story or collection almost invariably bears the marks of an earlier origin than any other form, and appears to be, if not the original form, at least the oldest surviving one. This fact, interesting in itself, becomes doubly so when taken in connection with the philological discoveries of the latest period of etymological research; discoveries which have placed the *language* of India in much the same relation to the oldest known form of the German, as we have supposed the fictitious *literature* of India to hold to that of Europe. Many of the stories of Syntipas are found almost verbatim in an Arabic manuscript of the 'Arabian Nights,' in the British Museum, but the whole style of the stories points evidently to an Indian origin.

Syntipas is the name of a philosopher to whom is committed the education of a certain Persian prince, the son of a king Cyrus. By his judicious management he teaches the boy more in six months than he had learnt from his other masters in as many years; but at the time when the king wishes in person to prove the acquirements of his son, the preceptor discovers by his skill in astrology that a great danger hangs over his pupil, which can only be averted by the silence of the latter during seven days. The king and his courtiers are naturally 'much perplexed' by this unlooked-for event, and many ingenious guesses are wasted as to the cause.; at last one of the king's women undertakes to bring her step-son to speech. After trying many blandishments, she confesses to him in plain words a passion which she has conceived for him, proposing to him to poison his father, and to take her to his arms and his throne. Horror at this treason extorts from the young man that speech which it had been prophesied was to be so dangerous, and the queen, following the example of every heroine of a similar story, accuses the prince of attempted violence. The king wishes to put his son to death, but is dissuaded by one of the instructors of the prince, who tells one of the most elegant stories in the series, on the evil of hasty judgments. A certain king, says the sage, attempted to seduce the wife of one of his attendants, but was repulsed by her virtue, and desisted from his design, leaving, however, his ring on a couch. The husband finding this token of his wife's infidelity as he imagines, separates himself from her, but assigns no reason for this till his wife's brothers complain of his conduct to the king, making their accusation under the parable of a man to whom they had let a field, and who had suffered it to lie waste. Following up the metaphor, the husband assigns as the reason of his conduct, that he has seen the foot-prints of a lion in his ground. The king acknowledging this ingenious reproof, confesses that the lion has indeed been there, but that he has in nowise injured the field, and that he will not return to it again.

The same counsellor tells the story of the parrot set by its master to watch his wife and report to him her conduct during his absence. The bird informs his master that his wife receives the visits of a lover; but on a subsequent evening the woman, by pouring water over his cage, and counterfeiting the noise of thunder, induces him to report to his master that a violent storm has hindered him from noting what has passed; and the master, knowing this story to be incorrect, imagines that the more important one previously told him was as little worthy of belief. This same tale is told with some amplification in the Tooti Nameh. The queen then tells an unimportant story of a father attempting to save his son from drowning, and being himself carried away by the current. The application she makes of this story is, that the king had need beware, lest in his compassionate willingness to spare his treacherous son, he should be himself betrayed to death. The second sage then tells a story, which is found in the Pancha Tantra,[*] of a woman who, while in company with her lover's page, perceives his master approaching. The page is hidden, and, whilst she is entertaining her lover, the husband comes in. Seeing him at a distance, she directs the lover to take a stick in his hand, and go away as if in anger; and she explains to her husband, that this man, their neighbour, had come to look for his page, who had taken refuge in her house, and had gone away angry, being unable to find him. In counteraction of this, the lady relates the story of the young prince betrayed by his counsellor into the hands of the Ghoule, as told in the 'Arabian Nights.' The Ghoule is a Lamia in this version, and the young man cries to Christ instead of Mohammed. The third counsellor relates how two tribes were involved in war for a vessel of honey.[†]

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[*] The Pancha Tantra is the Indian original of the Fables of Pilpay. A later modification of this collection (the Hitopadesa), containing nearly the same stories, has been translated into English by Sir William Jones, and also by the late Sir Charles Wilkins.

[†] A somewhat similar story, but more artificially related, occurs in Dubois' (professed) translation of the Pancha Tantra. In this latter, the honey is

(There is an Arabic proverb which alludes to a similar catastrophe resulting from the breaking of an egg.) He also tells how a certain woman, going to buy rice, was offered sugar with it, gratis, on condition of certain complaisances to the vendor. While she is within the house, the shop-boy empties the sugar from the bag and fills it with dust. When this is discovered by her husband, she pretends that, having dropped the money, she gathered up the dust, hoping to discover in it what she had lost. The husband helps to sift the dust, and, so says the malicious narrator, 'defiled his own beard.' The queen hereupon relates how a prince on his way to his bride was decoyed by his father's vizier to drink of a fountain which changed him into a woman. A traveller whom he meets, hearing his miserable story, consents to exchange sexes with him, on condition of a restoration within a certain time. At the time fixed however, the transformed woman informs the prince she is pregnant, and he, pleading the injustice of taking upon himself this additional burden, refuses to complete his agreement.* The fourth philosopher then tells a story of a bath-keeper giving up his wife to a young prince, in the false hope of obtaining profit without dishonour. The same sage tells another story, of a man leaving his wife, each taking to the other an oath of perfect fidelity during their separation. Towards the end of this term, a young man seeing the wife becomes enamoured of her, and seeks to be introduced to her through the intervention of an old woman in his neighbourhood. This latter persuades the wife to grant her employer a meeting, by a story of her daughter having been turned into a black bitch for her cruelty to a lover. The old woman going out to seek her employer is unable to find him, but brings with her the first man she meets, who proves to be the absent husband. The point of the story is in the readiness with which the wife vindicates herself, and puts her husband in the position of the injuring party, by representing the whole occurrence as a trap laid to try his fidelity. The queen tells a foolish story of a wild boar, who, looking up in vain for the figs which he expected an ape to throw down to him, burst the arteries of his neck and was killed. The story of the fifth sage is that of the hound slaying the serpent in defence of his master's child, of which we have a current European version in the legend of 'Beth Gellert.' He tells also another story of an old woman who procures the expulsion of a wife from her husband's house by laying a man's cloak, known to the husband, under his couch; and afterwards contrives to restore the wife by professing to have left the cloak there by forgetfulness. The queen then tells a story of a thief coming into an inn by night to steal the travellers' mules, and finding there a lion which had come for the same purpose, and which he mistook for a mule and mounted. The lion, taking this man for the 'guard and dæmon of the night' (*ὁ δαίμων ὃν λέγουσι τῆς νυκτὸς εἶναι φύλακα*), is terrified, and suffers him to keep his place quietly till the morning, when the man escapes into a tree. A monkey, meeting the lion, asks the cause of his terror, and assuring him that the supposed dæmon is a man, persuades him to return to the tree to kill him. The lion consents; but the thief contriving to kill the monkey in the tree, the lion, still more terrified than before, takes a precipitate flight.†

The two doves is a story told by the same sage, as a warning against hasty judgments. They had gathered a provision of corn for the winter, which being wet shrank in drying. The male dove, seeing this, accused his mate of having clandestinely robbed the store, and on her denial of this charge killed her. When the rains came, and the grain swelled to its original size, he discovered his error, and too late repented of it. This is one of the fables of the Kalilah wa Dimna, or Arabic version of the Pancha Tantra, but is not found in the Hitopodesa, the later Indian version. The story of the woman into whose basket had been introduced a honey-cake elephant is much of the same stamp as that of the woman buying rice (already quoted), but is hardly decent enough for quotation. The same judgment may be passed on the man with three wishes,—a satire on the vanity of human desires which has been repeated in a hundred different forms. The next story is also one of those malicious yet favourite jests of which every nation has a copy. A certain scholar has occupied himself, like the husband of the Wife of Bath, in collecting the wiles of women; of the folly of which attempt the wife of his host convinces him by a story and a practical exemplification.

At this point the prince, whose days of trial are accomplished, breaks silence, and explains the perfidy of his stepmother. This, though the end of his danger, is not the end of the story. A question arises, who of all the parties concerned would have been in fault if the prince had been put to death. The blame is successively cast upon every one of the actors in the story, when the prince, premising that his knowledge, compared with that of the sage, is 'but as a fly to an elephant,' begs permission to relate an apologue. A certain man made a feast, where amongst other viands there was milk for the guests' drinking. Now as the maidservant had brought this from the market on her head, a bird with a serpent in its claws had flown over it, and the serpent in its agony disgorged its poison into the vessel. The guests all drank and died, and the question is raised, who was blameable? The prince gives it as his opinion that blame rests upon no one agent concerned, but that the death of the guests was the result of destiny, and applies the same judgment to the hypothetical case of his own condemnation and execution. There are then told three stories: two of the wit of children, and one of the simplicity of an old man. The first of these is of a child who by his extravagant and petulant hunger laid a train for reproving his mother's lover; the second the well-known story of the three men who put their money into the hands of a woman, charging her to return it to the three only. One of these contrives to obtain possession of the money by fraud; and when the other two claim from her their deposit, by the advice of a child she holds them to the words of their bargain, that she was not to deliver up the money except to *three*; she cannot therefore give it, till the third, the thief, shall appear. The third story is of a merchant selling aromatic woods, who unhappily enters a certain city where the inhabitants all pique themselves upon their knavery. One of these, lighting a fire of aromatic woods, persuades the merchant that they are in that city so cheap as to be commonly used for fuel, and induces him to part with his whole stock at a low rate, for a small coffer full—he does not say of what. A little after this notable bargain, our merchant chances upon a company of these knaves (*μῖμοι*, the Greek author calls them), and is challenged by one of them to a trial of wit, the loser to be subject to the command of the elder. The merchant is beaten, as may be supposed, and is enjoined by the victor to drink up the waters of the sea—an old quibble. Putting off the execution of this arduous duty till the morrow, he is assailed by another 'mime,' a one-eyed worthy, who insists that the merchant, grey-eyed like himself, has stolen his missing optic, and drags him before the judge. On his way he is met by his hostess, who engages for his re-appearance and takes him home. After a feminine lecture to him for slighting her advice, for she had warned him of the character of her fellow-townsmen, she informs him that an old man holds a sort of school of knavery, whither the townspeople resort to receive his judgment upon their day's proceedings; and she advises him to be present there in disguise. Acting upon this suggestion, he hears his three friends severally recount their adventures, and the archmime blames each of them in turn: the first, because he might be required by the merchant to fill the stipulated measure with fleas, half male and half female, part blue-eyed and part dark; the second, because the merchant might if he pleased refuse to drink up the sea unless the rivers are kept from flowing into it; and the third, because he has left himself open to an embarrassing

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brought to the king by a huntsman, and a drop falling on the ground, a fly settles on it; a lizard seizes the fly; the king's favourite ichneumon attacks the lizard; the hunter's dog fastens on the ichneumon; the king strikes the dog; the huntsman, grumbling at the animal's punishment, is beaten by the king's order, and a general mutiny of all the huntsmen of the district is the consequence. We have many *chain-stories* of this kind in our own language, scarcely perhaps grave enough for type, but which any one, whose memory can reach to his nursery years, will readily remember.

* A story of the same kind, but with greater marks of originality, is found in Dubois' translation of the 'Pancha Tantra.'

† This is but an indifferent story in the hands of the Greek author, but 'it was a good jest when he heard it.' It is evidently derived from the following, which occurs in Dubois' version of the 'Pancha Tantra.' An old goat by mistake enters the den of a lion, and seeing flight to be useless, walks boldly up to him. The lion, somewhat dashed at the grave assurance of this strange figure, inquires the meaning of his visit, and is told that the bearded monster has vowed to slay so many tigers, and so many lions, and that having finished the first part of his task, he is ready to begin the second. The lion makes the best of his way out of the den, but the fox meeting him, laughs at his terrors, explains the real nature of the supposed monster, and persuades him to return. The goat, on the approach of the two, cries out to the fox, 'I bade thee bring me *two* lions, why hast thou brought only one?' and the lion, naturally concluding that the fox has betrayed him, escapes in greater terror than before. In the 'Tooti Nameh' a similar story is told of a lynx, or Siyah Gosh, and a lion; and Keightley, in his 'History of Fiction,' tells the tale in another form, of a man who, by a similar artifice, was delivered from a Ghoule.

demand from the merchant, in case the latter should think of requiring that the eyes of each party should be taken out and weighed, to determine the ownership of the disputed one. Acting upon these hints, the merchant obtains the full value for his merchandize, and makes besides his own terms with his tormentors.

The punishment of the queen is then debated on, one proposing that her hands and feet should be cut off, another that her tongue be cut out, another that her heart be torn from her body. The unhappy woman pleads for herself by the story of a fox which was shut up by accident in a walled city, and, finding no egress, lay counterfeiting death at the closed gate of the city. One passer by dilates on the great virtues of a fox's tail for 'sponging mules;' another lauds the virtue of its ears for stopping the crying of a fretful child; a third declares that the teeth of a fox are 'the sovran'st thing on earth' for a fit of the tooth-ache; and each appropriates to himself the particular part he has eulogised. All this, says our heroine, the fox bore manfully; but when a fourth sage declared that a fox's heart was a remedy for all evils, and took out his knife to possess himself of this panacea, the patient took heart of grace; and leaping up, escaped safely by the gate, which had by this time been opened. The queen's moral from all this is, that she would bear patiently either of the proposed minor punishments; but that the tearing out of her heart was a 'death of all deaths most bitter.' Her step-son pleads for mercy, on the ground of the weakness of the sex; and her punishment is commuted to shaving her head, branding her on the forehead, and parading her on an ass's back out of the city. A story to show the uselessness of resisting the decrees of Providence, like a thousand and one stories of the same kind, some of which our readers will remember as given in the 'Arabian Nights,' is the last in the book, and this is closed by a description of the prince's education, and of his examination by his father.

A curious story of this kind occurs in the Pancha Tantra:—Pushpaka, the favourite parrot of Indra, is decreed by fate to die: the solicitations of all the inhabitants of the heaven of Indra are answered evasively by Yama, and Death, personified, destroys his prey during the discussion. This doctrine of the iron force of destiny is by no means so prominent an article in the Hindu code of faith as it is in the Mohammedan; and in no system, Pagan or Mohammedan, does it appear with such awful emphasis as in the Teutonic or Scandinavian mythology. The whole of this takes a tone of mysterious melancholy, from the frequent mention of misfortunes to which even the gods are subject; which they can foresee, but not avert; and from the perpetual foreboding of that destruction of all things mighty, that twilight of the gods, of which perhaps the idea may have been derived from the *pralaya* of the Hindu cosmogony; but of which the outline has been filled up by the masculine imagination of the North with details which are read with trembling. Those who are desirous of pursuing this subject farther, and of examining more minutely the connection between the fictions of Oriental and Western nations, will find it worth while to refer to some or all of the works mentioned below.* Independent of the interest which these collections possess as illustrating the connection of the two most civilised quarters of the globe, they have in themselves a high value, as illustrative of the moral features of Eastern character, of which they contain a very faithful picture. The strong bent towards a bitter humour; the preference, in all maxims of state and policy, of a shrewd and crafty to a bold course of conduct; the inveterate habit of submission to authority in matters of opinion, a disposition common enough perhaps over all the world, but preternaturally developed in Asia; and the low estimation in which the female character is held; all these points stand out so plainly in every Eastern collection of stories, that he who runs may read. The last peculiarity especially is so exaggerated a trait of Asiatic character, that the object of many entire collections of tales is to illustrate the supposed worthlessness of the female character. We are too apt to repeat the assertion that the estimation in which the women are held is an index of the degree of civilization of a nation; yet we find the degrading opinions we have alluded to prevailing through the most polished periods of Hindu and Mohammedan history: we believe indeed that history will pretty well bear out the assertion that the Gothic race alone, with the exception of the Romans, civilized or uncivilized, has held more just and manly opinions.

The Greek text of Syntipas was edited from two Paris MSS. by Boissonade: 'Συντίπας. De Syntipa et Cyri filio Andreopuli narratio, Paris, 1828, 8vo.' A translation of Syntipas into modern Greek appeared at Venice in 1805. Another work attributed to Syntipas was also translated into Greek from the Syriac by Andreopulus. It is a collection of sixty-two fables, entitled Παραδειγματικοὶ λόγοι, and was edited by Matthiæ, Leipzig, 1781, 8vo.

SYPHAX. [NUMIDIA.]

SYRA, or SYROS (Σύρα or Σύρος), at present called Siro, is an island of the Ægean, which belongs to the group antiently called the Cyclades. It is south of Gyarus, and between Ceos and Tenos. Homer (*Od.*, xv. 402), who calls the island Syrie, places it above Ortygia, and says that it contained two towns: one of them was the birthplace of the philosopher Pherecydes. Its circumference, according to some of the antient authorities, was 20,000 paces; and, according to Mucianus, 160,000 paces. (Plin., *Hist. Nat.*, iv. 22.) Homer and other Greek poets describe the island as rich in pastures, wine, and corn. (Compare Strabo, x., p. 485; Pomp. Mela, ii. 7.) There are still ruins of one of the antient towns, and many valuable relics of antiquity have been discovered in this small island.

Syra is intersected by hills and narrow valleys. The inhabitants, who previous to the year 1821 amounted to about 1000, are of the Roman Catholic religion. In the war with the Turks, Syra remained neutral, for which reason many persons took refuge there, for the purpose of carrying on their mercantile business. The population thus soon rose to 5000; and, after 1828, it amounted to 10,000. During the Greek war, Syra was the central point of the commerce of Greece. After the pacification, commerce was restored in the other parts of Greece, and, in consequence, decreased in Syra; but the chief place of the island, Asprana, is still an important position, on account of the port of Fornigi. Syra is one of the principal stations for the French steam-boats which sail from Marseille to Constantinople.

(Prokesch von Osten, *Erinnerungen*, vol. i., p. 57, &c).

SYRACUSE (Συρακοῦσαι, in Greek; *Syracusæ*, in Latin; *Siracusa*, in Italian), a town on the east coast of Sicily, 30 miles south-south-east of Catania, and about the same distance north by east of Cape Passaro, the southern extremity of Sicily. Antient Syracuse, in the time of its splendour, was the largest city in Sicily, and one of the largest in the antient world: it was of a triangular form, and consisted of five towns, adjoining one another, but separated by walls: the oldest of these towns was Ortygia on the peninsula, originally an island of an oblong shape, about two miles in circumference, lying between the Great Harbour on the west, which is a splendid piece of water about five miles in circumference, and the Little Harbour, which was paved with marble flags, on the east. On the other side of the Little Harbour was the town of Acradina, which extended for about three miles to the eastward along the sea-coast, until it reached a bay, where was the port Trogilus, outside of the city. The western part of Acradina, adjoining Ortygia, stood on low ground, on a level with the island; but the remaining and larger portion of it lay on a range of heights which stretch from the sea for several miles inland, and are divided from the lowland by a natural wall of rocks. North of Acradina, and inland, stood the town of Tyche, on the same range of heights as the upper part of Acradina, being divided from the latter only by a double wall and a via intermuralis between. Tyche extended inland to the northward for a length of above two miles, and at its western extremity was the Epipolæ, consisting of several commanding heights, which were enclosed and made into a vast fortress by Dionysius the elder. South-west of Tyche, in the lower ground at the foot of the heights, was Neapolis, or the New Town, which, at its southern end, adjoined the lower part of Acradina. The whole was surrounded by an external wall, the length of which was 180 stadia, or rather more than 22 miles. Ortygia was the first part inhabited; but the population increasing, the island was joined to the mainland by a causeway across the narrow channel of the sea, and the neighbouring low grounds were built upon. The tide of

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[*] 'The Heetopades' of Vishnu Sarma, translated by Charles Wilkins, 8vo. Bath, 1787.

'Kalilah and Dimnah, or the Fables of Pilpay,' translated by Wyndham Knatchbull, 8vo., Oxford, 1819.

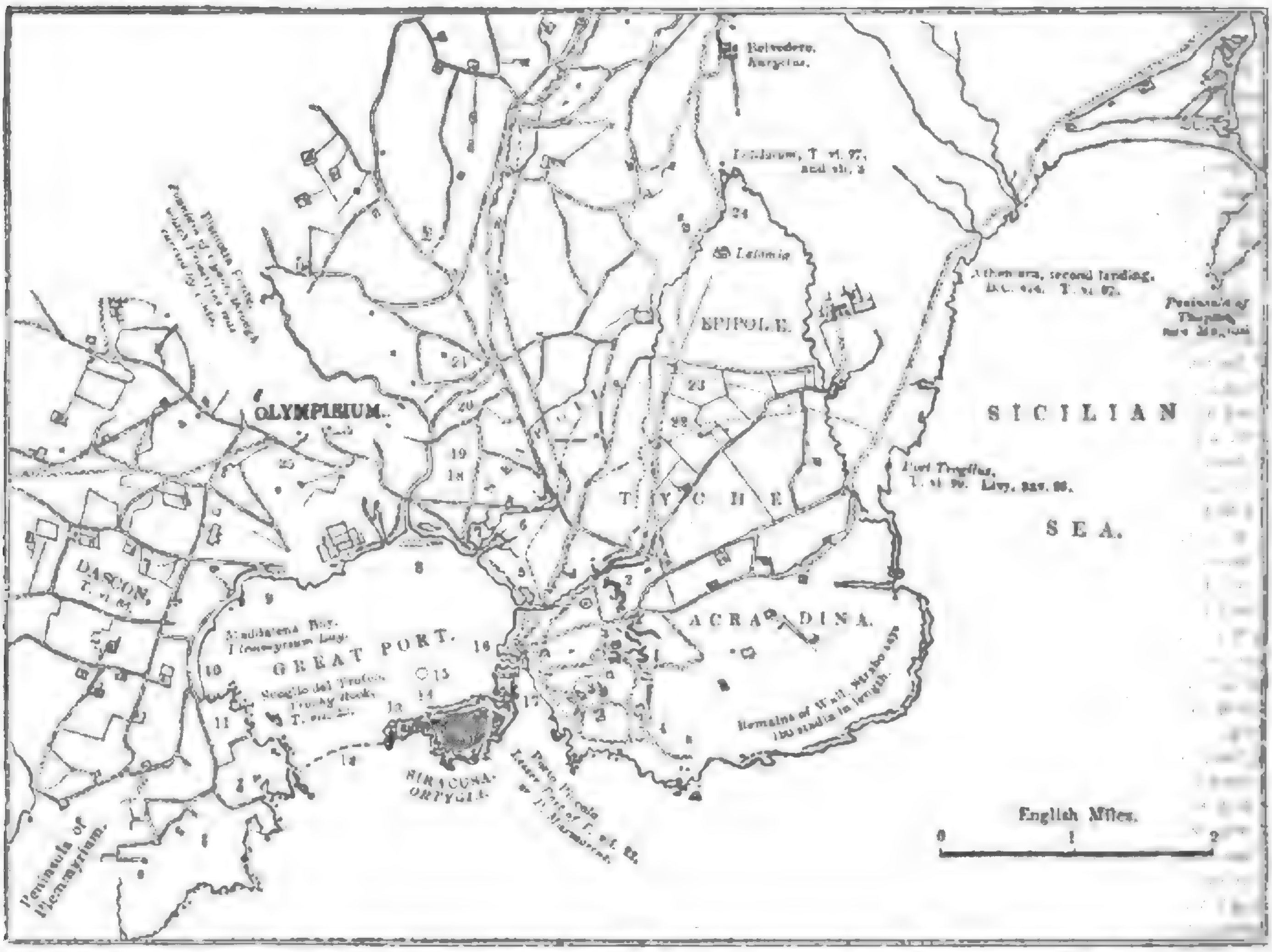
'Contes et Fables Indiennes traduites d'Ali Tchelebi Ben Saleh,' 3 tomes, Paris, 1778.

'Analytical account of the Pancha Tantra,' by H. H. Wilson; 'Transactions of the Royal Asiatic Society,' vol. i., pt i., pp. 155, et seqq.

population still continuing to flow, the heights were occupied next, and Acradina became a large and handsome town. Tyche was occupied next, and lastly Neapolis. Suburbs and gardens extended south of Neapolis to the mouth of the river Anapus, and beyond it, round the western shore of the Great Harbour to the steep peninsula of Plemmyrium, which faced Ortygia. After the Roman conquest, the population, having gradually decreased, became restricted to the original Ortygia and the lower part of Acradina, and all the upper city was already abandoned in the time of Augustus. The Saracens in the ninth century plundered and devastated Syracuse, which contained till then about 100,000 inhabitants; and from that time Ortygia, or the island, has been the only part inhabited.

The greater part of the upper town of Acradina, especially near the sea, is now a naked dreary rock, the surface having been thoroughly cleared of the materials of the antient city. No traces of antiquity, except some steps and a few courses of stones, not a vestige of a house, temple, or monument is to be seen on the extensive plain. The sea has undermined the shore, and the town-walls have fallen in and disappeared. Considerable remains of the external wall, built by Dionysius the elder, are seen farther north round Tyche and the Epipolæ, beginning from Scala Græca near the port Trogilus, and following without interruption the sinuosities of the hill. Not far from Scala Græca, at a place called Targetta, are the remains of a gate, from whence a street can be traced across the site of Tyche to the antient theatre at the other end near Neapolis. The ruts of wheels are seen deeply worn in the rock, and holes in the middle where the horses that drew the vehicles placed their feet. Traces of other streets are also seen, with foundations for walls cut in the rocks. The fields within and near the external walls of this part of the town are covered with immense heaps of stones thrown confusedly together. On the outside of the walls a green slope reaches from the foot of the rock to the plain, and is covered with old olive-trees.

Between the upper and the lower part of the town, and near the borders of Tyche, Acradina, and Neapolis, is the antient theatre, hewn out of the live rock. The steps are half hidden with bushes, poplars wave their heads over the ruins, and the water of the aqueduct rolls and falls from rock to rock, and is next collected into a small stream that flows into the Great Harbour. No part of the proscenium remains—no superstructure of any sort. When the theatre was in its perfect state, the approach to the upper seats was on a level with Tyche. Acradina lay even with the middle part, and the people of Ortygia and Neapolis had to ascend to it.



1 Antient Latomiæ or Quarries and used as prisons.
2 Ear of Dionysius, 64 feet.
3 Convent di S. Lucia.
4 Convento dei Cappuccini.
5 Stockade of Syracusans, T. vi. 101.
6 Battle, T. vi. 101.; Lamachus slain.
7 Lake and Marsh of Lysimeleia. T. vii. 53.
8 Great naval battle, T. vii., 70; Athenians 60, Syracusans 76 vessels.
9 Athenians first land, B.C. 415, T. vi. 65.
10 Triremes careening, T. vii. 24.
11 Athenian camp of Plemmyrium. Three forts and stores for the fleet, T. vii. 4, 23.
12 Battle of Triremes, T. vii. 38, and last sea fight, T. vii. 71.
13 Castello di Maniace.
14 Fountain of Arethusa, Strabo vi 270.
15 L'Occhio della Zilica, a copious spring of fresh water through the sea.
16 Battle of the Syracusan ships, T. vii. 22.
17 Forty-five Triremes, T. vii. 51.
18 Last camp of the Athenians after losing the Epipolæ.
19 Review of the Syracusan forces, T. vi. 96.
20 River Anapus—Fiume Alfeo, or Bufalaro.
21 Athenians ford the Anapus in the retreat, T. vii. 78.
22 Counter walls of the Syracusans, T. vi. 99.
23 Circular walls of the Athenians, T. vi. 98.
24 Hexapylum? Livy, xxv. 24.
25 Helorine Road, T. vi. 66, 70.

From the Plan of Syracuse published by the Society for the Diffusion of Useful Knowledge. T = Thucydides.

Not far from the theatre are the remains of an amphitheatre of the Roman period; and nearer to Ortygia are the remains of the palace of the sixty beds, said to have been built by Agathocles, the arches of which are constructed of a kind of hollow tubes of baked clay, and shaped like a long-necked bottle without a bottom. They are filled with mortar; and by inserting the neck of one into the wide end of the other a curved row is formed, and the whole covered with cement, on which flat bricks are laid. Near it are vestiges of the wide street mentioned by Cicero, which may be traced from the isthmus of Ortygia, and across the site of the upper town, to a spot called Santa Bonaccia, on the edge of the Portus Trogilus.

The Latomiæ were originally quarries excavated in the rocks that divide the upper from the lower town, from whence the stone for the construction of the city was drawn. They are from 60 to 80 feet deep. Some of them afterwards served as prisons; and on the surrender of Nicias the whole of the Athenian prisoners were confined in them and mostly died. The largest of these Latomiæ is annexed to the Capuchin convent of Palombino. A romantic garden and grove of fruit-trees called La Selva is formed at the bottom of it, and is secured from every wind by the surrounding cliffs. Another Latomia, which is near the antient theatre, is planted with olives, oranges, lemons, pomegranates, almonds, and figs. On one side of it, cut in the rock, is the remarkable excavation called the Ear of Dionysius. 'It is in the shape of a parabolic curve, ending in an elliptical arch, with sides parallel to its axis, perfectly smooth, and covered with a slight stalactitic incrustation that renders its repercussions amazingly sonorous. Although a considerable portion of it has been filled up, which I ascertained by excavation, it is still 64 feet high, from 17 to 35 in breadth, and 187 deep. It has an awful and gloomy appearance, which, with its singular shape, perhaps gave rise to the popular and amusing paradox that Dionysius had it constructed for the confinement of those whom he deemed inimical to his authority, and that from the little apartment above he could overhear all the conversation among the captives.....He could not however have listened with satisfaction or advantage, for if two or more people are speaking together it occasions only a confused clamour.' (Captain Smyth's *Memoir descriptive of Sicily*.)

The catacombs are vast excavations, of very remote antiquity, for the purpose of burying the dead: they form subterraneous streets of tombs cut out of the solid rock. They were converted by the early Christians into places of refuge from persecution. The entrance to them is under the small church of San Giovanni, in the lower part of Acradina. This church is one of the oldest Christian churches in Europe. The catacombs were filled with tombs of the dead of all ages and faiths—Greek, Roman, Christian, and Saracen.

The aqueduct was begun by Gelon and enlarged by Hieron. The stream is brought in subterraneous channels from Monte Crimiti, outside of the Epipolæ, until it enters the walls at the place where the fort of Labdalum stood. It then appears above ground, being received into an aqueduct upon arches and conveyed to some mills, after which the water falls down the steps of the great theatre at Neapolis.

Outside of the walls, and on the left bank of the Anapus, near the Great Harbour, are parts of the shafts of two fluted columns of the temple of Jupiter Olympicus, which was enriched by Gelon with the spoils of the Carthaginians. They are six feet and a half in diameter, and rest upon a plinth of two steps. There are other antient remains scattered here and there, but of no ascertained character.

The modern town of Siracusa, which, since the devastation of the Saracens in the ninth century, has been confined to the peninsula of Ortygia, is fortified, and has a regular garrison, but is commanded by the height of Acradina. It is a bishop's see; has 13,000 inhabitants, narrow streets, numerous churches and convents, and other public buildings, the most remarkable of which is the cathedral, once the identical temple of Minerva, which was plundered of its ornaments by Verres. Its exterior dimensions are 185 feet in length and 75 in width. It has been repeatedly repaired, and a new façade erected in very bad taste. There are also some remains of Diana's temple near St. Paul's church.

A bath, with a spiral staircase about 40 feet deep, is seen in the church of St. Philip; and there are also vestiges of the baths of Daphne, in which the emperor Constans was murdered in 668.

The celebrated fountain of Arethusa is a large pool of water, supplied by a spring, and separated from the sea by a wall, in the Ortygia, near the Great Harbour; and about 80 yards from it rises from the bottom of the harbour a copious spring, called l'Occhio della Zilica, which, according to the antient poets, was the Alpheus of Elis.

There is a museum at Siracusa containing the statues of the Landolina Venus and Æsculapius, some sarcophagi, a handsome collection of vases, inscriptions, coins, &c., and a public library. The principal private cabinets are those of Landolina and Capodieci.

Syracuse enjoys a delightful climate in winter, but the alluvial plain on the west side of the harbour, through which flows the Anapus, exhales pestilential miasmata in the summer months. The country around is very fertile. On the left bank of the Anapus is the fountain of Cyane, now called the Pisma: it is a circular basin of the purest water, about 60 or 70 feet in diameter, and 26 feet deep, stocked with fine fish. From it the water flows in a quiet deep stream to the river Anapus: on the sides of the stream is found the Cyperus Papyrus floating in abundance.

Many of the women of Syracuse, especially of the lower orders, are remarkable for the Grecian contour of their features. The people carry on some little trade by sea, but the place is by no means thriving.

(Bonanni, *L'Antica Siracusa illustrata;* Mirabella, *Pianta di Siracusa;* Swinburne, *Travels in the Two Sicilies;* Captain Smyth, *Memoir descriptive of Sicily*.)

History of Syracuse.—About 735 B.C., one year after the foundation of Naxos, by a colony of Chalcidians, Archias, a Corinthian, the head of a colony of Corinthians and Dorians, settled in the island of Ortygia, having overpowered the native Siculi. This settlement, which afterwards extended to the mainland, was the origin of the great city of Syracuse, a name said to be derived from a neighbouring marsh called Syraco. The epochs of the foundation of the four suburbs on the mainland, which became gradually so many large towns, are not known. Syracuse also sent colonies to other parts of Sicily, which founded Acræ, Casmenæ, and Camarina. The first two centuries of the internal history of Syracuse are very obscure. The government at first was in the hands of the 'geomori,' or 'gamori,' the original colonists who had taken possession of the land. Their estates were cultivated by slaves or serfs, called kyllyrii or killikyrii, who were the native Siculi reduced to bondage at the conquest. Fresh colonists coming in from other places formed the Demus, which was excluded from the body politic. The Demus however, having increased in numbers and wealth, claimed to participate in the offices and honours of the state; but about 492 B.C., the demus being joined by the kyllyrii, effected a revolution and expelled the geomori or aristocracy. The democratic government that followed was one of confusion, and did not last long, for Gelon, tyrant of Gela (τύραννος), having taken the part of the exiled geomori, marched to Syracuse with an army, and the people willingly opened the gates to him, when he was acknowledged as tyrannos, or sovereign, of Syracuse, 485 B.C. The rule of Gelon was temperate, and his reign was prosperous for Syracuse. He enlarged and embellished the town, and introduced several thousand additional inhabitants from Camarina and other towns, which he conquered. His successful war against the Carthaginians, and other particulars of his reign, are given under GELON.

After having made peace with Carthage, Gelon convoked a general assembly of the citizens of Syracuse, in which he appeared without arms or escort; and after giving an account of his public life, he offered to abdicate if they were dissatisfied with him. In reply he was saluted by the people as their saviour, and a statue was erected in commemoration of this occurrence. After his death Gelon was succeeded, according to his wish, by his brother Hieron, whose reign was upon the whole successful, but his administration was tainted with suspicion and tyranny. [HIERON I.]

Hieron was succeeded by his brother Thrasybulus, B.C. 467. Thrasybulus however proved even more tyrannical than his brother, and was driven away by the people after one year's reign. An assembly was then convened, in which a new constitution was framed. The public offices were to be filled chiefly by the antient citizens, while those who had been admitted by Gelon from other towns, as well as the naturalized mercenaries, were not to have the full right of citizenship. This occasioned a fresh revolt; the insurgents took possession of Acradina, but were defeated, and obliged to submit or emigrate. This was followed by various attempts of the wealthy citizens, who, having ingratiated themselves with the discontented, especially of the lower orders, aspired to usurp the supreme power. Several of them were executed: and in order to prevent a recurrence of such attempts, an institution was established, 454 B.C., called Petalism, in imitation of the Ostracism of Athens. Every citizen wrote upon a leaf the name of the citizen whom he thought most likely by his influence and wealth to aspire to the sovereignty; and the person whose name was written on the greatest numbers of leaves was exiled for five years. In consequence of this the more distinguished citizens withdrew themselves from public life, and the government fell into the hands of the poor. At last the citizens abrogated the Petalism.

About this time, in the period that immediately preceded the Athenian expedition to Sicily, Syracuse extended its conquests into the interior of Sicily. A native prince of the Siculi, called Ducetius, was defeated by the Syracusans, and obliged to beg for mercy, and was sent in exile to Corinth. Trinacria, the principal town of the Siculi, was taken after a most heroic defence, and was destroyed by the Syracusans and other Greeks.

In the year 427 B.C. the people of Leontini, being hard-pressed by the Syracusans, who wanted to subject them, applied to Athens for assistance. An Athenian fleet, with troops, was sent to Sicily, but after several desultory actions peace was made between Syracuse and Leontini, and the Athenian expedition withdrew. In 416 B.C. a quarrel between the towns of Egesta and Selinus brought in the Syracusans, who took the part of Selinus. The Egestans sent messengers to Athens, who were joined by others from Leontini, and represented to the Athenians that the Syracusans threatened to become the masters of Sicily, after which they would naturally assist the Peloponnesians, with whom they had a common origin, against Athens. War was decided on at Athens, and a formidable armament sailed for Sicily, B.C. 415.

The Athenian expedition of 136 triremes, with a considerable land force, under Nicias, Alcibiades, and Lamachus, after putting into Rhegium, sailed round to Messana Camarina, Egesta, and other towns of Sicily, in quest of auxiliaries against Syracuse, but almost all the towns which did not openly join Syracuse professed neutrality. The Athenians however took possession by surprise of Catana, where they passed the winter. Meantime Alcibiades had been recalled to answer some charges, and the supreme command remained with Nicias. [ALCIBIADES.] The Syracusans sent envoys to Corinth to request assistance, and both Corinth and Sparta, the latter chiefly at the suggestion of Alcibiades, who had taken refuge there from proscription, resolved to send succour to Syracuse under Gylippus, a celebrated Lacedemonian captain.

In the spring of 414 B.C. Nicias, having embarked his troops at Catana, landed a party of them in the bay of Thapsus, north of Syracuse, which, without being perceived, ascended the heights of the Epipolæ, took possession of them, and built there a fort which they called Labdalum. They then began to build a wall from Port Trogilus to the Great Harbour, so as to enclose Syracuse on the land side, whilst their fleet blockaded it by sea. In executing this work Lamachus was killed in a fight against a party of Syracusans. In the mean time Gylippus arrived in Sicily, collected some troops from Gela, Selinus, and other towns allied to Syracuse, marched towards Epipolæ, seized the fort Labdalum, and annoyed the Athenians in their encampment. The Syracusans attacked the Athenian fleet at the entrance of the Great Harbour; the fight was not decisive; but Gylippus with his land forces surprised the forts which the Athenians had raised on the peninsula of Plemmyrium. Another sea-fight took place, in which the Athenian galleys were worsted. Soon after Demosthenes and Eurymedon arrived from Athens with a new fleet of 73 galleys and about 8000 soldiers. Demosthenes attacked the heights of Epipolæ by night, but was repulsed with great loss. Gylippus went round to the Sicilian towns to collect fresh forces against the Athenians. After several discordant councils among the Athenian generals, who saw their land troops dwindle away both by sickness and by the hand of the enemy, who was superior to them in cavalry, it was resolved to embark the soldiers secretly and sail away with the fleet. Nicias, who had never been sanguine about the success of the expedition, now opposed the raising of the siege, from a feeling of honour as well as from fear of responsibility; but at last gave way to the opinion of his brother commanders. An eclipse of the moon however frightened the army, and the departure was deferred. Meantime the Syracusans, having heard of the intention of the Athenians, made demonstrations against their camp, and at the same time attacked the Athenian fleet in the Great Harbour, and defeated it. Eurymedon was killed, and eighteen Athenian galleys were taken. The Syracusans then blocked up the entrance of the Great Harbour by means of galleys and other vessels lying at anchor, and connected by means of chains, and thus shut up the Athenians. Nicias then resolved to fight his way out with the fleet. The Athenian vessels were heavy, those of the Syracusans light: the former, in trying to break through the chain, got crowded in one mass and became unmanageable; the crews were exposed to showers of stones from the enemy, and at last the Athenian fleet was driven against the shore, and the greater part of it was taken or sunk. There remained sixty vessels, with which Demosthenes proposed to escape whilst the Syracusans in their rejoicing were off their guard, but the sailors were too discouraged, and refused to sail. At last the Athenians resolved to abandon their remaining vessels and stores, their sick and wounded, and retire by land to Catana. The army broke up on the third day after the sea-fight, in two bodies, with the baggage in the centre. After crossing the Anapus, they were much harassed in the plain by the Syracusan cavalry and light troops, and after short marches and continual fighting for several days, the corps of Demosthenes, which was in the rear, was surrounded and overpowered; part of the Sicilian auxiliaries who served with the Athenians were allowed to return to their homes, and the rest of the soldiers, about 6000, surrendered at discretion, and were taken prisoners with Demosthenes to Syracuse. Nicias arrived that very evening on the banks of the Erineus, and, crossing the river, encamped on a mountain. The next day he was informed of the surrender of Demosthenes, and was himself attacked. After fighting all that day, his men having neither provisions nor water, he moved on next morning and reached the river Asinarus, where, the men rushing to the water to drink, the Syracusans fell upon them and slaughtered them without resistance. After a great massacre, Nicias, seeing no chance of safety, implored Gylippus to stop the slaughter, and the order being given to that effect, the survivors were taken prisoners to Syracuse. Of 40,000 men who had been engaged in the expedition, all were killed or taken prisoners, and not one of 200 vessels returned to Athens.

Of the prisoners, all the free-born Athenians and the Sicilians who were with them were confined in the quarries; the rest, servants, followers of the camp, &c., were sold as slaves. Nicias and Demosthenes were put to a cruel death. The prisoners in the quarries receiving but a small pittance of barley bread and water, and having no shelter by day or night, diseases broke out among them. The bodies of the dead were left to putrefy among the living, and this created contagion, of which most of them perished. Thus ended this formidable expedition, the ill success of which broke down the power of Athens, and had a great influence on the result of the Peloponnesian war.

After the defeat of the Athenians Diocles proposed in the assembly of the citizens, that as all orders had shared in the common danger and defence, all should share alike the offices of the state, and moreover that public offices should be filled, not by election, but by lot, a measure which was adopted. Diocles at the same time compiled a criminal code of a very severe kind. This democratic condition lasted very few years, for in 406 B.C. Dionysius, a clever demagogue, was elected commander, and soon became tyrant of Syracuse. The events of his long reign, including his wars against Carthage, are narrated under DIONYSIUS THE ELDER. He was succeeded by his son, who was finally expelled by Timoleon from Corinth. [DIONYSIUS THE YOUNGER.] Timoleon established a government of mixed democracy and aristocracy. After Timoleon's death, B.C. 337, there was a period of twenty years, marked by no very important events, till B.C. 317, when Agathocles by violence and treachery usurped the supreme power in Syracuse. The extraordinary career of this tyrant is given under AGATHOCLES.

After the death of Agathocles, B.C. 289, Syracuse recovered its independence, but being distracted by factions, the people chose, in 275, for their prætor, Hieron, who was a descendant of king Gelon, and after five years more he was made king. His very long, and upon the whole happy, reign is narrated under HIERON II. He died B.C. 216. His son, HIERONYMUS, did not inherit his abilities; he rashly quarrelled with Rome, which had become the preponderating power in Sicily, and although he was murdered shortly after, his false policy was persevered in, and a Roman army, under Marcellus, laid siege to Syracuse, and took it in 212 B.C. Here ends the history of Syracuse as a state. From that time it was merely a town of the Roman province of Sicily.

(Thucydides, vi. vii.; Diodorus, xiii., xiv., xvi., xix.; Müller's *History of the Doric Race*; Burigny, *Histoire de Sicile*; Clinton, *Fasti Hellenici*.)

SY'RIA, is the present European name of a country in Asia, which is situated along the eastern shores of the Mediterranean, and is a province of the Turkish empire. The name of Syria is not now known to the Asiatics, though some of their historians call it Souristan, or Soristan, which means the country of Souria, or Syria. The name Syria (Συρία) occurs in the Greek writers, whence it passed into the Latin language. The name by which it is at present known to the Asiatics is that of Belad el Sham, or 'the country to the left.' The Mohammedans of Mecca direct their face to the rising sun when they pray, and then Syria is to their left, and Belad el Yemen, or Yamen (the country to the right), is on the other hand.

Syria extends from 29° 45′ to 37° 25′ N. lat., and between 34° 10′ and 38° 45′ E. long. The boundaries are well marked towards the north, where it is formed by that portion of Mount Taurus which at present goes by the name of Alma Dagh (the antient Amanus), and towards the west, where it is washed by the Mediterranean Sea; the boundaries are ill defined towards the south and east, where Syria is contiguous to deserts, inhabited by nomadic tribes, who sometimes acknowledge the authority of the Turkish sultan, but more frequently disregard his orders and those of his governors. The boundary between Syria and Egypt begins on the shores of the Mediterranean about eight miles south of the town of Gaza, and thence runs south-south-west to a small fortress, called Nakhel, situated in the stony desert, which bears the name of El Tyh Beni Israël. From this place it extends nearly due east across the desert, until it meets the Wady Arabah, which it crosses at the base of a high mountain, called Tor Hesma, which, according to Buckhardt, constitutes the most southern point of the Eyalet of Damascus, or El Sham, and of all Syria. This summit is near 29° 45′ N. lat., or about eight hours' journey from the most northern recess of the Gulf of Akabah, which is the eastern branch of the northern part of the Red Sea. [RED SEA, vol. xix., 344.] From this summit eastward Syria borders on the desert of Arabia, and in these parts the boundary is undefined. It is considered that the steep descent which extends from the base of Tor Hesma east-north-east, and leads from the elevated plain of Arabia Petræa to the low desert of the Nejd, constitutes the boundary between the two countries; but it does not appear that the authority of the Turkish pasha extends to the east of the Hadji route (the great road of the caravans of Mecca), which runs northward through the town of Maan, and the castles of Kalaat el Hassa, Kalaat Belka, and Kalaat Zerka (32° 5′ N. lat.). So far the great caravan-road may be considered as the eastern limit of Syria. Farther north, Syria extends farther to the east, including the plain and mountain-region of the Haouran, which extends to 37° E. long., and perhaps somewhat farther east. Here it borders on the Syrian desert, in which 37° E. long. may be considered as its eastern limit as far north as the parallel of Damascus (33° 32′ N. lat.). From this parallel the boundary is considered to run north-east, passing about 20 miles east of Palmyra, or Tadmor, and striking the Euphrates about 30 miles above Rakka. Here Syria begins to border on El Jezira, or Mesopotamia, from which it is separated by the Euphrates from Racca upwards, to the place where the river breaks through the chain of the Alma Dagh between Bir and Rumkalah. The Alma Dagh mountains divide Syria from Asia Minor. A rough estimate gives to Syria an area of about 70,000 square miles, or about 12,000 square miles less than the extent of Great Britain.

The situation of Syria is peculiar. It is an isthmus which separates a sea of water and a sea of sand. On the west lies the Mediterranean, which extends over more than 40 degrees of longitude, or more than 2000 miles westwards, until it joins the Atlantic. On the east is the desert of Syria and Arabia, which extends to the Gulf of Persia over more than 10 degrees of longitude, or about 600 miles, and when the Gulf of Persia is included, the Indian Ocean is reached at the distance of about 1200 miles from the eastern border of Syria on the south. The isthmus of Syria reaches to the Red Sea, and of the two great branches into which that sea is divided at its northern extremity; the Bahr Akabah penetrates deeply into the isthmus, whilst the other, the Bahr Suez, extends along its south-western border and is separated from the Mediterranean only by the low isthmus of Suez.

The form of the surface is no less peculiar. The central part is furrowed by a longitudinal depression, or wide valley, which extends from its most southern point, the Bahr Akabah, to the base of the Alma Dagh, where it terminates with the lake of Bohhaire (36° 45′ N. lat.). This long valley, which extends over more than seven degrees of latitude, is divided in the middle (between 33° 15′ and 33° 25′) into two valleys by a high narrow ridge of mountains, the Jebel Arbel; and this ridge also divides the waters which run southward from those which run westward and northward. Thus the great valley is divided into two valleys, of which the southern is traversed by the river Jordan on the greater part of its extent, and is considerably below the surface of the sea. The northern valley is drained by the rivers Liettani (Leontes) and Aasy (Orontes). In its most elevated part, near the town of Baalbek, it attains an elevation at which in Europe corn can seldom be grown. The countries on each side of these valleys extend in some parts in elevated table-lands, in other places sunk down into large plains, and again rise into mountains, the summits of some of which are always covered with snow. The changes which the surface and its productive powers undergo in Syria are almost innumerable. We limit our description to the great features.

Southern Syria extends from the southern boundary of the country to 33° N. lat., or, more precisely, to the Bahr el Houle, or Lake Merom (33° 10′ N. lat.), and comprehends the southern valley, and the countries contiguous to it on the west and east.

1. The *Southern Longitudinal Valley* extends from the most northern point of the gulf called Bahr Akabah to the Bahr el Houle more than 250 miles in a straight line, and is naturally divided into three sections by two deep depressions, which are occupied by two large lakes. In the southern depression is the Dead Sea, called by the natives Bahr Lut; and in the northern the lake of Gennesareth, now called Bahr el Tabarieh. The southern part of the valley, or that which lies between the Bahr el Akabah and the Dead Sea, is called Wady el Arabah; the central portion, between the Dead Sea and the Bahr el Tabarieh, Wady el Ghaur, or El Ghor; and the northern, or that part of it which extends from the Bahr el Tabarieh to the Bahr el Houle, is called Wady Seissaban.

The Wady *Arabah* extends from south to north in a straight line for above 110 miles. The existence of this extraordinary valley was unknown in Europe till the publication of Burckhardt's travels (1822), and since that time it has attracted the attention of geographers. Many were inclined to think that, at some remote period, it had served as the channel by which the Dead Sea had discharged its waters into the Bahr Akabah, but it has been ascertained that this can never have been the case, as the level of the Dead Sea is considerably lower than that of the Red Sea. Several barometrical observations had established the fact that the difference in the level of the two seas considerably exceeded 600 feet; but a late traveller, Russegger, who has taken great pains to ascertain the exact amount, has found that the Dead Sea is 1341 French (or 1431 English) feet below the level of the Mediterranean. The watershed between the two seas occurs somewhat north of 30° N. lat., or about 40 miles from the Bahr Akabah. It does not however seem to traverse the valley in a straight line from east to west, but obliquely from south-east to north-west, and thus to occupy several miles from south to north. On each side of the Wady el Arabah the mountains rise to a great elevation. Near the watershed those on the west attain, according to Burckhardt's estimate, 2000 feet; and those on the east rise to 3000 feet. In approaching the Dead Sea they increase in height, which is probably to be attributed to the circumstance that the level of the valley here sinks much lower. The distance between the two mountain-masses varies considerably. Near the two extremities they are only 8 or 10 miles from each other, but towards the middle the valley is 20 miles wide. The surface of the valley presents considerable varieties. South of the watershed it is generally level, but has a considerable slope from east to west, so that near the western mountains it is very little above the sea-level, whilst along the eastern it may be from 200 to 300 feet higher. About three miles from the Bahr Akabah the soil is strongly impregnated with salt, but farther north sand prevails, and is intermixed with pieces of granite, porphyry, and greenstone. After the rains the country produces some grasses, and supplies indifferent pasture for sheep, goats, and camels; but in several places low hills of moving sand occur, which are destitute of vegetation. The watershed appears to be about 500 feet above the sea-level. North of the watershed there are some ridges of low hills running lengthwise through the valley, and dividing it into two valleys. In the western valley during the rains, and a short time after them, there is a stream, called El Jib, which at that season collects all the waters that descend from the eastern and western mountains, and carries them to the Dead Sea. The small rivulets which descend in the narrow valleys by which both mountain masses are furrowed, contain also at other seasons a stream of running water, but it does not then reach the bed of the El Jib, being lost in the gravel and sand. A few trees of that kind of acacia which produces the gum-arabic, tamarisks, and a few mimosas and shrubs grow among these sand-hills. The Beduins encamp here only in winter, when the torrents produce a copious supply of water, and a few shrubs spring up on their banks, affording pasture to sheep and goats; the camels live on the leaves of the trees, especially the acacia. Water is found even in summer a few feet below the surface. In proceeding farther north, between 30° 30′ and 31° N. lat., the Arabah does not appear to have any considerable descent towards the north, but it is longitudinally furrowed by a narrow valley, in the midst of which is the bed of the river El Jib. This narrow valley gradually sinks lower, so that at its northern termination it is 150 feet below the general level. Its width at the beginning is about one mile, but towards its termination hardly more than half a mile. The dry bed of the river, especially in the narrower part of the small valley, is overgrown with tamarisks, and in one or two places there are a few date-trees, but otherwise this tract is a desert. Near 31° N. lat. the general level of the Wady el Arabah descends abruptly about 150 feet, forming apparently a line of hills running east and west, and composed mostly of marl. All along the base of these hills there are springs of brackish water, which form a tract of marshy land towards the north. Between this salt marsh and the Dead Sea extends the most desolate portion of the Arabah. No trace of vegetation, no living creature is met with. At the base of the western mountains is a low mountain ridge, in general about 150 feet high, which runs for about 10 miles parallel to the Wady Arabah and the southern portion of the Dead Sea, and which is one mass of solid rock-salt, covered with layers of soft limestone and marl, through which the salt often breaks out, and appears on the sides in precipices 40 or 50 feet high, and several hundred feet long. From the base of this chain of rocks, which is called Usdúm, there break out several rills of transparent water, which run to the Dead Sea, but the water is as salt as the saltest brine. The tract between them, the bed of the Jib and the Dead Sea, is a perfect level, and extremely barren; but that on the east of the Jib is traversed by some rivulets descending from the eastern mountains, which have fresh water, and impart to the soil a considerable degree of fertility, so that there are some tracts which are cultivated. That part of the Arabah which lies north of 31° N. lat. is called El Ghor, a name which properly applies to the valley between the Dead Sea and the Lake of Tabarieh.

The Dead Sea occupies the greater portion of the valley between 31° 10′ and 31° 50′ N. lat. According to the most recent maps, the width of this lake does not exceed seven miles. [Dead Sea.] The mountains which enclose the lake on the east and west are not far from the shores towards its southern extremity, but they recede farther from them towards its northern end. On the eastern side, and about the middle of the lake, the steep mountain-masses come so close to the shores that a steep cliff overhangs the lake for about two miles. The width of the plain along the lake varies from one to four miles, the wider part being towards the northern extremity. The level tract along the western shore is covered with sand, and entirely unfit for cultivation: but on the eastern side, and especially towards the southern extremity, it is in many places very fertile, and is covered with forests, in the midst of which the peasants cultivate dhurra, tobacco, and indigo, and keep cattle. The heat in summer however is so great as to render this low tract almost uninhabitable, which is easily accounted for when it is remembered that the surface of the lake is 1431 feet below the Mediterranean. In summer the people go nearly naked. From this part indigo and tobacco are exported, and also the wool of a species of cotton-tree, and the juice extracted from this tree, which is used in Jerusalem as a cathartic.

The *Ghor* or *Ghaur*, or that portion of the Southern Valley which lies between the Dead Sea on the south and the Lake of Tabarieh on the north, extends about 65 miles in a straight line. The whole of this valley is below the level of the Red Sea, as the Lake of Tabarieh is 666 feet and the ruins of Jericho about 560 feet below it. The width of the valley is about six miles; but towards the Dead Sea it grows much wider. It is traversed by the river Jordan, which is here called Sheriat Kebir. Issuing from the Lake of Tabarieh, the river runs along the western mountains to Bisan, when it turns to the eastern mountains, along the base of which it flows for more than ten miles, and then returns to the western side, but afterwards continues to flow rather in the middle of the valley. The mountains which enclose the valley on the east are steep and high: they are also high and steep on the western side for nearly half the length of the valley, beginning from the south; but farther north they sometimes sink down to low hills, and continue so for several miles. The river flows in a bottom about half a mile wide, and at least forty feet below the general level of the Ghaur. This bottom is overgrown with high trees, and exhibits a luxuriant vegetation of plants and grasses, which present a striking contrast with the sandy and bare slopes which border it on both sides. In winter, the river inundates the bottom, but never rises to the upper plain. This upper plain is furrowed by numerous rivulets, which descend from the mountains and form numerous pools of stagnant water after the rains have ceased. In such places and near them, there is a luxuriant growth of herbage and wild grass, but the greater part of the ground is a parched desert, of which only a few spots are cultivated by the Beduins, who however keep large herds of cattle, sheep, and goats. The most important articles of cultivation are wheat and dhurra, but especially barley, which is exported. Towards the Dead Sea, the bottom of the river is less marked, the slope of the ground from the base of the mountains to its banks being very gradual, but the surface undulating. In these parts the Ghaur has a greater degree of fertility, and produces good crops of grain; but only a small portion is under cultivation. On the banks of the river there are willows, poplars, and tamarisks, and on the higher ground plantations of vines, pomegranates, and nebek-trees and zakkhum-trees (*Eleagnus angustifolius*). South of the ruined village of Richa (Jericho), and as far as the Dead Sea, the valley is nearly level, and the soil consists of clay impregnated with salt, and produces only salicornia, which is collected by the Beduins, as the ashes obtained from it constitute an important article of internal commerce, as many places have soap manufactories. [Salicornia.] The climate of the Ghaur is exceedingly hot. It is stated that the crops in the valley are four weeks earlier than at Jerusalem, which is easily accounted for, when the deep depression of the valley is considered, and the elevation of Jerusalem, which is nearly 2500 feet above the sea.

The *Bahr el Tabarieh*, formerly called the Lake of Tiberias and of Gennesareth, occupies about 12 miles of the extent of the valley in length, and about half as much in width. It is surrounded with steep and lofty mountains, except on the south, on both sides of the efflux of the river Jordan, where there is a sandy plain, and except along the western shore, from the town of Tabarieh northward, where an undulating plain, with an average width of a mile, or a little more, intervenes between the mountains and the lake. A considerable portion of this plain is cultivated by means of irrigation, and produces wheat, barley, dhurra, tobacco grapes, melons, and several kinds of vegetables. Burckhardt is of opinion that all kinds of tropical fruits could be raised here, the heat in summer being excessive; and he observes that the melons ripen four weeks sooner than at Damascus, to which town great numbers of them are taken. Some dates are also grown here, but there are no regular plantations. In the winter some cold is experienced, but frost is rare; snow also is rare. The water of the lake is slightly brackish, and some of the rivulets which descend from the western mountains are salt. There are also hot-springs.

The *Wady Seissaban*, or northern portion of the southern valley, extends from the northern extremity of the Bahr el Tabarieh to the southern banks of the Bahr el Houle, about 15 miles in a straight line. Perhaps one-half of its extent is below the sea-level, as the bridge called Beni Yakoub is 350 feet above the sea, whilst the lake of Tabarieh is 572 feet below it, as already noticed. The river flows in a narrow bed with an extremely rapid current. The higher grounds of the valley, which is here about two miles wide, are partly cultivated; and on the greater part of the cultivated tracts different kinds of vegetables are grown, especially cucumbers and gourds, which ripen three weeks sooner than at Damascus, where the produce finds a ready sale. There are many zakkum-bushes (*Eleagnus angustifolius*) and the thorny rhamnus (*Rhamnus spina Christi*) in the lower part of the valley. The Bahr el Houle, which is at the northern extremity of the valley, and which in the

Bible is called Lake Merom, is not large, and its extent varies according to the seasons. The low country which surrounds it to some extent is only inhabited on the eastern border, where the banks are overgrown with reeds and papyrus plants. The western and south-western banks are covered with a saline crust.

It is the generally received opinion that the Nahr Banias, or the river flowing from the east into Bahr el Houle, is the true source of the Jordan [Banias, vol. iii., p. 374], but a much larger river falls into the lake from the north, which originates about 20 miles north of it on the south-western declivity of the snow-covered mountain-mass known by the name of Jebel es Sheikh. Burckhardt calls this river Nahr el Hasbeya: it flows about 10 miles in a narrow valley surrounded by hills, which are planted with olive-trees, but farther south the valley increases to 3 or 4 miles in width, and the greater part of it is under cultivation, producing good crops of grain. This valley also bears the name of Wady Seissaban; and, if this is included, the southern valley is above 270 miles in length.

The course of the Jordan, which traverses the southern valley as far south as the Dead Sea, has been noticed under Palestine (vol. xvii., p. 161). Schubert says that its rapidity is nearly as great as that of the torrents of the Alps when they are swollen by the melting of the snow. He says that the width of the river opposite the village of Richa (Jericho), where the pilgrims bathe, does not exceed 100 feet, and its depth is there about 10 feet. The waters are very muddy.

2. The Desert called *El Tyh Beni Israël* (The Wandering of the Children of Israel) belongs partly to Syria and partly to Egypt, as the boundary-line between these two countries lies across it. It extends on the west of the Wady Arabah, and reaches southward to the Jebel el Tyh (29° 10′ N. lat.), which is connected with the extensive mountain-masses of Mount Sinaï. [Arabia, vol. ii., p. 213.] On the north the Tyh extends to the elevated table-land of Judæa, but in these parts the boundary-line between the desert and the fertile country does not appear to be distinctly marked. It occurs in the parallel of the southern extremity of the Dead Sea. The Tyh is a desert and elevated table-land, whose level above the sea has not been determined, but is estimated at between 1000 and 2000 feet. Along its eastern border its surface is much furrowed by deep watercourses, or wadys; in some parts lower depressions occur. In such places verdure is found in winter, and trees, especially talh-trees, all the year round. Some of the deep valleys are of considerable extent, and are visited by the Beduins in winter with their herds, and in summer for the purpose of collecting gum-arabic, which is carried to Cairo. The higher parts of the table-land have a hard gravelly soil without vegetation; and in many places there are low irregular ridges of limestone hills. The soil is generally covered with black pebbles. Wells are rare, and usually impregnated with sulphur. In the centre of the table-land its surface is much more level, as the wadies are only a few feet below the general level. In these parts also the soil is covered with black pebbles. In all the wadys the coloquintida is found, and there are several holes out of which rock-salt has been dug. Some tracts are sandy, but others occur which consist of a rich red earth fit for culture. In some places trees are abundant, and charcoal is made for the Cairo market.

3. The *Table-land of Judaea* joins the El Tyh on the north, and extends from the parallel of the southern extremity of the Dea Sead to 32° 30′ N. lat., having on the east the Dead Sea and the Ghaur, and on the west the plain of Falastin. The dividing-line between the last-mentioned plain and the table-land is near 35° E. long. The elevation of this table-land diminishes as we proceed farther north. El Khalil (Hebron) is 2877 feet above the Red Sea, or according to Russegger 3026 feet above the Mediterranean; Jerusalem 2667 feet; Nablous or Sichem 1863 feet; and Jenin, on the northern border of the table-land, only 558 feet above the Red Sea. North of 31° N. lat., the desert of the Tyh passes insensibly into a fertile country. The table-land there extends into an undulating plain, occasionally interrupted by low ridges of hills, which in summer are barren, but a part of the year are covered with grass and rich pasture. The lower parts preserve their verdure all the year round. The plain is furrowed by valleys, which sink considerably below the general level, and are full of corn-fields, and vineyards and orchards that produce excellent grapes and figs. Corn-fields are also numerous on the higher grounds, but they are interrupted by large tracts of naked limestone rocks, which come out upon the surface, and cover it to such a degree as to give the country the appearance of a very rocky region. This description applies to the interior of the table-land, as far north as Jerusalem, except that cultivation, and especially the plantations of olives, fig-trees, vines, pistachio-trees, apricots, pomegranates, oranges, and lemon-trees increase as we proceed north. The country is however rather bare of trees. The plains between the limestone rocks are covered with grass, which supplies pasture to sheep and goats, and herds of cattle, horses, asses, and camels. The mountains which form the eastern border of the table-land however, and extend along the Dead Sea, are a picture of desolation; they consist of yellow rocks without the least traces of vegetation. These mountains are distinguished from all other ranges of Syria by their summits, which do not present rounded masses, but rise in the form of pointed peaks and sharp edges, like the summits of the Alps. The barrenness which characterizes this tract extends over the whole table-land in the parallel of Jerusalem; for in this part even the mountains that form the western border of the table-land are comparatively barren, but farther south they are fertile.

North of the parallel of Jerusalem the unevenness of the table-land is much greater, and the hills frequently rise to the height of mountains. Such are the mountains of Ephraim (north of 32° N. lat.), of which however little is known except that they are covered with woods and bushes. The depressions between the hills are of considerable extent, and may sometimes be called plains. The slopes of the surrounding hills are gentle, and generally susceptible of cultivation, which is effected by making terraces on their declivities. At a few places there are valleys, some between the hills, and others formed by the action of the rivers in the more level country. The country is much less naked than it is farther south; at several places forests consisting of high trees occur, and large tracts are covered with bushes. Cultivation is attended to in some degree, but large tracts lie waste. Fruit-trees are very common, and olive and fig trees in some places cover several square miles in extent.

The climate of the table-land of Judæa may be inferred from that of Jerusalem and its vicinity. There are two rainy seasons, each of which lasts seven or eight weeks. The early rainy season sets in about the beginning of November, and lasts till the beginning of January. The late rainy season sets in at the beginning of April and somewhat later. The winter is rather cold, and frost in January and even February is not rare. Snow falls also, and sometimes very heavily. When Browne was there a very deep snow lay on the ground for 12 or 13 days. The late rains prolong the cold season frequently to the middle or end of May, and even to the beginning of June, whilst the early rains, which are commonly accompanied by south-westerly winds, contribute to preserve mild weather to Christmas, which season is considered the most pleasant. The summers are very hot. The thermometer sometimes rises to more than 100°, when the south-east and east winds, which blow from the Arabian and Syrian desert, have continued for several days. They are extremely dry. Schubert thinks that the mean temperature of the summer can hardly be less than 85°. The mean annual temperature, he thinks, must be 60° or somewhat more; and he observes, that neither the date-tree attains its full growth nor cotton can be cultivated with advantage. The mean temperature of Naples is higher than that of Jerusalem, which comes near to that of Cagliari in Sardinia.

4. On the west of the table-land of Judæa is the *Plain of Falastin*, as the antient country of the Philistines is still called by the Beduins. On the south it borders on the desert of the Tyh, near 30° 30′, and advances northward to the base of Mount Carmel, 32° 45′ N. lat., so that its length exceeds 150 miles, but the width varies greatly. It is widest on the south, where it is more than 60 miles across or rather 120 miles, as it extends to the Isthmus of Suez and to the delta of the Nile. In the parallel of Gaza it is about 25 miles wide or somewhat more, but as the shores of the Mediterranean trend to the east of north, it grows gradually narrower, and towards its northern extremity it is still more narrowed by Mount Carmel, which extends to the west of north. Between the base of this range and the sea the Plain of Falastin is only a few miles wide. The most

southern portion of the plain is a desert, whose surface is composed of sand, diversified by small hills which are produced by the strong winds, and a few wide depressions in the form of valleys, through which in winter-time the numerous watercourses of the Tyh find their way to the Mediterranean. It is certainly worse than the Tyh itself, as it is not visited even in winter time, and there are no trees and verdure in the valleys. In this desolate region the samiel originates, which is frequently experienced in the northern parts of the plain, to which it brings clouds of burning sand. The desert occupies the sea-shore between the delta of the Nile and the town of Gaza, and the sand blown from it into the sea is the principal reason why all the harbours of the Syrian coast as far north as Cape Carmel are choked up, and admit only small vessels. On the sea-coast the desert terminates near Gaza; but at the foot of the table-land of Judaea it extends about 10 miles farther north. The fertile portion of the plain of Falastin consists of a tract extending along the sea, with an average width of 5 or 6 miles, as far north as 31° 40′ N. lat., where it widens so as to reach the table-land of Judaea. A tract with a sandy barren soil, and an entirely level surface, extends along the sea; but farther inland the country is undulating, or interspersed with low hills, between which there often occur cultivable spots which contain plantations of fruit-trees. The most fertile part of the plain extends on both sides of 32° N. lat., and is known by the name of the Plain of Ramleh, or Rama. Though the soil consists of a reddish sand intermixed with some gravel, it has a considerable degree of fertility where it can be irrigated, and produces good crops of grain, and several kinds of fruit, as figs, olives, pomegranates, oranges, and lemons: the water-melons of this tract are of superior quality. There are many date-trees, sycamores, prickly pears, and aloes. The surface of this tract is interspersed with numerous small isolated hills: only a comparatively small portion is under cultivation, for want of water. The most northern part of the plain, or the narrow tract between the base of Mount Carmel and the Mediterranean, has a still better soil, and, where cultivated, produces wheat, barley, and cotton; but a great part of it has been converted into a swamp by the rivulets descending from Mount Carmel, and not finding their way into the sea owing to a series of sand-hills which have been thrown up along the shore by the south-west winds, which prevent their discharge. These swamps make rich pasture for cattle.

5. *Jebel Carmel*, or Mount Carmel, constitutes a remarkable feature in this part of Syria. [Carmel.]

6. Between Jebel Carmel and the north-east corner of the table land of Judaea, which comes close up to the lake of Tabarieh, extends the plain of Merj Ebn Omer, or Amer, the antient plain of Esdraelon. At its eastern extremity, near the mountains on the banks of the lake of Tabarieh, it is only from 5 to 6 miles wide; and in the middle of it rises a round isolated summit, Jebel Tor, or Tabor. [Tabor.] Farther west the plain widens, and between Nazara (Nazareth) and Jenin it is nearly 15 miles wide. Its extent from east to west probably does not exceed 15 miles. At the foot of Jebel Tor the surface is 466 feet above the sea; but it lowers quickly as we proceed westward, so that the greater part of it has a very moderate elevation above the sea-level, as is evident from the slow current of the river Nahr el Mekana (the antient Kishon), which, after a heavy fall of rain, inundates the adjacent country, and converts it into a swamp; but the swamp supplies good pasture for cattle, which in this plain are of a larger size than in any other part of Syria. Though the soil is of considerable fertility, only a small portion of this tract is inhabited. Corn and cotton are grown. Near the base of the hills and mountains surrounding the plain there are forests of evergreen oak, and in these parts there are also plantations of fruit-trees.

7. To the north of the *Plain of Ebn Omer* extends the *Hilly Region of Galilaea*, which is the most fertile part of Southern Syria. The surface presents great varieties. The hills rise with gentle acclivities, and subside into plains several miles in extent, or are separated by wide valleys. The highest hills lie west and north-west of Nazara, which attain an elevation of from 1700 to 1800 feet above the sea. The town of Nazara is in a flat valley on the declivity of a hill, 876 feet above the sea-level. The whole region seems to be fit for cultivation, and a considerable portion of it is cultivated, though there are extensive tracts, especially in the smaller valleys, which are covered with forest-trees. Corn and cotton are extensively grown, and form considerable articles of internal commerce. The olive and fig trees cover considerable tracts. Date-trees do not succeed.

This description applies only to the country south of 33° N. lat. The country north of it, and extending as far as 33° 30′, is entirely unknown, with the exception of the immediate vicinity of the Mediterranean.

8. Along the Mediterranean extends the Plain of Akka, which begins on the south at the base of Jebel Carmel, and extends northward to Ras el Abiad, or the White Cape, a distance of more than 20 miles. Between Jebel Carmel and the town of Akka (Acre) it may be four or five miles wide, but farther north it rarely exceeds two miles in width. The southern and wider portion has a sandy soil in the vicinity of the sea, but farther east it is tolerably fertile and moderately cultivated. In the northern district there are some stony tracts, though in general it is stated that the country possesses a considerable degree of fertility, but nearly the whole is uncultivated.

9. We pass to the east of the Southern valley. The most southern part of Syria is occupied by the extensive table-land of Petraea, which contains the mountain-regions of Shera and Belka, which enclose the Wady Arabah, the Dead Sea, and the Ghaur on the east, and also an extensive plain lying east of these regions, and continuing in that direction to the Desert of Arabia. The southern boundary of this region begins at Jebel Hesma, which marks the most southern point of Syria, and thence runs to the north of east to Akabah es Shamie, on the Hadji road of the Syrian caravan. In these parts it is marked by a steep descent, which leads from the table-land of Petraea to the plain of Nejd in Arabia, which has an arid sandy soil, generally covered with flints. Beyond the Hadji road the natural boundary between the two plains is not known. The Hadji road runs along the eastern declivity of the mountain-regions of Belka and Shera, having on the east a continuous chain of hills called El Zoble: thus the road traverses a long valley, in which several places occur where wheat and dhurra are cultivated, and extensive plantations of vines are found. These articles are easily disposed of by the Arabs to the pilgrims, but the greater part of the valley is not cultivated, owing to the want of water, without which nothing can be grown in these parts of Syria. The El Zoble range terminates on the south at the source of the river Modjeb, and farther south the Hadji road lies within the plain; but dhurra and barley are grown only at a few places, though in several other places, especially at Maan, there are large plantations of pomegranates, apricots, and peaches; with the exception of these isolated spots along the road, the plain is only used as pasture-ground by the Beduins.

The mountain-region of Shera extends from Jebel Hesma to the river Modjeb, from 29° 40′ to 31° 30′ N. lat., between the Hadji road on the east and the Wady el Arabah on the west, and occupies about 20 miles in width. When seen from the Wady el Arabah it has the appearance of a high range, at least 1000 feet higher than the mountains which enclose the Wady on the west, or about 3000 feet above the level of the valley: but when seen from the east, or the great plain, the mountains appear only as hills a few hundred feet elevated above the level of the plain, which shows that the great plain of Petraea is also at a considerable height above the sea. The mountain-region of Shera comprehends three districts, of which the southern properly is called Shera, that in the centre Jebal, and the northern Kerek. The southern part of this region consists of high ridges running generally from south-east to north-west, and separating deep depressions from one another. The ridges are generally flat on the top, but sometimes covered with low hills, which advance eastward into the plain. On the edge of the plain the depressions begin, presenting themselves sometimes as narrow valleys, and sometimes as basins. The largest of these basins is that called El Ghoeyer, which is much lower than the eastern plain, and upwards of 12 miles across at its eastern extremity, but it is narrower towards the west. The surface is rocky and uneven, and it is intersected by numerous glens and by three or four valleys, watered by rivulets, which unite and flow into the Arabah. This basin is noted for its excellent pasture, which is owing to the numerous springs, and is wooded along the rivulets; but there are no woods in the other depressions of this region, nor on the ridges. Villages are rather numerous in these depressions, and are mostly inhabited by Beduin tribes, who have applied to agriculture, and are industrious. In many parts not only the level grounds are cultivated, but the slopes of the mountains are formed into terraces, which are covered with corn-fields and plantations of fruit-trees. They cultivate wheat, barley, and dhurra, and their orchards contain apples, apricots, figs, pomegranates, olive and peach trees, and numerous vines. Dried figs and grapes constitute the principal articles of export, together with soda. The rivers which traverse this region generally contain water even during the summer, but it is only in winter that the water reaches the valley of the Arabah. The northern part of the mountain-region of Shera appears more in the shape of a table-land: for though it is likewise broken by wadies or glens, they are very narrow, and the country generally extends in wide plains surrounded by low ridges. It contains a much smaller portion of cultivated land than the southern districts, and is equally destitute of trees, with the exception of fruit-trees, which are planted in a few places. The cultivated tracts are chiefly limited to the neighbourhood of the towns of Tafyle and Kerek, and a few villages; but even the nomadic Beduins cultivate some spots which are favoured by a good soil and springs of water. The climate of this region is extremely agreeable. The air is pure; and though the heat is very great in summer, and increased by the reflection of the sun's rays from the rocky sides of the mountains, yet the temperature never becomes suffocating, owing to the refreshing breeze which generally prevails. The winter is very cold, deep snow falls, and the frost sometimes continues to the middle of March. This region would be much better cultivated and more populous if the inhabitants were not exposed to frequent incursions of the Beduins, who live in the eastern plain, and who levy tribute on them, and subject them to many hardships.

The *Mountain-region of the Belka* extends from the river Modjeb on the south to that of Zerka on the north, or from 31° 30′ to 32° 20′ N. lat. Its width between the Dead Sea and the Ghaur on the west, and the Hadji road on the east, rather exceeds 40 miles. The eastern district, or that contiguous to the Hadji road, is little elevated above the road, and constitutes a plain, most parts of which are interspersed with numerous low and isolated hills. Towards the south this plain is sandy or rocky, and in both cases barren; but towards the north it has a chalky or clayey soil, and is covered with a rich verdure in winter. There are no springs in this upper plain of the Belka, and the Beduins have no water except that which is collected in cisterns during the rains. The whole plain is destitute of trees, and generally even of bushes; but some more hilly tracts are overgrown with thick heath. The western districts consist of a succession of ridges and deep valleys opening into the level ground of the Dead Sea or the valley of the Ghaur. The ridges occupy a much larger space than the valleys, and are generally level on the top. In a few places however high hills rise above them. The upper part of the ridges are bare of trees, and generally covered with flints. The narrow valleys between them are always wooded at the bottom, and sometimes on their declivities.

The northern district, or the country north of 32° N. lat., is an extensive mountain-mass, whose highest part is in the middle of the tract, and is called Jebel Jelaad (Gilead). This higher ridge extends about ten miles from east to west, and near its most elevated summit, Jebel Osha, is what is called the tomb of the prophet Hosea, which is a place of pilgrimage for Turks and Christians. This mountainous country is almost entirely covered with high trees; oak, wild pistachia trees, and many others not known in Europe. In scenery it resembles a European country. It has numerous springs and small rivers; some of the rivers run underground, as the mountains consist of limestone. On the southern declivity of this tract, and in the vicinity of the town of Szalt, are the only tracts in the Belka which are under regular cultivation, though some other places are occasionally sown with dhurra by the wandering Beduins. The numerous and extensive ruins show that cultivation was formerly carried on here to a great extent, and probably has been discontinued on account of the frequent incursions of the nomadic tribes who live to the east. At present the Belka is considered the best pasture-ground in Southern Syria; and the most powerful tribes of the Beduins are frequently at war with one another for the possession of this region. In summer these tribes remain with their herds in the valleys of the western districts, where the grass never dries up; and in winter they either descend into the Ghaur or encamp on the upper plain. They have few camels, but numerous cows, sheep, and goats. Wheat, barley, and dhurra are cultivated. The vineyards are extensive near Szalt. Sumach and soda are collected; the first is sent to Jerusalem, and 3000 camel-loads of the latter go to Nablous. The climate of the Belka is as pleasant as that of the Shera, and the winters are as cold.

10. The *Belad Haouran* is to the east of the Ghaur. Along the valley it extends from 32° 21′ to 32° 45′ N. lat., but where it borders on the Syrian desert, which lies between it and the valley of the Euphrates, it advances as far north as 33° N. lat. It consists of two mountain-regions, the Jebel Ajeloun on the west, and the Jebel Haouran on the east, and a plain which lies between the mountain-regions.

The *Jebel Ajeloun* extends about thirty miles south and north, and about as many east and west. It is the most mountainous district of Southern Syria, and the best cultivated to the east of the southern valley. The highest part of the mountains is towards the south, north of the river Zerka (the antient Jabbok), where the mountains of Moerad and of Jebel Ajeloun rise much above the Jebel Jelaad of the Belka. The whole surface is a succession of mountain masses and valleys, and the valleys are rather large: the region is abundantly watered by streams, which either originate in this region or traverse it in its width, flowing from the plain of Haouran to the Jordan. It has great advantages over all the neighbouring countries as an agricultural district, which are still increased by its greater security against the inroads of the Beduins, who find it dangerous to carry on their depredations in a country which contains so many places that can be defended against cavalry. The numerous caverns also, which occur in the limestone rocks, of which the mountains are composed, offer safe retreats from an invading enemy. Wheat and barley are extensively cultivated in all the lower grounds, and in some places on terraces made on the declivity of the mountains. There are numerous plantations of olives and vines. The orchards contain pomegranates, figs, lemons, oranges, and other fruit-trees. Every kind of vegetable is grown. The climate of the valleys is very hot in summer. Burckhardt observed the thermometer at 100° in the shade. The sides of the mountains are chiefly covered with wood, consisting of oak, wild pistachia, walnut-trees, and several kinds not found in Europe.

The *Plain of Haouran*, which extends east of the Jebel Ajeloun, is a level, the northern part of which is frequently interrupted by isolated hills, which however are less numerous towards the south, and at last disappear entirely. These southern districts have a very sandy soil, and are almost uninhabited. But the northern districts have a soil consisting of a fine black earth, which possesses a considerable degree of fertility, but is very little cultivated. A village is built at the foot or on the declivity of almost every hill, but very few of them are inhabited. Most of them however are in such a state that the greater number of the houses can be rendered habitable with very little labour, and it frequently happens that these habitations are taken possession of by some wandering peasant for a short time. The Haouran peasants do not fix themselves in one place: they wander from one village to another, and they find commodious dwellings in the antient deserted houses. One camel is generally sufficient to transport their family and baggage; and as they are not attached to any particular spot by the possession of land, they have no repugnance to quitting the place of their birth. They are chiefly induced to change by the exactions of the Beduin tribes, who are considered the true proprietors of the plain. The few cultivated spots of the plain occur only on the banks of the rivers which descend from the Jebel Haouran, and in winter-time bring down a great volume of water, which is skilfully employed in irrigating the fields for crops of wheat, barley, or beans. During the winter the plain produces excellent pasture for the herds of the Beduins. There are no trees. The cold in December and January is severe.

The *Jebel Haouran* is much less extensive than the Jebel Ajeloun. It extends from 32° 25′ to 33° N. lat., but no part probably is more than 12 miles across. It is surrounded by plains, which are lower than the base on which the mountains rise; though the cold of the winter proves that they are at a considerable elevation above the sea. The mountain region is covered with several ridges running in different directions. The highest part of the mountain system is near 32° 40′ N. lat., where the Kelab Haouran, a summiin the form of a cone, rises considerably above the lower ridge on which it stands. It is wooded on the north and west, but bare on the east and south; and this observation applies to the whole mountain-region. In its present state only the northern and western base of this region are inhabited and cultivated, and cotton and tobacco are extensively grown. Wheat, barley, dhurra, and beans are cultivated. The wood with which the mountains are clothed is only stunted oak. In the mountains there are extensive pasture-grounds, even where there are no trees, as at the southern declivity of the region, where a great number of uninhabited villages and towns occur, the houses of which are generally in a tolerable state of preservation. In the month of November the Kelab Haouran was not covered with snow, but at its base Burckhardt experienced a hoar-frost.

East of the Jebel Haouran is the Syrian desert, of which Burckhardt gives the following account. To the distance of three days' journey there is still a good arable soil, intersected by numerous tells (hills), and covered with ruins of villages. Every day five or six are met with. This tract is called El Telloul, from the hills. There are no springs, but water is usually found by digging to the depth of three or four feet. At the point where this desert terminates begins the sandy desert called El Hammad, which extends eastward to the banks of the Euphrates, and southward to the Wady Serhhan. The Wady Serhhan is a deep depression which traverses the great desert between the northern extremities of the Red Sea and of the Gulf of Persia, nearly in the middle, and runs in a south-east direction.

Central Syria extends from 33° 10′ to 34° 40′ N. lat. It comprehends the most elevated portion of the country. Within its limits are the two mountain-ranges of the Libanus and Antilibanus, and the southern and highest portion of the northern valley. To the east of the Antilibanus is the elevated plain of Damascus.

1. *Mount Libanus*, called by the natives Jebel Libnan, constitutes a continuous range of mountains, which begins on the south at the castle called Kalaat el Shkif, south of 33° 20′ N. lat., and, running to the east of north, terminates near 34° 40′ with a ridge of hills called Jebel Shara. The northern portion of the range is called Jurd (*i.e.* Jebel) Baalbec, and the southern Jebel Sanin. As the higher part of the range is destitute of trees, it is considered that its average elevation above the sea must be at least 8000 feet. The highest part of it occurs between 34° 10′ and 34° 15′ N. lat., and is called Jebel Makmel. It rises to more than 12,000 feet above the sea-level, and is covered with snow all the year round. The highest part of the road, which passes over the range to the east and north of the Jebel Makmel, is 7590 feet above the sea. This range of mountains, with its declivities extending eastward and westward, varies between 12 and 18 miles in width in a straight line, of which extent less than one-fourth lies on the east side of the highest crest, so that on this side the declivity is much steeper than on the west, where its offsets generally approach the shores of the Mediterranean, and in a few places, as north of Beirout and at Ras El Shakka, come close to the water's edge. On both sides of the range a terrace occurs somewhat about the middle of its height, which divides the Upper and Lower Libanus. The Upper Libanus usually presents only steep declivities, either entirely bare, or clothed with a scanty vegetation, but a few spots have a fine growth of grass, and in summer they are used as pasture-ground by the mountaineer Arabs who visit this place. The most extensive of those pasture-grounds occurs near 34° N. lat., where there is a level tract near the summit of the range, which extends eight or ten miles in length, and from three to four in width, called Watty-el-Bordj. There are no springs on it, but for the greater part of the year it is covered with snow, and in the latter part of the spring it produces pasture not inferior to the best pasture-grounds on the Alps. The level ground which separates the Upper Libanus from the Lower is also generally without trees, but always covered with shrubs and grass. It contains small groves of cedars, not far from the northern base of Jebel Makmel, more than 6000 feet above the sea-level.

The Lower Libanus, to the west of the range, is one of the most interesting countries in Asia. That part of it which extends from Beirout (33° 50′ N. lat.) to Tarabloos (34° 25′) is called Kesrouan, though this name, according to Burckhardt, properly belongs only to the most southern district, which is entirely in possession of Maronites, to the exclusion of Turks and Druses. The Kesrouan is very well watered, as the greater part of the waters collected on the mountain-range descends towards the Mediterranean. The water-courses however lie in very narrow and deep valleys, the sides of which rise with a steep ascent several hundred feet above the narrow level at the bottom. As these water-courses are very numerous, the ridges between the valleys are very narrow, and there is no level on their tops. The traveller no sooner arrives at the summit than he immediately begins to descend. Each hill is isolated, so that to reach a place not more than ten minutes distant in a straight line, one is obliged to travel three or four miles by descending into the valley and ascending on the other side. The valleys, even where widest, never exceed a mile in breadth, but every cultivable spot is turned to account. The inhabitants build terraces on the declivities of the mountains to obtain a space of level ground, and to prevent the earth from being swept down by the winter rains, and at the same time to retain the water requisite for the irrigation of their crops. On these terraces and in the level spots of the valleys there are orchards, mulberry-plantations, vineyards, and fields of dhurra and other grain. The silk which is collected in these places is not inferior to any in Europe, and constitutes the principal article of commerce. The lower ranges and hills, with which the offsets of the Libanus terminate, are covered with plantations of olive-trees, but the narrow plain along the shores of the sea is generally not cultivated, except at the very base of the hills. There are however some small groves of date-trees. The higher part of the ridges which separate the valleys are generally wooded with fir-trees.

The eastern declivity of Mount Libanus differs greatly from the western. As in this part the highest crest of the mountains is near their base, there is no space for the water to form streams. It is therefore only furrowed by ravines, in which the water descends during the rains, with the exception of three or four rivulets, which preserve the water somewhat longer. This part of the Lower Libanus is covered with low oak-trees, the round-leafed and the common English kinds. On the narrow level plain which divides the Lower Libanus from the higher part of the range are some spots which are cultivated or planted with walnut-trees. Higher up the mountain is very steep, and the vegetation is scanty.

2 The *Northern Valley*, as far as it is included within Central Syria, extends along the eastern base of Mount Libanus in all its extent, or about 90 miles in length. Its width differs considerably. South of Baalbec, where the ranges of the Libanus and Antilibanus run parallel, it is only from 2 to 3 miles wide. But north of Baalbec the last-mentioned range declines more to the east, and the valley gradually grows wider. At Baalbec it is about 5 miles wide, and in the parallel of the northern extremity of the Antilibanus (near 34° 25′ N. lat.) more than 10 miles. It is naturally divided into two sections, as the waters of the southern districts run off to the south by the river Lietani (the Leontes of the antients), and the northern portion is drained by the Aazy or Orontes. The two river-basins however are not contiguous, for near 34° N. lat., and chiefly north of that parallel, is a tract about 12 miles in length, the waters of which do not reach either of these rivers, but are lost in the plain. This tract is the most elevated part of the valley; the town of Baalbec, which is built towards the southern border of it, is 3808 feet above the sea-level. The southern and more narrow part of the valley is called the Bekaa. It is watered by the Lietani river, which rises about 5 miles south-west of Baalbec, in a small lake, and traverses the Bekaa nearly in its middle. The river has water all the year round, being supplied by several copious rivulets which descend from the western declivity of the Antilibanus. The course of this river is only known as far as it lies within the Bekaa. Where the valley terminates on the south, near the castle of Kalaat el Shkif, the river turns west, and enters a hilly region which never has been visited by European travellers. It reaches the Mediterranean a few miles north-east of Sur (Tyrus). The Bekaa is famous for its fertility, and Burckhardt informs us that the soil produces usually ten-fold the seed, and in fruitful years twenty-fold. Still he thinks that more than one-sixth of the surface is not cultivated, though the numerous rivulets descending from the Antilibanus afford ample means of irrigation. The greater portion serves only as pasture-ground for the Beduins and Turkmans, who pass the winter here, and ascend in summer to the upper declivities of the Antilibanus. The northern and wider portion

of the valley is called Belad Baalbec. The soil of this tract is not much inferior to that of the Bekaa, but the proportion of cultivated land to that which is only used as pasture, or not used at all, is still less than in the last-mentioned district. Only a few villages occur in the middle of the valley, which, as well as the Bekaa, is destitute of trees; but there are numerous villages at the base of the mountains, especially along the Antilibanus, where small rivulets descend from the mountains and supply the means of irrigating the corn-fields and orchards.

3. The *Antilibanus*, which stands to the east of the valley just noticed, extends much farther to the south than the Libanus. It is divided into two portions by a long and narrow depression across the mountains, which occurs near 33° 40′ N. lat., and is called El Bogaz (the Gorge). The most frequented road from Beirout and Deir el Kamr leads through this depression. The Northern Libanus, or that portion of the range which lies north of the Bogaz, is very little known. It descends towards Belad Baalbec and the Bekaa with a very steep declivity, which is barren and destitute of wood except at a few places where rivulets descend in narrow glens: these glens are overgrown with trees. The eastern declivity of the range has never been seen by European travellers, and it is not known how far it extends, except along the road which passes over the mountain a few miles north of the Bogaz, where the mountains occupy a space of about 10 miles in extent. This part of the range has no great elevation. The highest point of the road is only 3148 feet above the sea-level, and less than 1500 feet above the adjacent plain of the Bekaa. It does not appear that any part of the Northern Antilibanus exceeds 6000 feet in elevation.

The Southern Antilibanus attains a much greater elevation. At the distance of about 12 miles south of the Bogaz an extensive mountain-mass rises to such an elevation, that its summit is always covered with snow: it is called Jebel es Sheik. This mountain-mass and its declivities cover a space of 20 miles from east to west. From the western declivity branches off a narrow ridge, which, towards the north, is called Jebel Arbel; but its southern prolongation is known by the name of Jebel Safed: it terminates on the south with the elevated mountains which lie to the north of the town of Safed: its length is about 35 miles. This range is very little known. South of the summit of the Jebel es Sheik lies an extensive mountain-tract, extending about 15 miles east and west, and as much to the south. It is mostly covered with thick wood, and only used as pasture-ground. From this mountain-region a ridge runs southward, which is called Jebel Heish, and which terminates with a hill, called Tel el Faras, in the elevated plain of Jolan, about 5 miles south of 33° N. lat. The two ridges of the Jebel Safed and of the Jebel Heish enclose that part of the valley of the river Jordan which lies north of the lake of Tabarieh, and is called Wady Seissaban. The direct road leading from Jerusalem to Damascus crosses the narrow ridge of the Jebel Heish about 12 miles north of the Tel el Faras, and at this place it is perhaps not more than 500 feet above its base: but the plain on which it stands is from 3000 to 3100 feet above the sea-level. The mountains are covered with forests of small oak.

4. The *Plains of Damascus* lie on the eastern side of the Antilibanus, surround its southern ridge, the Jebel Heish, and extend as far south as the Haouran. They form an intermediate terrace between the mountain-region and the low Syrian desert, which is farther east, and is much lower than the plains. At their southern extremity, where they border on the Haouran, these plains extend to a distance of 70 miles from the range; but farther north their width is less. In the parallel of Damascus they are only 30 miles wide. North of Damascus the boundary diverges towards the east; but in these parts it cannot exactly be determined, as the desert sometimes approaches near the caravan road leading from Damascus to Aleppo, but generally remains at a considerable distance from it. It appears that many cultivable though uncultivated tracts occur as far east as Tadmor [Palmyra], which is about 75 miles from the range of the Antilibanus.

The lowest part of these plains is about 12 or 15 miles east of Damascus, where an extensive lake, or rather swamp, occurs, called Bahr el Merdj, in which several rivers are lost which descend from the eastern declivity of the Antilibanus, and from the Jebel Haouran, from north, west, and south. The most remarkable of these rivers is the Barrada, which brings down all the waters collected on the eastern declivity of the Antilibanus between 33° 15′ and 33° 50′ N. lat. These waters unite at some distance from the foot of the range, in a wide depression of the plains, called El Gutha, in which the town of Damascus is built, and which is the most productive spot in Syria, if not on the globe. Burckhardt says that the gardens and orchards surround Damascus to the distance of 6 to 10 miles; and Schubert estimates the area which they cover at 130 or 150 square miles. The cultivated fields surrounding this forest of fruit-trees extend to a farther distance of some miles. The astonishing fertility of this tract is produced by the abundance of water, as the country is traversed by seven branches of the river Barrada, which always yield a copious supply of water for irrigation. The gardens contain all the fruit trees of Southern Europe, and also the Rhamnus lotus. Apricots are more abundant than other fruits; and considerable quantities of dried apricots, and a jelly made from them, are sent to Aleppo and all over Syria, and the countries bordering on the Euphrates. The plantations of walnuts, pistachia-trees, and the vineyards are also extensive. The wine is of first-rate quality. Every kind of grain grown in Europe is cultivated, except rice: dhurra is grown to a small extent. Other objects of cultivation are cotton, flax, hemp, madder, and tobacco. The castor-oil plant is cultivated for the oil. Pulse and vegetables of every kind are cultivated successfully. As the town of Damascus is 2337 feet above the level of the sea, the climate is far from being so temperate in winter as it is commonly supposed to be. Many of the more delicate fruit-trees sometimes suffer from severe frosts.

The most western portion of the plain, or that which extends between the southern extremity of the Jebel Heish and the Jebel Ajeloun, and from the lake of Tabarieh eastwards to the Hadji road, is called the Plain of Jalon. The ascent from the lake of Tabarieh is very steep and long. The surface is uneven and undulating, and there are a few isolated hills. Several considerable tracts have their surface formed of rocks, which are commonly covered with a thin layer of earth, on which grass springs up after the rains, but which are quite bare at other times. Other districts however have a fine soil, either black, grey, or red, and some produce rich crops. The greater part of them however is uncultivated and overgrown with a wild herb, on which cows and camels feed.

The plains extending east of the Hadji road, south of El Gutha, are rather hilly in the northern districts, short and low ridges running in different direction. These parts contain several stony tracts, and others which might be cultivated, if water was abundant. The greater part is at present only used as pasture-ground. The southern districts, or those which approach the northern extremity of the Jebel Haouran, contain too extensive rocky regions, called El Szaffa and El Ledja, which are divided from one another by a wide valley, called El Lowa. The Ledja, which lies to the west of El Lowa, is somewhat elevated above the general level of the contiguous plain. It is a level country with a stony soil, covered with heaps of rocks, among which are small patches which produce excellent pasture for the cattle of the Arabs. In the centre of the Ledja the ground is more uneven, the pasturing-places are less frequent and the rocks higher. This tract covers an area which extends from two to three days' journey from south to north, and one day's journey from east to west. The Szaffa, which is east of the Lowa, resembles the Ledja, except that the rocks with which it is covered are considerably larger, although the whole may be said to be even ground. There are no springs and no cisterns. This tract is two or three days' journey in circumference. The Lowa is a valley which separates the Ledja from the Szaffa, and is traversed by the river Lowa, which originates in the Jebel Haouran and falls into the Bahr el Merdj. On its banks is a plain of considerable extent, which is covered with the most luxuriant herbage, and was formerly well cultivated, as is proved by the ruins of numerous villages and towns in the valley. But at present it serves only as pasture-ground for the Beduins, who occasionally cultivate some spots with dhurra.

That part of the Plains of Damascus which lies north of the Gutha is only known where it is contiguous to the road running from Damascus to Aleppo. The road passes over two low ridges, which appear to be connected with the Antilibanus. The country through which it passes is in a few places covered with sand, but in general it has a rich cultivable soil, free from stones and sand, though, like all the plains of Damascus, it is destitute of trees and even of shrubs. Villages and cultivated tracts occur only at great distances. The Beduin tribes who inhabit the Syrian desert probably prevent the extension of agriculture.

Northern Syria comprehends that portion of the country which lies north of 34° 40′ N. lat. It differs in physical constitution from the more southern parts. A high mountain-range runs along the shores of the Mediterranean, and in some places close to them. At the back of it is the northern portion of the Northern Valley, which is divided by a hilly tract, extending from south to north, from the Eastern Plains.

1. The *Mountain Region* of Northern Syria is divided into two portions by the lower course of the river Aazy. The southern part, which comprehends about two-thirds of the whole, is known by the name of Jebel el Anzeyry, and the northern by that of Jebel Ahmar.

The Jebel el Anzeyry is divided from Libanus by a gap or depression, which extends between 34° 40′ and 34° 50′ N. lat., and is nearly 10 miles across. It is a low plain, called El Junie, which is nearly a dead level. Numerous torrents descend from the contiguous mountain-ranges, especially the Jebel Sharra, or northern extremity of Mount Libanus, and when copious rains fall in the mountains the plain is converted into a swamp. It is therefore uninhabited, and only used as pasture ground by the Turkmans and Kurds who inhabit this part of Mount Libanus.

The Jebel el Anzeyry occupies with its branches the whole tract between the Mediterranean and the Northern Valley, and is in width about 20 miles or somewhat more, except towards the southern extremity, where one of its offsets branches off eastwards, and terminates on the banks of the river Aazy, near the town of Hamah. It is called Jebel Erbayn. In this part the Jebel el Anzeyry is about 45 miles wide. The highest part of the range lies in general close to the valley of the Aazy, so that the space between it and the sea is filled up by numerous offsets, which sink down to low hills and enclose valleys of moderate extent. The principal chain terminates east of the town of Antakia, in the great bend of the Aazy. Where it terminates, it is connected with another chain of mountains, which rises a few miles north of the town of Latakia, and runs so close to the shores of the sea, that no road can be made along its western base. The declivities towards the sea are extremely precipitous and barren. It is the Mons Cassius of the antients, and is now called Jebel Akrah, or Okrah. It attains an elevation of 5318 feet above the sea. When the Jebel Akrah meets the Jebel el Anzeyry, it forms a tableland of some extent, which is covered with grass, but without trees. The elevation of the Jebel el Anzeyry is not known, but it never much exceeds 6000 feet above the sea-level. Its eastern declivity is generally very steep, and only covered with shrubs and low trees, but the western declivity is clothed with fine trees, and the wide valleys which lie between its offsets are cultivated with as much care as those of Mount Libanus. Orchards and plantations of mulberry-trees cover a great part of these valleys.

Jebel Ahmar, or the northern portion of the mountain-region begins on the Mediterranean, occupying the space between Ras el-Kanzier (36° 20′ N. lat.) on the north, and Jebel Musa, the Mons Pierius of the antients (36° 8′ N. lat.), on the south. Near Ras-el-Kanzier the summit called Jebel Keserik attains 5550 feet above the sea-level. From this summit the range runs north-east, but by degrees turns more to the north, so as to enclose the Gulf of Scanderoon on the east with a curved line. It joins the Alma Dagh about 10 miles north of 37° N. lat. Near 36° 30′ the road between Scanderoon and Antakia traverses it, and the most elevated pass is 4068 feet above the sea-level. This range never exceeds five miles in width. The mountains generally descend towards the Gulf of Scanderoon with a gentle declivity, and approach near its shores, except towards the north, where a level tract about two miles wide intervenes, which gradually increases to the breadth of seven miles. This wider part is fertile and cultivated, and it is diversified with orange and lemon groves. The remainder is almost entirely uncultivated, but full of ruins.

2. The northern portion of the *Northern Valley* begins at the termination of Mount Libanus (34° 40′ N. lat.) and Mount Antilibanus (34° 20′ N. lat.). North of these places a level country extends across the whole breadth of Syria, from the Mediterranean to the Euphrates, which is only interrupted in the eastern plains by ranges of low hills. The plain contiguous to the river Aazy and to the caravan-road leading from Damascus to Hems presents only a few gentle ascents and descents, except along the river, where the descent to its bottom appears to be continuous. It is quite destitute of trees; and though a great part of it is fit for cultivation, the extent of the cultivated tracts is small, and their number not great, which is mainly owing to the want of water.

The Jebel el Anzeyry begins in 34° 40′ N. lat., and on the plain extending east of the river Aazy a ridge of hills called Jebel el Aala rises near 35° N. lat. This last-mentioned ridge runs from south-east to north-west, and thus approaches the Jebel Erbayn, or eastern offset of the Jebel El Anzeyry, south of the town of Hamah, near 35° 5′ N. lat. From this point the river Aazy runs in a narrow valley, which is enclosed by rugged mountains, and which Burckhardt compares with that of the Wye in Monmouthshire. The valley however widens in some parts, and in one of these plains the town of Hamah is built. The length of this narrow valley is about 12 miles. At the northern extremity of this valley the eastern ridge sinks down to the level of the plain, but two or three miles farther north it rises again under the name of Jebel Shaehsabon, and here begins that fine valley which is called El Ghab, and which is about 35 miles in length; its width is about 5 miles, but it grows narrower towards the north. The river flows near the base of the Jebel El Anzeyry, where it forms numerous marshes. In winter it inundates the level ground, through which it flows and leaves many small lakes. The valley is also watered by numerous rivulets which descend from the adjacent mountains, and contain water all the year round, a circumstance which gives this valley a great advantage over that of the Bekaa. The villages are pretty numerous, and mostly built at the base of the mountains: they are surrounded by fields, on which dhurra and wheat are grown. The remainder is used as pasture-ground for cattle and buffaloes. The swampy ground being favourable to buffaloes, large herds of them are kept there. In summer the cattle are brought to the Jebel Shaehsabon, which is always clothed with excellent grass. The springs which flow from these mountains to the Ghab never dry up, and scarcely even diminish during the height of the summer. The wider valley of the Ghab terminates at Jebel Shogher, and hence the Aazy runs northward in a narrow valley, which contains very little land fit for agriculture; but the sides of the mountains are covered with plantations of fruit-trees: those of mulberry-trees and olive-trees are very extensive.

Where the Aazy emerges from this valley, and, turning north-west and west, flows along the base of the Jebel El Anzeyry, an extensive plain opens to the north, the antient plain of Antiochia, now called El Umk, which stretches to the base of the Alma Dagh. It is about 35 miles long, with an average width of 15 miles. Towards the middle of the plain is a deep depression, which receives all the rivers that descend from the mountains surrounding it on the east, north, and west, and form an extensive lake, called El Bohhaire, the antient Lake of Antiochia. It is about 12 miles long and 6 miles wide, and noted for its eels, which form an article of commerce. The country surrounding the lake rises in very gentle slopes towards the base of the Alma Dagh. The rivers which descend from them run in flat narrow valleys. The northern part of the valley is cultivated, and produces wheat, barley, and several kinds of pulse. The base of the surrounding mountains was formerly covered with trees, but the woods have been destroyed. The Lake of Bohhaire discharges its waters into the river Aazy by a navigable channel, called Kara-su (Black River), which runs south-south-west through the southern and lower part of the plain, which is entirely level, and for the greater part of the year nearly a swamp. No part of it is cultivated, and it is only used as pasture-ground.

The Umk constitutes the most northern portion of the Northern Valley, which is connected with the Mediterranean by the valley in which the Aazy reaches the sea by a west-south-west course. This last-mentioned valley is nearly 30 miles long, and from 4 to 6 miles wide between the Jebel el Anzeyry and the Jebel el Ahmar. The river runs near the base of the Jebel el Anzeyry, and on its northern banks is an undulating country, generally well cultivated. Much tobacco is grown, and the plantations of mulberry-trees are extensive: other fruit-trees also abound.

The river Aazy, called by the antients Orontes, rises in the Belad Baalbec, between the Libanus and Antilibanus. Its true source is still disputed. Buckingham places it between 34° 20′ and 34° 25′ N. lat., in a valley of Mount Libanus; but Barker (*London Geogr. Journal*, vol. vii. 100) places it at the base of the Antilibanus, near 34° 15′, where a copious spring issues from a natural basin in the rock. He observes however that the river Labweh unites its waters with the stream formed by the spring. The Labweh rises about 10 miles farther south, in one of the narrow valleys of the Antilibanus, which is about 12 miles to the north-east of Baalbec, and must therefore be considered as the true source of the Aazy. The Aazy drains the northern part of the Belad Baalbec, where it receives a considerable supply of water by the streams which come down from the eastern declivity of Mount Libanus. After having entered the plain north of the mountain-ranges, it falls into a lake, called Bahr el Kades, which is about six miles long and two wide, and by some travellers is considered as artificial. So far the river runs north-east, but it then turns north, and surrounding the base of the Jebel Erbayn by a great bend, enters the valley and runs first north-west and then north, until, in approaching El Umk, it gradually declines to the west and west-south-west, in which direction it reaches the sea near the village of Sweïdiyah. It is not navigated, but it is said that it could be rendered navigable for boats as far as Murad Pasha, on the lake of Antakia, 27 miles above Antakia, though its current is rapid below Antakia, the fall not exceeding five feet and a half per mile. Its mouth is obstructed by a bar, over which there is from three and a half to nine feet of water in winter. Part of the country through which the river flows is fertilised by its inundations, and other parts are supplied by it with the means of irrigation. The whole course of the river probably exceeds 200 miles.

3. The *Hilly Region*, which extends to the east of the valley of the Aazy and of the El Umk, from the town of Hamah to the base of the Alma Dagh, may occupy about 10 miles in width, south of 36° 10′ N. lat., but where it is contiguous to the El Umk it is more than twice as wide. The southern portion has somewhat the form of a range, the limestone rocks rising to a considerable elevation, and enclosing valleys. But many of these hills are only covered with bushes, and the arable grounds are not extensive. Barley and dhurra are grown. Vines are much cultivated, and grapes and debs are sent to Aleppo. The northern portion of the Hilly Region does not present high and steep ridges, but is rather an undulating country on a large scale. The hills indeed rise to a considerable height, their higher parts being about 1700 feet above the sea, but probably not 500 feet above the base on which they stand; and their slopes are gentle, and the depressions between the higher ground so wide, that they constitute rather plains than valleys. There are no watercourses, as the limestone rock absorbs all the moisture. The country however is rather fertile, and yields good crops of wheat and other grain, and cotton of excellent quality. On the hills there are plantations of fig-trees and olive-trees. There are no natural woods except shrubs.

4. The *Eastern Plains* occupy about two-thirds of the surface of Northern Syria, and extend from the Hilly Region to the banks of the Euphrates. They are divided into two parts by a ridge of low hills, called Jebel Allahhs, or Elahas. This ridge is near 35° 50′ N. lat., and appears to extend from the hills north-west of Hamah to the vicinity of the Euphrates: it is very little known, as it traverses a country little visited by Europeans. The same observation applies to the southern part of the plain, which contains in the west large tracts of good soil, which cannot be cultivated for want of water: towards the east it gradually passes into a desert, which occupies the greater part of it, and is divided from the Euphrates by a wooded tract several miles wide, and called El Zawl, or Gharabat.

The northern part of the plain is of a different description. It is traversed by three rivers, two of which rise on the southern declivity of Alma Dagh, and run southward. The river Sajur drains the north-eastern portion of the plain. It rises north of the town of Aïntab, brings down a great volume of water from the mountains, and falls into the Euphrates about 20 miles below Bir, after a course of about 80 miles. The Kowaik, or Kuaik, also called the River of Aleppo, because it passes near that town, rises in one of the great offsets of the Alma Dagh, and runs with numerous windings through the plain southward, until, in approaching the Jebel Allahhs, it is lost in swampy ground, similar to that of the Bahr el Merj near Damascus. This swamp is called El Matkh, or El Ghawas. The third river, called Zeheb, rises in a ridge of hills which run west and east, and terminate on the banks of the Euphrates south of the mouth of the Sajur. These hills compel the last-mentioned river to join the Euphrates. The Zeheb runs southward, and, after a course of about 40 miles, falls into a salt lake called El Sabkh, which is surrounded by low rocky hills. The lake is about six miles long and two wide. After the rains it inundates the narrow strip of land which, in summer, lies between its banks and the rocks, and when the water has been evaporated by the heat of the summer, this narrow strip is covered with pure salt, in some places two inches thick. This salt is collected in the month of August, and extensively used over a great part of Syria. The river Zeheb constitutes the boundary between the desert and the cultivable portion of the plain, as that part of it which lies east of the river has a sandy arid soil, and is considered as forming the most northern portion of the Syrian Desert. The surface of the plain is far from being level. Short ridges of low hills occur at several places, especially near Aleppo, the plain of that town being enclosed by such ridges on three sides. When the plain extends in a level, or in slight undulations, as is mostly the case, isolated hills, called 'tells,' are frequent. Burckhardt considers them to be artificial mounds. In their neighbourhood there are wells and villages. The soil of the plain varies greatly in its productive powers. East and south of Aleppo it is very stony, and the earth which covers the rocks is too thin to maintain moisture for a long time, and therefore is not productive. The soil of the plain to the west and south-west of Aleppo is better, especially in the neighbourhood of the hilly range, where it yields abundant crops of wheat and other grain. To the north-west and north of Aleppo the soil is indeed stony, but the earth is deeper, and cultivation is rather extensive. In many parts now lying waste it could be cultivated with advantage, which is proved by the great number of ruined villages which occur in these parts. The best part of the plain appears to be that which is contiguous to the road leading from Aleppo to Aïntab, especially towards the base of the Alma Dagh, where it is well watered, and yields more than one crop annually, though it is also stony. These plains in general do not sink below 1000 feet above the sea-level, except as we approach the Euphrates. Where they were crossed by the Euphrates expedition, between Aleppo and Aïntab, the surface of the Kowaïk was found to be 1263 feet above the Mediterranean, and that of the Sajur 1363 feet. The Euphrates, below Bir, is only 628 feet above that sea.

The climate of the plains, and especially that of the town of Aleppo, may be compared with the climate of Rome, though the difference in latitude amounts to more than five degrees and a half. The winter lasts about 40 days, from the 12th of December to the 20th of January. There is generally some frost, but it is slight, and the snow seldom rests more than one day on the ground. In February the vegetation is vigorous, and the trees are in blossom; but the spring soon passes, and at the end of May nearly all the smaller plants are dried up, and the whole country begins to look bare, with the exception of trees and bushes. Before May, showers occur occasionally, but after that time it does not rain, and rarely a cloud passes over the clear sky. The first rains occur about the middle of September, and are followed by settled and pleasant weather, which lasts from twenty to thirty days; but towards the end of November the later and more heavy rains set in, and continue to the beginning of the winter. In summer the heat is very great, but not insupportable, as strong westerly winds sweep over the plain and cool the air. Sometimes an easterly wind continues for four or five days, and though it does not produce the effects of a samiel, it imparts to the air a very great degree of heat. The inhabitants shut the doors and windows of their houses, and cannot stir out.

5. The *Alma Dagh* constitutes a portion of that extensive mountain-range which the antient geographers called Taurus. The Alma Dagh is the antient Amanus. It lies along the boundary of Syria and Anatolia, and its crest is considered as the boundary between these two countries. The range occupies in width about 30 miles, of which the larger portion belongs to Anatolia. The mountains are very

precipitous, and can only be traversed by beasts of burden in a few places. The most frequented road runs from Aleppo due north to Aintab, and thence over the Alma Dagh to Kaisariyeh and Angora. There are said to be two or three mountain-roads farther west, in the valley of the river Afrin, the largest of those streams which fall into the Bohhaire, or Lake of Antiochia. The mountains are well wooded. Many thousand acres are covered with large cedars, and in other places there are firs and juniper trees.

Climate.—Syria, though situated within the temperate zone, exhibits all the climates of the globe. The lower part of the Ghaur, which is more than 1000 feet below the sea-level, and is enclosed by high mountains, probably has a mean annual temperature not lower than that of the equator, whilst the most elevated parts of Mount Libanus and of the Jebel es Sheik are covered with snow all the year round. But no regular meteorological observations have been made in any part of Syria. Syria is subject to very violent earthquakes. In 1837 the southern districts were laid waste by a very violent earthquake, by which several towns were destroyed. (*London Geogr. Journal*, vol. vii., p. 101.) At other times the northern districts have suffered. In the country surrounding the Dead Sea there are many traces of volcanic action. Hot springs occur in numerous places, and in others there are depressions which have the appearance of craters. Burckhardt also mentions several hot springs in the mountains which enclose the Umk on the north-east; and Pococke states that an extinct volcano exists in the mountains between the mouth of the Aazy and the Gulf of Scanderoon, which however has not been noticed by more recent travellers. If this volcano really exists, it would constitute the most eastern point of the volcanic region which extends over the Mediterranean between 36° and 42° N. lat.

Productions.—Wheat and barley are the principal kinds of grain which are cultivated, except in those parts which have too arid a soil, where dhurra is almost exclusively grown. Three kinds of dhurra are grown, dhurra gaydi, dhurra sayfeh, and dhurra dimiri. Spelt is much cultivated in the southern district, but very little oats, and no rye. Schubert however found wheat, barley, and rye growing wild in the plain of Ibn Omer, and hence he concludes that rye must formerly have been an object of cultivation in these parts. Rice is only cultivated on the banks of the Bahr El Houle and in the Wady Seissaboun. The most common pulse are peas, lentiles, the Egyptian bean, the *gishrungayga* (Phaseolus Mungo), and the gilban (Lathyrus sativus). Of other vegetables, three kinds of hibiscus are grown, especially Hibiscus esculentus and Hibiscus praecox: also artichokes, melons, especially water-melons, cucumbers, and pumpkins. Potatoes are only cultivated in some valleys of Mount Libanus, and capsicum in the southern districts.

The cultivation of cotton is very general, especially in the northern provinces, where it is of good quality. Hemp is much cultivated in some parts, but flax only in a few places. Madder is grown in Central and Northern Syria, and indigo in the Ghaur and on the eastern banks of the Dead Sea, but only to a small extent. The cultivation of sesamum and of the castor-oil plant is much attended to: the oil of both is generally used for burning. Tobacco is grown in many places; and in some, especially along the sea north of Akka, it is of excellent quality, and furnishes a considerable article of export to Constantinople and other countries.

The cultivation of fruit-trees is much attended to. Some kinds cover large tracts, as the fig on the northern portion of the table-land of Judaea, the olive along the coast of the Mediterranean and in the neighbourhood of Damascus, the mulberry-tree on the western declivity of Mount Libanus and the Jebel El Anzeyry, and the pistachia-tree on the stony hills surrounding Aleppo. Vineyards are numerous in the more mountainous districts, and also on the table-land of Judaea. The wine made on Mount Libanus is of excellent quality. Dried grapes and debs are considerable articles of internal commerce. Other fruits are almonds, apricots, peaches, pomegranates, oranges, lemons, apples, and pears. Dates are at present found in abundance only in the Plain of Akka: at Jericho, the dates of which were formerly celebrated, only a few trees occur. The zakkum and storax are grown in the gardens. The most remarkable trees, which are partly cultivated and partly grow wild, are the sycamore, carob-tree, the Indian fig, the mulberry, and the pistachia-tree.

The forests on the mountains consist of cedars, firs, and pines. Those of the table-lands chiefly consist of several kinds of oak, which however do not attain a large size. They produce however the best galls that are known. There are also the azerol (*Crataegus azerolus*), the walnut, the strawberry-tree, the laurel, terebinth, Juniperus Sabina, and Juniperus Phoenicea. Much scammony and sumach is gathered in the forests of Mount Libanus as articles of export.

The domestic animals which Syria has in common with England are horses, cattle, asses, sheep, and goats. Few horses are kept by the agricultural population; but the wandering tribes, the Arabs, Turkmans, and Kurds, pay great attention to the breed of horses. The breeds of the Arabs and that of the Turkmans are different: that of the Kurds is a mixture of the two. The Arabian horses are noted for beauty and speed. The number of cattle is comparatively small, and, except in a few places, of small size The asses and mules are of a large breed, and they serve as substitutes for horses in the transport of goods. Sheep and goats are very numerous. In many parts, especially in Northern Syria, that species is kept which has the large broad tail: there are camels and buffaloes. Camels are found everywhere, even on Mount Libanus, on pastures which are more than 6000 feet above the sea. Some of the Beduin tribes whose pasture-grounds are indifferent, which is the case with most of those who live to the east of the Dead Sea, have no animals except camels, and live on their produce exclusively. Two breeds of camels are distinguished. Those of the Turkmans, which pasture at the foot of the Alma Dagh, are larger, and generally carry a weight of 800 pounds; while the Arabian camels carry only 600 pounds. But the Arabian camels bear heat and thirst better than the Turkman camels, and are content with coarser food. Buffaloes are only found on the sea-coast, between Beyrout and Tarablous, and in the Wady Ghab. Those which are kept on the sea-coast are much larger, and not inferior to those of Egypt.

Beasts of prey are not numerous, with the exception of jackals, foxes, and hyænas, which are frequent in some parts of the desert mountains. There are bears on Mount Libanus and Antilibanus. Wolves are only found in the forests of Alma Dagh. Wild boars are very numerous in many parts. Deer are met with on the Alma Dagh and near Mount Tor; and in the desert parts are several kinds of antelopes: the most common is the Antelope hinnuleus. In the mountains of the Belka the bouquetin of the Swiss and Tyrol Alps (Capra ibex) is said to be very numerous. Hares and porcupines abound, and the dipus jerboa is common in the southern deserts. There are several varieties of eagles. Partridges and pigeons abound in many parts, especially on Mount Libanus. In the mountains east of the Southern Valley there are immense numbers of a bird called katta, which is considered to be the Tetrao Alkatta. Several kinds of fish and shell-fish are found in the Mediterranean, but not in large quantity; but a considerable fishery is carried on in an inland lake of the Ghab, where a fish, called black fish (Macropteranotus niger), is so abundant, that annually, between October and January, a great quantity is taken, cured, and sent to remote places. This fish is from five to eight feet long. Fish are also very abundant in the Bohhaire. In the Mediterranean is the Ianthina fragilis, or common purple shellfish. The tortoise, (Testudo Græca) occurs frequently on the table-land of Judaea, and turtles in the Barrada, or River of Damascus. None of the snakes are considered to be poisonous. Bees are very abundant on Mount Libanus, whence wax and honey are exported. The rearing of silk-worms is carried on to a great extent on the mountainous tracts near the coast, and silk constitutes the most important article of export from Syria. The locusts frequently lay waste the fields: the Arabs eat them, and salt them for food. There are no metals found in Syria except iron, which is worked in the Kesrouan in Mar Hanna, west of Beirout, where also coal has lately been discovered. Burckhardt found iron and quicksilver at the western base of Jebel es Sheik. Salt is got from the lake called El Sabkh, and also from the sea-water of the Mediterranean. In the Tyh Beni Israël, and at the southern extremity of the Dead Sea, there are mountains almost entirely composed of rock salt. Bitumen, or asphaltum, is collected on the west shores of the Dead Sea. Burckhardt was told that it comes from a mountain on the eastern side of the sea, and south of Wady

Mojeb. It oozes from fissures in the cliff, and collects in large pieces on the rock below, where the mass gradually increases and hardens until it is rent asunder by the heat of the sun with a loud explosion, and falling into the sea is carried by the waves in considerable quantities to the opposite shores. This will explain a passage of Tacitus (*Hist.*, v. 6), where he speaks of asphaltum being collected on the Dead Sea. It constitutes an article of export. In the northern Ghaur pieces of native sulphur are found at a small depth beneath the surface.

Inhabitants.—The population of Syria consists of agricultural and nomadic tribes. Nearly all the 'Fellahs,' as the agricultural population of Syria is called, belong to one race, resembling in the structure of their body the Beduin Arabs, and speaking also the Arabic language. There is indeed, as Burckhardt observes, a difference between the Fellahs and the Beduins, which is easily observed in the adults of both nations. The Arabs are generally of short stature, with a thin face, scanty beard, and brilliant black eyes; the Fellahs are taller and stouter, with a strong beard and a less piercing eye. But this difference seems chiefly to arise from their mode of life; for the youth of both nations at the age of sixteen have precisely the same appearance. The Fellahs however are divided, according to their religion, into Christians, Jews, and Turks. Under the last name all the Mohammedans are comprehended: the greater part of them are descendants of Arabs, true Turks being only found in Northern Syria, and few in number. The Jews are numerous in Southern Syria, west of the southern valley, but they are rarely found east of that valley, or in the other parts of the province. They are most numerous in the vicinity of the five holy cities, Jerusalem, Tabarieh, Safed, Nablous, and Khalil (Hebron). The Christians are found everywhere. Even in the Haouran the Christians constitute one-fourth of the agricultural population. They are either of the Greek church or Roman Catholics. The Maronites, who have joined the Greek Latin church, constitute a peculiar sect [MARONITES, vol. xiv., p. 438]: they live exclusively on the western declivity of Mount Libanus, in the Kesrouan, and are a very industrious people. Among the Mohammedans is a sect called Metawelis, which is distinguished by fanaticism and intolerance: they are most numerous in the Bekaa and the Belad el Baalbec.

There are also three religious sects in Syria, which are neither Christians nor Mohammedans, the Druses, Anzeyrys or Nossaïries, and the Ismanlies. The most powerful of them are the Druses, who indeed pay tribute to the Turkish pashas, but otherwise are independent, and their chief may be considered as the master of the whole of Mount Libanus, with the adjacent districts of the Bekaa. [DRUSES, vol. ix., p. 160.] The Anzeyries, or Nossaïries, inhabit the mountain-region which has received its name from them, and which lies between the lower course of the Aazy and the Mediterranean. They are likewise an industrious people. The Ismanlies are few in number, and inhabit some villages in the mountains of the Anzeyry. They are considered to be a remnant of the Assassins and Ismaelites. [ASSASSINS, vol. ii., p. 494; ISMAELITES, vol. xiii., p. 46.] Nothing is known of the religious tenets of these people. When they are among Mohammedans or Christians, they conform to the religious ceremonies of their creed, visit the mosques, and pray: but they keep closely together, and thus the Druses have succeeded in acquiring a great influence in Syria.

If by the term Nomadic tribes we understand not only people who exclusively live on the produce of their herds and flocks, but also those who cultivate some small spots of ground, and yet principally derive their subsistence from their cattle, and consequently are obliged to change their abode, we may say that there is hardly any tract of considerable extent in Syria without nomadic people on it. This is the effect of the character of the country, in which two districts are generally found contiguous to one another, one of which affords pasture in winter and is barren in summer, while the other yields pasture in summer, and cannot be pastured with advantage in winter. This obliges those who have large herds or flocks to a continual change of abode. But this state of things is very destructive to agriculture under a weak and distracted government like the Turkish of the present day. Nomadic tribes are difficult to keep in order, and they soon inspire the peaceful husbandmen with such a dread of their depredations, that he gladly pays them a tribute on condition of their not laying waste his fields and carrying off his cattle. Burckhardt observes that the tax which the agriculturists of the Haouran pay to the nomadic tribes dispersed among them is much heavier than all the taxes imposed by government and their own chiefs; and this is the reason why so fertile a country, which yields twenty-five fold, is nearly a desert. These hurtful effects are less felt in those parts where the nomadic portion of the inhabitants is not so great; but even on the table-land of Judaea the peasants are generally tributary to the emirs of the nomadic Arabs. There is probably no part of Syria in which this state of things does not exist, except in the country of the Druses, and in the immediate neighbourhood of some great towns, such as Damascus, Aleppo, and Hamah.

There appears to be at present only one tribe of Beduins in Syria who never cultivate the ground, but who live exclusively on the produce of their herds of camels, sheep, and goats. This is the Aeneze, who wander about in the Syrian and Arabian deserts, from 28° to 36° N. lat., and pass the winter there, which lasts from the beginning of October to the end of April, when the rains cause grass and herbs to spring up in many parts of the deserts, on which their flocks feed; but they enter the limits of Syria at the beginning of May, and remain there till after September. At this time they approach the caravan road leading from Aleppo to Damascus, and the Hadji road leading from Damascus to Mecca. They come to these places for a twofold purpose, water and pasture for the summer, and to exchange their cattle for corn as winter provision. If they are at peace with the pasha of Damascus, they encamp quietly among the villages near the springs or wells.

The other Arabian tribes generally cultivate some small part of the district in which they wander about with their herds, and which they consider as their property, obliging the cultivators to pay a heavy tax for permission to cultivate it, and for protection against the individuals belonging to their tribe. The most powerful of these tribes are the El Howeytat and the Beni Neym, who live in the mountain-region of El Shera and in the adjacent plain; the Beni Szakher, who are in possession of the rich pasture-grounds in the Belka, and likewise visit the plain of Haouran; the Adouan, who are found in the Jebel Ajeloun; and the Fehily and Serdie, who move about in the plain of Haouran and the mountains in their vicinity. All these tribes are only nominally dependent on the Turkish governor, and though they pay a small tribute, they levy much larger sums on the agricultural inhabitants of these countries. The other tribes of Arabic origin are not numerous, and they are dispersed over the country as far north as 36° N. lat., where their pasture-grounds are contiguous to those of the Turkmans and the Kurds.

The Turkmans and the Kurds are in almost exclusive possession of the elevated range of the Alma Dagh and the tracts at its base. The eastern districts of these mountains are occupied by the Kurds, and the western by the Turkmans. It is not possible to fix a boundary between them, as in many parts both nations have settled together. They descend from the mountains in winter, and spread over the plains even to a considerable distance south of Aleppo. Some small tribes of both nations, the Turkmans and Kurds, have even settled on the northern districts of Mount Libanus, where they are in contact with the Arabic tribes who pasture in the Bekaa.

The Turkmans are not different from the Turks, and they are the stock from which the Turks sprung. The most powerful tribes of the Turkmans still inhabit those parts where the Turkish empire was formed in the fourteenth century, the elevated table-lands of Anatolia. In the structure of their body, and in their language, there is very little difference between them, except what is the effect of a different mode of life and of a separation of four centuries. Burckhardt was struck with the elegance and regularity of the features in the women of the Turkmans: he considers their complexion as fair as that of European women. That tribe of Turkmans which is settled on the Alma Dagh and in its vicinity is called Ryhanlu. It is not more than forty or fifty years since they applied to agriculture: in the level parts of their country they cultivate wheat, barley, and several kinds of pulse. The cultivation is not carried on by the Turkmans themselves, but by peasants or fellahs, who are either straggling Kurds, or the peasants who belong to some abandoned villages. The Turkmans remain with their herds in the Umk from the end of September to the middle of April, when they go to the mountains, and by degrees advance as far north as Al Bostan and Gurun and the mountain-ranges in the vicinity of these places, which are more than 100 miles from the parts where they pass the winter. They have horses, camels, sheep and goats, and a few cattle. Their women are very industrious. They make tent-coverings of goats' hair, and woollen carpets, which are inferior only to those of Persian manufacture. They have also made great progress in the art of dyeing. Their colours are very beautiful, and they employ indigo and cochineal, which they purchase at Aleppo. The brilliant green which they give to the wool is much admired, and is produced from some herbs which are gathered in the mountains in summer. The Turkman Ryhanlu pay some attention to the education of their children, but Burckhardt thinks that out of fifty hardly one can read or write. They are not immediately dependent on the Turkish pasha, being tributary to Tshapan Oglu, the powerful proprietor of the eastern part of Anatolia, who resides at Yuzgat, to whom they pay an annual tribute of 6215 piastres in horses, cattle, and other things. The internal affairs of the nation are conducted by a divan, composed of the chiefs of the thirteen minor tribes into which it is divided.

The Kurds who inhabit Syria are evidently a tribe that emigrated long since from Kurdistan to the mountain-range which traverses Western Asia west of the lake of Van, between 38° and 39° N. lat., whence they have gradually spread to the Alma Dagh. At present they are almost exclusively in possession of the western portion of that range, from which they descend in summer to the plains east of Aleppo. There are also some Kurds in the northern districts of Mount Libanus, where however they do not seem to be permanently settled. Burckhardt observes that these Kurds bring annually into Syria from 20,000 to 30,000 sheep from the mountains of Kurdistan, as Syria does not produce a sufficient number of sheep for the consumption of the inhabitants. After visiting the large towns with their flocks, they take to Mount Libanus those which they have been unable to sell, in order to pasture them there until they find an opportunity of selling them in that mountainous district, where few sheep are kept by the Druses and Maronites. The Kurds, who inhabit the Alma Dagh, cannot properly be called a nomadic nation, as most of them live in villages, are stationary, and occupied in agriculture and the rearing of cattle; but there is still a considerable number of families that change their abode according to the seasons, in order to procure pasture for their cattle. The Kurds have a language of their own, which, according to Burckhardt, is a mixture of Persian, Armenian, and Turkish.

Political Divisions and Towns.—Syria is divided into four eyalets, or pashaliks, two of which, Akka and Tarablous, extend over the countries on the shores of the Mediterranean as far north as 35° 55′ N. lat.: the third, Aleppo, occupies the most northern part, from the Mediterranean to the banks of the river Euphrates, and as far south as 35° 45′; and the fourth, Damascus, the interior of the country south of 35° 45′.

1. *The Eyalet of Akka*, better known in Europe by the name of St. Jean d'Acre, to which the eyalet of Gaza was added at the beginning of this century, occupies the whole coast from the boundary-line of Egypt to the Bay of Junie, or Kesrouan (33° 55′ N. lat.), and extends over the plain of Falastin, Mount Carmel, the plain of Ibn Omer, the hilly region of Galilee, the plain of Akka, and the Bekaa and Belad Baalbec. The southern districts of this eyalet are partly sterile and partly of indifferent fertility: the central districts are rather fruitful, and the northern exhibit a considerable degree of fertility, and in many places they are well cultivated. The greater part of the silk and wax exported from Syria is collected in these countries. In Mount Libanus there are rich mines of iron, and in their vicinity coal has lately been discovered. The most remarkable places from south to north are Gaza [vol. xi., 98], a thriving place, containing, according to Dr. Robinson, 15,000 inhabitants.

Jaffa, or Joppe, a town with about 4000 inhabitants, has a harbour, which is so choked up with sand as at present to admit only small boats: the roadstead also is dangerous, the anchorage being too near a ledge of rocks: the town is built on a conical eminence overhanging the sea, and is surrounded on the land side with a wall, in which there are towers at unequal intervals. It has no commerce, but is the common landing-place of the pilgrims who go to Jerusalem, of which place it may be considered the port.

Ramleh, or Ramah, east-south-east of Jaffa, lies in a fertile and well-cultivated plain: it has 15,000 inhabitants, who derive some advantages from the road from Joppe to Jerusalem, which passes through this town.

Kaïsariyeh (Cæsarea) had formerly a harbour, which at present is filled with sand: it was once a large town, as the extensive ruins still prove, but it is now nearly uninhabited.

Tantura has a harbour for small boats, and carries on some commerce with Egypt, from which it receives rice and linens: it exports cattle and fruits.

Kaïfa, or Haïfa, is a small place built on a bay formed by Cape Carmel, but the bay has little depth of water, and admits only boats.

Akka, or St. Jean d'Acre. [Acre, vol. i., p. 98.]

Tsur, or Sur, the antient Tyrus, is built on an isthmus about 400 feet wide, which is supposed to have been formed by the embankment that Alexander the Great made for the purpose of taking the antient town, the site of which is now uninhabited, and consists of a rock covered with brown earth. The harbour has been filled up with sand, and the roadstead is unsafe, but it is better than that of either Akka or Saïda. The population amounts to 3000 individuals, most of whom gain their livelihood by fishing and agriculture. It exports tobacco, wax, and fire-wood.

Zaïda, or Zeïdeh, the antient Sidon, is built on rising ground which overhangs the sea. The streets in the upper town are narrow and dark, but in the lower part of the town they are wider. Its harbour was filled up by Fakr-ed-Din, in the last century, and at present admits only boats. The roadstead is protected by a ledge of rock, rising about 15 feet above the sea-level, and 500 feet long, at the end of which is a small fortress. It has safe anchorage during the prevailing south-western winds, but it is exposed to the northern gales. The town has between 7000 and 8000 inhabitants, and several dyeing-houses: large quantities of silk are exported.

Beïrut. [Beirut.]

Junie is a small town with a landing-place for small boats: it carries on some commerce with the island of Cyprus.

In the interior are the following towns:—

Nazareth, or, as it is now called by the natives, Nazarah, is built in a beautiful valley which opens into the plain of Ibn Omer, and is in one of the most fertile and best cultivated districts of Galilee. It has about 2000 inhabitants, and a fine church.

Tabarieh, the antient Tiberias, is on the banks of the Bahr el Tabarieh, on a small plain, surrounded by mountains. Towards the land it is enclosed by a thick and well-built wall. It contains about 4000 inhabitants, who have some commerce with the Beduins of the Ghaur, and of the country north-west of the town. It is a place of pilgrimage for the Jews, who constitute about one-third of the population: the remainder of the population are Turks, with the exception of a few Christians. This place was nearly levelled to the ground by the earthquake of 1837.

Szafed, nearly due north of Tabarieh, is a neatly-built town, situated round a hill, on the top of which is a Saracenic castle. It contains 600 houses, of which about 150 are inhabited by Jews, who consider this one of their holy cities, and about 100 houses by Christians. In the neighbourhood there are large plantations of olives and vineyards. There are some manufactures of cotton cloth, and dyeing-houses. The population is between 6000 and 7000. This place also was almost destroyed by the earthquake of 1837.

Zahle is in a narrow valley, at the eastern base of Mount Libanus, which opens into the Bekaa. It contains from 800 to 900 houses, and is almost exclusively inhabited by Christians, who make much cotton cloth and some woollen stuffs. They have 20 dyeing-houses, and a considerable trade with the Beduins of the Bekaa.

Baalbec. [Baalbec, vol. iii., p. 221.]

Deir el Kamr, the capital of the emir of the Druses, south-east of Beirut, in a valley of Mount Libanus, is a considerable place. [Druses, vol. ix., p. 160.]

2. The *Eyalet of Tarablous*, the smallest of the political sections of Syria, extends along the sea-coast from the Bay of Junie to Cape Possidi, about 12 miles south of the mouth of the river Aazy, and comprehends the northern and more elevated portion of Mount Libanus, the plain separating this

mountain from the Jebel Anzeyry, and the largest portion of the last-mentioned range. The whole of it, with the exception of the plain, is fertile and well cultivated. It produces silk, tobacco, oil, fruits, galls, and wax, for exportation. The inhabitants are Turkmans, Kurds, Anzeyris, and Ismanlis: the two last-mentioned tribes are only found in the Jebel Anzeyry, where the emir of the Anzeyris lives in the small town and castle of Szafitta. The following are the chief places in this eyalet, from south to north.

Meinet Berdja, a small harbour, and a still smaller town, which has some commerce with Cyprus, and receives from that island wheat and salt.

Jebail, the antient Byblus, is a small town, enclosed by a wall. It has a small harbour, and carries on some commerce with Cyprus.

Batroun, the antient Bostrys, is a town consisting of from 300 to 400 houses, mostly inhabited by Maronites. There is no harbour, but an artificial inlet has been formed in the rocks, which admits a few coasting boats. It has no commerce: excellent tobacco is grown along the shores of the Mediterranean.

Tarablous, the antient Tripolis, called by the Arabs Tarábolos, one of the most commercial places of Syria, is built on the declivity of the lowest hills of Mount Libanus, and is divided by a river, called Nahr Kadish, into two parts, of which the southern is the more considerable. The town is well built, and is much embellished by gardens, which are not only attached to the houses in the town, but cover the whole triangular plain between the town and the sea. The town is supplied with excellent water by an aqueduct, which crosses the river upon arches. It has a population of between 15,000 and 18,000 individuals, and some large manufactures of soap for exportation. The harbour is about two miles from the town: it is called El Myna, and is itself a small town, inhabited by sailors and shipwrights. This harbour is formed by a line of low rocks stretching from the western side of Myna about two miles into the sea, towards the north, but it is not safe in northerly winds. In a north-north-west direction from the harbour there is a line of small islands, the farthest of which is about ten miles from the mainland. The exports consist of a large quantity of silk, sponges, soap, and alkali, to Anatolia; galls brought from the Anzeyry mountains, yellow wax from Mount Libanus, madder from Hamah and Hems, scammony and tobacco. The tobacco goes to Egypt.

Jebili is a small town, in the neighbourhood of which much tobacco is grown, which is exported to Latakia. There is a small port.

Latakieh, called by the natives Ladekiye, the antient Laodicea, stands on the northern edge of an elevated tongue of land, called Cape Ziaret, which advances nearly two miles beyond the general line of coast. The houses stand partly in the midst of gardens and plantations, and most of them have flat roofs. The port, called Scala or Marina, is about half a mile from the town, and separated from it by gardens and plantations. The harbour is a small basin, with a narrow entrance: it is however well sheltered, except to the west. It admits only vessels of 100 tons burthen. The chief exports of this place are tobacco of excellent quality, most of which goes to Egypt, cotton, raw silk, and wax. The imports are rice from Egypt, wine from Cyprus, and assorted goods, especially hardware, from England.

In Mount Libanus is Kanobin, a convent, the seat of the patriarch of the Maronites. In its vicinity are the famous cedars of Mount Libanus. About a mile and a half from the coast is the island of Ruad, on which the antient town of Aradus was built: it is at present nearly uninhabited.

3. The *Eyalet of Haleb*, or *Aleppo*, contains the northern part of the Jebel Anzeyry, the valley of the lower Aazy, together with the Ghab, the Jebel Amar, the Umk, the Hilly Region of Northern Syria, and the Northern Plain. The western and northern portion is very fertile, and in many places is well cultivated; the eastern is partly stony, and partly sandy, and for the most part a desert. The salt lake El Sabkh is in the plain. The Beduins are only found in the eastern and southern districts; near the range of the Alma Dagh, and within the range are the Turkmans and Kurds.

On the coast are the harbours of Scanderoon, or Iskenderun [Scanderoon, vol. xxi., p. 1], and of Sweïdiyah. The latter is not far from the mouth of the river Aazy, and has good anchorage, but it is much exposed to western and south-western winds. Near it there is a large and scattered village of the same name.

In the valley of the river Aazy is Antakia, or Antiochia [Antiocheia, vol. ii., p. 108], and in the plain is the capital of the eyalet of Aleppo, or Haleb. [Haleb, vol. xii., p. 12.]

To the south-west of Haleb, and near the base of the Hilly Region, is the town of Edlip, containing more than 1000 houses, some manufactures of cotton stuffs, a few dyeing-houses, and a large manufacture of soap. It has a considerable trade with the fertile and well-cultivated district in which it is situated, which it provides with rice, coffee, oil, tobacco, and manufactured goods.

Aintab is a large town, situated at the base of Alma the Dagh. [Ain-Tab.]

4. The *Eyalet of Damascus*, or *Sham*, extends over the southern of the two great plains which occupy the north-eastern portion of Syria, over the plains of Damascus, the southern portion of Mount Antilibanus, the greater part of the Wadys Seissaban and El Ghaur, the table-land of Judæa, the Haouran, and the mountain-regions of the Belka and the Shera. Its productions, though very various, do not supply articles of export, with the exception of alkali, galls, and bitumen; but this eyalet supplies the numerous manufactures of Damascus with most of the materials which are used in them. There are Beduin Arabs in every district, but no other nomadic tribe.

On the table-land of Judæa is Jerusalem, called by the Arabs 'Kods el Sherif' (the sanctuary of the just) [Jerusalem, vol. xiii., p. 108], Nablous, and Khalil. Nablous, the Sichem of the Bible, and the Flavia Neapolis of the Romans, is a town of considerable extent, and well built. It is situated in a valley, which is covered with plantations of fruit-trees, and is a thriving place. Khalil, the Hebron of the Bible, and one of the holy cities of the Jews, is south of Jerusalem, not far from the place where the table-land of Judæa joins the Desert of El Tyh. It contains about 3000 inhabitants, and has some glass-houses.

On the banks of the river Aazy are the towns of Hamah and Hems. Hamah, the antient Epiphania, lies on both sides of the river, and is partly built on the declivity of a hill and partly on a plain. It contains between 30,000 and 40,000 inhabitants, among whom are many rich Turkish families. Though the houses make no great show, they are well arranged and furnished. It is one of the principal places to which the Arabs resort to buy tent furniture and clothes, and it has several manufactures: the abbas, or woollen cloaks, made here are much prized. There are four bridges over the river. Hems, the antient Emesa, contains a population of between 25,000 and 30,000 individuals, and several manufactures. It is not so well built as Hamah. To the south-east of this town, at the distance of nearly 100 miles, are the ruins of Palmyra, or Tadmor [Palmyra, vol. xvii., p. 175.]

In the valley of the Upper Jordan, or Seissaban, are Hasbeya, Rasheyat-el-Fukhar, and Banias (vol. iii., p. 374). Hasbeya is built on the top of a mountain, and is a thriving place, with 700 houses, and manufactures of cotton-cloth for shirts and gowns, and a few dyeing-houses. In the vicinity are traces of quicksilver, iron-ore, and upwards of twenty-five pits, from which the Bitumen Judaicum is obtained, which is an article of trade, and sent to Aleppo, Damascus, and Beirout. Rasheyat-el-Fukhar, farther south, is only a village on the top of a mountain: it contains about 100 houses, each of which may be considered as a manufactory of earthen pots. They are moulded in very elegant shapes, painted with red earth, and form a considerable article of inland trade, especially in the eastern districts of Syria.

In the Plains of Damascus there is only Damascus, or Sham. [Damascus, vol. viii., 296.]

In the mountain-regions east of the Jordan are the towns of Szalt, Kerek, Tafyle, and Maan. Szalt, which is nearly in the centre of the Belka Mountains, is situated on the declivity of a hill. It constitutes a republic, independent of the Turkish pashas, who have made several attempts to subject it, but without success. The population consists of about 400 Mussulman and 80 Christian families of the Greek church, who live in perfect amity together. The greater part of the population is agricultural; a few are weavers; and there are about twenty shops, which furnish the Beduins who inhabit this region with articles of dress and furniture. Much sumach, which is collected in the mountains, is sent to Jerusalem for the use of the tanneries; and ostrich feathers are taken by the Beduins to

Damascus. In its neighbourhood are the ruins of Amman, or Philadelphia. Kerek lies in the northern district of the Shera Mountains, and is built on the top of a steep hill, which is surrounded by a deep and narrow valley. It is inhabited by 400 Mussulman and 150 Christian families, who live on a footing of equality, are independent of the government, and masters of that part of the mountain-region, which is inhabited by a tribe of Beduins who are dependent on the chief or sheik of the town, who however has a very limited authority within the place itself. It appears however that during the Egyptian administration, Szalt, as well as Kerek, has been again subjected to a strict obedience to government. The population is agricultural, and sends sheep, goats, mules, hides, wool, and madder to Jerusalem, and provisions to the Hadji road, which is about 15 miles east of the town. Tafyle is in the centre of the Shera Mountains, on the declivity of a hill, in a country abounding in springs and rivulets, and full of plantations of fruit-trees. Figs, wool, butter, and hides are sent to Gaza. The town contains about 600 houses, but suffers much from the exactions of the Howeitat Beduins, the authority of the Turkish government being very small. The town of Maan stands on two small hills on the desert table-land which is east of the mountains of Shera. It consists of about 100 houses on both sides of the Hadji-route, which divides the town. There are several springs, by means of which the extensive plantations of figs, pomegranates, apricots, peaches, and plums are watered. No corn is grown in these parts. The town owes its existence to the Hadji-road, and derives considerable profit from the pilgrims by selling them provisions brought from other parts, especially from Khalil and Gaza. West of Maan, in the Wady Musa, near the great Wady El Arabah, are the ruins of PETRA (vol. xviii., p. 35).

Manufactures.—Syria is the most manufacturing country in Western Asia. With the exception of hardware and cutlery, there is hardly any manufactured article imported into Syria; but a great variety of goods which are made in Syria are exported to Egypt and Anatolia, and still greater quantities go to the countries farther east, and find their way into Persia, where they meet the articles brought from Hindustan. The most manufacturing town is Damascus. The manufacturing industry of this place is of great antiquity, for it is mentioned by the prophet Ezekiel (chap. xxvii., 16 and 18), at a time when probably no manufactures existed in any part of Europe.

We may even conjecture with some degree of probability that the extensive commerce which the Phœnicians carried on in antient times was founded rather on the manufactures of Damascus than on their connection with India, or any other country of Asia. The Phœnicians were probably supplied from Damascus with a great number of manufactured articles for the market of the countries that surround the Mediterranean, and they supplied the manufactures of Damascus with some of the materials used in them. The extent of the manufacturing industry of this town may be conceived from the statement of Schubert, that above 40,000 persons are employed in making silk stuffs, especially satin and silk damasks and brocades; and that caravans frequently go from Damascus to Haleb, which take no other goods but articles of this description. A considerable number of persons are also engaged in the manufacture of cottons and linens, and there are numerous tanneries. The manufacture of saddles and horse and camel trappings is also important: these articles are sent to a great distance, being highly prized all over the East. The workmen in jewellery and gold and silver show both taste and skill. Many others work in copper and iron; and though the sword-blades of Damascus have not at present that reputation which they formerly had, this seems more the effect of the improvements in the manufacture of swords in other places, than of a deterioration in the manufactures of Damascus. There are several extensive tobacco-manufactures and soap-houses; and also a great number of workmen in ivory and precious woods. The number of persons who make perfumes, balms, aromatic oil, sweet-scenting essences, &c., of which the inhabitants of the East are very fond, is much larger than in any of the manufacturing towns of Europe.

From the account of Schubert it appears that there is a branch of manufacturing industry at Damascus, which is hardly known in Europe, that of ready-made dishes, of cakes, and all kinds of confectionary and pastry, which are sent to remote places, and even find a sale among the Beduin Arabs. This account is confirmed by Poujoulat, who stated that there are more than 400 cooks in Damascus. Poujoulat has given a list of the principal branches of manufacturing industry in Damascus. [DAMASCUS, vol. viii., p. 296.]

The manufactures of Haleb are small compared with those of Damascus, and mostly limited to cotton and silk stuffs, and gold and silver lace. It must also be observed that some branches of manufacturing industry are carried on in most of the small towns, and even in some villages, such as cotton stuffs for gowns and shirts, the dyeing of cotton, mostly blue and red, tanning leather, and making soap. Such places however supply only the neighbourhood, and the Beduins who resort to them for such articles, and they rarely if ever work for a distant market.

Commerce.—The commercial intercourse between Syria and Europe is very small. None of the agricultural products of Europe are in demand in Syria; no kind of grain is imported, with the exception of rice, with which Syria is supplied from Egypt. The manufactured goods of Europe are not in demand, not being adapted to the taste and customs of the East. The only article which is imported to a certain extent is hardware, which is almost exclusively supplied by England: some French cloth is also imported. The chief articles sent from Europe to Syria are supplied by the East and West Indies, and consist of indigo, cochineal, and coffee. The consumption of coffee from the West Indies has increased considerably in Western Asia since the beginning of the present century. Very little sugar is imported: the debs, an extract from grapes, is used as a substitute for it in most parts of Western Asia; and this article is made in Syria to a great extent, and of the best quality: it is also exported to the other parts of the Turkish empire in Asia and to Egypt. The most important article of export to Europe is silk, which probably amounts to 2000 bales of 200 lbs. each; a fact which shows to what extent this branch of industry is carried in Syria, when it is considered that probably a much greater quantity is consumed in the manufactures of Damascus and Aleppo. Other less important articles are galls, olive-oil, sponges, fruits, and tobacco. The fruits, which are principally exported, are dates, raisins, figs, and pistachia-nuts. Madder is also exported to a moderate extent. There is some maritime intercourse between Syria on one side, and Egypt, Cyprus, and the coast of Caramania on the other. It is carried on by small coasting-vessels, which are best adapted to the shallow and narrow harbours of the Syrian coast, and is limited to the exchange of some agricultural products, and to the exportation of soap and some cotton stuffs. Egypt receives chiefly live stock and tobacco, for which it pays with rice.

The commerce between Syria and the countries to the east and north of it is very extensive, but we have no information by which we can form an estimate of its amount. We only know that at all seasons of the year numerous caravans are on the road going or returning from these parts. This commerce is concentrated in Aleppo, as the desert which lies between the town of Damascus and that of Hit on the Euphrates is almost impassable, and is also in the possession of the powerful tribe of the Aeneze Beduins, so that a caravan rarely passes directly from Damascus to Hit by the way of the ruins of Palmyra. It may be said that this route is almost entirely abandoned, and the manufactured goods go from Damascus to Aleppo, whence they are carried to Anatolia and Constantinople, and to Mosul, Bagdad, and Basra. Two well-frequented roads lead from Aleppo to Constantinople through Anatolia. The most western leads from Aleppo westwards to Antiochia (Antaki), and thence through the Baïlan Pass to Scanderoon, whence it runs along the shores of the Bay of Scanderoon to Adana. From this place it ascends the elevated table-land of Anatolia, and passing through Koniyeh, Afiyum Kara-Hissar, and Kutahiyah, reaches the Sea of Marmora at Ismid. The eastern commercial road runs due north from Aleppo, and traverses the chain of the Alma Dagh between Aïntab and Al Bostán, where it proceeds to Kaïsariyeh. At the last-named place the road divides; one branch, running north-east, leads to Sivas, Tokat, and Amasieh, and the other continues in a north-east direction to Angora, and thence to Ismid and Constantinople. Two roads lead from Aleppo to Persia, which divide at Orfa in Mesopotamia. From Aleppo the road runs north-east to Bir, where the Euphrates is crossed, and from which place to Orfa it continues westward. The northern road leads from Orfa to Diarbekr, where it passes the Tigris, and thence goes over a very mountainous district to Bedlis and Van, and from Van it continues to Tabriz. The southern road crosses the whole width of Mesopotamia, beginning at Orfa, and passing through Mardin, Nisibin, and Mosul, where it crosses the Tigris, and whence it continues through Kirkuk, Kirmanshah and Hamadan to Teheran. This road is also sometimes used by the Bagdad caravans, which then proceed from Mosul through Samarah to Bagdad. But the most frequented caravan-road between Aleppo and Bagdad lies to the west of the Euphrates, passing from Aleppo in a south-eastern direction through the northern and less desert part of the Syrian Desert, which it enters after leaving the El Sabkh, or Salt Sea. It reaches the banks of the Euphrates at Annah, and runs along it to Hit, where it crosses the river and then goes due east to Bagdad, or continues south-east by Hilla to Basra.

It has been said that no account has been given by any traveller of the country between 33° and 33° 20′ N. lat. on the west of the Southern Valley. But Dr. Robinson has lately traversed this country obliquely in his journey from Safed to Sur, and he says that this tract is distinguished by peculiar features. After having crossed three valleys, he entered a wide plain by a considerable ascent. Volcanic rocks were dispersed over it, and they increased in number as he proceeded north-west, until they covered the whole surface of the ground. In the midst of this plain was a depression, which was evidently the crater of a volcano, and the lowest part of it was occupied by a lake. The whole tract was entirely barren. From this high ground he descended into another basin-like plain of smaller extent, which was cultivated and surrounded by bushy hills, and separated by a valley from a high undulating table-land, the soil of which was fertile and cultivated, and which was enclosed by swelling hills covered with shrubs and trees. So far the country was drained by water running to the Bahr el Houla. He then passed over higher ground, interspersed with hills, but otherwise presenting an almost level tract on the top, which formed the water-shed between the Bahr el Houle and the Mediterranean. It was covered with small oak-trees. The remainder of the country presented a succession of wooded hills and valleys, of which the cultivated portion was small, the whole being employed as pasture for cattle, which are so numerous, that butter is used instead of oil, which is the case in no other part of Palestine. The hills are much more thickly wooded than in any other part of Southern Syria west of the Great Valley, and fire-wood is a considerable article of export from Sur, to which it is brought from this country. In approaching Sur, Dr. Robinson passed through an extensive undulating region, which was well cultivated, and he then descended from the higher ground, which, according to his estimate, was from 1200 to 1500 feet above the sea-level towards the shore, to a country which consists of numerous ridges and of valleys opening towards the Mediterranean, in which there are woods of prickly oak, maple, arbutus, and sumach, and in which the plantations of tobacco were extensive. Their produce is exported from Sur.

(Russell's *Natural History of Aleppo*; Pococke's *Description of the East*; Volney's *Voyage en Syrie et en Egypte*; Burckhardt's *Travels in Syria and the Holy Land*; Browne's *Travels in Africa, Egypt, and Syria*; Buckingham's *Travels in Palestine through the Countries of Bashan, &c.*; Schubert's *Reise in das Morgenland*; S. Robinson's *Travels in Palestine and Syria*; Burckhardt Barker's *Notes made on a Journey to the Source of the river Orontes*, in *London. Geogr. Journal*, vol. vii.; Ainsworth's *Notes upon the Comparative Geography of the Cilician and Syrian Gates*, in *London Geogr. Journal*, vol. viii.; Chesney, *On the Bay of Antioch*, in *London Geogr. Journal*, vol. viii.; Count Bertou's *Journey to Akabah*, and E. Robinson's *Travels in Palestine, &c.*, in *London Geogr. Journal*, vol. ix.; Medem and Parthey, Notes in Berghaus's *Geographische Memoir zur Erklärung und Erläuterung der Karte von Syrien*; Count Forbin's *Travels in Greece, Turkey, and the Holy Land*; E. Robinson's and E. Smith's *Biblical Researches in Palestine, Mount Sinai, &c.*; and *A General Statement of the Labours and Proceedings of the Expedition to the Euphrates*, in *London Geogr. Journ.*, vol. vii.)

SYRIA (ἡ Συρία) was the Greek and Roman name for that country of Asia which forms the whole or a part of the district called in the Bible Aram (אֲרָם), the Arabian name of which is Sham, and the European, Syria. The etymology of the name is very uncertain: the only derivations worth mentioning are two, the first of which is from Sur, an antient name (and also the modern name) of Tyre; the other makes it a shortened form of Assyria (Major Rennell supposes Syria to be Assyria without the article),—a supposition somewhat supported by the fact that the two names are often confounded or used indifferently by the antient writers. (Herod., vii. 63.) In fact, of the various senses in which the word is used, one makes it include nearly the whole of Assyria, that is, all that country except Mesopotamia. In this, its widest extent, Syria included all the country to the west of the Euphrates, as far south as Egypt and Arabia, while on the north and west it embraced the greater part of Cilicia, Cappadocia, and Pontus, its boundaries on this side being the river Halys and the Euxine Sea. (Herod., i. 72; v. 49; Strabo, xvi., p. 737; Rennell's *Geog. to Herod.*, i., pp. 254, 347.) Pliny (v. 13) and Mela (xi. 1) carry its boundaries still farther to the east and north, and make it include Mesopotamia and Armenia. It appears indeed that all the tribes of the great Aramaean family were called Syrians, in the widest and most antient sense of the word.

In the most usual application of the word, Syria was the district bounded by the range of Amanus on the north, by the Mediterranean on the west, by the Euphrates and the Arabian Desert on the east and south, and by the 'river of Egypt' (probably the river El-Arish) on the south-west. In a still narrower sense it sometimes denoted the same district, with the exception of Phœnicia and Palestine. (Ptol., v. 16.) Herodotus, in speaking of Palestine, includes it in Syria, as a subordinate division: he calls it 'the Palestine Syria' (ἡ Παλαιστίνη Συρίη, ii. 106).

The Syrians (not including the inhabitants of Phœnicia and Palestine under the name) derived their descent from Aram, the youngest son of Seth (*Gen.*, x. 22).

History of Syria to the death of Alexander the Great.—The earliest records of the state of Syria represent it as consisting of a number of independent kingdoms, of which the following are mentioned in the Bible:—(1.) Aram of Damascus (אֲרַם דַּמֶּשֶׂק. 2 *Sam.*, viii. 6; *Isaiah*, vii. 8; xvii. 3; *Amos*, i. 5) was always the most powerful city, and in some sense the capital of the country. Its kings were frequently engaged in war with the Jews. (2.) Maacah (מַעֲכָה), in the neighbourhood of Bashan, had a king in the time of David (2 *Sam.*, x. 6). (3.) Geshur (גְּשׁוּר), in the neighbourhood of Maacah (2 *Sam.*, iii. 3; xiii. 37; xv. 8), had still a king in the time of Solomon. (4.) Aram of Beth Rechob (אֲרַם בֵּית רְחוֹב. 2 *Sam.*, x. 6) was a district at the foot of Anti-Libanus, named after the town of Rechob, in the neighbourhood of the town of Dan, or Laish, in the north of Palestine. (5.) Near this was Chul (חוּל, *Gen.*, x. 23). Besides these, the towns of Hamath, Helbon, Riblah, Tadmor, Betheden, Berothai, Mash, and others, had probably their own princes.

The conquests of David (B.C. 1055, &c.) brought these states into subjection to the kingdom of Israel; but they again became independent at the close of Solomon's reign (B.C. 975). From this time the kingdom of Damascus especially is frequently mentioned in connection with the history of the Israelites, and it appears gradually to have grown in power, and to have held supremacy over the other states of Syria (1 *Kings*, xx. 1), and even to have given the kings of Israel great trouble, till the reign of Joash (B.C. 845), who obtained considerable successes against Benhadad (2 *Kings*, xiii. 22-25). The last king of Damascus was Rezin, who having engaged with Pekin, king of Israel, in war against Ahaz, king of Judah, Ahaz invited Tiglath-Pileser, king of Assyria, to attack Damascus, which he took, and carried the inhabitants captive to Kir (2 *Kings*, xvi. 1-9) about the year 740 B.C. (Clinton's *Fasti Hellenici*, i. p. 273-4.)

From this time Syria formed a part of the Assyrian, Babylonian, Persian, and Macedonian empires in succession, but during this whole period, down to the death of Alexander the Great (B.C. 323), its history presents nothing worthy of notice.

Syria under the Seleucidæ, down to its subjection to Rome.—The wars between the generals of Alexander for the possession of western Asia are narrated in the articles ANTIGONUS, EUMENES, PERDICCAS, and SELEUCIDÆ. After the battle of Ipsus (B.C. 301), Syria, with the exception at first of Cœlo-Syria and Palestine, fell to the share of Seleucus

Nicator, and henceforth it became the central portion of the kingdom of the Seleucidæ, the usual abode of the kings being at its capital, Antioch. A list of the kings of this dynasty is given in the article SELEUCIDÆ, and the history of their reigns under their respective names. For the relations of Palestine and Syria during this period, see JEWS, MACCABEES, ASMONÆANS. The empire of the Seleucidæ was destroyed, and Syria was declared a Roman province by Pompey, in the year 65 B.C. The small district of Commagene was left for a time under its own princes. [COMMAGENE.] During the civil wars of Rome, Syria suffered much from the conflicts of the two parties, the power of native robbers, and the incursions of the Parthians, and it was not till the reign of Augustus that it became quietly settled as a part of the Roman empire. It was governed by a proconsul, who commonly resided at Antioch. In the year 6 A.D., upon the banishment of Archelaus, Judæa and Samaria were added to the province of Syria, to which they henceforth belonged, with a short interruption during the reign of Herod Agrippa I.

Antient Divisions of Syria.—Under the Macedonian kings, Syria was divided into four parts (tetrarchies), which were named after their capitals, Antioch, Seleuceia, Apamea, and Laodicea. Both the Greeks and the Romans called the northern portion of Syria, that is, the whole country with the exception of Coele-Syria, Phoenice, and Palestine, by the name of Upper Syria (*ἡ ἄνω Συρία*, Syria Superior), to distinguish it from Coele-Syria (*ἡ κοιλη Συρία*, that is, the Hollow Syria), which was the name given to the valley between the ridges of Libanus and Anti-Libanus. Under the Romans the province was divided into nine districts: Cassiotis, Apamene, Chalcidice, Seleucis, Pieria, Commagene, Cyrrhestice, Chalybonitis, Palmyrene. The following were the chief towns:—1, In Cassiotis, which lay along the coast, between Mounts Casius and Libanus, and touched Phoenice on the south; Gabala (Jebili), a sea-port; farther north, Laodicea (Latakieh), formerly called Ramitha, and afterwards Leuce Acte; Poseidion (Posseda, or Ras Bosyt). 2, In Apamene, which lay east of Phoenice and Cassiotis, along the course of the Orontes: Emesa (Hems), near a lake formed by the Orontes, celebrated for its temple to Elagabalus, or the sun, whose priest became emperor of Rome [ELAGABALUS], for the defeat of Zenobia, by Aurelian, and for its defence against the Arabians (A.D. 635); Arethusa (Rostan); Epiphania, the Hamath of the Bible and the present Hamah; Apamea, formerly Pella, and now Kalaat el Medyk; Seleuceia on the Belus (Schjure?); ANTIOCH. 3, In Chalcidice, which lay east of the Orontes, towards the desert; Chalcis, the ruins of which still exist near Kinesrin. 4, In Seleucis, north of the mouth of the Orontes: Seleuceia, on the sea, the ruins of which are at Souvadia, or Sweïdiyah. 5, In Pieria, which lay on the Issicus Sinus (Bay of Scanderoon), and reached on the north to the Syriae Pylae, the pass which divides Syria from Cilicia: Alexandria (Scanderoon). 6, In Commagene, which occupied the northernmost corner of the country between Mounts Amanus and the Euphrates: Samosata (Samaisat) on the Euphrates, the birth-place of Lucian, and of Paul the heretic; Adata, afterwards called Germanicea, and in Latin, Germanica Caesarea, in honour of the emperor Caligula, at a later period Telesaura, and now Chadach, or Marah; Doliche (Dolicha); Antioch at the Taurus, perhaps Bahasna). 7, In Cyrrhestice, which extended from the plain of Antioch eastward to the Euphrates: Zeugma, where there was a passage over the Euphrates, opposite to Birtha (Bir); Arudis, at the mouth of the Marsyas; Hierapolis, formerly Mabog, which name the Greeks turned into Bambyce (*βαμβυκη*), now in ruins at Mambej, one of the most important cities of Syria, and famous for a temple of Astarte; Beroea, formerly Chaleb, and now Haleb, or Aleppo, the most important town of modern Syria [HALEB]; Gindarus (Gundyareh), a mountain fortress, where Ventidius defeated the Parthians. 8, In Chalybonitis, which was antiently a fertile strip of country on the west bank of the Euphrates, between the river and the desert, but is now swallowed up by the desert, the sands of which cover the ruins of its cities: Thapsacus, the Tiphsach of the Bible, afterwards Amphipolis, and now the little town of Der, on the Euphrates; somewhat higher up the river was Zenobia (Zelebi), which some geographers identify with Thapsacus. 9, In Palmyrene, the south-eastern portion of the country, which, like Chalybonitis, was once partially irrigated and cultivated, but is now a part of the desert: Palmyra, the Tadmor of the Bible, built by Solomon, according to Josephus, the splendid ruins of which still exist near the little village of Tadmor. These ruins, which belong to the period of the Roman empire, are described under PALMYRA; PHOENICE and PALESTINE are described in separate articles.

Diocletian extended the boundaries of Coele-Syria, and added it to Phoenice, under the name of Phoenicia Libanensis. Constantine the Great erected Commagene and Chalybonitis into a new province under the name of Euphratensis, and Theodosius II. divided the remainder of Syria into Prima and Secunda. Antioch was the capital of the former, and Apamea of the latter.

History of Syria under the later Roman Emperors.—Under the Cæsars Syria was one of the most populous, flourishing, and luxurious provinces of the empire. It had a considerable commerce, and formed indeed the emporium which connected the Eastern and Western quarters of the world. Hadrian, upon his accession (117 A.D.), fixed the eastern boundary of the empire at the Euphrates, and henceforth the frontier province of Syria was exposed to repeated inroads, first from the Parthians and afterwards from the Persians. The province was overrun, and almost subdued by Sapor (A.D. 258), from whom it was rescued by Odenathus (261-264), whose elevation to a share in the empire by Gallienus, his death, the attempt of his widow Zenobia to establish an independent sovereignty in the Eastern part of the empire, and her defeat by Aurelian (273 A.D.), are related under PALMYRA.

At the end of the third century, and in the fourth, the Saracens, or inhabitants of the Arabian deserts, who were destined to wrest this valuable province from the empire, began to make their appearance, sometimes in the legions, but more often among the enemies of Rome. But before falling under their arms, Syria once more felt the power of the Persians. In the reign of Phocas, Chosroes II., after reducing Mesopotamia and the neighbouring states, crossed the Euphrates, reduced Hierapolis, Chalcis, and Beroea, and finally Antioch, which he almost completely destroyed (A.D. 611). Heraclius, who had obtained the empire in 610, took the field in 622 against Chosroes, who had in the meantime conquered not only Syria, but also Palestine (614), and had overrun Egypt and Asia Minor (616). In a series of brilliant campaigns Heraclius repeatedly defeated Chosroes, and at last drove him beyond the Tigris (A.D. 627), and Siroes, his son (and by the murder of his father, his successor), made a treaty of peace with Heraclius (A.D. 628), one of the conditions of which was the restoration of the 'true cross,' which had been carried into Persia after the sacking of Jerusalem in 614. But this brilliant recovery of the Eastern provinces was only the prelude to their final loss under the same emperor.

Conquest of Syria by the Saracens.—The history of this period is related by Gibbon, in the 51st chapter of his *Decline and Fall*. His account should be compared with the notes in Milman's edition of that work, and especially with Price's *Chronological Retrospect of Mohammedan History*. Mohammed himself had taken a few towns of Syria (630 A.D.), and his successor, Abu Bekr, had scarcely mounted the throne when he sent a circular letter to the Arabian tribes, calling them to the invasion of Syria (A.D. 632). A large army of Saracens assembled at Medina, whence they marched into Syria under the nominal command of Abu Obeydah, but virtually led by the fierce Khaled, 'the sword of Allah.' They first attacked Bosra, on the east of the Jordan, which was betrayed by the governor Romanus. They then laid siege to Damascus (A.D. 633). The defence was obstinate, and in the meantime Heraclius had assembled an army of 70,000 men at Emesa, under the command of his general, Vardan. The armies met at Aiznadin, the Greeks were utterly routed, and the Arabs returned to the siege of Damascus, which fell, after an obstinate resistance, in 634 A.D., about July or August. After some irregular exploits, which served to show the undaunted valour and fanaticism of Khaled, and to strike terror into the Syrians, the conquest of the country was carried on by the reduction first of Heliopolis and Emesa, and then of other important towns. In the meanwhile Heraclius had prepared for a last effort in defence of Syria. An army of 80,000 men brought from the different provinces of the empire, with a light-armed force of 60,000 Christian Arabs, encountered the Mohammedans on the banks of the river Yermuk; but few Christians escaped from the field of battle (A.D. 634). Henceforward the conquest proceeded with little opposition. The sacred character of Jerusalem procured for it an honourable capitulation, which the caliph Omar himself came from Medina to receive (637 A.D.). Aleppo submitted, but the castle offered an obstinate resistance, and was taken by surprise, and Antioch purchased its safety at the expense of obedience and 300,000 pieces of gold (A.D. 638). In the same year Heraclius fled from Antioch to Constantinople, and after a show of resistance at Caesarea by Constantine, his eldest son, the province was abandoned to the Saracens, to whom the remaining cities at once submitted. (Compare the article Omar.)

Syria under the Khalifs.—Under the Ummeyahs, or Ommaiades, the seat of government was at Damascus, whither it was removed from Kufa by Moawiya, who reigned from 656 to 679, but it lost this distinction in 749, when the Abbassides took up their residence at Bagdad.

For more than nine centuries the history of Syria has been to a great extent included under that of Egypt. [Egypt.] It was subjected with the latter country to the Turkish usurper Ahmed Ebn e' Tooloon, who founded the dynasty of the Tooloonides, which lasted from 868 to 906 A.D., when the Khalif Moktafee recovered both countries; and afterwards to another Turkish usurper, Akhshed Mohammed Ebn Tughg (A.D. 936), whose dynasty lasted till 970; when Moez, a successor of Mahdee, conquered Egypt, and soon afterwards Syria, as far as Damascus, and founded the dynasty of the Fatimite caliphs, whose capital was at Cairo. [Fatimides.] In 1076 the Turks invaded Syria and Palestine, took Damascus and Jerusalem, and established an independent kingdom under the princes of the house of Ortok. The Caliph Mostali retook Jerusalem in 1096, but lost it again, with a large portion of Syria, in the first crusade, at the close of which the Christian kingdom of Jerusalem was established, which included the antient Palestine and a tract of country round Antioch. This kingdom lasted from 1099, the year in which the crusaders took Jerusalem, to 1187, when Salah-ed-Deen (Saladin) recovered it. [Crusades; Salah-ed-Deen.] His dynasty, the Eyoobites, lasted till 1250, when it was destroyed in Egypt and Damascus by the revolt of the Baharite Memlooks. Seif-ed-Deen, the sultan of Aleppo, great-grandson of Salah-ed-Deen, recovered Damascus, but he was overthrown and slain in an invasion of the Moguls from Persia in 1260. For the history of European connection with Syria in the twelfth and thirteenth centuries, see Crusades.

Syria continued subject first to the Baharite and then to the Circassian Memlooks till the overthrow of the latter by the Turks in 1516-17. [Mamelukes.] Their possession of the country was however interrupted for a short time by Timur, or Tamerlane, who invaded Syria and sacked Aleppo in 1400, and in the next year destroyed Damascus. He did not however attempt to keep possession of the country.

Syria under the Turks.—In the year 1516 Syria was conquered and united to the Ottoman empire by the Sultan Selim I. It is still under the power of the Porte

In the later history of Syria there is nothing worthy of notice till its invasion by Napoleon, A.D. 1799. [Bonaparte, vol. v., p. 124-5.]

In the year 1831, Mehemet Ali, the present viceroy of Egypt, having formed the design of erecting Egypt and Syria into an independent kingdom, took up arms against the Porte on the pretext of a dispute with the pasha of Damascus. His son, Ibrahim Pasha, invaded Syria, and took Gaza in October, and on the 9th of December attacked Acre. After in vain issuing a firman, commanding Mehemet to withdraw his forces from Syria, the sultan declared war against him (April 15, 1832). In the mean time Ibrahim, assisted by French and English officers and Greek sailors, and having formed an alliance with the chief of the Druses of Lebanon, took Acre on the 21st of May, and Damascus on the 13th of June. On the 7th of July he defeated the army of the sultan at Hems, took Antioch on the 1st of August, and on the 21st of December utterly routed the forces of the sultan at Koniah in Anatolia, taking the grand vizier prisoner, and then pressed on for Constantinople. In the mean time the sultan claimed the help of Russia. That power prepared to act against Mehemet Ali by sea and land. France and England now exerted themselves to guard against the preponderance of Russian influence, and at length a peace was concluded, and the sultan, by a firman issued on the 6th of May, 1833, confirmed Mehemet in his government of Egypt and Candia, granting to him in addition that of Damascus, Tripoli, Said, Safed, Naplous, and Jerusalem, and on the 9th orders were sent by the viceroy to Ibrahim to repass the Taurus. Mehemet did not however renounce his project, while on the other hand the sultan continued to watch for a favourable opportunity of recalling the concessions extorted from him. After a long series of indecisive movements on both sides, and of fruitless negotiations between the two parties and the great European powers, matters were brought to a crisis by the renewal of hostilities in Syria, in May, 1839, followed by the defeat of the Turkish forces by Ibrahim at Nezib (June 25), and the desertion of the Turkish fleet to Mehemet Ali on the 4th of July. On the 16th Mehemet announced to the new sultan Abd-ul-Medjid his determination to assert by force his claim to the hereditary government of all the provinces under his command, as a reply to the sultan's offer of the hereditary government of Egypt. The five powers of England, France, Austria, Prussia, and Russia, now induced the Porte to take no further steps without their advice. The negotiations which followed ended in the secession of France, and the conclusion of a treaty between the remaining four powers and Turkey, to compel the submission of Mehemet. The treaty was signed in London, on the 15th of July, 1840. In pursuance of this treaty a fleet consisting of English, Austrian, and Turkish vessels, commenced operations on the coast of Syria by the storming of Beyrout about the middle of September. Acre and Sidon shared the same fate shortly afterwards, and after much negotiation, Mehemet consented to give up Syria entirely, and received from the sultan the hereditary government of Egypt (January 11, 1841). Sir C. Napier has just published a history of this war.

The religions of Syria are various. There are Mohammedans, who are of the Shiite sect, Jews, Christians of the Greek, Latin, and Armenian churches [Greek Church], besides remnants of other antient Christian sects. There are also many European residents, especially of the English and Lutheran churches, to watch over whose interests, and to advance Christianity among the Jews, a bishop of the Anglican church (Dr. Alexander, a converted Jew) has recently been sent out, with the title of bishop of Jerusalem, by the combined efforts of the English and Prussian governments.

SYRIAC LANGUAGE. The Syriac, or Western Aramaic [Aramaean Language], is a language of the Semitic family, and was spoken by the inhabitants of Syria and Mesopotamia, and, after the Captivity, in Galilee. It differs very little from the Chaldee, or Eastern Aramaic, the resemblance between the dialects being so close that Chaldee written in Syriac characters, without points, is good Syriac, with the exception of one inflection in the verbs. The two dialects differ chiefly in their systems of vowel points and in the use of a different character.

Under the Seleucidae, the Syriac was, in all public transactions, and to a great extent in common use, supplanted by the Greek, but even to this day it is sometimes heard in Syria. A mixture of the two dialects of the Aramaic formed the common language of Palestine in the time of Christ [Aramaean Language], and hence we find in the New Testament many idioms and some words of the Syriac.

The principal, as it is also the most antient work in the Syriac language, is the Peshito, or old Syriac version of the Bible. [Syriac Version.]

The principal Syriac grammars and lexicons are the following: Schaaf, 'Opus Aramaeum,' 1686; C. B. Michaelis, 'Syriasmus,' 1741; J. D. Michaelis, 'Grammatica Syriaca,' 1784; Jahn, 'Elementa Aramaicae Linguae,' 1820; Yeates' 'Syriac Grammar,' 1821; Dr. F. Nolan, 'Introduction to the Syriac Language,' 1821; by far the best grammar is Hoffmann's 'Grammaticae Syriacae Libri iii.,' 1827: there are lexicons by Trostius, Gutbirius, Schaaf, and Zanolini.

SYRIAC VERSIONS of the Bible. Of these several exist, two of which are of considerable importance. 1. 'The Peshito (*literal*) Version,' also called 'The Old Syriac Version,' is one of the most antient and valuable translations of the Bible. The version of the Old Testament is ascribed by various traditions to the age of Solomon, to the hand of Asa, priest of the Samaritans, and to the Apostle Thaddeus. It is referred to by Ephrem the Syrian, in the middle of the fourth century, as generally known and used, and therefore it must have been in existence a considerable time before. Modern critics have referred its date variously to the first, second, and third centuries, the majority to the first. The opinion now generally adopted is that of Michaelis, who ascribes the translation of both Testaments to the most flourishing period of the Syrian churches, namely the end of the first and the beginning of the second century.

The version of the Old Testament was certainly made from the Hebrew, which it closely follows; but there are indications of the translator having made use of the Septuagint and of the Chaldee paraphrase. The great antiquity of this version, much higher than that of any existing Hebrew MS. of the Old Testament, makes it a most valuable source of biblical criticism. It is on the whole a very good translation, but not equal throughout. A different method of interpretation is followed in different books, for instance in the Pentateuch and the Chronicles. From this circumstance Jahn infers that it was the work of different persons. The arguments to the Psalms prove that their translator was a Christian.

The version of the New Testament contains the four Gospels, the Acts of the Apostles, the Epistles of Paul (including that to the Hebrews), the First Epistle of John, the First Epistle of Peter, and the Epistle of James. It is undoubtedly one of the best versions of the New Testament in any language, and is used as their standard by the churches of Syria and the East. A very antient MS. of the Syriac version was brought by Dr. Buchanan from a Syrian church in India, and is now in the library of the University of Cambridge.

The version of the Old Testament was first printed in the Paris Polyglott, but from an imperfect manuscript; the passages which were wanting were indifferently translated by Gabriel Sionita from the Vulgate. This text, revised by the help of four MSS., was reprinted in Walton's Polyglott. The version of the New Testament was first brought into Europe by Moses of Mardin, who was sent by Ignatius, the patriarch of the Maronites, on a mission to Pope Julius III. in 1552. It was first printed at Vienna in 1555, at the expense of the emperor Ferdinand I.

There is a later and very inferior translation of the books of the New Testament which are wanting in the Peshito, namely, the second Epistle of Peter, the second and third of John, the Epistle of Jude, and the Apocalypse, made from the original Greek, probably in the sixth century.

2, The Philoxenian, or Syro-Philoxenian Version of the New Testament, is so called from Philoxenus, bishop of Hierapolis, in the province of Aleppo (488-518), under whose auspices it was translated by Polycarp. It was revised by Thomas of Heraclea in 616. It is translated from the Greek text, but is very inferior to the Peshito.

The remaining Syriac Versions are not of sufficient importance to require a separate notice. They are described, with the Peshito and Philoxenian, in Marsh's notes to his translation of the 'Introduction' of Michaelis, Wiseman's 'Horæ Syriacæ,' and the 'Introductions' of Horne and Jahn.

A list of the editions of the Syriac Versions is given in the 'Bibliographical Appendix' to the second volume of Horne's 'Introduction.'

SYRIANES. [RUSSIA; SLAVONIANS.]

SYRIA'NUS, a Greek philosopher, born at Alexandria or at Gaza, was the leader of the school of New Platonists at Athens, next after its founder, Plutarch, the son of Nestorius. He died in the year 450 A.D. His works, the greater number of which are lost, are enumerated by Suidas. They are:—1, 'A Commentary on Homer,' in seven books; 2, 'On the Republic of Plato;' 3, 'On the Theology of Orpheus;' 4, 'On the Gods of Homer;' 5, 'On the Harmony of Orpheus, Pythagoras, and Plato;' 6, 'Ten Books on the Oracles.' The two following works are extant:—7, 'A Commentary on some parts of Aristotle's Metaphysics;' and, 8, 'A Commentary on the Rhetoric of Hermogenes.'

The Greek text of the Commentary on Aristotle was edited by Leonh. Spengel, in his *Συναγώγη Τεχνῶν*, 1828, 8vo. Bagolini found a Latin translation of a portion of the work in a MS. and published it at Venice, 1558, 4to. The Commentaries on Hermogenes are contained in the second volume of the Aldine edition of the Greek orators, in 2 vols. folio, 1508-1509, and in the 'Rhetores' of Walz, vol. iv., 1833.

He was also the author of two epigrams, one of which is printed without a name in the Palatine Anthology, ii., p. 122; or in the edition of Jacobs, iv., p. 233; the other is preserved by the Armenian philosopher David, and printed by Schöll.

(Schöll's *Geschichte der Griech.-Lit.*, iii., pp. 50, 182, 375; Hoffmann, *Lexicon Bibliographicum*.)

SYRINGA (from 'syrinx,' *σύριγξ*, a pipe), the name of a genus of plants belonging to the natural order Oleaceæ. The English name of this genus, lilac, in derived from *lilag*, the Persian for a flower. It is known by a small 4-toothed calyx; funnel-shaped corolla, with a 4-parted limb; 2 stamens; a trifid stigma; a 2-celled, 2-valved, 2-seeded capsule; the valves boat-shaped, with a dissepiment in the middle. The species are natives of Europe and the colder parts of Asia; they are deciduous shrubs, with simple leaves, having purple or white flowers, which are arranged in beautiful thyrsoid terminal panicles, and are very fragrant.

S. vulgaris, the common lilac, known by its ovate heart-shaped pointed leaves. It is a native of Persia, Hungary and the borders of the Danube. Dr. Sibthorp found it wild on Mount Hæmus, but not in Greece. This shrub has been long cultivated by the Turks, and was brought from Constantinople to Vienna by the ambassador Busbequius, in the middle of the sixteenth century, from whence it spread over the rest of Europe. It is now one of the commonest ornaments of our shrubberies, blossoming, together with the laburnum, in May. It is one of the few shrubs that resists the injurious influence of the smoke of cities, and flourishes in great perfection in most of the squares of London. It grows to the height of 20 feet and upwards, and sends up from the parent stem an abundance of suckers, which, if allowed to grow, form a dense mass of stems; these are commonly left, but if cut down as they are produced, the parent stem may be trained so as to grow as a small tree. It grows very fast, as much as from eighteen inches to three feet in the year, and endures, according to the soil, for twenty to fifty years. It is frequently planted, either alone or in combination with other shrubs, for the purpose of forming ornamental hedges for gardens, &c. The plants with which it is sometimes mixed in this way are the sweetbriar, the white and scarlet thorn, the Guelder rose, &c. Several varieties of the common lilac are found in shrubberies, the best known of which are the common blue lilac (*S. v. cærulea*), which is known by its blue flowers: the common purple lilac (*S. v. violacea*), frequently called the Scotch lilac, also known by the colour of its flowers; and the common white lilac (*S. v. alba*), with white flowers: this last flowers the earliest. There are also two varieties with red flowers, one of which is the *Lilas de Marly* of the French gardeners.

S. Josikea, Josikas lilac, has elliptic-lanceolate, acute, ciliated, wrinkled, glabrous leaves seated on short petioles, and white on the under surface, and purple flowers. It is a native of Transylvania, and was discovered by the Baroness von Josika, after whom it was named by Jacquin. It attains the height of six or eight feet, and has broad leaves, shining and dark green above and hoary beneath. It grows in damp shady places near water. Though very dissimilar in appearance to the common lilac, it has been suspected to be only a variety of that species. It is not yet very common in our nurseries.

S. Persica, the Persian lilac: leaves small, lanceolate; flowers purple. It is a native of Persia, and is a small shrub, from four to six feet high. It is one of the most ornamental of low deciduous shrubs, and on that account is very commonly cultivated. When planted in pots and forced, it may be made to flower at Christmas; but by this process the fragrance of the flowers is lost. Of this species also three varieties are found in the nurseries, the white, the cut-leaved, and the sage-leaved Persian lilacs.

S. Chinensis, Chinese lilac: leaves ovate-lanceolate, flowers purple. It is a native of China. In characters it is intermediate between *S. vulgaris* and *S. Persica*, and agrees with a hybrid plant produced at Rouen by M. Vain, and called *S. Rotomagensis*, the Rouen lilac. It is a plant that grows vigorously, and attains a height of ten or twelve feet. The sorts known in nurseries as the Belgic *Lilas de Marly* and the *Lilas saugé* are varieties of this species.

S. Emodi has elliptical-oblong leaves, glaucous beneath, attenuated at the base, and acuminated at the apex with purple flowers. It is a native of Kumaon near the Himalaya. The *S. villosa* has villous leaves, and is found in China on mountains about Pekin, but neither of these species is cultivated in this country, although both would probably bear this climate.

All the lilacs will grow in almost any kind of common soil; the best way of propagating them is by the suckers which they send off in so great abundance. They may be grafted on privet or ash stocks, and in this way the inconvenience of their great produce of suckers may be got rid of.

(Loudon's *Arb. et Frut.*, vol. ii.; Don's Miller, iv.)

Syringa is also the name that is commonly but improperly given to the species of Philadelphus, or Mock-orange. The name Syringa was given to the lilac on account of its stems being used for the manufacture of Turkish pipes. The stems of the Philadelphus coronarius are also used for the same purpose, and equally with the lilac it had the name of Pipe-privet, or Pipe-tree, given it when first introduced into this country, and afterwards the name Syringa. [PHILADELPHUS.]

SYRINGE (from Σύριγξ, a pipe), a portable hydraulic instrument of the pump kind, commonly employed for the forcible ejection of fluids. In its simplest form it consists of a cylindrical tube, with a perforated nozle at one end, and a piston or plunger, to the rod of which a ring or other convenient handle is attached. The tube being held in the left hand, with its nozle immersed in water, the piston is drawn to the upper end of the tube by the right hand. The pressure of the atmosphere upon the surface of the water causes it to follow the piston, so that the syringe becomes filled with water. The instrument is then removed from the vessel of water, and, by pushing the piston back towards the nozle, its contents may be ejected with a force proportionate to the power applied to the piston. Syringes of various sorts are extensively used for surgical, horticultural, and other purposes, a few of which may be briefly noticed.

The use of syringes for extinguishing fires is alluded to under FIRE-ENGINE, vol. x., p. 277. Syringes for this purpose appear to have been much used in London before larger and more perfect engines became common. Hebert (*Engineer's and Mechanic's Encyclopædia*, vol. i., p. 505) mentions some of these, which are still, he says, preserved in the vestry-room of St. Dionis Backchurch in Fenchurch Street, and which are supposed to have been used at the great fire of 1666. He describes such instruments as being usually made of brass, and holding from two to four quarts each. 'Those of the former capacity were,' he says, 'about two feet and a half long, and one inch and a half in diameter, that of the nozle being half an inch. They were furnished with handles on each side, and every syringe required three men to work it. One man on each side grasped the handle in one hand and the nozle in the other, while a third man worked the piston or plunger, drawing it out while the nozle was immersed in a supply of water, which filled the cylinder; the bearers then elevated the nozle, when the other (man) pushed in the plunger, the skill of the bearers being employed in directing the stream of water upon the fire.' The large syringes used for horticultural purposes might, in many cases, be used with advantage on the first discovery of a fire, when a very small quantity of water, promptly applied and accurately directed, might prevent serious mischief.

Garden-syringes are made either to throw water in a compact jet, from a simple nozle with one perforation, or to distribute it in the form of a shower, from a rose perforated with a number of small holes. In the latter case especially, as time would be lost in filling the syringe if the water were compelled to enter through the fine perforations by which it is ejected, it is usual to add a nozle of comparatively large bore, through which water is allowed to enter, although a self-acting valve prevents it from returning the same way. Several different caps may be fitted to the same syringe; those for throwing jets having the injection and ejection nozles side by side, while those for producing showers have the injection nozle in the centre of the rose. In some cases the water is thrown from such syringes against a wall, that it may rebound so as to wash the back or under surface of the leaves, in order to remove the eggs of insects deposited upon them; and some syringes are made with curved nozles, for use in a similar way. Their portability renders instruments of this kind particularly useful in conservatories. Syringes may also be applied with advantage in washing carriages, cleaning windows, and for other useful purposes.

In medicine and surgery syringes of various kinds are employed in administering clysters; in injecting fluids into, or removing them from, the stomach or bladder; injecting liquids into wounds; and injecting coloured liquors or melted wax into veins, &c., in anatomical preparations. The application of the syringe as a stomach-pump is peculiarly important. In this case a flexible tube is put into the mouth of the patient, with a guard between the teeth to preserve it from injury, and a branch pipe is added to supply the syringe with liquid from a vessel, when it is used for injection, and to afford a channel for the escape of the abstracted liquid when the syringe is employed to empty the stomach. By an ingenious arrangement of valves, the same instrument may be so modified as to act equally well in either way. One method of using such an instrument is, first to inject a diluent into the stomach, and then to pump it back again, together with the injurious matter which it is desired to remove; and another plan sometimes found advantageous, is to inject a fluid into the stomach until an involuntary discharge takes place through the mouth, and to continue the operation until the stomach is cleansed, this being indicated by the fluid returning unchanged. A similar instrument may be used for injecting tobacco-fumes into the intestines. Syringes are also used for similar purposes in veterinary surgery.

The pneumatic instruments known as exhausting and condensing syringes are described under AIR-PUMP, vol. i., p. 239. A kind of condensing syringe for igniting tinder by the sudden compression of air has been contrived, though not brought much into use. It is sometimes made in the form of a walking-stick.

In 1822 Mr. James Harris, of Plymouth, communicated to the Society of Arts a method of preserving oil-colours for painting in syringes formed of tin, or of brass tinned internally. The details of his plan, which possesses several advantages over the common method of tying up the colours in pieces of bladder, are given in vol. xli. of the Society's 'Transactions.' A similar contrivance, in which the syringe is formed of glass, and other details are different from Mr. Harris's, although the same principle, that of propelling the piston by means of a screw, is preserved, has been lately brought much into use; and, still more recently, tubes of very thin metal have been adopted, from which the colour is expressed by collapsing the tube between the finger and thumb, without the use of a piston.

(Jamieson's *Dictionary of Mechanical Science*; Hebert's *Engineer's and Mechanic's Encylopædia*; &c.)

SYRINGO'DEA (from *σύριγξ, a pipe*, on account of their long tubular corolla), a genus of plants belonging to the natural order Ericaceæ. This genus was formed by David Don out of the old genus Erica. It possesses the following characters: calyx 4-leaved, glumaceous; corolla long, tubular, usually rather dilated at top, rarely a little contracted; limb short, 4-lobed; stamens for the most part inclosed, filaments capillary, anthers 2-parted, cells of anthers short, obtuse, mutic or aristate at the base, dehiscing by an oblong foramen; stigma simple or capitate, and in some species annulated with an elevated disk; capsule 4-celled, many-seeded; seeds oval, compressed, smooth. (Don's Miller, iii.) The species, of which one hundred and twelve are described by George Don in Miller's Dictionary, are all natives of the Cape of Good Hope. They are erect shrubs, with loose leaves and large showy flowers, which are crowded at the tops of the branches on every side, and form a spike-like inflorescence. In their cultivation they require the same treatment as heaths. [ERICA.]

SYRINGO'PORA. [MADREPHYLLIŒA.]

SYROPU'LUS, or SGUROPULUS, SILVESTER, a dignitary of the Greek church, wrote a history of the Council of Florence, which was convened in 1438 A.D. by Pope Eugene IV., at Ferrara, and in 1439 removed to Florence. The principal business of the council was to settle the differences between the Greek and Latin churches. Syropulus, who was present at the council, writes in a spirit of opposition to the attempted union of the churches, and his work must therefore be considered an ex-parte statement.

This work was published, with a Latin translation and notes by Robert Creighton, an Englishman, at the Hague, 1660, folio. Its publication called forth a work on the opposite side by Leo Allatius [ALLATIUS], entitled 'Exercitationes in Creightoni Apparatum, Versionem, et Notas, ad Historiam Concilii Florentini scriptam à Sguropulo Rome, 1674, 4to.

(Schöll, *Geschichte der Griech.-Lit.*, iii. 323; Mosheim's *Ecclesiastical History*, cent. xv., pt. ii., c. ii., § 14, note.)

SY'RPHIDÆ, a family of dipterous insects of the section *Brachystoma* of Macquart, the species of which are distinguished by their having the palpi inflated at the extremity, the fore part of the head often with a prominence, the labrum large, arched, and emarginated; the stylet of the antennæ is usually dorsal; the abdomen is most frequently depressed and elongated; the wings have one discoidal cell, three posterior cells, the first of which is closed, and the second extends along the posterior margin of the wing; sometimes there are some small terminal nervures; the anal cell is large, and a longitudinal nervure divides the discoidal cell, as well as the posterior.

The present family contains upwards of forty genera, a great portion of which have representatives in this country. The species frequent flowers and woods: the larvæ of the species of *Syrphus* is in the form of an elongated cone; they fix themselves, &c. with a kind of glue, and feed exclusively on aphides. Some of the *Syrphidæ* inhabit the nests of the humble-bees (*Bombus*), and these so much resemble the species of Bombi, that they might at a first glance be mistaken for them. Other *Syrphidæ* live in the larva state in water and mud; and these larvæ are provided with a long slender tail, through the extremity of which they respire, it being raised to the surface of the water or mud for the purpose.

SYRRHAPTES. [Tetraonidæ.]

SYRTES (*αἱ Σύρτεις*) was the name given by the Greeks and Romans to the two gulfs on the northern coast of Africa, one of which they called Syrtis Major (*ἡ μεγάλη Σύρτις*), and the other Syrtis Minor (*ἡ μικρὰ Σύρτις*). Both Syrtes were the terror of the antient mariners. The name is said to be derived from the Greek verb *σύρω* (*draw* or *drag*), from their drawing in ships and swallowing them up in their sandy shoals. Another derivation is from the Arabic word *sert* (sand), which is at this day applied to the district on the shores of the Syrtes.

1. The Greater Syrtis, now called the Gulf of Sidra, is a very large bay on the northern coast of Tripoli, lying between the promontories of Boreum (Ras Teyonas) on the east, and Cephalae (Ras Kharra) on the west, the distance between which is 230 geographical miles: its greatest depth is about 110 geographical miles. Strabo (p. 835-6) gives 930 (or, according to the correction of Casaubon, 5000) stadia for its circuit, 1500 for the diameter of its mouth, and about the same for its depth. The Sahara, or Great Desert, here comes down almost to the sea, leaving here and there only a narrow strip of land inhabitable. The gulf is very shallow and full of quicksands, and the coast is covered by a chain of little islands. On this dangerous shore it was difficult to prevent ships from being driven by the north winds, to which the gulf is completely exposed, while the effect of such winds on the water made the soundings very uncertain. Under all these difficulties the great terror of the antient mariner in these parts was 'lest he should fall into the Syrtis.' (*Acts of the Apostles*, xxvii. 17.) Strabo (p. 836) describes the difficulties of this and the Lesser Syrtis as arising from the above causes, and adds that a ship once involved in them rarely escapes; and he ascribes it to the singular audacity of men that they ever attempted to navigate the coasts of the Syrtes.

2. The Lesser Syrtis, now called the Gulf of Khabs, on the southern corner of Tunis, lies between the promontory of Brachodes, or Caput Vada (Ras Kapondiah), on the north, and the island Meninx (Jerbah) on the south. Besides this island, those of Cercina and Cercinitis (Karkennah) lie in its mouth, the width of which was generally reckoned from these islands to that of Meninx, and was estimated at 600 stadia, or 60 geographical miles (Agathemerus, i. 5; Eratosthenes, ap. Strabo, p. 834), which is the real distance. Eratosthenes (*l. c.*) gives 1600 stadia for the circuit of the coast. The Roman writers, measuring from other points, give larger results than the above, namely, 100 Roman miles for the width of the mouth, and 300 for the circuit. (Mela, i. 7; Plin., v. 4.) This gulf is said by Scylax (p. 48) to be even more dangerous than the Greater Syrtis. Its dangers arise however not so much from quicksands as from 'the variations and uncertainty of the tides on a flat shelvy coast.' (Rennell.)

The Syrtes were known to the Greeks in very early times. Herodotus mentions only one of them by the name of Syrtis (ii. 32, 150; iv. 169). It is generally thought that in these passages Herodotus means the Greater Syrtis, and that his Lake Tritonis is the Lesser. He states (iv. 178-9) that Jason, when on a voyage to Delphi prior to the Argonautic expedition, was driven by a north wind from Malea into the shallows of Lake Tritonis, but he nowhere speaks of the dangers of the gulf which he calls Syrtis. His allusions are very difficult to explain. Müller supposes that the story about Jason refers to the Greater Syrtis (Orchomenus, p. 354); and Niebuhr contends that wherever Herodotus speaks of the Syrtis, he means the Lesser. ('Vermischte Schriften, i., p. 147.')

The march by land round the Greater Syrtis was difficult and dangerous. Edrisi describes a portion of the road as passing over ground in a state of solution; in fact, sand saturated by the sea-water. Strabo (p. 836) states that Cato, in marching from Berenice, through the Syrtis, was compelled to pass through deep and burning sand. In connection with this march, Lucan gives a very spirited description of the Syrtis (ix. 390, &c.).

The Lesser Syrtis is remarkable for the great variations of its tides, in consequence of the east winds, to which it lies open. The lake bordering upon it, which is now called El Sibkah, or the Lake of Marks, seems to have been once connected with the Syrtis by a channel; and this lake must be included under the Lake Tritonis of Herodotus, if we suppose the latter to be the Lesser Syrtis.

(Rennell's *Geography to Herodotus*, ii., sec. xxiii., p. 314, &c.; Heeren's *Researches, African Nations*, i., p. 33; Mannert, *Geographie der Griechen und Römer*, x. 2, pp. 106, 157; Georgii, *Alte Geographie*, p. 504; Shaw's *Travels*, p. 194.)

SYRUPS are medicinal solutions of sugar, either in water alone, as in simple syrup, or in liquids charged with some peculiar principle of an active kind, such as senna or buckthorn, or merely grateful from its colour or fragrance, or both, such as syrup of violets. These must be of a proper consistence, either by having a suitable quantity of sugar added to the water at first, or by subsequent evaporation of the superfluous water. The former is the preferable mode, as the syrup keeps better. The purest and most thoroughly refined sugar should be employed, and generally in the proportion of two parts of sugar to one of fluid. When made, the syrup is to be preserved in closely-stopped bottles, and kept in a cool place, the temperature of which never exceeds 55° Fahr.; but, with every precaution, fermentation is apt to occur, particularly if warm or boiling water has been employed to extract the vegetable principle, as is most improperly enjoined in the 'London Pharmacopœia,' in the syrup of Althaea, when cold water is most appropriate. so also with the syrup of poppies, which, when given in a state of fermentation to children, too often aggravates the disorder of the bowels it was intended to alleviate. When too little sugar is used, fermentation is still more apt to occur: when too much, the excess crystallizes. Syrups are more used for their fragrance or colour than for their medicinal properties, which few possess to any important extent. Their number might well be diminished.

SYRUS, PUBLIUS. [Publius Syrus.]

SYSRAN. [Simbirsk.]

SYSTEM (Mathematics), a word little used: we hear sometimes of a system of equations, or a system of curves or surfaces; the former meaning a set of equations which are related to each other in the same problem, the latter a class of curves or surfaces which are connected by any law.

SYSTEM (Astronomy). This term is applied to every theory of the disposition and internal arrangements of the solar system, or of the material creation generally. Thus we have the system of Ptolemy, of Copernicus, &c. Perhaps a short description of the distinctive characters of the different systems may be useful in a work of reference.

Ptolemaic.—The earth is an absolutely fixed centre, and the planets revolve in circles about centres which themselves revolve round the earth. [Ptolemaic System.]

Copernican.—The sun is a centre, round which the planets revolve. Some of the machinery of the Ptolemaic system is retained.

Tychonic.—The sun is a centre of motion to all the planets, which revolve round it, while the sun and planetary orbits are carried together round the earth as a fixed centre.

Semi-Tychonic.—The sun is a centre of motion to Mercury and Venus, as in the Tychonic, and the motions of the other planets are as in the Ptolemaic system.

Newtonian.—There is no fixed centre, the sun only approximating to that character from its greater magnitude. The orbits of the planets are approximately represented by ellipses, exactly by ellipses of which the elements vary.

The Newtonian system is frequently called Copernican, from its rejecting what Copernicus rejected; but it is far from receiving all that Copernicus received. The introduction of the ellipse is due to Kepler. We have not included the system of Des Cartes [Vortices] because it has reference to physical causes, and contains no peculiarity of arrangement. [Ptolemaic System; Brahe, Tycho; Copernicus; Newton; Principia; Gravitation; Solar System, &c.]

The term system is also applied to the subdivisions of the solar system: thus we have the terrestrial, Jovial, Saturnian, Uranian sytems.

SYSTEM, PTOLEMAIC. This article would have come under Syntaxis, but for circumstances which occasioned delay.

In the article Ptolemaic System we have explained the principal points of that system as exhibited by the followers of Ptolemy, and in the form in which it was attacked by the followers of Copernicus and Galileo. Our present article has reference to Ptolemy personally, and to his astronomical writings. We shall begin by a short account (from Delambre) of his *μαθηματικὴ σύνταξις*, or mathematical syntaxis, which obtained from his commentator Theon the name of *μεγάλη σύνταξις*, or great Syntaxis, shortened and heightened by the Arabs into Almagest.

Book I. Ptolemy gives notice that he intends to state briefly all that has been well done or well known before him, and to enlarge upon what has not. He gives his proofs, physical and metaphysical, that the earth is spherical and fixed, and that the primary motion of the stars is circular; as also that the earth is the centre of the universe. One sphere produces the diurnal motion, another that of the precession: his expressions in this chapter do not settle the point whether he believed in the solid spheres, or only considered them as an hypothesis. He describes the theory and construction of his table of chords, and two instruments for observing the solstices, and deducing the obliquity of the ecliptic. It is doubtful from his expressions whether he had ever used the first, which is the better of the two, and whether the second could be made available. He gives no observations, and his result is that the distance of the two tropics is between 47⅔° and 47¾°, which is very nearly that of Hipparchus, without any allowance for the diminution which must have taken place between the times of Hipparchus and Ptolemy. He applies the table of chords to find the degrees of the equator and ecliptic which come on the meridian together.

Book II. Dividing the earth into four parts by the equator and one meridian, Ptolemy begins by assuming that one only of those parts is habitable. This part he divides into portions or climates by the lengths of their longest days. The latitudes are found from the gnomon; but in the examples Rhodes (where Hipparchus observed), and not Alexandria, is chosen: Delambre suspects that these examples are taken from Hipparchus, and that negligently. He fixes the times when the sun will be in the zenith of a given place, gives the method of determining the longest day, describes the various climates above mentioned up to the pole, converts the ordinary mode of reckoning time (namely, twelve hours to the day and twelve hours to the night, differing at different times of the year) into sidereal time, and enters into details, and gives tables, on the position of the ecliptic in various latitudes with respect to the horizon. He speaks of the table of longitudes and latitudes given in his Geography.

Book III. Ptolemy gives the reasons for the tropical year being preferable to the sidereal. He contends for the tropical years being all of the same length, in opposition to Hipparchus, who, he affirms, suspected an inequality: this point, as between Hipparchus and Ptolemy, is discussed at length by Delambre. Hipparchus had determined the length of the year by comparing his own solstices with those of Meton and Euctemon, and had made it upwards of six minutes too long. Ptolemy compares his own equinoxes (as he says) with those of Hipparchus, and, though the interval was nearly 300 years, contrives to produce the result of Hipparchus. This has caused Ptolemy to be suspected of inventing equinoxes, and not observing them; and, it must be allowed, not without strong reason. This very curious point is also discussed at length by Delambre. This third book also contains the solar theory, in which the orbit of the sun is supposed to be a simple excentric. Ptolemy avowedly agrees with Hipparchus in the main points of this solar theory, and adds, without mention of the latter, a true account of the equation of time, specifying the two main parts of which it consists. This was misunderstood by Ptolemy's successors, and it was not until the time of Newton that the error was set right (by Flamsteed). Delambre is inclined to suspect that as Hipparchus really had the elements of the equation of time in his possession, the want of mention of his name is not to be considered as conclusive in favour of Ptolemy.

Book IV After describing the advantage of using eclipses for determination of the moon's place, and mentioning the well-known Chaldean Saros (referring however only to ancient authors generally), Ptolemy proceeds to give his values of the daily motion of the moon, both with respect to the stars, her perigee, and her node. In the first he agrees with Hipparchus, and in the second and third makes such trivial alterations in the results of the latter, that it is difficult to see how he could have thought his own observations good for such small quantities. After mentioning that all his predecessors, without exception, had seen only one inequality in the lunar motion, he makes mention of a second (see the next book). The first inequality (the equation of the centre) he combines with the motion of the apogee by an epicycle. The description of the eclipses, from which he detects the amount of this inequality, is followed by the process. He then proceeds to the motion of the node, which he detects by observation of distant eclipses presenting the same phases. In the whole of this chapter he is apparently following Hipparchus.

Book V. This book contains the account of the discovery of the evection [Moon], of which even Delambre admits that this one discovery would place Ptolemy in the first rank of astronomers; but not without observing that it appears from Ptolemy himself that Hipparchus had felt the want of a second inequality, but had not time or opportunity to work it out. This complicated inequality depends upon the positions of the sun and moon with respect to the moon's perigee: it was ascertained by comparison of eclipses, and represented by placing the epicycle of the former inequality upon a revolving excentric. He then proceeds to the subject of the distances of the sun and moon from the earth. Hipparchus had doubted whether the parallax of the former was appreciable, but had not ventured to suppose it less than 3′. Ptolemy brings nearly the same result, and so makes the sun's distance about the twentieth part of its real amount in that of the moon he is not so correct as Hipparchus.

Book VI. This book is devoted to eclipses, the determination of the limits within which they are possible, and their prediction in the case of lunar eclipses. He appears not to have had any reliance on his own theory for a solar eclipse.

Book VII. Ptolemy notes most particularly the apparent positions of the fixed stars, comparing them with those given by Hipparchus, to prove that the precession affects them all equally. So very numerous are his observations, considering the paucity of those which he gives on much more important and doubtful subjects, that some have doubted whether he ever really did observe anything with instruments in the matter of the fixed stars. Hipparchus made the precession to be one degree in a hundred years, instead of seventy years; and Ptolemy takes care to verify his result by a most suspiciously close accordance of observations. The celebrated catalogue which this book contains was observed by Ptolemy himself, as he says, though it has been suspected that he merely added his own and Hipparchus's value of the precession to the longitudes of the latter. No star is contained in it which could not be seen at Rhodes, though there are several which an Alexandrian observer might have added. Longitudes and latitudes, not right ascensions and declinations, are employed, and Ptolemy states that they were directly observed. The number of stars is 1022, rather less than that in the catalogue of Hipparchus. Delambre's comparison of the distances of stars from each other, as compared with those deduced from Ptolemy, is elaborate.

Book VIII. The Milky Way is described. The construction of artificial globes is pointed out in a manner exactly resembling that in use at present. Long details follow on the rising and setting of the stars with respect to the sun.

Books IX., X., XI. These books treat of the motions of the planets: the first generally, and of Mercury in particular; the second of Venus and Mars, the third of Jupiter and Saturn. Hipparchus, Ptolemy says, had hardly commenced this subject. He places Venus and Mercury between the earth and sun, in opposition to the opinion held by some. He recognises two distinct motions: the first what we should now call the motion of the planet round the sun; the second arising from that of the earth round the sun. His principal apparatus is an excentric, with a revolving motion, on which the planet moves in an epicycle. In the case of Mercury and Venus, the epicycle answers to the orbit of the planet; in Mars, Jupiter, and Saturn, to the orbit of the earth. In the first cases, the motion of the centre of the epicycle is that of the sun; in the second, the motion in the epicycle. This obvious dependence of the motions of all the planets upon that of the sun leads to no remark upon the possibility of the sun itself being the centre of their epicycles. The complication of these hypotheses, which afterwards became so striking, begins in an attempt to represent the motion of Mercury by an additional circle.

Book XII. contains the deduction of the phenomena of stationary and retrograde motion in the planets from the theory already laid down.

Book XIII. contains the modifications of the positions of the epicycles which were necessary to represent the planets' motions in longitude; and also an account of the distances from the sun at which they begin to appear.

The first account of the Optics of Ptolemy was given by Delambre (*Hist. Astr. Anc.*, vol. ii.), from a Latin manuscript translation in the Royal Library at Paris. Montucla and others were only able to speak of it from the presumption that Alhazen had copied it: among other mistakes which this gave rise to was the attributing to Ptolemy a good explanation of the apparent enlargement of the sun and moon near the horizon. It contains, among many errors and some good experiments on the passage of rays from one medium into another, a distinct statement of the fact of atmospheric refraction, of its tendency to raise the stars towards the zenith, and its increase with the zenith distance of the star: the phenomenon being attributed to its true cause, the alteration of density in the media which the light traverses. That Ptolemy wrote on Optics is certain, and Delambre seems to take it for granted that this translation in the Royal Library is really that of Ptolemy's work from the Arabic. There are other copies mentioned in library catalogues, and a proper comparison and critical discussion of the claims of the work will no doubt one day arrive.

The work on the Planisphere, attributed to Ptolemy, has also come down through the Arabic. It is on the stereographic projection, which was known to Hipparchus; and Proclus mentions the work of Ptolemy as being modelled on that of Hipparchus. The other work on the Analemma (an instrument intended to facilitate the construction of sun-dials) is also only known by translation from the Arabic. The Τετράβιβλος, a work on astrology, has come down in Greek, with the paraphrase of Proclus. All these works are fully described by Delambre, with whom it was a labour of love (towards Hipparchus) to sift the writings of Ptolemy.

The fate of the Ptolemaic system, since the Galilean reform, is a close parallel with that of the Roman church in England. The advocates of the now established system, remembering only the opposition with which their opinions were met by those once in power, and forgetting the services which the older establishment had rendered through a long period in which no opposition was dreamed of, exhausted the powers of language in undiscriminating depreciation; and Ptolemy, who was the astronomer's best guide and no bad one either, all things considered) for centuries, and the monasteries which preserved all literature through the same period, are only known and spoken of as the destroyed of Copernicus, or the denounced of Luther. In time, a tardy justice is done, and never was there an instance in which it was more required than that of the Syntaxis.

If we look at the immense mass of labour which Ptolemy left behind him, to say nothing of the works which have been lost, and consider that not one fragment of it exists which did not actively exercise minds of all degrees of power from the first translations of the Arabs to the middle of the seventeenth century, we may form a slight idea of the effect of his writings. Only Aristotle, of all the antients, can be compared with Ptolemy in the commanding character of his influence.

As to his astronomical observations, we see no reason to decline to follow Delambre, who has, we think, shown, almost to demonstration, that Ptolemy was perhaps not an observer at all, and that at most his observations must have been of the rudest kind, compared with those of Hipparchus. It is from Ptolemy himself that we learn this: for there is no one to confront with him: in stating most plainly where he follows Hipparchus, in conducting his imitations or adaptations of the latter with a degree of openness which invites attention to the source from whence he drew, and, above all, in the candid admiration with which he expresses himself on the subject of his predecessor's merits, he earns, or ought to earn, confidence when he expressly attributes anything to himself. The epithets which he bestowed on Hipparchus, the lover of toil and truth (φιλόπονος κα φιλαλήθης), may well be added to his own name.

It is as an astronomical theorist that Ptolemy has earned the fame which outlasts his system. His much abused epicycles were no other than a geometrical representation of the process which a modern analyst would have been obliged to follow under the same circumstances. If a periodical magnitude is to be represented, a series of sines or cosines is chosen, the angles of which depend upon the periods of the observed inequalities, and the coefficients upon their extreme magnitudes: this is precisely the algebraical representation of the process of Ptolemy. A question has arisen as to whether he himself believed in the solid crystalline orbs which his followers placed in the heavens. Some of his phrases would imply that he leaned to such a belief, but a much larger number are expressive only of an hypothesis which *saves appearances*, to translate literally, or represents phenomena. Had he really adopted such a material mechanism, he, who could argue that celestial motions must be circular, because circular motions are the most perfect, would not have been without some *à priori* reason for the solidity of his planet-carriages. If he had had a better physical system, the state of mathematics would not have permitted the use of it; and Copernicus himself had no more satisfactory mode of explaining the inequalities of the planetary motions than these same epicycles; nor, as we have said, could a modern astronomer, with new phenomena to represent, and no physical cause to refer them to, do otherwise than adopt the same course, in trigonometrical language, instead of geometrical. The methods of Ptolemy are those of a great mathematician; and the explanation of the equation of time, of the evection of the moon, and of the planetary orbits, are, the two first absolutely, and the third as compared with anything which preceded, masterpieces of success, the last of which has only lost its glory because the pertinacity of his distant followers led them to put a mathematical explanation in the place of a physical one. Delambre, who hints hard, and we think unfairly, at a division of the merit of the two former with Hipparchus, sees in the method proposed by Ptolemy for the representation of what we now call the excentricity of Mercury's orbit, the circumstance which suggested the ellipse to Kepler.

The Syntaxis and other works of Ptolemy fell into the hands of the Arabs, and gradually went out of sight in Europe, as did most other Greek writings: the first was translated into Arabic, Persian, and Hebrew. The bibliographical history of Ptolemy's works might almost make a small volume; and we must here content ourselves with a short abstract of the principal points, referring for the rest to Fabricius's 'Bibliotheca Græca.' The first work printed was the book on astrology (1484 and 1493).

1515, Venice, folio. First Latin translation of the Almagest from the Arabic: manuscript and translator unknown, once thought to be Trapezuntius—'Ductu Petri Liechtenstein, Coloniensis Germani.'

1525, Venice, folio. Latin translation by George of Trebizond (Trapezuntius), said to have been made from the Greek: reprinted in 1527 (?), and 1528 by Gauricus, and in 1551 (Basle).

1536, Basle, 4to. The Planisphere (in a collection). 1558, Venice, 4to., the same, with Commandine's Commentary.

1538, Basle, fol. The first Greek edition, with Theon's Commentary and that of Pappus on the fifth book: by Grynæus, from a Nürnberg manuscript obtained by Cardinal Bessarion.

1541, Basle, folio. Third Latin translation (all the works except the Geography). This is Trapezuntius, edited by Schrekenfuchsius.

1549, Wittenberg, 8vo. The first book of the Syntaxis (Greek), by Er. Reinhold: again in 1560, Paris, 8vo.

1556, Paris, 8vo. First and second book of the Syntaxis (Latin, S. Gracilis).

1562, Venice and Rome, 4to. The Analemma, with Commandine's Commentary: again in 1572, Rome.

1569, 8vo. Canones Art. Math. (Gr., Lat.), by Reinhold.

1620, London, 4to. De Hypothes. Planet., by Bainbridge. [Ptolemaic System.]

1630, Paris, folio. De Apparentiis Inerrantium, &c. (in the Uranologion of Petavius); first printed in Greek in the third volume of the Bibl. Græca of Fabricius (1718-1728).

1786, Nancy, 4to. Montignot's French edition of Ptolemy's Catalogue (according to Fabricius, Strassburg, 1787).

1813, Paris, 3 vols. 4to. The splendid Greek and French edition of the Syntaxis, by M. Halma.

The thirteenth volume of the Memoirs of the Astronomical Society, now preparing, will contain a fully revised and collated edition of Ptolemy's Catalogue (with others), by Mr. Francis Baily.

SYSTEM, in the musical language of the Greeks, had the same signification as the word Scale has in modern music. [SCALE.] Each of the many genera of the antients was a system in itself if we may venture to assert anything positively concerning a subject which is, and seems likely to be for ever, involved in much obscurity. [GENERA.]

In modern music the term *System* is applied to any theory of harmony, that is to say, of the origin of chords, and of the manner of treating them in composition. Thus we have the systems of Rameau, Tartini, Kirnberger, &c., which see under the names of their respective authors. The System of Guido d'Arezzo, or that ascribed to him, included the elements of our present mode of notation; also the division of the scales into hexachords, and a mode of solmisation founded on such division. [GUIDO; HEXACHORDS.]

SYZYGIES AND QUADRATURES. The syzygies of a planet or of the moon are those points of its orbit at which it is in conjunction or opposition with the sun: the quadratures are the precisely intermediate positions. Thus at new and full moon the moon is in syzygies; at half moon, in quadratures.

SYZY'GIUM, a large tropical genus of plants of the natural family of Myrtaceæ, so named from sy'zygos (σύζυγος), coupled, in consequence of the manner in which the branches and leaves are united together in pairs. The calyx-tube is obovate, with the limb nearly entire. Petals 4-5, forming a calyptra. Stamens numerous, free. Style single. Stigma simple. Ovary 2-celled, ovules several in each cell. Berry one-celled, one or few seeded. Trees or shrubs of a highly ornamental appearance from their smooth shining leaves, which are opposite and entire.

Of the species *S. Guineense*, a native of the coast of Guinea and Senegal, has been employed as a remedy in rheumatism. *S. paniculatum*, a native of the Isle of Bourbon, is there called *Bois d ecorce blanche*. *S. Jambolanum* is a native of the East Indies, and there most extensively diffused, being planted near villages in clumps of trees, chiefly on account of its fruit, which is sometimes called Java plum by Europeans, but Jamoon by the natives. It is of a rich purplish colour, but of a subastringent sweetish taste, which is more agreeable to the native than to the European palate. The fruit is sometimes soaked for an hour in salt and water, when it makes an approach to the flavour of olives. The bark is astringent, and dyes of a brown colour: the wood is hard, close-grained, and durable, and therefore much employed.

SZATHMAR is a county in the kingdom of Hungary with an area of 2230 square miles, and 212,875 inhabitants, of whom the Hungarians are the most numerous; next to them are the Wallachians, some Germans, Russniaks, Slavonians, and 4000 Jews. [HUNGARY, *Circle beyond the Theiss*.] They are of the Roman Catholic, Greek, Lutheran, and Calvinist religions. The rivers are the Theiss, Szamos, Kraszna, and Tur. The eastern corner of the county is covered with mountains, which are very rich in gold, silver, and other metals. The western part of the county, which is by far the largest, has no mountains, but forms a portion of the great plain of the kingdom of Hungary. The climate is healthy, and the soil in the plain very fruitful, producing abundance of wheat, maize, flax, hemp, tobacco, and fruit. The sides of the mountains, to a great extent, are covered with vineyards, which yield excellent wine. In the mountainous parts, especially about Nagy (*i.e.* Great) Banja, there are good breeds of oxen, sheep, and swine, and great quantities of bees: honey and wax are important articles of commerce. In the large forests there is abundance of game, and some beasts of prey, wolves, foxes, and bears. In the marshes there are large flocks of water-fowl; and in the rivers, especially the Szamos, many kinds of fish. The country is very rich in minerals, viz. gold, silver, lead, copper, zinc, antimony, arsenic, amethysts, chalcedony, jasper, porphyry, granite, sandstone, basalt, saltpetre, brimstone, and soda. Of the two royal free towns in this county, the largest is SZATHMAR-NEMETHY, which was formed in 1725 by the union of two towns, Szathmar and Nemeth, which are separated by the river Szamos. The part called Szathmar is in an island in the river, and is surrounded with a wall. The principal public buildings are the cathedral, and one Roman Catholic, two Greek, and two Protestant churches; the handsome townhouse, the residence of the bishop, formerly a Jesuits' convent, and the seminary. This town is the see of a bishop, with six canons, founded in 1804, by the emperor Francis. The bishop has under him a theological seminary, a gymnasium, a lyceum, and normal school. The Greeks and Protestants have also their schools in both parts of the town. In the environs there are extensive vineyards and plantations of plum-trees. The fruit of these trees, dried or pounded, and the brandy distilled from it, are highly esteemed, and are considerable articles of commerce, large quantities being exported. The population is about 15,000; the inhabitants manufacture linen and earthenware, and have some trade.

Nagy Banya, the second and smaller city, is situated in a fine valley surrounded by mountains, in the eastern part of the county, about 10 miles from the frontier of Transylvania. It was formerly called in Latin, *Rivuli Dominarum*, and in German, *Frauenbach;* but at present in all languages it is called by the Hungarian name, Nagy Banya, which means a great pit or great mine. It is not known what nation first began to work the mines in the neighbourhood: in 1142 Geysa II., king of Hungary, settled a colony of miners from Saxony in this place. It is probable that the mines had been previously worked, and that the want of skilful workmen induced the king to send for Saxon miners. The town has a handsome square, which appears to have been long surrounded by good buildings, but the town in general is ill built and irregular. The inhabitants, about 5000 in number, are half Roman Catholics, and half Protestants, chiefly Calvinists. They have manufactories of linen, cotton, pottery, and crucibles, and carry on a good trade in earthenware, litharge, fruit, and chestnuts, of which there are extensive forests in the environs. The mines of gold, silver, and lead in the surrounding mountains are among the richest in Hungary.

Nagy Karoly, the largest town, though not a city, is the capital of the county, and has above 11,000 inhabitants, who raise excellent corn, maize, and tobacco, and make wine. They also manufacture linen and cotton, and make large quantities of boots and shoes for exportation. The town is of considerable extent, has a handsome square, a county-house, a town-house, and several churches and chapels; a college of the Piarists, a gymnasium, and a primary school. There is here also a very fine palace of Count Karoly, with extensive gardens, an excellent stud, and a Swiss farm, where a great number of buffaloes are bred. In the neighbourhood there is a park in which there are wild boars and hogs, and a preserve for pheasants.

Felso Banya, is a mining town with 4700 inhabitants, who are chiefly employed in the rich gold, silver, lead, copper, zinc, and iron mines. They also manufacture a great deal of earthenware.

(Thiele, *Das Königreich Ungarn;* Blumenbach, *Die Oesterreichische Monarchie; Ungarn, Sclavonien, und Croatien*, Anonymous.)

SZEGEDIN, the capital of the Hungarian county Czongrad, is situated on an eminence on the right bank of the Theiss, at its junction with the Maros. The external form of the city is a square, surrounded with circular fortifications. It is divided into the city, called Palenka, which has well-built houses, and neat but unpaved streets; the citadel, which is surrounded with walls and moats, and includes some barracks; the Upper and the Lower suburbs; and a street called Kukurntz-Varos, or the corn-market. The whole contains 32,200 inhabitants, of whom about 750 are Jews. There were formerly 20 churches and other buildings appropriated to divine worship in the city. at present there are six Roman Catholic churches, a Greek church, which is accounted one of the handsomest in Hungary, and a synagogue. Among the principal public buildings are the county-hall, the house of correction, the handsome town-house, and the great salt-magazine. There are also a Piarist college and gymnasium, a Roman Catholic high school, several hospitals, a military cadet-school, a workhouse, and a Hungarian theatre.

Being situated in a fertile country at the conflux of two rivers, possessing considerable revenues, and a territory of its own, 220 square miles in extent, Szegedin should long since have drawn to itself the trade not only of Hungary, but of Transylvania and Turkey; and this the more easily as the two latter countries are nearer to it than to Pesth, and it has greater facilities for communicating with the two circles of the Theiss. Its trade is however considerable and profitable, the chief articles of which are salt (300 vessels loaded with salt come annually from Transylvania), tobacco, of which 60,000 cwt. are sent every year to Hungary, corn from the Banat, timber and wooden wares from Transylvania, horned cattle, hops, and wool. There is a very great manufactory of snuff, the tobacco for which is grown in the vicinity; a soda manufactory, and some considerable soap manufactories, which furnish a kind of soap which is in great repute. Above 40,000 cwt. of cotton from Turkey pass annually through the town to Pesth and Vienna. The wine made in the neighbourhood is good, but will not keep above a year.

Szegedin is a very old place, and in the time of Matthias Corvinus it was one of the most celebrated cities in the whole kingdom. It was taken by the Turks under Soliman II. after the battle of Mohacs, August 26, 1526, in which king Lewis II., 2 archbishops, 6 bishops, 28 magnates of the highest rank, and a great number of nobles of distinction lost their lives. It remained in the possession of the Turks till 1686, when it was retaken by the Austrians soon after the defeat of the Turkish army by Sobieski under the walls of Vienna. In the following year, 1687, the Turks were again totally defeated by the duke of Lorraine on the same battle-field of Mohacs.

(Thiele, *Das Königreich Ungarn;* Blumenbach, *Die Oesterreichische Monarchie; Ungarn, Sclavonien, und Croatien,* Anonymous.)

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T.

T is the thin (tenuis) letter of the dental or palato-dental series. For the various forms of the symbol by which it is represented, see Alphabet. The chief changes to which the letter is liable are as follows:—

T is interchangeable with *c*, as Lat. *nuc* (*nux*), Eng. *nut*. [See C (§ 6).] The resemblance of these letters in Latin manuscripts is so close, that it is often difficult to distinguish them. Hence there is much uncertainty in the orthography of many words in that language. Yet there is no doubt that *contio*, an abbreviation of *conventio* (*coventio*, in the sense of *contio*, actually occurs in the so-called bacchanalian inscription), and *nuntius* or *nountios*, an abbreviation of *novi-ven-tius* (compare *nov-i-tius*), should be preferred to the forms *concio*, *nuncius*, which are commonly found in English editions of Latin authors.

T interchangeable with *d*. [See D.]

T interchangeable with *th*, whether as pronounced in *thin* or in *the*. Thus the Latin *t* corresponds for the most part to *th* in English, as *tu*, *tres*, *tenuis*, *tundo*, *tum*, *trudo*, *torqueo*, *pater*, *mater*, of the former language, severally correspond to *thou*, *three*, *thin*, *thump*, *then*, *thrust*, *throw*, *father*, *mother*, of the latter. As regards the pair of words, *torqueo*, *throw*, it is worth observing that they both have a double meaning, *hurl* and *twist*. Even the termination of the third person in the Latin and old English verbs presents the same analogy, as *amat*, *loveth*.

T, or PT, interchangeable with *p*. [See P (§ 7, 8).]

T interchangeable with *s*. [See S.]

T interchangeable with *st*. This interchange might be inferred from the one preceding. Examples exist in *art*, *wilt*, *shalt*, compared with the usual termination of the English second person.

T interchangeable with *l*. Thus the Latin words *lingua* (also *dingua*), *lacr-uma* (also *dacr-uma*), *lacerare*, *ligare* (also *dicare*), severally appear in English as *tongue*, *tear* (subst.), *tear* (verb), *tie*. Hence ἑτερος is allied to the Latin *alter*, and *mitis* of the Latin to *mild* in English. Compare also the Latin *ali-quod*, &c. with the German *et-was*, &c. [See L.]

T interchangeable with *nd*. This change is perhaps not common. Examples are, Lat. *et*, Germ. *und*, Eng. *and*; Lat. *sed* or *set*, Germ. *sond-ern*, Eng. *sund-er*, *sund-ry*, &c.; Greek ἑτερος, German *ander*, Lat. *fund-us*, Eng. *bottom*.

T disappears from the beginning of words before *l*, as in *latus*, the so-called participle of *fero*, but in fact connected with the Latin *tollo*, and the Greek τλη-μι, ταλ-ας, τολ-μη. An older form of *latus* was perhaps *tlatus* or *stlatus*.

T in the middle of words, when flanked by vowels, often disappears. Thus the Latin words *pater*, *satis*, *vita*, *amatus*, *amata*, reappear in French as *père*, *sez* (in the compound *as-sez*, from *ad-satis*), *vie*, *aimé*, *aimée*. Similarly, from the map of Gallia, viewed in connection with the map of France, may be derived the examples,—*Autura*, *Eure*; *Caturiges*, *Chorges*; *Catalauni*, *Châlons* (sur Marne).

T at the end of words is frequently dropped. Of the omission of a final *t* in pronunciation, the French language has numerous examples, as in *et*, *fait*, *est*, &c. It is very probable that a final *t* has in this way disappeared from the third person singular of many tenses in the French verb, as *il aime*, *il aimera*, *qu'il finisse*, &c. In the interrogative form *aime-t-il*, the interposed *t* really belongs to the verb, and owes its preservation in this form to the fact that a vowel follows. It is an error to attribute the insertion of the letter to the necessity of avoiding an hiatus. Even the Greek language drops this *t* in the suffix of the third person, as in τυπτει, ετυπτε, for τυπτετι, ετυπτετι. Compare the middle forms τυπτεται, ετυπτετο.

Ti before a vowel is often changed to a sibilant represented by *s*, *sh*, *ch*, &c. Thus from the Latin *faction* (*factio*) are derived the French *façon* and the English *fashion*. So *avaritia*, *malitia*, *vitium*, became in French and English *avarice*, *malice*, *vice*.

TAASING. [Denmark; Fünen.]

TAB. [Persian Gulf.]

TABARCA, TA'BRACA, or THA'BRACA, a small island close by the north coast of Africa. It is situated opposite the north-eastern corner of Numidia, at the mouth of the little river Tusca, on the left bank of which there was an antient town of the same name as the island, which Pliny (*Hist. Nat.*, v. 2; compare Ptolemæus, iv. 3; Pomp. Mela, i. 7, 5) calls an 'oppidum civium Romanorum.' Of this town many ruins are still scattered on the bank of the river, which is now called Zaine. (Shaw's *Travels*, p. 99.) The little island of Tabarca has in modern times been in the possession of the Genoese, who once derived considerable advantage from the coral fisheries there, and built a fort upon it to protect their settlement. But when the profits of the coral fishery decreased, the Genoese left the island to the dey of Tunis. (Shaw's *Travels*, p. 142.) The island is at present in the possession of the French, to whom it was given up in 1830 by the dey of Tunis. The harbour is now again much frequented by fishermen, on account of the rich coral fisheries in the neighbourhood.

TA'BARI' is the surname of Abú Jaafar Mohammed Ibn Yezid Ibn Jerír, a celebrated Arabian historian, who was called At-tabari because he was a native of Amol, the capital of Tabaristán, where he was born in A.H. 224 (A.D. 839). Tabari was the author of many works on various subjects, such as a commentary on the Korán, which is greatly praised by Abu-l-fedá (*Ann. Musl.*, iii.), and a treatise on Mohammedan law. But the work by which he is best known in Europe is his general history from the creation to A.H. 302 (A.D. 314-5). This work was abridged and continued by George, son of Al-'amid, generally called Elmacin, who brought it down to the year 512 of the Hijra (A.D. 1118-9). That portion of the abridgment which begins at the death of the Mohammedan prophet was published in Arabic and Latin by Thomas Erpenius, and printed for the first time at Leyden, 1625, fol., together with the 'Historia Arabum,' by Rodericus Toletanus. Tabari's Chronicles were translated into Persian by Abú Ali Abdu-l-ghani, Vizir of the Samanide prince Mansúr Ibn Núh. Soon after the death of Tabari, the copies of his original work became so scarce, that the Persian text was retranslated into Arabic; the Persian version is now being translated into French by Mr. Dubeux under the auspices and at the expense of the Oriental Translation Fund. Tabari died at Bagdad, in A.H. 310 (A.D. 922).

(Hamacker, 'Spec. MSS. Orient.,' *Bib. Lugd.-Bat.*, p. 24; D'Herbelot, *Bib. Or.*, sub voc. 'Thabari.')

TABARIEH. [Palestine, p. 163; Syria, p. 472.]

TABASCO. [Mexican States.]

TABERG. [Sweden.]

TABERNACLE, THE (אֹהֶל מוֹעֵד, and sometimes chiefly in *Numbers*, אֹהֶל הָעֵדוּת, or מִשְׁכַּן הָעֵדוּת; LXX., σκηνὴ, or σκήνωμα τοῦ μαρτυρίου; that is, the tabernacle of the testimony), was a sacred building, partaking of the nature of a tent, which was set up by the Israelites in the wilderness for the worship of God, and carried with them in their journeys. Hence it is called by Jewish writers 'a portable temple' (ἱερὸν φορητὸν, Philo, *Opp.*, ii., p. 146, ναὸς μεταφερόμενος καὶ συμπερινοστῶν; Joseph., *Antiq.*, iii. 6, 1). It was made under the direction of Moses, in exact conformity to a pattern shown to him by God when on Mount Sinai. (*Exod.*, xxv. 40; xxvi. 30, &c.; *Heb.*, viii. 5.)

The tabernacle was an oblong rectangle, 30 cubits in length, 10 in width, and 10 in height. Its two longer sides looked north and south, the entrance being at the east end. The sides and the west end were composed of boards of shittim (acacia) wood, overlaid with gold. These boards stood upright, and were supported by tenons projecting from their lower ends, which dropped into sockets of silver, each board having two sockets. Each board was 10 cubits long, and 1½ wide; and there were 20 boards to each side, and 8 to the end. Here arises a difficulty. The 8 boards at the end make up 12 cubits, instead of 10. Now it is clear from *Exod.*, xxvi. 22-24, that the two boards at the corners were of a different form from the other six, and in fact their form is described in that passage, but the description is not quite easy to understand. The most natural explanation seems to be that each of the corner boards was divided into two parts, one of a cubit and the other of half a cubit in breadth, that these two parts were then fastened to each other at right angles, and that they were so placed in the building that the half-cubit formed part of the west end, while the whole cubit stood face to face with the first board of the side, to which it was in some way fastened (*Exod.*, xxvi. 24), thus making the corners of the building firm. The boards were still further supported by bars of acacia-wood overlaid with gold, which were passed horizontally through rings fastened to the boards. Of these bars there were five to each side and five to the end.

The east end, at which was the entrance, was covered by a curtain of fine linen, ornamented with needle-work in blue, crimson, and scarlet, and supported by five pillars of acacia-wood, overlaid with gold, furnished with golden hooks, and standing on brass sockets, one socket to each pillar. Across the interior of the tabernacle, at the distance of two-thirds of its length from the entrance, was another vail, of exactly similar work and materials, supported by four pillars like those at the entrance, but with silver sockets. This vail divided the tabernacle into two chambers, which were respectively 20 feet by 10, and 10 feet by 10, of which the outer and larger was called the Holy Place (הַקֹּדֶשׁ), the inner the Most Holy, or the Holy of Holies (קֹדֶשׁ קֳדָשִׁים; LXX., τὸ ἅγιον τῶν ἁγίων; Joseph., τὸ ἄδυτον).

The structure thus formed (which was still open at the top) was covered by four different kinds of curtains. The first covering was of the same materials as the two vails, and consisted of 10 curtains, each 28 cubits long and 4 wide, which were first joined together five and five, thus forming two curtains, each 28 cubits by 20, and then these two curtains were coupled together at the longer edges by golden fastenings, and laid over the tabernacle so that the fastening lay over the inner vail; the one curtain reached exactly to the entrance, without falling over it, thus covering the Holy Place, and the other covered the Holy of Holies with half its length (10 feet), leaving 10 feet to hang over the back of the tabernacle, while the remainder of the curtains fell over the sides (according to the opinion of some, *within* them), leaving one cubit at the lower end of the boards uncovered, since the heights of both sides, and the width of the building, make up 30 cubits, but the width of the curtains was only 28. The next covering was of fine spun goats'-hair, and resembling the former in every respect except that it was somewhat larger. Over these coverings, to protect them from the weather, were two more, the first being of sheep-skins dyed red, and the outer of skins of *tachash* (תַּחַשׁ), a word which is variously explained as meaning the badger, the seal, or a blue colour.

The tabernacle was surrounded by a large court, called 'the court of the tabernacle,' which formed a rectangle of 100 cubits by 50, and was enclosed by fine linen hangings, suspended on 60 pillars of 5 cubits in height, with silver capitals and hooks, and brass sockets. The four pillars in the middle of the eastern side supported a curtain like the vails of the tabernacle, which formed the gate of the court. Around this court were the tents of the tribe of Levi, and then at a greater distance the encampments of the other tribes, three tribes on each side of the tabernacle.

Each of the sacred vessels and instruments had its appointed place in the tabernacle. Near the entrance of the outer court was the brazen altar of burnt offering, on which were presented all the burnt offerings and sin offerings which were not required to be offered without the camp. Further on was the brazen laver, where the priests were required to wash their hands and feet before they entered into the tabernacle.

Within the Holy Place was the golden table of shew-bread on the north side, and the golden candlestick on the south side, and the golden altar of incense, with their instruments. In the Most Holy Place was the ark of the covenant, with its cover, the mercy-seat, the symbol of Jehovah's throne.

None but the priests were allowed to go into the tabernacle. They entered it twice a day; in the morning to put out the lights, and in the evening to light them; and also on the Sabbath to place the new shew-bread. The Holy of Holies was entered by the high-priest alone, and by him only once a year, on the great day of atonement. Of course there was a necessary exception to these rules when the tabernacle had to be taken down or set up. The care of this service and of carrying the sacred things on the march was committed to the families of the Gershonites, the Merarites, and the Kohathites, of the tribe of Levi.

The tabernacle was first set up by Moses on the first day of the first month of the second year from the Exodus, when the presence of God was manifested by the shekinah, which filled the tabernacle. Whenever the camp was at rest, the shekinah was over the tabernacle, as a cloud by day and a fire by night. The lifting up of the shekinah was the divine signal for the people to march; and when it again rested in any spot, there the tabernacle was set up, and the camp was formed around it. After the conquest of Palestine the tabernacle was set up in Shiloh, where it remained, with the ark of the covenant in it, till the latter was carried out to battle and taken by the Philistines just before the death of Eli. (1 *Sam.*, iv. 16-21.) After seven months the Philistines, moved by the judgments of God, restored the ark, which however was not brought back to Shiloh, but to Kirjathjearim (1 *Sam.*, vii. 1-2), where it remained till David brought it to the city of David in Jerusalem, and pitched a tent for its reception (1 *Chron.*, xiii.-xvi.), where it remained, with a short interruption during the rebellion of Absalom, till it was placed in the Holy of Holies of Solomon's temple. (2 *Chron.*, v.)

We have not such exact information respecting the history of the tabernacle during this period. By comparing 1 *Sam.*, xxi., with *Mark*, ii. 26, we learn that it was at Nob in the time of Saul. At the beginning of Solomon's reign it was at Gibeon (1 *Kings*, iii.), whence it was taken by Solomon, and laid up in the Temple, at the time when he removed the ark. (2 *Chron.*, v.)

The institution of the tabernacle was in perfect accordance with the spirit of the Israelitish constitution. God was the king of Israel; he had promised to be with them, and to go with them in their journeys; and the tabernacle was his abode. Here the glory which was the symbol of his presence was displayed, and hither the people came to worship him and to inquire his will, while his chosen servants (the priests) attended constantly upon him. (*Ps.*, lxxxiv. 4-7.) When Israel was firmly settled in the promised land, and a special place was fixed on for the display of God's presence, the moveable tabernacle was superseded by the permanent temple. The New Testament assigns to the tabernacle a higher meaning, as typical of the blessings of the Gospel. (1 *Heb.*, ix.)

(Winer's *Biblisches Realwörterbuch*, art. 'Stiftshütte;' Calmet's *Dictionary*, s. v.; Jahn's *Biblical Antiquities*; *The Tabernacle in the Wilderness*, 1 vol. fol., with four splendidly illuminated plates, Bagster, 1842.)

TABERNACLES, FEAST OF (חַג הַסֻּכּוֹת, ἑορτὴ σκηνῶν, σκηνοπηγία), was the last of the three great annual festivals of the Israelites, which required the presence of all the people in Jerusalem (*Exod.*, xxiii. 16; *Levit.*, xxiii. 34; *Numb.*, xxix. 12; *Deut.*, xvi. 13). Its object was to commemorate the dwelling of the people in tents during their journeys in the wilderness; and it was also a feast of thanksgiving for the harvest and vintage, whence it is called 'the feast of ingathering.' It was celebrated in the autumn, at the conclusion of the vintage, and lasted eight days, namely, from the 15th to the 23rd of the seventh month (Tisri, which corresponds to October). The first and last days were holy convocations, in which no work might be done, and the last was the greatest day of all the feast (*John*, vii. 27). In the opinion of many biblical antiquarians, the feast of tabernacles properly lasted only for seven days, the eighth being peculiarly 'the feast of ingathering.' (*Nehem.*, viii. 18.)

This feast lasted longer than either of the other great feasts; it was kept with greater demonstrations of joy and more sacrifices were offered during its continuance. (*Levit.*, xxix. 12-38.)

During the feast the people dwelt in booths, which were made on the tops of their houses (*Nehem.*, viii. 16). These booths were made of the leafy branches of certain trees, which are mentioned in *Levit.*, xxiii. 40, and *Nehem.*, viii. 15, and among which seem to be included the citron, the palm, the olive, the myrtle, and the willow. These booths were meant to represent the tents in which the Israelites dwelt in the wilderness. In the sabbatical year, the law was read in the presence of all the people at this feast. (*Deut.*, xxxi. 10-13; *Nehem.*, viii.)

Like many others of the institutions of the Mosaic law, the feast of tabernacles was neglected during the period from the settlement of Israel in Palestine to the Captivity. It was revived in the time of Ezra and Nehemiah. (*Nehem.*, viii.)

Plutarch (*Sympos.*, iv. 6) gives an account of the feast of tabernacles, which he supposed to be in honour of Bacchus.

The later Jews have added other ceremonies to those which are assigned to this feast in the law. 1. They carry a citron in the left hand, and a bundle of branches, namely, one of the palm-tree and two of the willow and myrtle, in the right, with which they walk in procession round the reading-desks in the synagogues, singing Hosannahs. This ceremony, which is repeated seven times on the seventh day, is said to be in commemoration of the taking of Jericho by such a repeated procession round its walls. (*Joshua*, vi.) On each of the seven days of the feast they pour out a libation of water. They assert that this was done anciently before the altar at Jerusalem, with water brought from Siloa. 3. They assert that lights were burnt in the court of the women on the first evening of the feast. These lights were in large golden candlesticks, and their brightness was visible over all the city.

(Winer's *Biblisches Realwörterbuch*, art. 'Laubhüttenfest;' Jahn's *Biblical Antiquities;* Jennings's *Jewish Antiquities.*)

TABERNÆMONTA'NA, a genus of the natural family Apocyneæ, found in the West Indies and South America, also in New Holland, India, and other tropical parts of Asia. It was named by Plumier in honour of James Theodore, who was surnamed Tabernæmontanus, from Berg-Zabern, the place where he was born. He was author of two works, his 'Kraüterbuch,' and 'Figures of Plants.' The first, published in 1589, and the second in 1590. He was also physician to the elector-palatine, and died in 1590. The genus is characterised by having monopetalous inferior flowers. Corol salver-shaped. Stamens 5, included. Anthers sagittate. Ovaries 2. Style filiform. Stigma dilated at base, trifid. Seeds in a follicle, immersed in pulp. The flowers of many species are very sweet-scented, and the double-flowered variety of T. coronaria is a very ornamental shrub, and one of the most common in Indian gardens. The deep red pulp surrounding the seeds of this species appears capable of yielding a beautiful colour. The cream-like sap of T. utilis, the milk-tree, or Hya-hya of Demerara, is not only of an innoxious character, but said to be very nourishing. It affords a remarkable example of a tree of this suspected family yielding an article of food. Some of the other species are employed as medicines in the countries where they are indigenous. The sap of T. persicariæfolia is considered a poison in the Isle of France. The wood is employed in turnery.

TABERNÆMONTANUS, JACO'BUS THEODO'RUS, a physician and botanist, was born at Berg-Zabern in Alsace, whence he takes his name. He first practised as an apothecary in his native place, and thence removed to Paris, where he graduated. On returning to his native country, he took up his residence and practised his profession at Worms. He was made physician to the elector-palatine John Casimir, and also to the bishop of Spire. He lived at a time when confidence in vegetable remedies in disease was carried to the greatest extent. He diligently studied this department of his profession, and the result of his labours was given to the world in the form of a large folio volume, under the title 'Neue Vollkommen Kraüterbuch,' or new complete herbal. He lived to see only the first part of this volume published, which was in 1588. Several editions of this work were afterwards published in Germany, to which the two last parts were added. The second edition was published at Frankfort in 1613, by Caspar Bauhin, and contained descriptions of 5800 species of plants, of which 2480 were illustrated by wood-engravings. The best and latest edition published is that of Hieronymus Bauhin, which appeared at Basle in 1731 This work appears to have been for a long time a standard botanical authority. The descriptions of the plants are minute, and an immense space is devoted to the consideration of their medical properties. Tabernæmontanus maintained the principle, which has many advocates at the present day, that Providence causes those plants to grow in a district which are beneficial for the diseases that arise in it. To such an extent did he carry his views on this point, that it is said that at the siege of Metz, in 1552, in which he was engaged as physician to the army, he applied nothing but mugwort to the wounds of the soldiers, because it grows plentifully in the neighbourhood. The cuts in the work are badly executed, and are mostly inferior copies from preceding works. This however did not prevent their being republished without the letter-press, by Nicolas Bass, the printer at Frankfort, in 1590, under the title 'Icones Plantarum,' &c. In the latter part of his life, Tabernæmontanus removed to Heidelberg, where he died in 1590. He also published two other works: the first, on mineral waters, entitled 'Neue Wasserschatz,' in 1584, and which went through three editions; the second was published in 1586, and is entitled 'Regiment und Bericht wie man sich in Sterbenslaufen halten soll.'

TABES. This word belongs to a period in the history of medicine, when nosologists were less informed than they now are of the true nature of many diseases; and, instead of classifying these according to their essential characters in reference to the single standard of healthy function, selected and arranged such signs and appearances only as were sensibly manifest to the observer, or were described by the patient. The nomenclature founded on this arrangement consisted in naming by uninterpreted symptoms: it involved many breaches of natural affinity, and gave great opportunity for empirical practice. Thus a cough, a dropsy, a palpitation of the heart, would be spoken of as individual diseases; whereas they may on the one hand be joint symptoms of a single malady (as imperfect valvular action of the heart); or, on the other hand, taken singly each would be but a sign, common to many disorders, which might have no other feature of resemblance, and might require even opposite treatment. Such a name is 'tabes,' and under it are isolated certain symptoms, afforded by the nutritive functions in various conditions of unhealth: the acceptation of the word being a 'cachexia (or state of chronic ill-health) attended by emaciation;' in which sense it is synonymous with the words 'atrophy' and 'marasmus.'

Emaciation belongs, as a symptom, more or less to two-thirds of the diseases which terminate life, and essentially denotes an unfavourable disturbance of the healthy equilibrium between supply and expenditure in the animal economy. Mere leanness, or scarcity of fat (the opposite condition to obesity), is not a sign of disease: in many it exists through life, as an inherited physiognomical character; and in most it prevails during those periods, at which the vital powers are most active: it characterises those individuals in whom, and that period of their existence in which, the reproductive function is most efficient, the muscular system most powerful, the respiration most complete, the feelings most excitable, and the intellect keenest. It stamps, in a word, the characters of energy and excitability on its subject, and it is usually only in the absence of these qualities that obesity prevails. Now, as obesity indicates that nature has accumulated the surplus materials of nourishment, in a form which admits of their subsequent appropriation to the needs of the economy (a provision, familiarly known in hybernating animals, and to which the secretion of starch in the vegetable kingdom is analogous); so does emaciation, or loss of flesh, declare that the system is either drained or ill-fed, and is repairing its deficiency at the expense of particular organs. 1. This state may arise from a deficient supply of material for organic nutrition, either where the food is, in quality or quantity, insufficient; or where the digestive canal is unable to appropriate it; or where (as in the disease which is the subject of the next article) its due absorption into the blood is hindered. 2. It may occur from too profuse or too partial expenditure on the part of the organization, as where protracted diarrhœa, or the discharge from large ulcerated surfaces, exhausts the material of nourishment; or where a sustained intensity of mental excitement or of bodily fatigue deranges its balance. From this account of emaciation it is obvious that it must accompany very different chronic disorders, which have been confounded in the unscientific word 'tabes;' and from the marked falling away which attends pulmonary consumption [PHTHISIS PULMONALIS], it is probable that many cases of this destructive complaint have been so miscalled. The name is now retained for only two forms of disease, and derives its special meaning from the accompanying adjective.

Tabes mesenterica is that wasting of the body which follows scrofulous inflammation of the mesenteric glands; and *Tabes dorsalis* denotes an impairment of general health, attended by emaciation, muscular debility, and signs of nervous exhaustion, in persons who have given inordinate licence to the sexual appetite.

The treatment of the emaciation and debility which constitute the symptomatic state called 'tabes,' must be adapted to remedy the primary disease. If exhaustive discharges exist, measures must be taken to arrest them, and will vary according as the drain from the system is maintained by diarrhœa, hæmorrhage, or suppuration. If absence of healthy food, or inability of the digestive organs to appropriate nourishment, have caused the emaciation, nutritious diet with careful regard to the intestinal complaint must be adopted. In all cases the main object of the practitioner is to effect a removal of the noxious influence which has deteriorated the health; and success in this particular, followed by such tonic treatment as may be called for, will re-establish the natural balance of healthy nutrition.

TABES MESENTE'RICA. This name is applied to a particular slowly-disorganizing affection of the mesenteric glands, and expresses the marked emaciation which attends the disease. It is through the mesenteric glands that the nutritive products of digestion are transmitted in their course to the great current of the circulation; and any disorder which destroys or obstructs these organs must, in proportion to its intensity, affect their function, and derange the process by which healthy materials of renovation should constantly be commingled with the blood. Hence in part arises the loss of flesh in this form of tabes; but the direct hindrance of nutrition which the disease involves is not the sole though an important cause of the symptom; for the general ill-health, of which tabes mesenterica is but a part, and other co-existing complaints, usually co-operate in producing it.

The disease is one among many manifestations of scrofula; and to the glands of the mesentery is essentially the same as those obstinate glandular enlargements of the neck, with which the eye is more familiar, are to their region of the body. From difference of position and of relations it includes other symptoms and graver consequences than theirs; but it originates in the same constitutional tendencies, and follows the same general progress, as they. It belongs, like other forms of scrofula, to early life; the ordinary period of its invasion being from the second to the twelfth year. In the Hôpital des Enfans, of Paris, children are received from a year after birth till the completion of sixteen years of age; and M. Guersent, the physician of this institution, states that the disease exists among those admitted in the proportion of 7 or 8 to 100; and that it is more frequent among female children than among males.

The morbid appearances on dissection of fatal cases are, a more or less complete transformation of the glands into tubercular masses, with various consequent or coincident diseases of the adjoining organs. The glands appear at the commencement of the complaint to be the seat of a feeble inflammatory action, under which they merely swell and become preternaturally reddened with blood: but this stage of simple congestion soon induces a further change, in which the characteristic product of scrofulous inflammations becomes deposited in the tissue of the gland. The dull white granular tubercles, by which the infiltration commences, are gradually multiplied in number or increased in volume; and, in like proportion, the glandular substance itself is absorbed to make room for the encroaching disease, till at length a rounded tubercular mass results, varying for each tumour from the size of a marble to that of an egg. In a still more advanced condition of the disease suppuration frequently occurs in these tumors, and they are then seen to contain the cheese-like matter of softened tubercle mixed with pus. The abscess so formed excites irritation in its neighbourhood; the folds of peritoneum covering it become glued together, and its progress occasionally extends to discharging itself into the nearest intestine, or through the external integument of the abdomen. A certain amount of inflammation of the peritoneum, with adhesions and effusion of serum (ascites), attends these latter stages; and some inflammation and ulceration of the mucous membrane of the intestines are likewise frequently found.

For a particular account of its causes the reader may refer to those of SCROFULA. Original weakness of constitution, shown in general susceptibility to the impressions of disease, in slowness and insufficiency of reactive and reparative power, is the groundwork of these, and constitutes the main peculiarity of the so-called *scrofulous diathesis*. But this weakness may, where inborn, be aggravated, or, where naturally absent, be artificially produced by a variety of depressing causes; by insufficient or unhealthy food, by neglect of cleanliness and exercise and clothing, by residence or constant occupation in ill-ventilated buildings, by exposure to cold and damp: all of them influences to which the young of the poor in crowded towns are exposed, and with which too frequently an inherited predisposition powerfully co-operates. Derangement of the bowels must be considered the most frequent special cause of this particular form of scrofula; the irritations, inflammations, and ulcerations of their mucous surface (of which such full evidence is given in the state of the tongue and excretions, and in the tympanitic abdomen) excite corresponding conditions in the absorbent glands connected with them (precisely as a lesion of the hand irritates the glands of the axilla), and the inflammation so beginning takes a course determined by the peculiar constitution of its subject.

As regards symptoms, it may be observed that in its earliest stages the disease has no signs by which it may be certainly distinguished; that it is not till the glands are so enlarged as to become sensible externally that their affection can be positively declared. The early symptoms are those of the intestinal disorder or irritation, which is acting as a cause of the disease: capricious appetite, irregular and unhealthy stools, flatulence or occasional vomiting, loaded tongue, foul breath, harsh skin, sallow complexion, and loss of flesh, with an accelerated pulse, may have existed for some time, before enlargement of the abdomen attracts notice. It will then usually be found that steady pressure on this part causes uneasiness or pain. As the growth of the glandular tumors continues, the signs of intestinal disease become more marked; diarrhœa with mucous stools, increased emaciation, frequent pulse, and evening accession of fever, marking this stage, in which the tumid abdomen contrasts remarkably with the wasted limbs and shrunken wan face of the patient. Finally, hectic fever with exhaustive diarrhœa, or acute abdominal inflammation, or the progress of the constitutional disease in other organs, or absolute starvation (atrophia), terminates life.

The treatment of tabes mesenterica must be in accordance with the general rules for management of scrofula, and consists in that modified tonic system, to which the name of 'alterative' is given. To maintain a healthy state of the secretions, and to fortify the general health, compose this plan of treatment; and the modes of fulfilling the indications may be thus briefly detailed: cleanliness, warm clothing, and suitable exercise will promote the action of the skin; small quantities of castor-oil will regulate the evacuations from the bowels, if these be sluggish, and occasional mild mercurials, with rhubarb and alkalies, improve the character of the intestinal secretions: residence in a dry mild climate, or by the sea-side, a light but nutritious diet, carefully adapted to the varying whims of the appetite, and, where it can be borne without producing feverishness, some vegetable bitter (as calumba or cascarilla) will prove most successful in supporting or improving the general strength. Where there is no abdominal tenderness, and where the secretions have been brought into a healthy state, gentle friction of the abdomen with some stimulating liniment may be conjoined with other means; but this is quite inadmissible in the latter stages of the complaint, or where tenderness of the abdomen prevails. Within the same limitations, iodine is sometimes of service, and may be used both by inunction and by internal administration; but its effects require to be most carefully watched, and its employment must be suspended if it increase fever, or cause any irritation of the stomach or bowels.

The treatment here sketched will, in the commencement of the disease, often prove successful in effecting the removal of the tumour and restoring the patient to health; but in the more advanced state the physician can have little hope to do more than restrain the urgent diarrhœa by occasional opiates, and retard death by a carefully-regulated and nutritious diet.

TABLATURE, in Music, is the old mode of notation for instruments of the lute kind. For this purpose six parallel lines were used, each representing a string, on which were placed letters referring to the frets on the neck of the instrument. The time, or duration, of the notes was marked by characters over the letters, answering to the minim, crotchet, &c., and often, as by Mace, in his *Musick's Monument*, by the notes themselves. There were different systems of Tablature; but the subject is not now worth the trouble which a knowledge of it would demand.

TABLE BAY. [CAPE OF GOOD HOPE.]

TABLE. By a table is meant a quantity of information arranged under heads in such manner that by looking under one head the general disposition of the whole points out where to look for the matters of information connected with that head: the object being an immediate power of reference to any one fact or result without the necessity of looking at others. In any astronomical table, the matter by which we enter the table to look for other matter is called the *argument;* that which is found by means of the argument has no distinct name; we might call it the *tabular result*. It would be useful to generalize these terms. Thus in a table of contents, the number of the page or chapter is the argument, and the abstract of the matter contained is the tabular result: in an alphabetical index the principal word, found by means of its first letter, is the argument; and the number of the page in which the matter is contained is the tabular result. It is, unfortunately, useless to say much on any tables except mathematical ones. Works containing collections of facts, in which the tabular form ought to be frequently used, are in most instances altogether free from them; and as to indexes, the art of making them seems to be lost: very few books, except those on law, have anything deserving the name. The reason is obvious enough: where proper information is not given, the table shows the spot where it ought to be, *vacant;* and a good index points out not only what *is* in the work, but also that which *is not*.

When the matter sought for is found by one argument only, the table is said to be of single entry; when by two, of *double entry*. Thus the common multiplication table is one of double entry; and so is any chronological table which consists of more than one column.

The method of printing mathematical tables is usually defined so closely by the nature of the subject, that no remark is necessary except on the type. The numeral characters, up to about the year 1785, used to be smaller in the body than those now constructed, with distinguishing heads and tails. Dr. Hutton, we believe, first employed the character in which all the numerals are of the same depth, the heads or tails being compressed into the body. This very disadvantageous change was adopted by the type-founders, but only in England: the consequence was that the superior legibility of the antient and of the modern continental tables was matter of common remark among those who had to use them. Another circumstance which contributed to this result was the introduction of numerals with thick and thin parts, the superior elegance of which was supposed to be a recommendation. The consequence was, that in many English tables it was difficult to distinguish 3 from 8, and 9 or 6 from 0. Of late years however some works* have been published which have used the old type, both as to heads and tails and uniform thickness; and their decided superiority over tables of the Huttonian character, even of much larger type, is pretty generally admitted. This is a point of great importance, for any circumstance which produces a wrong result upon the computer's paper is equally to be deprecated, whether it be an error in the formula used by the author of the tables, or an incorrectness of the printer or reviser; and in like manner a given amount of tendency to error is of the same bad consequence, whether it be due to the mathematician or the type-founder. This is not true of works of theory or reasoning: it may there be the fault of the reader if he do not correct a mere slip, whether of the author or printer; but in works of reference all the parties to the result are of equal importance.

Since the invention of logarithms, the appetite for tables has not grown with the progress of mathematics. Calculation by logarithms is so convenient for ordinary purposes, that many persons who are even well versed in mathematics are not aware how much assistance they might derive in particular cases from the various tables which have been published. The list which we mean to give does not profess to be a bibliography of tables, but will nevertheless give information on the subject to all who are not particularly given to mathematical bibliography.

We may divide mathematical tables into general and special; the first consisting of purely arithmetical and trigonometrical tables, and also tables of logarithms. The special tables are those which are used in the higher parts of mathematics, in commerce, navigation, astronomy, meteorology, &c. We may further divide tables into tables of facts and tables of mathematical results. All sciences have their tables of facts; thus the raw observations of astronomy, magnetism, and physics in general are frequently tabulated: with these we have comparatively little to do, since they are rather the materials for the formation or verification of other tables, than of primary use as tables.

Of simple arithmetical tables we may notice the following:—

§ 1. *Tables of Multiplication.*—The oldest we have seen noticed is one printed in 1610, at Münich (Murhard). There have been several others of great extent, but they are scarce. Hutton's 'Tables of Products,' printed by the Board of Longitude, 1781, go up to 100 times 1000, but have not the reputation of correctness. Riley's 'Tables of Products,' published anonymously, London, 1775, contain the first nine multiples of all numbers up to 10,000, in a very clear figure, and are useful. Dodson's 'Calculator,' London, 1747, has the same up to 1000, not so conveniently arranged. But by far the most powerful table of this kind is Crelle's 'Rechentafeln,' Berlin, 1820, in two thick 8vo. volumes. This contains every product up to 1000 times 1000, so arranged that all the multiples of one number are seen at the same opening of the book. All who have used this table know how to dispense with logarithms in many cases with great advantage. There is no table which we so much desire to see reprinted in this country, with a few alterations, which would render it more commodious. An anonymous Table, Paris, 1794, goes up to 1000 × 103; and another, Paris, An VII., the same; a third, Versailles, 1825, the same, with many metrological tables added. Schubler's 'Rechnung's Lexicon,' Nuremberg, 1739, goes to 2400 × 100. Oyon's Table, Paris, 1824, goes to 509 × 500; that of Cadet, Paris, 1797, to 1000 × 100. [QUARTER SQUARES.]

§ 2. *Tables of Division and of Prime Numbers.*—Gruson, 'Pinacothèque,' Berlin, 1798, gives for all numbers under 100, or primes under 400, the quotient and remainder of every number under ten times the divisor, by inspection: also, divisors without remainders, up to 10,500. Lidonne, 'Tables de tous le Diviseurs,' &c., Paris, 1808, gives the divisor of all numbers up to 102,000. The original edition of Barlow's Tables gives the factors of all numbers up to 10,000, and a register of prime numbers up to 100,103. Chernac, 'Cribrum Arithmeticum,' &c., Daventriæ, 1811, gives the prime numbers up to 1,020,000, and the lowest divisor when not 2, 3, or 5. Burckhardt, 'Table des Diviseurs,' &c., Paris, 1817, gives the prime numbers up to 3,036,000, with the lowest divisor of each number when not either 2, 3, or 5. This last is, we believe, the greatest undertaking of the kind. Anjema's 'Tabula Divisorum,' Leyden, 1767, goes up to 10,000; and Pigri's Table, Pisa, 1758, the same. Krause, Jena and Leipsic, 1804, has primes and factors up to 10,000. Newman, 'Tabellen, &c.,' Dessau, 1785, has factors and primes up to 100,100.

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* In the new series of the Nautical Almanac, the heads and tails first reappeared, but the swelling of the type was not rejected. The works in which the old legibility is completely restored are, as far as we know, the tables of logarithms (four and five figures), and the reprint of Barlow's Tables (Taylor and Walton), the six-figure logarithms (Longman), and Lieut. Raper's Elements of Navigation.

Guldinus and Schooten both are said to have given tables of prime numbers, but we have neither found them nor a description of them. Thomas Branker appended to his translation of Rhonius's Algebra a table of primes and divisors for all numbers under a hundred thousand. This was reprinted by Baron Maseres, and was appended to his tract 'On the Doctrine of Permutations and Combinations,' London, 1795; a book very easy to be obtained.

Vega (Octavo logarithms, vol. ii., 1797) gave primes and divisors up to 102,000, and further primes up to 400,000.

§ 3. *Tables of Squares, Cubes, Square Roots, and Cube Roots.*—Up to one thousand these are very common; we shall mention these which go higher. The oldest we know of is Maginus, 'Tabula Tetragonica,' Venice, 1592, which gives squares, and, we believe, cubes also, up to those of 10,100. Guldinus, 'De Centro Gravitatis,' Vienna, 1635, gives the squares and cubes up to those of 10,000. Pell, London, 1666 (Murhard), squares to that of 10,000. Ludolf, 'Tetragonometria Tabularia,' Frankfort and Leipsic, 1690, gives the squares up to that of *a hundred thousand:* the largest table of squares in existence, and very little known. J. P. Buchner, 'Tabula Radicum,' &c., Nuremberg, 1701, gives squares and cubes up to those of 10,000. Hutton (table in § 1) gives squares up to that of 25,400, and cubes up to that of 10,000.

Dodson 'Calculator' (§ 1) gave square and cube roots up to those of 180: Hutton afterwards gave the same up to those of 1000 (where first, we do not know). Barlow, 'Tables,' London, 1814, gave squares, cubes, square roots, cube roots, and reciprocals, up to those of 10,000; the interminables to seven decimal places. These were reprinted a little while ago (London, Taylor and Walton, 1840), from the original, after re-examination. Tables of squares and cubes, up to those of 10,000, were reprinted from Séguin's 'Manuel d'Architecture,' with a descriptive preface, at Paris, about the beginning of the century. Meinert's Logarithms, Halle, 1790, contain squares and cubes up to those of 1000. Boebert, 'Tafeln, &c.,' Leipsic, 1812, goes to the square of 25,200, the cube of 1200, and the square and cube root of 1000. Beyens, Ghent, 1827, goes to the square of 10,000, and the cube of 1000. Schierk, 'Tafeln, &c.,' Rohn om Rheim, 1827, has squares up to that of 10,000.

Joncourt, 'De la Nature, &c. de Nombres Trigonaux,' Hague, 1762, gave triangular numbers up to that of 20,000, cubes up to that of 600, and showed how to use the former in the construction of squares and square roots. As to higher powers than the third, Hutton and Barlow, in works above cited, give every power of every number up to the tenth power of 100. Barlow gives also the fourth and fifth powers of numbers from those of 100 to those of 1000.

§ 4. *Pure Decimal Operations.*—Besides Barlow's reciprocals (§ 3), the only remarkable tables of which we know under this head are Goodwyn, 'Table of the Circles arising from the Division of a Unit,' London, 1823, and 'Tabular Series of Decimal Quotients,' London, 1823 (both anonymous). The first gives all the circulating decimals which can arise from any fraction whose denominator is under 1024; the second arranges all fractions which in their lowest terms have a numerator not exceeding 99 and a denominator not exceeding 991, in order of magnitude, and gives their equivalent decimals to eight places. Mr. Goodwyn (of Blackheath) was an indefatigable calculator, and the preceding tables are the only ones of the kind which he published. His manuscripts, an enormous mass of similar calculations, were lately purchased by the Royal Society.

Of pure trigonometrical tables, independently of logarithms, the following are the most remarkable:—

§ 5. REGIOMONTANUS on triangles, Nuremberg, 1533, contains his and Purbach's table of sines. Apian, 'Introductio Geographica,' Ingolstadt, 1533, and again in 'Instrumentum primi mobilis,' Nuremberg, 1534, gave sines. Copernicus (1543) gave one in his book 'De Revolutionibus.' In 1554, Erasmus REINHOLD published the first table of tangents. In 1588, the table of secants of MAUROLICO was published (posthumously). The three are first united in the 'Canon Mathematicus' of VIETA, Paris, 1579, the first trigonometrical tables which resemble the modern ones in arrangement. (A very rare book: Hutton gives a description, from his own copy, in the preface to his tables.) The 'Thesaurus Mathematicus' of Pitiscus, Frankfort, 1613, contains the sines for every ten seconds, to what we should now call 15 places of decimals, and for every second in the first and last degrees; all computed by Rheticus. Pitiscus himself added the first and last 35 minutes, to 22 places of decimals. But a larger work of Rheticus was published by Valentine Otho, the 'Opus Palatinum,' Neustadt, 1596, a complete trigonometrical canon, to every ten seconds, and to ten places of decimals. Lansberg, 'Geometria Triangulorum,' 1591, had given a complete canon for every minute, to seven places. Hutton thinks this is the first in which the three headings are sine, tangent, and secant. The trigonometry of Pitiscus (1599) gave the same. Magini, 'Primum Mobile,' Bologna and Venice, 1609, gave another. Schooten, 'Tabulae Sinuum,' &c., Amsterdam, 1627, is a complete canon to seven places, in a pocket volume with pages of two inches by four. It is often said to contain no error; but we believe the author's own assertion in the preface is the source of this opinion: Hutton found many errors in the last figures. There have been no trigonometrical tables of note published since the invention of logarithms, except those which contain logarithms.

The principal tables of logarithms are the following:—The interest attaching to this species of table makes us dwell a little more on the earlier specimens.

§ 6. 1614. Napier, 'Mirifici Canonis Logarithmorum Descriptio,' Edinburgh. Sines and hyperbolic logarithms of sines and tangents, to every minute and seven decimals.

1616. Reprint of the above, by Edward Wright, to one figure less, with Napier's explanation translated into English, and preface by Briggs, London.

1617. Briggs, 'Logarithmorum Chilias Prima,' London.

1618. Benjamin Ursinus, 'Cursus Mathematicus,' Cologne, contains Napier's Logarithms. His 'Magnus Canon,' Cologne, 1624, contains a recomputation of the Napierian logarithms of sines, to every ten seconds.

1619. John Speidell, 'New Logarithms.' A new arrangement of Napier's, but giving sines, tangents, and secants, with numbers also to 1000. Reprinted in 1627.

1619. Napier, 'Mirifici Logarithmorum Canonis Constructio,' Edinburgh, edited by Napier's son.

1620. Reprint of Napier, both the 'Descriptio' and the 'Constructio,' at Lyons, by Bartholomew Vincent, bookseller.

1620. Gunter, 'Canon of Triangles,' first trigonometrical canon, with Briggs's Logarithms.

1624. Briggs, ''Arithmetica Logarithmica,' London. Logarithms (decimal) to fifteen places, from 0 to 20,000, and from 90,000 to 100,000. After his death, in 1631, a reprint was made by one George Miller; the Latin title and explanatory parts were replaced by English ones; 'Logarithmicall Arithmetike,' &c. We must doubt the reprint of the tables, and think that they were Briggs's own tables, with an English explanation prefixed, in place of the Latin one. Wilson (in his History of Navigation, prefixed to the third edition of Robertson) says that some copies of Vlacq, of 1628, were purchased by our booksellers, and published at London with an English explanation premised, dated 1631. Mr. Babbage (to whose large and rare collection of tables we have been much indebted in this article) has one of these copies; and the English explanation and title is the same as that which was in the same year attached to the asserted reprint of Briggs. We have no doubt that Briggs and Vlacq were served exactly in the same manner.

1624. Kepler, 'Chilias Logarithmorum,' Marpurg. (Napierian.) He also republished Napier's own table in the Rudolphine Tables (1627). Reprinted at Strasbourg in 1700.

1626. Wingate, 'Arithmetique Logarithmique,' Paris (reprinted at Gouda, in 1628, according to Murhard). Wingate was an Englishman who first carried Briggs's logarithms into France. The work was reprinted in England, in the same year. Dodson, Hutton, Ward, &c., say the year of the French publication was 1624, but Lalande and Delambre knew of none previous to 1626, and a copy of the last date which we have examined bears no mark of being a second edition, and refers to nothing as published before, except a tract on the rule of proportion (Gunter's Scale). The logarithms are from Gunter.

1626. John Maire, 'Canon Mesotetologisticus,' &c., Leyden. Such a work is mentioned by Murhard from Scheibel. It contained sines of minutes, to 7 decimals, in Napierian logarithms; with differences to ten seconds.

(?) 1626. Henrion's Logarithms, Paris. (Dodson, followed by Hutton.) Lalande knew nothing of this work, nor Delambre. Sherwin (Preface) says he examined his table by one of Vlacq's, in large octavo, printed at Gouda, in 1626, of which table we find no other mention.

1628. Adrian Vlacq, 'Arithmetica Logarithmica,' Gouda. The whole ten chiliads of numbers, from 0 to 100,000, to ten decimals. Sines, &c. to every minute.

1631. Norwood, 'Trigonometrie.' Logarithms to seven places; numbers to 10,000, sines, &c. to every minute.

1632. Cavalieri, 'Directorium Generale Uranometricum,' Bologna. Eight-figure logarithms, the ten first thousand numbers in columns of twenty: the sines, &c. to various divisions in different parts of the quadrant. It would be very convenient to have a short mode of denoting change of intervals; the following could hardly be misunderstood:—Cavalieri's tables are, 0 (1″) 5′ (5″) 10′ (10″) 20′ (20″) 30′ (30″) 1° 30′ (1′) 45°. The table of logarithmic versed sines is said to be the first given. Cavalieri gave logarithms again in his trigonometry (1643); and in his 'Tabula Trigonometrica,' of which we do not know the date.

1633. Gellibrand, 'Trigonometria Britannica,' Gouda. Briggs's work, which he did not live quite to complete. Sines, tangents, and secants, with logarithms of the two former, all to fifteen places of decimals, except the tangents and secants, which are to eleven. It is to hundredths of degrees, not to minutes.

1633. Vlacq, 'Trigonometrica Artificialis,' Gouda. Logarithms of sines, tangents, and secants, to every ten seconds, and to ten places of decimals. Twenty thousand of Briggs's logarithms of numbers are added.

1633. Nathaniel Roe, 'Tabulæ Logarithmicæ,' London. Seven-figure numbers to 100 thousand, ten-figure sines, &c. to hundredths of degrees. The first table in which attempt at compression was made: the numbers are in columns of fifties, the first figures of the logarithms being at the top.

1634. Herigone, 'Cursus Mathematicus, vol. iii., Paris, Said to be the first digested course of mathematics; contains logarithms, apparently from Wingate's French of 1626.

1634. Frobenius, 'Clavis Univ. Trigon.' The (by that time) usual Briggs's logarithms to seven places.

1634. Cruger, 'Praxis Trig. Logarith. cum Logar. Tab.,' &c., Amsterdam.

1635. Cruger, 'Doctrina Astronomiæ,' Dantzig. Contains logarithmic tables.

1635. Gellibrand, 'Institution Trigonometricall,' London. Numbers to 10,000 (seven places?); sines, &c. to every minute (seven places). In the same year, at the end of Well's 'Sciographia,' to which Gellibrand wrote a preface, are tables agreeing with the above description, in everything but the logarithms of numbers, which are carried to 10 places. Are these two different tables?

1635. Anonymous, 'Logarithmeticall Table,' London. Attributed to Wingate. Dodson is followed by Hutton in saying that Wingate published an English edition of his French logarithms. But Hutton never saw any prior to this of 1635, and we can find no mention of anything of Wingate's translated from French, except (in an old catalogue which gives no dates) 'The Construction and Use of the Logarithmeticall Tables,' not tables themselves. The logarithms of the table now before us are of six figures, and for the first time units' figures are at the head of the columns, and the tens down the margin. There are tables of 1632, attributed to Wingate.

1654. John Newton, 'Institutio Mathematica,' London, 2 vols., 12mo. Contains tables.

1657. Oughtred's Trigonometry, London, published both in English and Latin in the same year. The logarithms however are from the same type, with the Latin title, in both: they are complete six-figure logarithms: the numbers, which go to 10,000, having seven figures.

1657. John Newton, 'Help to Calculation,' &c. for converting sexagenary tables into decimal by logarithms.

1658. John Newton, 'Trigonometria Britannica,' London. The logarithms of sines, &c. are 0 (0°·001) 3° (0°·01) 45°, to 7 decimals; also sines and logarithms of sines to 14 decimals. The logarithms of numbers are thrown into the **form which they have ever since preserved in seven-figure** tables.

With John Newton we may very well close the account of the early tables of logarithms. From his date we shall give only those which have had great notoriety, or would even now be of use to any one into whose hands they fall.

1681. Jonas Moore, 'New Systeme of the Mathematics,' London. The second volume contains a full table of seven-figure logarithms, with the natural sines, &c., and a table of proportional parts. Also, for the first time in England, a complete minute-table of natural and logarithmic versed sines.

1706. Sherwin, 'Mathematical Tables,' London. The first work, we believe, in which the proportional parts are in the same page with the logarithms; and the common differences in the trigonometrical logarithms made common. Second edition, 1717; third, revised by Gardiner, and the best, 1742; fifth and last, 1771, very erroneous—the most inaccurate table Hutton ever met with.

1717. Abraham Sharp, 'Geometry Improved,' London. A large table of areas of the segments of circles: but it contains logarithms of all numbers to 100, and all primes under 1100, true to sixty decimals. Also an immense mass of results on the regular solids.

1742. Dodson, 'Antilogarithmic Canon,' London. This work is unique of its kind: it contains the number, to eleven figures, corresponding to every logarithm from ·00001 to 1·00000: the author corrected the faults in most copies with his own hand. Harriot began such a table, according to Wallis, and Dr. Pell told Wallis that Warner had finished the table, and that it was in the hands of Dr. Busby, master of Westminster School. It was never published, and is probably lost.

1742. Gardiner, 'Tables of Logarithms,' London. Numbers 1—102100, sines, &c., 0 (1″) 72′ (10″) 45°, all to seven places, with logistic logarithms, &c. Rare, and much esteemed for accuracy: the author corrected the faults with his own hand.

1770. Reprint of Gardiner at Avignon, by Pezenas, Dumas, and Blanchard, with the first four degrees to single seconds, from a manuscript of Mouton. (Lalande.) There was a reprint of some sort at Florence, in 1782.

1772. Gherli's Logarithms, Modena. Very much the same as Hutton's in their contents.

1778. Schulze, 'Sammlung Logarithmischer,' Berlin. This collection is highly spoken of. It contains the last published hyperbolic logarithms of sines and tangents.

1785. Hutton, 'Mathematical Tables,' London. Many editions. A very correct set, with sines, tangents, &c., and versed sines, complete, both natural and logarithmic. For those who want seven places, and can have but one book, there is none better.

1792. Michael Taylor, 'Tables of Logarithms,' London. In the trigonometrical part the sines and tangents are *to every second*. The errata of this work have been published in various Nautical Almanacs.

1783 and 1795 (new tirage, 1821, with many errors corrected). Callet, 'Tables Portatives,' &c., Paris. The first edition was substantially that of Gardiner; the second, *stereotyped* by Firmin Didot, is one of the most correct and convenient, as well as extensive works in existence: many persons prefer it to any other. It contains the usual seven-figure logarithms from 1 to 108000—common and hyperbolic logarithms, each to 20 decimals, up to 1200—logarithms, common and hyperbolic, to 18 decimals, with first, second, and third differences, from 101060 to 101179—numbers to logarithms, common and hyperbolic (to 20 figures), from ·00001 to ·00179, with the same differences, common logarithms to 61 decimals, and hyperbolic to 48, to all numbers from 1 to 1000 and all primes to 1097; the same for numbers from 999980 to 1000021—multiples of 2·30258 … and ·43429 …. to 100 times—arcs to 25 decimals, for both sexagesimal and centesimal division—seven-figure sines, &c. for each minute of the centesimal division—sines (15 decimals) and their logarithms (the remaining places up to 14, the first seven being in the last table)—proportional parts—sexagesimal seven-figure logarithms of sines and tangents 0 (1″) 5° (10″) 45°—logistic logarithms. Those tables are tolerably, but, we believe, not extremely, correct in all parts, except in the latest tirage. They were the first in which the line was broken at the change of the third figure of the logarithm of a number.

1791-1807. Maseres, 'Scriptores Logarithmici,' London. The first volume contains a reprint of Kepler's Logarithms, the sixth and last of Napier's work of 1614, and John Sperdell's logarithms of numbers.

1794. Vega's edition of Vlacq, 'Thesaurus Logarithmorum,' Leipsic, 1794. See Vlacq of 1628 and 1633. A very correct work: a ducat was offered for every error detected.

1797 and 1812. Vega, 'Tabulæ Logarithmico-Trigonometricæ,' Leipsic. The usual logarithms of numbers, sines, &c. 0 (1″) 1° 30′ (10″) 6° 2′ (1′) 45°—divisors and primes already noticed—eight-figure hyperbolic logarithms from 1 to 1000, and for all primes up to 10,000—powers of hyp. log. 10, and their common logarithms (from exponent ·01 to 10·00)—squares and cubes of numbers up to those of 1000, &c.—logistic logarithms, binomial coefficients, and astronomical tables various. There are various smaller editions from Vega, as at Leipsic, 1820 and 1826.

1800 or 1801. (An IX.) Delambre and Borda, 'Tables Trigonométriques Décimales,' Paris. These tables were corrected from the grand *Tables du Cadastre*, still unpublished.* [PRONY.] They contain, the common logarithms of numbers, 11-decimal logarithms of numbers from 1 to 1000, and from 100,000 to 102,000; 11-decimal logarithmic sines 0 (10″ centesimal) 100°; 11-figure hyperbolic logarithms from 1 to 1000; 7-decimal logarithms of sines, tangents 0 (1″) 2° (10″) 100° centesimal.

1814. Barlow's Tables, London. Here are found eight-figure hyperbolic logarithms up to that of 10,000, calculated from the primes in Vega. They had been previously printed in Rees' Cyclopædia.

1818. Gruson's Logarithms, Berlin. Contains also squares, cubes, square roots, and cube roots up to 1000.

1827. Babbage, 'Tables of Logarithms,' London. *Stereotyped.* Seven-figure logarithms of numbers only, now exceedingly correct. Printed on various coloured papers: Callet's stereotyped sines were at one time printed on yellow paper in France to accompany them; but the French paper was of so bad a colour, that we believe the experiment was not continued.

1827. Salomon, 'Tables de Logarithmes,' Vienna. A large collection: contains also squares, cubes, square roots, cube roots, up to those of 1000; and divisors up to 102,011.

1827. Hantschl's Tables, Vienna. Ten-figure logarithms of primes up to 15,391; squares, cubes, square and cube roots, up to those of 1200; factors up to 18,277; and others.

1827. G. F. Ursinus, 'Logarithmi,' &c., Copenhagen. A complete six-figure table: rather common in England.

1829. Bagay, 'Nouvelles Tables Astronomiques,' Paris. An imitation of Michael Taylor's, sines and tangents to every second.

1830. Hassler, 'Logarithmic, &c. Tables,' in a pocket form. New York. Seven-figure logarithms throughout: to half-minute intervals through the greater part of the tables of sines, &c. The logarithms of numbers broken as in Callet. We dislike this mode extremely; but many find it convenient.

1831. Lalande, 'Tables de Logarithmes,' Paris. *Stereotyped* in 1805; 1831 is the date of the first *tirage* with all corrections made. Five-figure tables throughout, and no mistake has ever been found in them, though it is said a reward was offered for any detection. There are, we believe, Brussels and other editions which have not the same character. The original work of Lalande, or Lacaille, Lalande, and Marie, had six places; last edition 1804; there was another, bearing the name of Lalande only, stereotyped in 1804. A similar table, with *seven* decimals, has been published for the use of students preparing for the Polytechnic School, and is sometimes furnished for the genuine Lalande: it is useless for ordinary purposes. If the English reprint of the tirage of 1831 (presently noted) be as correct, and no error has yet been found, it is much the better as to type and paper.

1834. Wallace, 'Mathematical Calculator,' Glasgow. Six-figure logarithms, with other tables.

1836. Anonymous (Simpkin, Marshall, and Co.), 'Logarithmic Tables.' A very neat reprint of Hassler without the (to us) objectionable breaking of the lines in the logarithms of numbers.

1839. Anonymous (Taylor and Walton, under Useful Knowledge Society). *Stereotyped.* A reprint of Lalande (*tirage* of 1831) with a few additions, closely compared with other tables. No error was found in Lalande, and none has hitherto been found in this reprint. The old numeral type was first completely restored in this work.

1840. Anonymous (Taylor and Walton), Four-figure logarithms on a card. *Stereotyped.* Reprint of a table originally privately circulated among practical astronomers. (See *Companion to the Almanac* for 1841.)

1842. Sines and tangents to match. Stereotyped.

1840. Farley, 'Six-figure Logarithms,' London. Stereotyped. An excellent table for those who want six figures.

1841. Gregory, Woolhouse, and Hann, 'Tables for Nautical Men.' Contains five-figure logarithms, neatly printed; the only instance we know in which five-figure logarithms have proportional parts.

1841. Riddle, 'Tables,' &c. The six-figure logarithms from Mr. Riddle's well-known work on navigation. *Stereotyped.*

Of the misuse of tables, no instance is more common than that which consists in taking tables of too many places of figures. Four are very often enough, more than five are rarely wanted; but when this happens, tables of seven figures are more conveniently used than those of six, owing to the saving of calculation which is made by the presence of proportional parts. In purely trigonometrical calculations, the advantage of six figures over five sometimes makes itself apparent. It is our own practice, when five figures are suspected to be insufficient, to have recourse to seven at once, which, we are satisfied, is a saving both of time and thought.

§ 7. The next tables which we shall mention are those which are wanted in the higher mathematics.

Extensive tables of *elliptic functions* are in Legendre's 'Traité des Fonctions Elliptiques,' 2 vols. 4to., 1825 and 1826. The *factorial* function, Γx, is tabulated in the same work; and also in the 'Exercices du Calcul Integral' of the same author, Paris, 1817, in which several other definite integrals are also tabulated. An abridgment of this table (with ready means of restoring it fully) is in the treatise on the Differential Calculus (*Lib. U. K.*), p. 587. Tables of the integer form of Γx, or $1.2.3 \ldots (x-1)$, or rather of the logarithms of the values, are given by C. F. Degen, 'Tabularum Enneas,' Copenhagen, 1824, up to $x=1201$, to 18 decimal places: this table is reprinted to six decimal places at the end of the article 'Theory of Probabilities' in the Encyclopædia Metropolitana. Tables of the integral $\int \varepsilon^{-t^2}\,dt$ were first given by Kramp, with logarithms of the values, in 'Analyse des Refractions Astronomiques,' Strasburg, 1799. This table is reprinted in the Encyc. Metrop., art. 'Theory of Probabilities.' The form in which this integral more usually occurs in the theory of probabilities (with the factor $2 : \sqrt{\pi}$) was given (by Professor Encke, we believe) in the Berlin 'Astronomisches Jahrbuch' for 1834, from whence it was copied into the article in the Encyc. Metrop., above noticed; and (with extensions) into the 'Essay on Probabilities and Life Contingencies' in the Cabinet Cyclopædia, and into the article on Probability in the new edition of the Encyclopædia Britannica. A few other definite integrals have been tabulated: one very useful one, $\int dx : \log x$, by Soldner, 'Nouvelle Fonction Transcendente,' Münich, 1809, copied into the 'Differential Calculus' (*Lib. U. K.*), p. 662. The integrals known by the name of Spence's *Logarithmic Transcendants* are in the work with that title (Edinburgh, 1809; Sir J. Herschel's edition, London, 1820). There are a few of the integrals necessary in optics scattered through the Memoirs of the Institute and of the Cambridge Philosophical Society (in memoirs by Fresnel and Mr. Airy). Perhaps we should also mention the tables for the solution of indeterminate equations of the second degree. Of these there is one in Legendre's 'Théorie des Nombres;' another has been given by Jacobi; and a third, by Degen, called 'Canon Pellianus.'

As to astronomical tables, it would be impossible give any account of the enormous mass which exists or has existed; nor would such an account be of any use, except for astronomical history. They may be divided into two classes: first, the tables of observations published by public or private observatories; secondly, the fundamental tables deduced from observations, to aid in the deduction of future predictions. As to the former, every well-conducted observatory in full work publishes periodically (at intervals of one or two years) its volume of observations, latterly with their reductions. As to the second class, they are not the daily materials of the astronomer, but of the computer of his ephemeris, who supplies the necessary predictions for the current year. In England the Nautical Almanac gives in the preface full references to the tables employed in predicting places, whether of sun, moon, planets, or stars. For general purposes connected with the elements of the solar system, see Baily, 'Astronomical Tables and Formulæ,' London, 1827.

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* There was once a commencement of the printing made, and we have seen some of the proof sheets.

The tables in the other physical sciences are mostly collections of facts, and, we believe, generally speaking, by no means so complete as they might be. The value of tabular information seems to be not sufficiently felt. A large portion of every book of chemistry, for instance, is a detailed statement in words at length of facts which might with great advantage be made the components of a table.

§ 8. It remains to speak of commercial tables, a subject of great interest in this country, which has produced a great many. The mathematical tables connected with this subject may be divided into those intended to facilitate calculations of money with regard to other countries, and with regard to transactions in this country; to which we must add, as distinct heads, tables of annuities and other life contingencies, and metrological tables, or tables of weights and measures. Of all these we shall only mention a very few.

The most complete work on foreign exchanges, and on the weights and measures of England as compared with those of other countries, is 'The Universal Cambist,' &c., London, 1821 (2nd edition), 2 vols. 4to. (with supplements), by the late Dr. Patrick Kelly. We may also mention Tiarks's Arbitration of Exchanges, London, 1817.

Tables of interest began to be published at the beginning of the seventeenth century. The earliest we have met with is Richard Witt, 'Arithmeticall Questions,' London, 1613, which, before the introduction of the notation of decimal fractions, gives tables or *breviats* containing the significant figures, with rules equivalent to the management of the decimal point; and Clay's 'Briefe, &c. Tables,' London, 1624. In the first half of that century we find in catalogues the works of Fisher, Butler, Webster, and others, with anonymous writers, all containing tables of interest, annuities, or leases. For the tables known by the name of Æcroid, see MORTALITY. The tables of leases, Cambridge, 1686, had the approbation of Newton, as Lucasian professor, and have since been often reprinted, and styled Newton's. Under this impression they still are sold, as there are persons who believe they were constructed by Newton. In 1726 the first really extensive tables of interest were published by John Smart. The results are interpolated for half years, which give the tables the appearance of being calculated for interest payable half-yearly; but the fact is that yearly payments are supposed. A second edition of this work, enlarged, by C. Brand, London, 1780, has the reputation of containing many errors. Mr. Baily's 'Doctrine of Interest and Annuities,' London, 1808, is as extensive as Smart's for whole years, and as correct; and the Tables of Leases, London, 1807, by the same author, contain the simple cases which the name implies, tabulated by themselves. The 'Doctrine of Interest,' by Francis Corbaux, London, 1825, contains the real distinction of yearly, half-yearly, and quarterly interest: these tables are repeated in the same author's work on Population, London, 1833. Mr. Hardy's 'Doctrine of Simple and Compound Interest,' London, 1839, contains rates of interest increasing by ¼ per cent. from ¼ up to 5 per cent., with succeeding integer rates. All the standard works on life annuities contain tables of compound interest.

There seems to have been a tendency at the beginning of the last century to publish commercial tables in copperplate, probably with a view to secure the advantage which stereotype has since secured in a better form. Thus we have the 'arithmeticall tables' of C. Bardon (Roy. Soc. library) without date; Lostan's 'Manual Mercantile,' second book (first never published), London, 1733; Rev. G. Brown's Arithmetica Infinita, London, 1717; the two last being multiplication tables with multiples of numbers and fractions useful in money transactions, arranged under heads. The following may be mentioned as containing hints which might even now be useful: Benjamin Webb, 'Tables for Buying and Selling Stocks,' London, 1759; also 'The Complete Annuitant, or Tables of Interest,' London, 1762; Hayes's 'Moneyed Man's Guide,' a table for Computing Dividends, London, 1726. The French have a large number of tables answering to our ready reckoners, under the names of Barême (a word of the same use with them as Cocker with us) compt-faits, &c. We have seen one of them of the decimal character, in which a metal plate with rectangles pierced in it serves, on one rectangle being placed over the integers of the number given, to make another separate those of the number to be found.

On the standard tables of life contingencies we refer to MORTALITY, adding that since the publication of that article, the Amicable Society has published tables of its experience by distributing them in print among their proprietors. The work of Mr. Jones on *Life Annuities*, in the 'Library of Useful Knowledge,' which is now brought nearly to a close, contains more tables than the old standard works all put together, and is the first in which extensive tables for what is called *Barrett's Method* are furnished, both for one and two lives.

The practice of stereotyping tables is one which should be strongly enforced, if it were not that publishers seem now to be aware of its importance. A second edition derives no authority from the goodness of the first, because the printer, who is, as already observed, as important a person as the author in the matter of tables, has again stepped between the latter and the public. In reading the proofs of important tables, it is desirable that three persons should be employed, one to read from the manuscript, the others to watch two separate proofs, without communication with each other, as done in the Nautical Almanac Office. The strictest investigation should take place in the proof which is taken from the stereotype, ordinary pains being taken with the previous proofs. Persons who have to correct the proofs of tables alone should bring the manuscript as near as possible to the proof by folding it conveniently: even if the folds were altered after every two or three lines, so as always to have both manuscript and proof under the eye in one position, it would not give more trouble than would be well repaid. Double figures should be particularly attended to: no mistake is so likely to be made, either by the compositor or the reader, as 744 for 774, and the like. This, and misplacing the order of the figures, as 012 for 102, are the things which it is most difficult to avoid. Again, of the two things under examination, manuscript and proof, the more difficult one should be looked at first, for the mind is apt to allow knowledge derived from the more easy to give help in interpreting the more difficult. Thus if the type be harder to read than the manuscript (a very common thing with our thick even-sized numerals), make out the proof first, and then look at the manuscript; and *vice versâ*. If two readings be given, vary the mode; the following may for instance be the plan adopted: if the manuscript column contain *a*, *b*, *c*, &c., and the printed column A, B, C, &c., look at *a*, compare it with A, then at B, compare it with *b*, then at *c*, compare it with C, and so on; the order of inspection being *a*A, B*b*, *c*C, D*d*, &c. Some persons examine best by the eye alone, others by the ear also, repeating aloud. Each one must ascertain for himself which practice is best for him; but whatever it may be, it should be varied. Alteration of position, motion of the hand or foot occasionally to mark the transitions, change of the tone of repeating, &c., are useful: it is hardly credible, to those who have not tried, how much the perceptions are dulled by the monotonous comparison of one column of figures with another, or how many and how gross errors both eye and ear, when tired, will suffer to pass. Persons who are not much used to this labour might very well proceed as follows. Let them request the printer to make, at his own discretion, a certain number, say three, of mistakes (author-traps) in every page, carefully registering them, but not on the manuscript. The author may then be certain that he ought to detect three mistakes in every page, and will know that he has been careless if he have not that number at least. But at the same time, an author who has not reason for confidence in himself, may very safely leave good manuscript tables entirely to the printer, if he make the latter understand that he does not intend to correct till all is printed off, and will require every page containing an error to be cancelled. No good printer would now refuse to engage to furnish a fac-simile of a manuscript, on the simple condition of being allowed to refer to the author for decision as to any doubtful word or figure in the writing; and the accuracy with which the first-rate London printers turn out their proofs is surprising. We have frequently looked at page after page of table-matter more times than we should otherwise have thought necessary, merely because the total absence of detected error left it an unsettled point whether it was the excellence of the proof, or a temporary suspension of our own quickness of perception, which caused the absence in question.

Catalogues of tables (separate) may be seen in the catalogue of the Royal Society's Library; in Murhard's *Bibl. Math.*; in Lalande's *Bibl. Astron.* (in virtue of the index); but there is nothing approaching to even a moderately perfect catalogue.

TABLE, ROUND. The most famous Round Table is that of King Arthur, which is said in the old romances to have been constructed by the wizard Merlin for Uther Pendragon, Arthur's father, from whom it passed into the possession of Leodigan, or Leodegrance, king of Camelard, or Carmalide, whose capital was Carshaise, and then came to Arthur as the portion of his wife Guenevre, daughter of that monarch. The romance of the 'Mort d'Arthur' says that Merlin made it 'in token of the roundness of the world;' according to the metrical romance of Merlin, it was made in imitation of one which had been set up by Joseph of Arimathea in commemoration of that at which the twelve apostles ate the last supper with their divine Master. The Round Table is not mentioned at all by Geoffrey of Monmouth, either in his 'Chronicle,' or in his 'Life of Merlin' in Latin verse; but it is noticed by his contemporary Wace of Jersey, in his metrical 'Roman de Rois d'Angleterre.' The Round Table was 'intended,' to quote the analysis of the romance of Merlin given by Ellis (*Specimens of Early English Romances*, i., 249), 'to assemble the best knights in the world. High birth, great strength, activity and skill, fearless valour, and firm fidelity to their suzerain were indispensably requisite for an admission into this order. They were bound by oath to assist each other at the hazard of their own lives; to attempt singly the most perilous adventures; to lead, when necessary, a life of monastic solitude; to fly to arms at the first summons; and never to retire from battle till they had defeated the enemy, unless when night intervened and separated the combatants.' There are different accounts of the number of the Knights of the Round Table, which indeed appears not to have been always the same. The romance of Merlin, which states that Uther had no power to fill all the seats, makes that king nevertheless to have nominated 250 knights, and these are also spoken of as forming the number of the order under Leodegrance. The 'Mort d'Arthur' makes Leodegrance say, in surrendering it to Arthur, 'I shall give him the Table Round, the which Uter Pendragon gave me, and when it is full complete, there is an hundred knights and fifty; and, as for an hundred good knights, I have myself, but I lack fifty, for so many have been slain in my days.' Of the fifty knights that were wanted, Merlin was at the moment only able to find twenty-eight for Arthur; but some were added afterwards. Other accounts again make the complete number under Arthur to have been only a hundred. It is asserted by some of the chroniclers that some time before Edward III. instituted the order of the Garter, he established in the castle of Windsor a fraternity of twenty-four knights, and erected for them a round table, in imitation of that of Arthur, with a chamber in which it was placed, still known by the name of the Round Tower; and though this story is rejected by Antis, in his 'History of the Order of the Garter,' Warton (*Hist. of Eng. Poet.*, ii., 87) gives some reasons for thinking it probable enough. Bishop Percy, in his 'Reliques of Antient English Poetry' (i., 41, 42), remarks 'that the round table was not peculiar to the reign of King Arthur, but was common in all the ages of chivalry. The proclaiming a great tournament (probably with some peculiar solemnities) was called holding a Round Table.' And he quotes a passage from Dugdale, in which that learned antiquary, describing a tournament held at Kenilworth by Roger de Mortimer, in the reign of Edward I., says, 'Then began the Round Table, so called by reason that the place wherein they practised those feats was environed with a strong wall made in a round form.' Percy adds that Matthew Paris frequently calls jousts and tournaments *Hastiludia Mensæ Rotundæ*. These round tables were probably a contrivance on the principle of the modern Round Robin, to prevent any dispute about precedency. There are several circular elevations in different parts of England which are still called Arthur's Round Tables.

TABLES, TWELVE. [TWELVE TABLES.]

TABOR, MOUNT (תָּבוֹר; LXX., and Josephus, *Ἰταβύριον*), now called Jebel-et-Tûr, is an insulated eminence, about 1000 feet high (according to the most probable out of several different calculations), on the eastern side of the great plain of Esdraelon in Palestine. It lies about two leagues south-east of Nazareth. It stands out alone from the high ground which surrounds Nazareth, and on the north it has at its foot an arm of the great plain of Esdraelon, which sweeps away north-east to the lake of Tiberias. The mountain consists of limestone. Its form, as seen from the south-west, is a segment of a sphere; from the west-north-west it presents the appearance of a truncated cone. The ascent is long and winding, occupying generally about an hour; the path is of antient construction; in some places steps are cut in the rock. The sides have a good soil, and are covered with clumps of oak-trees. 'The proper summit,' says Dr. Robinson, 'consists of a beautiful little oblong plain or basin, twelve or fifteen minutes in length from north-west to south-east by six or eight in breadth. This is skirted on the south-west by a ledge of rocks of some altitude, covered with foundations and ruins, and on the north-east by lower rocks; and this higher ground on both sides is thickly overgrown with bushes and small trees, while the basin itself lies in grass without trees or ruins.'

There are considerable ruins on the summit of the mountain. There are traces of a thick wall all round the top, the masonry of which seems not later than the time of the Romans. This is very likely to be the wall built round the mountain by Josephus, in the Jewish war. (*Vit.*, § 37; *Bell. Jud.*, ii., c. 20, § 6.) On the ledge of rocks at the southern side of the summit, particularly at its eastern end, there are large ruins of fortifications, and apparently of dwelling-houses. There is a gateway, of Saracenic architecture, called 'the Gate of the Wind.' It is known that churches and monasteries stood here both before and during the Crusades. There is a small vault on the south east, where the Latin monks from Nazareth celebrate an annual mass in memory of the Transfiguration, and on the north side the Greeks observe the same festival among the ruins of a church. The festival of the Virgin is also celebrated here by the Greek priests from Nazareth, and a multitude of pilgrims. There are many cisterns on the summit; most of them are dry, but in one Dr. Robinson found good water.

All travellers describe the view from Mount Tabor as very beautiful, but they differ about its extent. Dr. Robinson, who spent a whole night on the mountain, and saw the view both in the evening and in the morning, states that on the west it embraced the western part of the plain of Esdraelon, but the ridge of Carmel almost entirely intercepted the sea view. On the north and north-east appeared Safed and its mountains, overtopped by the snowy summits of Jebel Es-Sheikh (Mount Hermon): between the mountains of Safed and the foot of Tabor lay the north-east branch of the plain of Esdraelon. Though only a spot of the water of the lake Tiberias could be seen, the whole outline of its basin was clearly visible; and beyond this the table-lands of Jaulân and Haurân, and to the south of them the mountains of Bashan and Gilead. On the south the view is almost immediately bounded by the mountains of Duhy (Little Hermon) and Gilboa, the latter appearing over the summits of the former. On the south-east the view extends far down the valley of the Jordan. Dr. Robinson adds that a line drawn from Tabor to the summit of Little Hermon marks the division between the waters which run eastward into the Jordan and those which flow westward through the plain of Esdraelon into the Mediterranean.

The name of Tabor occurs several times in the Old Testament (*Josh.*, xix. 12, 22; *Judges*, iv. 6, 12, 14; *Psalms*, lxxxix. 12; *Jerem.*, xlvi. 18; *Hosea*, v. 1.) There was upon it one of the cities of the Levites, belonging to the tribe of Zebulon. (1 *Chron.*, vi. 77.) The description given by Polybius (v. 70, § 6) of the city of Atabyrium ('Αταβύριον), as well as the name itself, proves it to have been Tabor.

This city was taken by stratagem and fortified by Antiochus the Great, B.C. 218 (Polyb., *l. c.*). In the Jewish war a battle was fought at the mountain between the Romans under Gabinius, and the Jews under Alexander, the son of Aristobulus, about B.C. 53 (Joseph., *Antiq.*, xvi., c. 6, § 3; *Bell. Jud.*, i., c. 8, § 7); and the summit, as above mentioned, was afterwards fortified by Josephus. At a later period of the war a great multitude of the Jews, who had taken refuge here, were compelled to surrender to Placidus. (Joseph., *Bell. Jud.*, iv. 1, 8.)

Tabor is not mentioned in the New Testament; but in the fourth century after Christ the opinion seems to have sprung up, which has since been generally held, that it was the scene of our Saviour's Transfiguration. (*Matt.*, xvii.; *Mark*, ix.; *Luke*, ix. 28; 2 *Pet.*, i. 18.) It has been long since observed by Lightfoot and Reland, that the Gospel narratives rather point to some place on the north of the lake of Tiberias; but Dr. Robinson has set the question at rest by an observation so simple that it is marvellous how it escaped the notice of former writers, namely, that at the very time referred to, the summit of Tabor was occupied by a fortified city.

(Dr. Robinson's *Biblical Researches in Palestine*, vol. iii., pp. 209-225; Winer's *Biblisches Realwörterbuch*, art. 'Thabor.'

TABOR, a circle in the south-east part of the kingdom of Bohemia, is bounded on the north by the circle of Czaslau, on the east by Moravia, and on the south and west by the circle of Budweis. The area is 1170 square miles, and the population 200,000 inhabitants. The country is an undulating plain, with a few hills and mountains. The most considerable river is the Luschnitz, and there are many small lakes or meres. The soil is fertile, and produces corn, flax, and culinary vegetables. Oxen and sheep are very numerous; and the mountains are rich in silver and other minerals, and in precious stones. The chief manufactures are of woollen, cotton, and linen.

TABOR, the capital of the circle of Tabor, is situated in 49° 24′ N. lat. and 14° 30′ E. long. It stands on an eminence called Mount Tabor, on the river Luschnitz, in a romantic country. It is said that the castle of Tabor was built in the year 774, by a nobleman named Koten, round which the town gradually arose, but it was totally destroyed in 1268. In 1420 it was rebuilt, and strongly fortified, by Zisca, leader of the Hussites, part of whom were called, after the town, Taborites. The principal buildings are the cathedral, which is worth seeing, and an Augustine monastery. The town has 4500 inhabitants, among whom there are many Jews. Their chief occupation is weaving linen and woollens, and they have some trade in corn. (Blumenbach, *Die Oesterreichische Monarchie*; R. E. v. Jenny, *Handbuch für Reisende im Oesterreichischen Kaiserstaate*.)

TABRIZ, the capital of Azerbijan, a province of Persia, is situated, according to Monteith, in 38° 4′ N. lat. and 46° 8′ 30″ E. long. The town is said to have been founded by the wife of the famous Caliph Harun al Rashid, in 791. It was repeatedly destroyed by earthquakes, and in 1635 by Murad IV., the Turkish emperor, but it was always restored. In Chardin's time (1673) it was a very large town, equal in size to Ispahan, and containing 500,000 inhabitants; but this statement was made by Chardin on the information collected from the natives, and is apparently a great exaggeration; even now the natives give to the town a population of 250,000 individuals, though, according to the estimate of travellers, it hardly exceeds 50,000. During the last century Tabriz was more than once taken by the Turks, damaged by earthquakes, and reduced to a very low state; but at the beginning of the present century, Abbas Mirza, the son of the shah of Persia, was made governor of Azerbijan, and organized the military force at Tabriz, which he intended to oppose to the progress of the arms of Russia. Since that time the town has greatly improved, though the larger part of the area enclosed by the antient walls is still covered with ruins and gardens.

Tabriz is built on the elevated table-land which extends from the south-western shores of the Caspian Sea, in a west-north-west direction to the eastern recess of the Black Sea, and whose centre is occupied by Mount Ararat. It lies towards the south-eastern termination of this table-land, and is about 4800 feet above the sea-level. It is therefore nearly 3000 feet higher than Madrid, and this is the principal reason of the great severity of the climate. Some travellers compare the winters of Tabriz with a moderate winter of St. Petersburg, and others with that of New Brunswick, or of the central states of the North American Confederation. In this season eastern and north-eastern winds are prevalent, and the frost is continual. The thermometer sometimes sinks to zero of Fahrenheit. Monteith states that the mean temperature of the month of February was only 8·2°. Falls of snow are frequent and heavy, and the snow sometimes covers the ground for six months, which was the case in 1821. In these hard winters many travellers lose their lives, and whole caravans are frequently exposed to imminent danger. The easterly winds blow through the narrow valleys of the table-land with a violence of which the inhabitants of Europe can hardly conceive an idea. To the great quantity of snow in winter the fertility of the country is owing; for there are not more than two or three showers between March and December. The air during this time is so extremely dry, that steel, which is continually exposed to it, never shows the least rust, and dew is a thing entirely unknown. The heat of the summer is very moderate. Between the 19th of June and the 1st of July the thermometer only once rose to 75°. Sometimes indeed hot winds blow from the south-west, and raise the temperature of the air considerably, but they are rare, and do not continue for a long time. At other times the air is always pure, dry, and bracing.

Tabriz is built on a plain of moderate extent, surrounded on the north and south by ranges of high hills, which rise into pointed peaks, and present a rugged outline. They are without trees, and barren. The plain is open towards the west, and in that direction it widens gradually as it approaches the banks of the lake of Urmiyeh, to which it extends. The plain is very fertile, and produces abundant crops of grain where it can be irrigated: it also contains extensive plantations of fruit-trees, and is in general the best cultivated and most populous tract in Persia, with the exception of the low countries of Ghilan and Mazanderan.

The town is surrounded by a wall of sun-burnt bricks, which has a circuit of about three miles and a half, and in which are seven gates. The streets are tolerably straight, but not paved. The houses are made low, on account of the earthquakes, and mostly built of sun-burnt bricks. They have no windows towards the streets, but are convenient in the interior. The suburbs are extensive, and the orchards, which cover large spaces, are kept in good order, and watered by numerous keresis (subterranean canals). Grapes, melons, apricots, quinces, pears, and apples are of superior quality. In many of the gardens there are the ruins of magnificent old buildings. There are no buildings distinguished by architectural beauty, not even the mosques. The most remarkable is the old castle, which was built by Ali Shah.

The manufactures of Tabriz are not extensive, with the exception of those of cotton cloth, which only produce coarse goods for the consumption of the lower classes. There are a few silk-weavers, who receive the material from Mazanderan, but the produce of their industry is indifferent. Tabriz is one of the most commercial towns of Persia. Its principal commerce is with Tiflis in Russia, with Trebizond, and with Constantinople. It sends to Tiflis, by the way of Erivan, silk, cotton, rice, galls, and dried fruits, and receives from Russia, iron, copper, caviar, cloth, Russian leather and other kinds of leather, cochineal, and several manufactured goods, especially iron. It is stated that the annual value of the goods imported from Russia in this way exceeds 300,000*l*. The English manufactures, which were formerly brought to Persia by the port of Aboushir on the Gulf of Persia, now reach it by a shorter way, being unshipped at Trebizond on the Black Sea, and carried overland through Erzerum, Bayazid, and

Khoi. Their value is at least equal to that of the goods brought from Russia. Many English goods reach Tabriz by the caravans, which are continually going between that town and Constantinople, and pass through Erzerum, Tokat, and Angora. The export by this road consists chiefly of rice, wool, hides, sheep and goat skins, furs, carpets, shawls, and some minor articles. It is stated that the foreign commerce of Tabriz annually introduces into Persia goods to the value of a million of pounds sterling. The merchants of Tabriz are at present not immediately connected with India and Bokhara, but receive the goods of these countries by the way of Herat and Teheran.

(Eli Smith and Dwight's *Missionary Researches in Armenia*; Kinneir's *Political and Geographical Memoir of the Persian Empire*; Fraser's *Travels in Koordistan*, *&c.*; Ker Porter's *Travels in Georgia, Persia, Armenia*, *&c.*; Wilbraham's *Travels in the Trans-Caucasian Provinces*, *&c.*)

TABULAR SPAR. [Wollastonite.]

TACAZZE, River. [Abyssinia; Nile.]

TACCA, a genus of plants of the natural family of Taccaceæ, placed near *Aroideæ* and *Aristolochiæ*, and resembling Dioscoreæ, in having radical tubers which abound in fæcula. The genus is named from the Malay name of one of the species, which are found in the hotter parts of India and in the South Sea Islands. The genus is characterized by having a six-partite calyx, with a six-partite corol, and six stamens which are inserted in the calyx. Styles 3. Stigmas stellate. Berry dry, hexangular, many-seeded. The plants have perennial tubers, with a short compressed rhizoma, from which proceed the stalked and the so-called radical leaves and herbaceous scapes. The plants of this family are possessed of some acridity both in their tubers and in their herbaceous parts, but the roots lose some of this quality by culture, at the same time that they become larger. Those of *T. pinnatifida*, the best-known species, and a native of the Malayan Peninsula, the Moluccas, Madagascar, and New Holland, are roundish, red, the size of a man's fist, extremely bitter, and acrid. The tubers of this plant, and also those of *T. dubia* and of *T. montana*, are rasped and macerated for 4 or 5 days in water: a white highly nutritious fæcula, like arrow-root, is then separated, and, like sago, is employed as an article of diet by the inhabitants of the Malayan Peninsula and the Moluccas. In Otaheite and some of the Society Islands they make cakes of the tubers of *T. pinnatifida*, which are the *Tacca youy* of some navigators. They form an article of diet in China and Cochin China, and also in Travancore, in India, where, according to Dr. Ainslie, they attain a large size, and the natives eat them with some acid to subdue their acrimony. (Royle's *Illustr.*, p. 378.) The petioles and stalks boiled for some time are also used as articles of diet in China and Cochin-China. In Otaheite the plant is called *tya*: its fæcula is largely prepared and is sometimes preferred to that of arrow-root by the English, to whom it is sold under that name by the native converts at the missionary station and exported to London. It is also sometimes called Otaheite salep. This plant must not be confounded with the *Arum macrorhizum*, the tuberous root-stalk of which is also edible, and when prepared is called *taka*, which similarity in name and in uses has frequently caused confusion, and the mistaking of one plant for the other. In Singapore, *Tacca cristata* is called 'Water-Lily.'

TACCA'CEÆ, a small natural order of Endogens belonging to the epigynose group. There are but two genera belonging to this order, Tacca and Ataccia. The species are large perennial herbaceous plants, with a tuberose root, a short stem bearing scapes, and having exstipulate, radical, pedatifid, pinnatifid, rarely entire leaves, with curved parallel veins. The flowers, which are placed on the top of a single scape, are in umbels, and are united; the tube of the perianth is superior, and united to the germen; limb petaloid, equal or unequal, persistent; stamens six; filaments dilated; ovary composed of three connected carpels, with five parietal polyspermous placenta; styles three, connate; the fruit baccate, with seeds lunate, striated, and the embryo situated on the outside of fleshy albumen.

Some difference has arisen amongst botanists as to the position of this order in a natural system. Bartling refers them to Exogens, but almost all other botanists have referred them to Endogens. Blume considers the order as one standing between Araceæ and Aristolochiaceæ, agreeing with the former in habit and the latter in its superior perianth. On account of its inferior fruit and the absence of a spadix, it is placed by Lindley in his epigynous group.

The species are found in the hotter parts of India, in the South Sea Islands, also in tropical Africa. The tuberous roots, as well as the enlarged petioles of many of the species after they have been cooked, are frequently used as food. [Tacca.]

TACHY'DROMUS, Illiger's generic name for the *Courier Birds*, *Cursorius* of Lacépède, *Coure-vite* of the French. [Cursorius.]

Mr. Vigors places this form among the *Charadriadæ* [Plovers], and Mr. Swainson arranges it in the same family, giving it a position between *Œdicnemus* and *Glareola* [Patrincole], and it stands between the same genera and in the same family in the *Birds of Europe and North America* of the Prince of Canino.

Mr. G. R. Gray makes the *Cursoriinæ* the second subfamily of the same family. The *Cursoriinæ* are placed by him between the *Œdicneminæ* and the *Charadrianæ*, and comprise the following genera:

Cursorius, Lath. (*Charadrius*, Gm.; *Tachydromus*, Ill.); *Oreophilus*, Gould; *Ortygodes*, Vieill. (*Hemipodius*, Sw.; *Ortygis*, Steph.); *Pluvianus*, Vieill. (*Charadrius*, Gm.; *Cursor*, Wagl.; *Hyas*, Gloger.; *Ammoptila*, Sw.; *Cheilodromus*, Rüpp.).

N.B. *Tachydromus* is also used by Daudin to designate a genus of lizards.

This saurian is placed by MM. Duméril and Bibron at the head of their first group of *Autosaures Cœlodontes*, viz. the *Cœlodonts* with smooth toes, or *Leiodactyls*.

Generic Character.—Tongue with a base not sheathing, moderately extensile, divided at its extremity into two small flattened filaments, with a surface offering papillose folds in chevrons. Palate toothed or not toothed. Intermaxillary teeth conical, simple. Maxillary teeth compressed, the first simple, the succeeding ones tricuspidate. Nostrils open at the summit of the rostral canthus, each in a single plate (the naso-rostral). Eyelids. Tympanic membrane extended within the auricular border. A scaly, dentilated, and but little marked collar. Belly furnished with imbricated scales, which are smooth or carinated. Some inguinal pores. Feet each with five toes slightly compressed. Tail very long and cyclotetragonal.

MM. Duméril and Bibron, whose description this is, remark that the *Tachydromi* are distinguished from all other Cœlodont Lacertians by the peculiar form of the papillæ of their tongue, which resemble folds having the figure of chevrons enclosed one within the other, the summit of which is directed forwards.

The same authors add that these Lacertians have a pyramido-quadrangular head, the body a little higher than it is wide, the back slightly convex, the belly flat, and the sides slightly arched outwards. The proportions of their limbs are entirely in unison with the size of the trunk; but the tail is excessively long, longer indeed than in any other autosaur, forming sometimes three-fourths of the total length of the animal. The four first toes of the anterior and posterior feet are regularly graduated (étagés); the fifth has nearly the same length as the second.

The tongue (which is rather wide backwards, where it presents a sort of V-shaped notch, between the branches of which the glottis is situated) narrows as it advances towards its free extremity, which is a point divided into two flattened filaments, on which are no papillose folds similar to those which the greater part of the surface of this organ presents.

In general, the palate is armed with very small teeth; at least MM. Duméril and Bibron have felt some with the aid of the point of an iron instrument in the greater portion of the individuals observed by them. There are about twenty small, conical, simple intermaxillary teeth curved slightly inwards; twenty-six upper maxillaries on each side, and thirty below on each side. The first of these upper and lower maxillaries are simple and conic, whilst all the others are flattened laterally, tricuspidate at their summit, and very close set against each other.

The external nostrils are two circular orifices, rather large, which open at the summit of the frenal region in the rostro-nasal plate.

The upper eyelid is shorter than the lower, the slit is perfectly longitudinal. The ear, or rather its aperture, is somewhat large and nearly circular; the tympanic membrane is extended within its circumference.

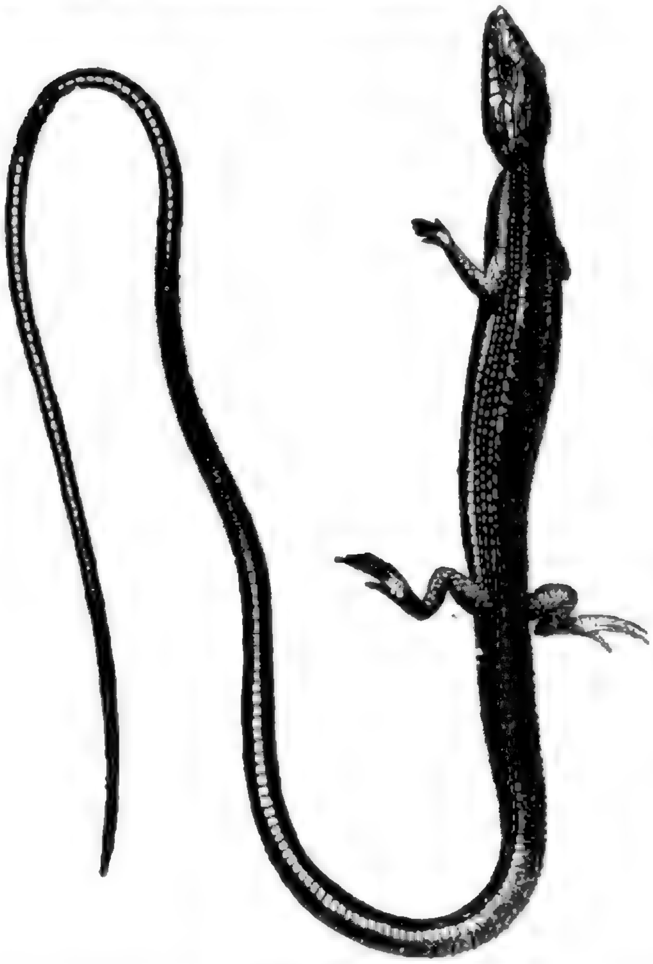
The surface of the head is entirely covered with plates, absolutely as in the Lizards properly so called. There are a rostral plate, two naso-rostrals, an inter-nasal, two fronto-parietals, a small inter-parietal and an occipital equally small. The palpebral or supra-ocular regions, which are bony, have three plates of different sizes. On the frenal region there exists a small naso-frenal plate and two large post-naso frenals. One of the upper labials, that which is situated below the eye, occupies not only a very large longitudinal space, but ascends to the orbital border.

The under part of the neck presents a scaly serrated collar, but in general it is but little apparent. Scales, and not plates, protect the temples.

The scaly covering of the upper part of the neck, of the back, and of the tail, is composed of great carinated, angular pieces, more or less imbricated, and rather distinctly disposed in transversal rows, especially the caudal ones, which are, consequently, verticillated.

The sides, on the contrary, present only very small scales, having a granular aspect. The lower regions of the neck, the breast, and the belly are protected by rhomboidal imbricated scales, which are smooth or carinated, but always disposed in longitudinal series. There are lozenge-shaped imbricated scales on the arms and the front of the hind feet; the under part of the anterior limbs and the posterior surface of the thighs are furnished with granules. The pre-anal region is covered in great part by a single plate surrounded with small scales. The base of the tail presents no kind of spines nor spurs; but there exists in each groin one or two tubular crypts.

Only two species are at present known: *Tachydromus sexlineatus* and *Tachydromus Japonicus*.



Tachydromus sexlineatus.

The first of these is olive above, and on each side of the back, from the angle of the occiput to the lateral part of the base of the tail, is a beautiful white stripe between two black lines; certain parts of the sides of the neck and sides, those which are furnished with granules, are sprinkled with pretty small black spots with a white eye. The other regions of the lateral parts of the neck and the trunk are of a bluish tint with golden reflections. Between the nostril and the eye a black line; two others of the same colour, separated by a white stripe, extend longitudinally on the temple. The lower part of the head, of the neck, of the breast, and of the belly, are very pure nacreous white. The tail sometimes is simply olive; sometimes, on the contrary, it presents a brilliant copper, or even golden colour. Length about a foot, of which the tail measures about three-fourths.

Locality.—China, Cochin China, and Java? (D. and B.)

TACHYGLOSSUS, Illiger's name for the ECHIDNA.

TACHYLITE, a mineral which resembles obsidian, and has also been supposed to be similar to isopyre. It occurs in plates and massive. No cleavage. Fracture small conchoidal. Hardness 6·5. Translucent, opaque. Lustre vitreous, vitreo-resinous. Colour brownish and greenish-black. It is found in small masses at Säsabühl, near Göttingen, in basalt and wacke. It does not appear to have been analysed.

TACHY'PETES, Vieillot's name for the *Frigate Bird.* [PELECANIDÆ, vol. xvii., p. 386.]

TACHYPHO'NUS. [FRINGILLIDÆ, vol. x., p. 483; TANAGERS.]

TA'CITUS, CAIUS CORNE'LIUS, was probably born in the reign of Nero, but neither the place of his birth nor the exact date is known, nor is anything known of his parentage. There is no reason for supposing that he belonged to the illustrious patrician gens of the Cornelii, nor any evidence of his having been born at Interamna as it is sometimes stated. The few facts of his life are chiefly collected from his own works, and from the letters of his friend the younger Pliny. Tacitus was about the same age as Pliny, but the elder of the two. Pliny was born about A.D. 61 [PLINY THE YOUNGER], in the reign of Nero, which commenced A.D. 54.

A passage of the elder Pliny (*Hist. Nat.*, vii., 16) speaks of a son of Cornelius Tacitus, the procurator of the emperor in Belgic Gaul. Lipsius concludes that this Cornelius Tacitus was the historian; but as Pliny died in A.D. 79, it seems hardly probable that the passage can apply to him. It has been conjectured that the procurator was the father of the historian. Tacitus states that he owed his first promotion to Vespasian, and that he was indebted for other favours to his successors Titus and Domitian (*Hist.*, i. 1). In the year A.D. 77, C. Julius Agricola, then consul, betrothed to him his daughter; and the marriage took place after the consulship of Agricola. Tacitus does not state what places he filled under Vespasian and Titus, but in the reign of Domitian he informs us that he assisted as one of the Quindecemviri at the celebration of the Ludi Seculares, which event took place in the fourteenth consulship of Domitian (A.D. 88). At that time he was also praetor (*Ann.*, xi. 11).

He was not at Rome when his father-in-law Agricola died there (A.D. 93), in the reign of Domitian; but it is too much to affirm, as some have done, that he was an exile during the time of Domitian. It has already been shown that he was at Rome in the year A.D. 88. A passage in his Life of Agricola (c. 45) rather leads to the inference that he was at Rome during many of the atrocities which Domitian perpetrated after the death of Agricola, though he had been absent from Rome for four years prior to Agricola's death. On the death of T. Verginius Rufus, in the reign of Nerva (A.D. 97), he was appointed Consul Suffectus, and Pliny enumerates it as the crowning event to the good fortune of Verginius that his panegyric was pronounced by the consul Cornelius Tacitus, the most eloquent of speakers.

Tacitus is recorded by his friend Pliny as one of the most eloquent orators of his age. He had already attained some distinction as an advocate when Pliny was commencing his career. In the reign of Nerva, Pliny and Tacitus were appointed by the senate (A.D. 99) to conduct the prosecution of Marius Priscus, who had been proconsul of Africa, and was charged with various flagrant crimes. On this occasion Tacitus replied to Salvius Liberalis, who had spoken in defence of Priscus; his reply, says Pliny, was most eloquent, and marked by that dignity which characterized his style of speaking. (Pliny, *Ep.*, ii. 11.)

The contemporaries of Tacitus were Quintilian, the two Plinys, Julius Florus, Maternus, M. Aper, and Vipsanius Messala. He was on terms of the greatest intimacy with the younger Pliny, in whose extant collection of letters there are eleven epistles from Pliny to Tacitus.

In one of these letters (vi. 16) Pliny describes the circumstance of the death of his uncle, Pliny the Elder, and the letter was purposely written to supply Tacitus with facts for his historical works.

It is not known when Tacitus died, nor whether he left any children. The emperor Tacitus claimed the honour of being descended from him, but we have no means of judging of the accuracy of the emperor's pedigree; and Sidonius Apollinaris (*Ep.*, lib. iv., *ad Polemium*) mentions the historian Tacitus among the ancestors of Polemius, a praefect of Gaul in the fifth century of our æra.

The extant works of Tacitus are, 'The Life of Agricola,' 'The Treatise on the Germans,' 'Histories,' 'Annals,' and the 'Dialogue on Orators, or the causes of the decline of eloquence.' None of his orations are preserved.

The 'Life of Agricola' is one of the earliest works of Tacitus, and must have been written after the death of Domitian (A.D. 96). The Proemium, or Introduction to it, was written in the reign of Trajan, and the whole work probably belongs to the first or second year of that emperor's reign. As a specimen of biography it is much and justly admired. Like all the extant works of Tacitus, it is unencumbered with minute irrelevant matter: the life and portrait of Agricola are sketched in a bold and vigorous style, corresponding to the dignity of the subject. The biographer was the friend and son-in-law of Agricola, whom he loved and revered; but he impresses his reader with a profound conviction of the moral greatness of Agricola, his courage and his prudence, without ever becoming his panegyrist. The 'Life of Agricola' was not contained in the earliest editions of Tacitus.

The Histories, which were written before the 'Annals,' and after the death of Nerva, comprehended the period from the accession of Galba to the death of Domitian; to which it was the author's intention to add the reigns of Nerva and Trajan (*Hist.*, i. 1). There are only extant the first four books and a part of the fifth, and these comprehend little more than the events of one year, from which we may conclude that the whole work must have consisted of many books. Unfortunately the fifth book contains only the commencement of the siege of Jerusalem by Titus.

The 'Annals' comprehended the history of Rome from the death of Augustus to the death of Nero, a period of two and fifty years, which ended with the extinction of the Julian House in Nero. A part of the fifth book of the 'Annals' is lost; the seventh, eighth, ninth, tenth, the beginning of the eleventh, and the end of the sixteenth and last book are also lost. These lost portions comprehended the whole reign of Caligula, the first years of Claudius, and the two last years of Nero's reign. It is said that the preservation of the historical works of Tacitus is due to the emperor Tacitus (Vopiscus, *Tacitus*, 10), who caused them to be transcribed ten times every year, and copies to be placed in the libraries. But the works of Tacitus, and more particularly the 'Annals,' were neglected during the decline of the empire, and few copies of them were preserved. The first five books of the 'Annals' were not found till the beginning of the sixteenth century, when they were discovered in the abbey of Corvey, in Westphalia, and published at Rome, in 1515, by Philip Beroaldus.

The 'Germany' of Tacitus has been the subject of some discussion as to its historical value. The author does not inform us whence he drew his materials for the description of the usages of these barbarians, many of whom could only be known by hearsay even to the Roman traders and adventurers on the frontiers of the empire. The work contains numerous minute and precise details, for which it must be assumed that the writer had at least the evidence of persons conversant with the German tribes on the frontiers; and there is nothing in the description of Tacitus which is substantially at variance with what we know of the early Germans from other sources. The soundest conclusion is that the picture of the Germans is in the main correct; otherwise we must assume it to be either a mere fiction, or a rhetorical essay founded on a few generally known facts: but neither of these assumptions will satisfy a careful reader.

The Dialogue on the causes of the decline of eloquence may have been written in the reign of Vespasian: it is at least probable that it is an early work of Tacitus. It has been sometimes doubted if it is by Tacitus, but the style is in favour of the common opinion, though it presents in many respects a marked contrast to the 'Annals,' the work of his mature years. Messala, one of the speakers, attributes the decline of oratory to the neglect of the arduous method of study adopted by the older orators, who learned their art by attaching themselves to some eminent speaker, and by experience in the actual business of life: in Messala's time the school of the rhetorician was the only place of discipline for the young. But Maternus, another speaker, indicates more truly the causes of the decline of eloquence, by a reference to the political condition of the Romans and the suppression of their energies under the Empire, as compared with the turbulent activity of the republican period.

The 'Annals' of Tacitus are the work of his riper age, on which his historical reputation mainly rests. Though entitled Annals, and generally sufficiently true to the chronological order of events, the title of Annals conveys no exact notion of the character of this work. The writer moulded the matter of his history, and adapted it to his purpose, which was not a complete enumeration of the domestic and foreign events of the period, but a selection of such as portrayed in the liveliest colours the character of the Romans. The central figure in this picture is the Imperial power, and the person who wielded it, the Princeps, and every event is viewed in relation to him. The notion of the Romans of the age of Tacitus is inseparably associated with the notion of the government of one man. The power that had been founded and consolidated by Augustus, had been transmitted through many princes, few of whom had distinguished themselves by ability, and some had sullied the purple with the most abominable crimes. Yet the imperial power was never shaken after it was once firmly established, and the restoration of the old republic was never seriously contemplated by any sober thinker. The necessity of the imperial power was felt, and the historian, while he describes the vices and follies of those who had held it, and often casts a glance of regret towards the republican period, never betrays a suspicion that this power could be replaced by any other in the abject and fallen state of the Roman people. It is this conviction which gives to the historical writings of Tacitus that dramatic character which pervades the whole, and is seen in the selection of events and the mode in which they are presented to the reader. It is consistent with this, that the bare facts, as they may be extracted from his narrative, are true, and that the colouring with which he has heightened them may often be false. This colouring was his mode of viewing the progress of events, and the development of the imperial power: the effect however is, that the reader often overlooks the bare historical facts, and carries away only the general impression which the historian's animated drama presents.

Tacitus had formed a full, and, it may be, a correct conception of the condition of the empire in his own time, and the problem which he proposed to himself was not only to narrate the course of events from the close of the reign of Augustus, but to develop their causes. (*Hist.*, i., 4.) For his 'Annals' at least he could claim, as he does, the merit of strict impartiality: he lived after the events that he describes, and consequently had no wrongs to complain of, no passions or prejudices to mislead him. (*Annal.*, i. 1.) He observes also, in the commencement of his Histories (i. 1), that neither Galba, Otho, nor Vitellius had either conferred on him any favour or done him any injury. To Vespasian, Titus, and Domitian he acknowledges his obligations. The reign of Domitian is unfortunately lost; but we may collect from the expressions in the 'Life of Agricola' (43, 45, &c.), that the favours which Tacitus had received did not save this contemptible tyrant from the historian's just indignation.

The tone which characterizes the historical works of Tacitus is an elevation of thought which had its foundation in the moral dignity of the writer and the consciousness of having proposed to himself a noble object. He was a profound observer of character: it was his study to watch the slightest indications in human conduct, and by correctly interpreting these outwards signs, to penetrate into the hidden recesses of the heart. His power of reaching those thoughts which are often almost unconsciously the springs of a man's actions, has perhaps never been equalled by any historical writer. If any man has ever approached him in this power, it is Feuerbach, who ('Merkwürdige Criminal-Rechtsfälle,' that is, 'Remarkable Criminal Cases'), while laying bare the inmost soul of a murderer, makes us shudder at the contemplation of enormities of which every man is capable. Tacitus had lived through a time when the value of the lessons of philosophy had to be tested by their practical application, and his historical studies carried him through a period in which the mass were sunk in sensuality, and the really good and great had no consolation but in the consciousness of their own thoughts. Though he appears to belong to no sect of philosophers, his practical morality was of the Stoic school, the only school which in those degenerate times could sustain the sinking spirits of the Romans, and which even under favourable circumstances guided the conduct of the wise Aurelius, the noblest man that ever possessed sovereign power. The religious opinions of Tacitus partook of the character of his age: he had no strong convictions, no settled belief of a moral government of the world: his love of virtue and his abhorrence of vice were purely moral; they had no reference to a future existence. (*Ann.*, iii. 18; vi. 22.) In one of his earliest productions he hopes rather than expects that the souls of the departed may still live and be conscious of what is passing on earth. (*Agric.*, 46.) But in his latest writings there are no traces that his hopes or his wishes had ever ripened into a belief.

The style of Tacitus, especially in his 'Annals,' is the apt expression of his thought: concise, vigorous, and dramatic. He has perhaps attained as great a degree of condensation as is compatible with perspicuity; sometimes his meaning is obscured by his labour to be brief. His historical works are especially works of art, constructed on a fixed principle, and elaborated in obedience to it. He loves to display his rhetorical skill, but he subdues it to his dramatic purpose. It is a fault that his art is too apparent, that his thoughts are sometimes imperfectly or obscurely expressed, that he affects an air of mystery, that his reflections on events are often an inseparable part of them, and consequently the impressions which it is his object to produce can only be rectified by the rigorous scrutiny of a matured mind. Yet those who have made Tacitus a study generally end in admiring him even for some of those qualities which at first repelled: almost every word has its place and its meaning, and the contrast between the brevity of the expression and the fullness of the thought, as it marks the highest power of a writer, so it furnishes fit matter for reflection to those who have attained a like intellectual maturity.

Tacitus must have had abundant sources of information, though he indicates them only occasionally. He mentions several of those historians who lived near his own time, as Vipsanius Messala and Fabius Rusticus: he also speaks of the memoirs of Agrippina and others. The Orationes Principum, the Fasti, the Acts of the Senate, and the various legislative measures were also sources of which he availed himself. It has been already intimated that the minute detail of events was often foreign to the purpose of Tacitus, and accordingly he is sometimes satisfied with giving the general effect or meaning of a thing without aiming at perfect accuracy. Thus we cannot always collect with certainty from Tacitus the provisions of the Senatus-consulta of which he speaks; and for the purpose of any historical investigation of Roman legislation, his statements must sometimes be enlarged or corrected by reference to other sources, and particularly to the 'Digest.'

The first edition of Tacitus, which is extremely rare, was printed at Venice, in 1470, by Vindelin de Spira: this edition contains only the last six books of the 'Annals,' the 'Histories,' the 'Germany,' and the 'Dialogue.' The subsequent editions are very numerous. One of the best editions is that of Ernesti, by Oberlin, Leipzig, 1801, 2 vols. 8vo.: it contains the valuable notes and excursus of Lipsius, the best of all the commentators on Tacitus, and in his department one of the first of modern scholars. The last edition is by Immanuel Bekker, Leipzig, 1831, 2 vols. 8vo. There is a 'Lexicon Taciteum,' by Bötticher, Berlin, 1830. 8vo.

There are translations of Tacitus in Danish, Swedish, Dutch, German, French, Italian, Spanish, Portuguese, and English. The Italian translation of Davanzati is considered to be a model of condensed and vigorous translation. A French writer considers that his own language is perhaps best capable of representing the thoughts of the eloquent and ingenious historian, of emulating his precision, attaining his elegance, and aspiring to his energy (*Biog. Univ.*, art. 'Tacite'); an opinion which is perhaps not true. D'Alembert translated various passages from Tacitus. The English version of Murphy, which first appeared in 1793, is loose, diffuse, and feeble, and hardly expresses the meaning of the original: as a work of art, being a translation of a work which is above all other historical works characterized by its art, it is contemptible. Gordon's version, which appeared before that of Murphy, is a harsh and rugged version; but it is tolerably faithful to the meaning of the original, and was probably useful in helping Murphy to it.

For further information on the editions and translations of Tacitus, and on works in illustration of him, see Hain's *Repertorium;* and Schweigger's *Handbuch der Classischen Bibliographie.*

TACITUS, MARCUS CLAUDIUS, a Roman emperor, was the successor of Aurelian. After the interregnum of nearly seven months, which followed upon the death of that prince, the senate, by request of the army, met to elect an emperor. At the advanced age of seventy-five, Tacitus, then princeps senatus, was chosen unanimously, in spite of his unwillingness to accept a dignity too great for his declining years. The army confirmed the act of the senate, and the new emperor commenced his reign in September, B.C. 275, with the most favourable assurances from all classes of his subjects. Tacitus immediately instituted some salutary reforms relating to the coinage and other matters. He restrained the luxury of the times by sumptuary laws, and was himself an example of the greatest temperance, modesty of deportment, and single-minded magnanimity. He gave up his whole private fortune to the state, and introduced no change in his dress or way of life. He was of very studious habits, and gave orders that the works of the historian Tacitus, from whom he claimed descent, should be preserved with the greatest care in the public libraries, and copies of them made every year. He used his power with great forbearance, except perhaps in the punishment of those concerned in the murder of Aurelian, whom he is said to have put to death without discriminating their several degrees of guilt. The frontiers of the empire were at this time in a disturbed state, and Tacitus committed the chief command of the East to Probus, in whom he reposed entire confidence.

The Scythæ, or Goths, pretending that they had been summoned by Aurelian to aid him in his Persian war, made an irruption at this time from the Palus Mæotis into Pontus and Cappadocia.

Coin of Tacitus.

British Museum. Actual size. Copper. Weight, 54½ grains.

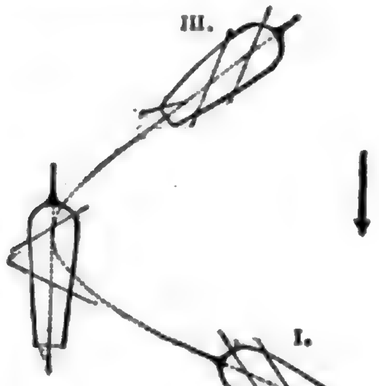
(The C after IMP denotes Cæsar.)

Tacitus proceeded thither in person with his brother Florianus, and having first tried conciliatory measures, compelled them to retire by force of arms. His reign, commenced with such fair prospects, was now prematurely and abruptly terminated. He had appointed Maximinus governor of Syria, who treated his subjects with such cruelty, that the magistrates of the towns in that province, aided by those yet surviving of the murderers of Aurelian, conspired against him and killed him. Despair of pardon led them to commit a greater crime, and they formed designs against the life of the emperor, who fell a victim to their treason at Tyana in Cappadocia, after a reign of about eight months, in the spring of the year 276. According to one report, he died of disease, harassed by seditions; but the statement of Zosimus and Zonaras, that he was murdered by the conspirators, seems entitled to greater credit. After his death, his brother Florianus seized the empire, but was put to death two or three months afterwards. Gibbon attributes to Tacitus many of the measures introduced at this time to revive the power of the senate. It is certain that he showed great deference to that body; and when they refused to make his brother Florianus consul because the time of election had expired, he expressed himself pleased with their frankness. The coins of Tacitus record his victory over the Scythians by the inscriptions

Victoria Gothi and Victoria Pontica; see also Gruter, excii. 5; and for his Life—Vopiscus, in the 'Historia Augusta;' Zosimus; Zonaras; Aurelius Victor, *De Vit. et Mor. Imperat. Roman.;* Tillemont, *Histoire des Empereurs*, iii.; Gibbon, ii.

TACKING is an operation with the rudder and sails, by which, when a ship is proceeding in a course making any acute angle with the direction of the wind on one of her bows, her head may be turned towards the wind so that she may sail on a course making nearly the same angle with its direction on the other bow.

In order to accomplish this motion, the sails being braced, as at I., so as to allow the ship to have as much velocity as possible in her actual direction, the helm is turned a-lee, as it is called, when the force of the water on the rudder, together with that of the wind on the mizen-sail, causes the ship gradually to turn her head towards the wind. By this motion the planes of the main and fore sails are brought in the direction of the wind, when they begin to shiver, and soon afterwards they are taken aback, or the wind presses them against their masts. In this state the mainsail is braced round to the opposite side of the ship, as at II., and the action of the wind on the foresail, while it arrests the forward motion of the ship, turns her head round from the direction of the wind so as to bring the latter upon the other bow: the foresail is then braced rapidly round on the other tack, that is, parallel to the new position of the mainsail, as at III., when it is immediately filled by the wind, and the ship proceeds in the new course; the action of the wind on the mizen sail, together with that of the water on the rudder, preventing her from falling too far from the direction which she is required to take.



TACQUET, ANDREW, a mathematician of some celebrity, who was born at Antwerp in 1611. He entered at an early age into the order of the Jesuits, and was one of the many members of that body who distinguished themselves by the works which they composed for the advancement of the sciences. He held the post of professor of mathematics during fifteen years, and died December 23, 1660.

Tacquet published at Antwerp, in 1651, a work in 4to., in four books, on the sections of cylinders and on the figures formed by the revolutions of segments of circles; and to these books he added a fifth in 1659. In the year 1655 he published, in 8vo., 'Elementa Geometriæ planæ ac solidæ, quibus accedunt ex Archimede theoremata;' and, in the same year, 'Arithmeticæ Theoria et Praxis accuratè demonstrata.' These two last works appear to have been for a long time in use in the schools of the Jesuits.

A collection of the principal works of Tacquet was published at Antwerp in 1669, in two folio volumes, under the title of 'Opera Mathematica demonstrata et propugnata à S. L. &c.' Among these works are Astronomiæ libri octo; Geometriæ Practicæ libri tres; Opticæ libri tres; Catoptricæ libri tres; Architecturæ Militaris liber unus; Cylindricorum et Annularium libri quinque; and Dissertatio de Circulorum Volutionibus.

In the treatise on astronomy, the author, in conformity to the system of Ptolemy, considers that the earth is immovable at the centre of the universe; but it is thought that he adopted this supposition less from a conviction of its truth than through deference to the authority of Riccioli, whose work he follows, and through an unwillingness to admit the hypothesis of Copernicus on account of its contradiction to the letter of certain passages in the Scriptures. In the work on cylinders, &c. he determines the superficies and volumes of bodies formed on cutting a cylinder by planes in different directions; and he investigates the surfaces and volumes formed by the revolutions of different segments of circles and of the conic sections about axes in given positions: the reasonings are conducted by geometrical processes agreeably to the methods then recently introduced by Cavalieri and Gregory of St. Vincent. In treating the theorems selected from Archimedes, Tacquet assumes, in order to diminish the length of the demonstrations, that regular polygons may be inscribed within and described about circles, till at length their areas and peripheries differ respectively from those of the circles by magnitudes less than the least that can be assigned: then, considering the polygons and circles as identical, he obtains the ratio of the peripheries of the circles and the equivalent for their areas: by assuming also that there may be described about a sphere a polyhedron whose surface shall differ from that of the sphere by a magnitude less than the least that can be assigned, he determines both the volume and the superficies of the latter. Archimedes had demonstrated that the volume and superficies of a sphere are to those of a circumscribing cylinder in the ratio of 2 to 3; and Tacquet, by such assumptions as those above mentioned, proved that the same ratio exists between the volumes and superficies of a cylinder and of an equilateral cone, when both are described about the sphere.

TACTICS (τακτικός) properly signifies the art of forming the troops of an army, or the ships of a fleet, in order of battle, and of making changes in the dispositions of either according as circumstances may require.

Under the word STRATEGY it has been shown that previously to the commencement of active warfare, it is necessary to occupy one fortified place or more near the frontiers of an enemy's country for the purpose of placing there in security the magazines of an army, and of receiving support in the event of being obliged to retire. And as an army in quarters now generally occupies a considerable extent of country, it would evidently be advantageous to have a fortified place on each of its flanks, in order to prevent the enemy from getting to the rear without making a circuitous march of such extent that ample time would be allowed for counteracting the project. The fortresses occupied by an army constitute the *base*, and the roads by which it is to advance to the immediate seat of war are called *lines of operation*.

In Europe, an army while in the field can draw much of its support from the country in which it is acting, and therefore it does not always wholly depend upon its magazines for the means of subsistence; yet even in this part of the world the supplies of provision and forage which can be obtained in an enemy's country are often precarious, and an army without a regular communication with its depôts is in danger of being reduced to the necessity of surrendering in order to avoid being starved. Such a disaster is still more likely to overtake an army engaged with the people of the East, if unprovided with the means of support in itself, since there the military force of the country consists chiefly of swarms of light cavalry, who, avoiding regular engagements, hang continually upon the invaders, both preventing supplies from arriving, and cutting off all parties who may be beyond the protection of the main body.

A single line of operations is considered unfavourable, unless it be at all seasons secure against the enterprises of the enemy, since the latter, if he be in the vicinity, may attack the columns on their march or may intercept the convoys on the road. A like objection applies to lines of route at considerable distances from each other, since the troops moving on them may not be able to support each other in the event of those on any one road being attacked. Lines of operation proceeding from points near the centre of a base line, and lying between others which may be in the possession of the enemy, are called interior lines; and these are always favourable both for the troops during their marches and the security of the convoys. Roads proceeding from the extremities of a base are called exterior lines; and troops moving on such roads, particularly if the enemy occupy any part of the ground between them, are more liable to be attacked than those whose routes lie on interior lines. Diverging, or, as they are called, eccentric lines, proceeding from any one point or more in a base may be considered as advantageous for offensive operations, since by them bodies of troops may be rapidly moved up at once to different points in an enemy's line; and if compelled to retreat from such points, they will gradually approach towards each other: they will thus be enabled to unite at some point in the rear, and afford each other mutual support. It should be observed however that such lines ought not to have a great degree of divergence, especially when there are few or no cross roads of communication, since then the columns in their advance may become so far separated as to be in danger of being cut off in detail; and the like objection is applicable to diverging, or eccentric, lines of retreat.

During the campaign in Russia, in 1812, the armies of Barclay de Tolli and of Prince Bagration retired from Smolensko, one by the St. Petersburg road and the other by that of Moscow: they became thus separated so far as to be unable to support each other, and had the French emperor been aware of the circumstance, it is probable that both of them would have been annihilated. Fortunately for Russia, Barclay succeeded, by a long and hazardous march through cross roads, in rejoining his colleague. On the other hand, it must be observed that concentric, or converging, lines of operation in rear of an army are sometimes unfavourable for a retreat: the Prussians, after the battle of Jena, suffered a severe augmentation of their disasters by the two divisions of the army, which had been unconnected during the action, becoming intermingled in their retreat, so that a state of inextricable confusion ensued.

In the campaign of 1809, the British and Spanish armies were compelled to act on what are called double eccentric lines of operations: for Lord Wellington was on the line of the Tagus, having Lisbon for a base, while Venegas with a Spanish army was employed in La Mancha; and there were besides the forces in Gallicia and Leon. The armies, being thus separated from each other, were quite unable to co-operate for one object, even had the Spanish generals and armies been capable of executing any combined operations.

The manner of reconnoitring ground, of selecting positions, and of performing the details of military manœuvres, have been described under RECONNOISSANCE, MILITARY POSITIONS, and EVOLUTIONS MILITARY; and, in the present article, it is intended only to explain the principles of tactics with relation to the marches of armies, the general movements on a field of battle, and the conduct of a retreat.

Marches comprehend all the movements by which an army transports itself from one place to another: when they are made at the opening of a campaign, and at a considerable distance from the enemy, they are called *routes;* and on such an occasion the object generally is to invade a country, to seek subsistence, to surprise the enemy or force him to make countermovements, in executing which he may be advantageously attacked. During a campaign, and in the enemy's sight, marches are made in order to attack some important position which he may occupy, or succour some post which he may threaten, or in order to fall back on the magazines of the army. At the end of a campaign an army marches to the quarters which it is to take up for the winter.

When an army already encamped in order of battle is to advance towards the ground directly before it, the march is said to be to the front; and if it is to proceed to ground on the right or left of the line, the movement is called a flank march. In the former case it would be advantageous if there were several roads nearly parallel to one another, and all tending to the position which is to be occupied; and it would even be proper, should there not already exist a sufficient number, to make such, by cutting through woods or walls, forming causeways over marshes, or bridges over streams. The army might then be divided into several short columns, so as to be able with facility, if suddenly attacked, to deploy into line at any moment either during the march or on arriving in the new position: the intervals between the lines of route should therefore be, as nearly as possible, equal to the extent which the columns moving in those lines would occupy when formed in order of battle. The advanced guard, consisting both of infantry and cavalry, may march before the head of the centre column at the distance of about a mile; and these troops should be accompanied by the pontoons, and the sappers who are to remove the obstacles, or form the bridges. When the French army advanced into Russia, in 1812, it marched in three great columns nearly abreast of each other: the centre column proceeded along the main road; and the country being one vast plain, the others with their artillery moved over the ground on both sides.

On a flank march along nearly parallel roads, since the heads and rears of the columns are where the extremities of the wings of the army would be if in order of battle, the several lines of route should be as near together as possible, that the troops may readily move into their proper places in re-forming the line; and it is obvious that, in such marches, the divisions in each column should be well closed together; for should they become separated by rivers, marshes, or any other obstacles, the enemy might seize the opportunity to attack a division before it could be supported by the others.

The difficulty of returning rapidly to the order of battle when attacked, is the reason that flank marches in the presence of an enemy are dangerous, particularly when the ground offers no impediment to his approach: they however become necessary when a position is to be taken up on either extremity of an enemy's line; and in order that they may be executed with safety, the columns should be protected in flank by a corps appointed for the purpose. In general an effort is made, by false demonstrations, to deceive the enemy, for a time at least, respecting such movements: these consist in opening roads in different directions through woods or enclosures, in laying bridges over streams, in sending provisions and stores, and even bodies of troops, to various points; and, while the enemy is in a state of uncertainty concerning the object of the demonstrations, the columns secretly commence their march: care however is to be taken that detachments, when sent out as feints, do not proceed so far from the army as to be cut off, or compelled to retire with great loss.

In the usual order of march the artillery should be formed in divisions corresponding to those of the troops, in order that each column may have a portion attached to it, and ready to act with it in the event of being obliged suddenly to come to action independently of the rest of the army. A few pieces of artillery generally accompany the advanced-guard in order to protect the deployment and commence the action; and a division composed of the heaviest pieces may move with the cavalry for its support. During the march, the place of the artillery is in rear of the column to which it belongs, that it may not impede the movement of the troops; that of the reserve artillery being behind the centre column, in order that it may readily move up to the position in which it is to be employed. If some point of attack has been previously decided on—if, for example, it is intended to commence an engagement by assailing a village or an intrenchment—a considerable division of the artillery must accompany the columns destined for that purpose; and if the army while making a flank-march is likely to be attacked on the road, some artillery proceeds at the head of each division of the troops. Should an attack in such circumstances take place, the troops must form as quickly as possible, and the artillery must be placed where it may serve to repel the assailants by its fire.

If an extensive movement is to be made in order to arrive at the position of the enemy, it is necessary to be careful that the latter may not, by short routes, attack the army on the march. This manœuvre was successfully performed by the Prussians at Liegnitz in 1760: the king, being surrounded by the Austrians and Russians, and in danger of being overwhelmed, on learning that the corps of General Loudon was moving to turn his left and fall on his rear, while other troops were to attack him in front, suddenly decamped, leaving troops and artillery to occupy the attention of Marshal Daun in front, and defeated Loudon on his march: by this action he opened a communication with Breslau, and caused the siege of Schweidnitz to be raised.

In all marches the breadth of a column must depend upon that of the road, and space should be afforded for the officers and orderlies to pass by the side of the troops without inconvenience: care should be taken, when any change is made in the breadth of a column previously to entering a defile, that the formations be made without allowing the troops to fall into confusion.

To force a defile which is occupied by an enemy possessing artillery, and covered by epaulemens, is an undertaking which is likely to be attended with some loss: but if it is necessary to attempt it, the troops which guard its entrance should be dispersed by a fire of artillery; and then the infantry of the army may enter the defile protected by light troops and artillery placed on the slopes or summits of the heights, in situations where their fire may act with effect against the enemy's position, or against the posts which he may occupy. These detachments must be followed by reserve troops, by whom they may be strengthened, or on whom they may retire if repelled. The enemy is thus, if possible, to be driven from every post by which the defile, with its parallel or transverse passes, if such there be, is flanked; when the main body of the army may dispose itself in the position which shall appear most favourable for maintaining possession of the ground while the enemy remains in the neighbourhood: strong detachments must also be placed in situations which may command every approach to the flanks of the defile.

The operations to be performed at the commencement of an offensive war will depend in part on the form of the frontier: if this be convex towards the enemy, it may be considered as favourable for the operations, since the invading army setting out from its quarters, which may be supposed to be at the centre of the curve, may then march on roads nearly in the direction of the radii towards the points of attack, while the enemy will be compelled to act on the periphery of the curve by long lines of communication, and consequently his troops will be obliged to make fatiguing movements in order to arrive at the points which are to be defended. In the event of having penetrated into the enemy's country, some strong posts should be secured, in order that they may serve to protect the succeeding operations. Fortified places are usually on rivers, or in situations from whence cross-roads diverge into the country; and the possession of even one such place would be advantageous, as a depôt for artillery and stores, while the rivers or roads would facilitate the conveyance of supplies to the army.

On the other hand, in order to defend or cover a country, an army should be posted so that by short movements it may reach the enemy; and it must be understood that, in acting on the defensive, the corps of troops should not be stationed at great distances from each other, in the expectation of being able to defend every point which may be menaced by the enemy. This error was committed at the opening of the campaign in 1809, on the advance of the Austrians in great force towards the frontiers of France; when General Berthier so separated the divisions of the French army, that all of them might have been separately defeated, had the movements of the Archduke Charles been more rapid than they were.

When two armies are in the neighbourhood of each other, an engagement, either general or partial, may take place: the latter usually consists in an attack on one wing, or on some advanced part of the enemy's line, in order, by driving it back, to obtain a more advantageous position, or to secure some line of communication. A general action may become necessary when an invasion of a country is to be prevented, when a besieged fortress is to be relieved, when the position occupied is to be defended, or when that which is occupied by the enemy so far obstructs the communications as to deprive the army of the means of subsistence. A battle may also be hazarded if the position of the enemy be disadvantageous, if the divisions of his army are ill supported, or if his force is weakened, either from some part being badly covered, or from considerable detachments having been made.

An army drawn up for parade is usually disposed in two lines, with the infantry in the centre of each, and the cavalry on the wings; but this is far from being the case on service, since the nature of the ground will frequently render a contrary disposition necessary: in some parts of the field the troops may be in a single line, in other parts in two, or even in three lines.

The order of battle immediately previous to an engagement depends so much on the facility which the ground may afford for disposing and moving the troops, that it is scarcely possible to assign any rule for the formation; yet it is usual among military writers to class all the different dispositions of an army under two kinds, which are designated the *parallel* and the *oblique* order. The first comprehends all dispositions in which the troops of both armies may be engaged at once along the whole of their fronts: it was very generally employed by the Greeks and Romans, and during the middle ages: but it is now seldom adopted, since the weaker army is in danger of being outflanked; and should any part of it be driven back, the rest of the troops would either be turned and thus cut off, or be also compelled to retire. The battle would therefore be lost; and, being closely pursued, the defeated army incurs the risk of being entirely ruined. At the battle of Talavera, July, 1809, the two armies were drawn up in parallel order, and the attack was made by the French at the same time on the centre and on both wings of the allies.

The oblique order of battle may be said to have been employed by the antients when it was intended to break the enemy's line: on such occasions the phalanx was drawn up in the form of a wedge, and it advanced with an angle in front against the centre of the line. At the battle of Arbela, the army of Alexander attacked only the right wing of the Persians; and at the battle of Cynoscephalæ, the consul Flaminius, ordering one of his wings to remain on the ground which it then occupied, advanced with the other against the army of Philip. (Polyb., ex. 3, lib. 17.) But this order of battle was first employed on sound military principles by Frederick III. of Prussia.

It does not always consist in drawing up an army in a straight line, which, if produced, would meet the line of the enemy; for this, on account of the inequalities and accidents of the ground, is seldom possible: nor are the two wings of an army always placed at unequal distances from those of the enemy, though this is frequently the case. The principle of the oblique order consists in such a disposition of the troops as may enable a portion of the army to engage at some one point in the enemy's line, while the rest, protected by the obstacles of the ground, is stationed so as to be able to support the troops engaged, or prevent the enemy at other points of his line from attacking those troops in flank; and a great commander will always manœuvre so that his army, even though inferior on the whole to that of the enemy, may be superior in strength at the point of attack.

The attack is generally directed against one of the enemy's wings in the hope of being able to turn it, that is, to get beyond its extremity, or in its rear, and thus to cut off its retreat or intercept its supplies; but if the wings are well protected by the ground, or by intrenchments, or by strong reserves being posted there, and if at the same time the centre has been weakened by troops having been drawn away, or by those which form it being widely disseminated, the attack may be advantageously made against that part of the line. At the battle of Corunna, January, 1808, the British and French armies were in oblique order, the right of the former being near the left of the latter; while the opposite extremities were, by the nature of the ground, kept at a considerable distance from each other. The French made a charge with two strong columns, one of which advanced towards the British centre, and the other attempted to turn its right: in order to take this last column in flank, a part of the British army was placed obliquely to the line; and its fire, together with that of the reserve, which was moved up to the support of the right wing, prevented the success of the manœuvre. At the battle of Eckmühl (1809), Napoleon with his right wing attacked and defeated the left of the Austrians: by this success he cut them off from Vienna, and compelled them to retire towards Bohemia. Again, at the battle of Borodino, in 1812, the French attacked the Russian army at its centre and on its right wing, and succeeded in gaining the heights in that part of the position, after having suffered immense loss in storming a redoubt which protected them, and which was gallantly defended by the élite of the Russian infantry.

Whatever be the order of battle, a strong reserve of troops is necessary in order that any part of the army may be succoured by it when weakened by losses, or when in danger of being overpowered by numbers. At the battle of Albuera, the timely bringing up of the reserve, when the first line was destroyed, was the means of the victory being gained; and at the battle near Bayonne, December, 1813, two British regiments having been improperly withdrawn from an important position, that position was in danger of being lost, when General Hill brought up the reserve and maintained the action. Strong reserves are particularly necessary when armies engage on a plain, as then the whole of a line may be forced into action, and in the event of being defeated, its ruin would be inevitable without the support of a numerous body of troops.

When cavalry commence an action, its charge should be preceded by a fire of horse-artillery placed on one of its wings. The fire of that artillery should at first be directed against some part of the enemy's line which is at a distance from the point to be attacked; and if the latter point should be weakened by troops being withdrawn from it to strengthen that point against which the fire is directed, the artillery and cavalry immediately move rapidly forward: the former, having discharged some rounds of grape-shot, retires, and the cavalry is left to execute its charge. Should the artillery become mixed with the combatants, it would be in danger of being taken by the enemy, whereas, being kept in reserve, it may after the charge either join in the pursuit or protect the retreat.

Infantry generally commences an attack by a fire of light troops; and these are accompanied by a part of the artillery, which joins in the firing, the rest remaining in reserve. If the skirmishers retire in order to allow the first line of the army to engage the enemy, the reserve artillery is brought up with that line, and it disposes itself by the side of that which had previously been in action, or it goes to one of the wings. Should the enemy's line become disordered, the horse-artillery gallops up to within range of grape-shot, and completes the victory.

The stations of artillery in position should if possible be such that the fire of the guns may converge towards some battery of the enemy, in which case the fire of such battery against those guns is necessarily divergent. In general when an army acts on the offensive, the lines of fire from batteries in position should form nearly right angles with the front of the position, in order that the attacking columns may have room to form in the intervals between those lines of fire: but if the enemy be the assailant, the lines of fire may form acute angles with the position, in order that he may be thereby annoyed when nearly in contact with the troops; the fire of the artillery being directed against the points where the enemy's troops are in masses, as against the heads and flanks of the columns of attack. The guns should not however be placed in position til. they are wanted, in order that they may be as little as possible exposed to the fire of the enemy; and if any battery is subject to a heavy cannonade, another should be immediately placed in a situation where its fire may cross that of the first battery on the ground occupied by the enemy's guns. When placed on elevated ground, the guns in a battery should be able to defend all the slope of the height up to them; and when that is not possible without bringing them so near the brow as to be exposed to the view of the enemy, other guns should be placed where their fire may flank the ascending ground.

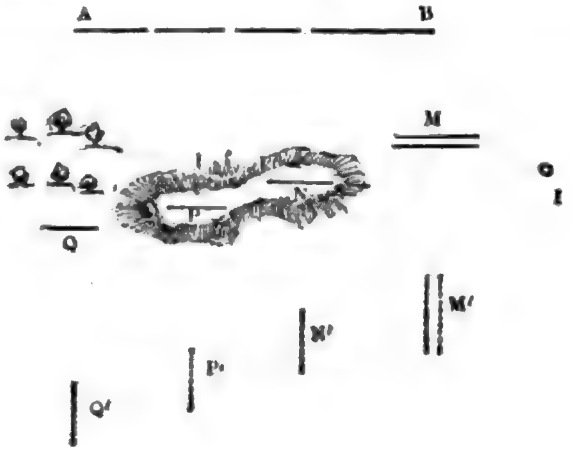
Artillery consisting of 9-pounder guns are found most convenient for the batteries which are placed with the troops: such guns are capable of serving to defend the position, and they may be employed to destroy walls, displace abatis, or ruin field intrenchments. Howitzers are also used in the field for the purpose of throwing shells into redoubts or villages, or among troops protected by hedges, hollow ways, &c., where the shot from gun-batteries could not take effect. Horse-artillery should be kept with the reserve, and be ready to advance wherever it may be required, either to support a part of the line which is likely to be forced, or to gain the flanks or rear of the enemy; and when it is required to get possession of a position before the enemy can arrive at it, the horse-artillery, on account of the rapidity of its motion, may be employed for the purpose.

The batteries by which an army is protected in its position constitute a sort of bastions, being usually placed a little in advance of the infantry of the line. If the army receives the attack of the enemy, the artillery commences the action by a cannonade while the enemy is at a distance; and if the army acts on the offensive, the artillery supports the columns of attack. It is usual, when guns are fired in position, to direct them so that the shot may strike the ground in front of the enemy's line, and afterwards by rebounding make a series of grazes among his troops. When the ground is hard and even, these ricochets are very destructive; but if soft, or much broken by inequalities, the shot plunges in the ground and does comparatively but little execution.

The best proportions for the quantity of artillery in an army is one gun for every 500 men (infantry), and one gun of the horse-artillery for every 250 men (cavalry).

Armies, whether on the offensive or defensive, are generally kept in columns till the proper moment for deploying has arrived; for by this disposition both parties are enabled to conceal their projects from each other till one of them has determined to commence the action, and each is in a condition to make such movements as may be necessary in order to give him an advantage over his opponent. The Spanish General Cuesta was blamed for having, at the battle of Medellin (1809), in which he was defeated, advanced towards the French army in one weak line three miles long; when by keeping the troops in columns he might have moved them between the enemy's divisions, and thus, by separating them from each other, have destroyed them in detail. If a position is such that the army occupying it is exposed at several points to be attacked, those points should be occupied by small bodies of troops, the bulk of the army being kept behind in columns ready to march to any point where their services may be required. Thus the enemy will be embarrassed from the impossibility of determining the force of the army at any one point; and his only chance of success will lie in the quickness of his movements. The circumstances which may determine a general to attack a position at any particular point, are the appearance of that point being weak on account of troops or artillery being withdrawn; from the ground being there more easy of access than elsewhere, or from its capabilities of affording cover to troops in their advance.

If an army, as AB, in position on level ground, is to be attacked on its left wing B, the army acting against it is usually placed en échelon, as at M, N, P, Q, each division consisting of a battalion or a brigade; and this formation may be accomplished by moving up the different columns as at M′, N′, P′, Q′, to the places which, when deployed, they are to occupy during the engagement. It would be advantageous however that the heads of the columns should remain till the moment of deployment in a line parallel to that of the enemy, in order to keep the latter as long as possible in suspense respecting the real point of attack. A favourable moment is then chosen for bringing the greatest mass, as M′, to the wing at B, which is supposed to be the weakest part of the line, but it should be observed that this intention will succeed only when the different columns can be moved to their stations with great rapidity; for if the enemy has time to perceive the manœuvre, he will not fail to take measures to counteract it. The échelons must always be so near one another as to allow them to be mutually supported, yet not so near to the enemy as to be in danger of being forced into action. In order to explain the process of turning an enemy's position, let it be supposed that the left wing B of his line is in a plain, and not well protected by works and consequently that it may be turned, while the right wing A is covered by woods. Strong columns are formed

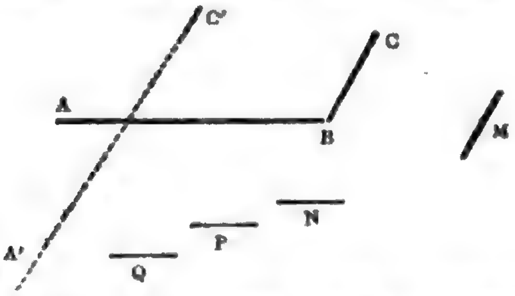


at M in order to perform the manœuvre of turning the flank B. The divisions at N and P constitute the centre, and may be supposed to be on elevated ground so as to be refused to the enemy; while Q may consist of a small division extended along the skirts of the wood merely to keep the enemy in check.

Should the enemy reinforce his left B, by drawing troops from his right A; and should this circumstance become known after the troops M have set out on their march towards B, the infantry of the column M may then change their route and proceed towards N and P, concealing their strength as much as possible by passing through woods and hollow ways, if such there be, while the cavalry, supported by some infantry in a village, as at I, move towards M as before, in order to deceive the enemy. The central columns P and N then move towards their left, and unite with the troops Q to attack the wing A. Thus the disposition of the army is completely changed; and if the change is effected with rapidity, the enemy might not have time to reinforce the wing A before it would be turned. If the troops in the wing B were to advance to attack the central columns at P and N, and these were to retire, those troops would be unable to produce any effect, as it would be necessary to recall them in a short time on account of the danger then threatening the right wing.

This is nearly what took place at the battle of Leuthen (1757), when the king of Prussia advancing against the Austrian army, made demonstrations as if he would attack their right wing. Marshal Daun, though for a time he suspected the feint, was at length deceived and sent all his reserves to strengthen that wing: the king observing this, proceeded immediately to execute an oblique attack; for which purpose his columns moved rapidly to the right and deployed on the left wing of the Austrians: this wing gave way, and the right wing wheeling up to attack the Prussians' left, the two armies were brought into parallel positions. These movements produced in the Austrian line disorder and openings by which the Prussian cavalry penetrated and took possession of the village of Leuthen: the Austrians rallied twice afterwards, but they were finally obliged to retreat. At the battle of Albuera (1811) the French general at first moved his columns as if he intended to attack the left of the allies, but soon causing them to change the direction of their march, he rapidly placed nearly two-thirds of his army in order of battle perpendicular to the right of the British line. By this movement the allies were obliged to change their front, and, as this was done under a heavy fire, the enemy was upon them before they had time to complete the new formation.

When an army, in the position AB, is attacked on one wing as B, by the corps M, and is in danger of being turned, it may endeavour to prevent the success of the manœuvre by throwing back that wing in a direction BC, parallel to that of the attacking corps M: this is called forming the army *en potence:* the angle B is however weak, for the troops in BC by falling back may become crowded and disordered; AB may become exposed to a raking fire from M, and BC to a like fire from troops at N. It is evident however that M cannot now turn the flank BC without making a circuitous movement, by which it may become separated from the rest of its line: and if the army AB is strong enough, it may form a line parallel to the direction of CB. By such a movement the parallel order would be restored, and the wing A might even be made to turn the left, Q, of its opponent: this should of course be attempted, as the return to a parallel order of battle leads to no useful result. In order to effect it, the division BC should retire gradually, while the brigades in AB wheel back, in order to keep in connection with it; at the same time the brigades at A wheel to their front so as to form the new line A′C′, in a direction oblique to that of Q, P, N.



An attack on an enemy's line is often made by a strong division drawn up in one column for the purpose of forcing its way through the line at some point where it appears to be weak, and thus compelling the different corps to retire that they may not be separately overwhelmed. This is the mode of attack which was practised with so much success by Napoleon against the Continental armies, but which failed when attempted against the British troops both in Spain and at Waterloo.

It is adopted when an attack is to be made on an enemy behind retrenchments, in which case the troops move as much as possible towards the salient angles of the work in order to avoid the direct fire; it is also necessary when the ground only permits the troops to advance on a narrow front, as in defiling through a ravine: in fact, if an enemy's position have obstructions in its front, it must necessarily be attacked in columns if at all. The columns should be connected with each other by bodies of light troops, and the attack should be made with a view of separating a wing of the enemy from his main body.

The attack in column possesses some advantages over one made by troops deployed in line while the men remain steady in the column; for the enemy is intimidated by the sight of a vast body coming against him, while the assailants feel confidence from their union. A rapid succession of efforts directed against troops in a slender line will also, in general, succeed in breaking their order; but there are several circumstances which more than counterbalance these advantages: during the advance over uneven ground the men lose their ranks and fall into confusion; the flanking fire of the enemy's artillery makes great havoc among the crowded masses, and the columns can only oppose this fire by an irregular fire from its sides; disorder then ensues, the commands of the officers are no longer regarded, and an attempt to deploy for the purpose of making an attack in line only completes the disorganization. An attack in column can, indeed, scarcely succeed unless it were preceded by a heavy fire of artillery: this will put the enemy's line in disorder; and in the event of forcing it, the column may then be deployed in order to secure its advantages.

If a line, nearly equal in strength to that of the opponent, on being attacked in column, were to stand firmly, it is probable that the attack would fail; and even if the line were penetrated, the troops, by forming themselves in hollow squares, disposed chequer-wise, so that their fires may cross on the ground in their front, have invariably been found capable of resisting the efforts of the assailants. This last manœuvre was recommended by General Jomini, and was for the first time employed at the battle of Aspern, in 1809. In that action Napoleon perceiving the Austrian line to be weakened in the centre, ordered it to be attacked by the whole corps of Marshal Lannes, which for this purpose was drawn up in one great column. The column, preceded by artillery, advanced rapidly, and succeeded in penetrating the line. The troops in that part gave ground, but forming themselves in squares, they resisted all the efforts of the French cavalry to disperse them, while the wings of the army closing upon the flanks of the column poured into it a destructive fire of artillery, which at length forced it to retire in confusion between the two fortified villages which supported its wings. The attack of the French at the battle of Wagram had however complete success: the Austrians, being doubtful of the precise spot at which Napoleon would cross the Danube, had very widely dispersed their troops; the centre of their line was particularly weak, and against this part the French emperor determined to direct a dense column: this was composed of the reserve of the army, and the charge was preceded by a heavy cannonade which still further dispersed the Austrian troops. The army, being thus broken, was compelled to retreat. At the battle of Talavera (1809) the French in strong columns attacked at the same time the centre and both wings of the British line: the latter was drawn up three deep, and its fire of musketry and artillery directed against the heads and flanks of the columns, aided by charges of cavalry, drove the enemy back with great slaughter. an indiscreet pursuit made by the Guards was the cause of much disorder in the centre, and the enemy returning to the charge, that part of the line was completely broken; but fresh troops being ordered up to the spot, their fire kept the enemy in check till the disordered troops rallied, and the artillery continuing to play on the flanks of the enemy's columns, the latter at length gave way.

The success of an action is often promoted by sending out a detachment with directions to fall on the flanks or rear of the enemy during the engagement: the sudden appearance of a body of troops in such a situation cannot fail to produce embarrassment in the army which is attacked, and to diminish the energy of its operations towards the front. On the other hand there is some danger in sending out large detachments from an army, as it is seldom possible to afford them due support; and therefore they may be cut off by the enemy. The distance which the detachment has to march, together with the state of the roads on which it must move, should be ascertained with precision, in order that it may be at the appointed post at a seasonable moment, and such determinations are very uncertain, particularly if the corps has to make a great circuit. It almost always happens that the detachment arrives too late for the accomplishment of the object; and this was the case with a detachment sent by the king of Prussia during the action at Torgau (1760), with a view of turning the left of the Austrians and cutting off their retreat.

Detachments are however constantly sent out to protect the parties reconnoitring a country, to guard a convoy, or to support a foraging party: in these cases its object is less to fight than to cover a retreat; therefore the troops advance with circumspection, and retire when the enemy appears in superior force. During the war in Spain (1813), Colonel (Sir Frederick) Adam having been detached to occupy a post at Ordal, ten miles in advance of the army under Lord William Bentinck, in Catalonia, was suddenly attacked by the French army, and his troops dispersed: this misfortune is ascribed to neglect in not having placed outposts, by which warning might be obtained of the enemy's approach.

An army which gains an advantage over its adversary is always more or less deranged by the action, and it is necessary that it should endeavour to recover its order preparatory to receiving the second line of the enemy, should the latter advance to renew the combat. On the enemy retiring, the first line of the victorious army advances, and then the second line follows it in order to support it, sending, if necessary, battalions or squadrons to replace such as have been much disordered during the action. In the event of the second line, or reserve, of the enemy being defeated, since then there is no apprehension that the action will be continued, companies of troops may be detached in pursuit of the retreating army; but every precaution should be taken to keep them within the support of the main body, and particularly to prevent the troops from dispersing for the purpose of plundering the country. The advance of the whole army in pursuit should continue so long only as it can be conducted with order, and in masses strong enough to oppose the enemy if his troops should rally in a good position. If disorder should take place among the pursuers, the latter should be made to fall back on the reserves: the pursuit of a retreating army can, indeed, be seldom continued beyond the first elevated ground at which the latter may arrive; since, however little discipline it may preserve, it may there rally and return to the order of battle. The consequences of the actions at Jena and Waterloo are exceptions to this rule, because the vanquished armies were at those places too completely disorganized to allow them to make any attempt to rally.

When the success of an action begins to be doubtful, and it is apprehended that the army must retreat, some of the heaviest artillery should be drawn off to a good position on heights, or behind streams or hollow ways, while the lighter artillery remains engaged: the first line of the defeated troops is then made to pass through the intervals of the second, or of the reserve, while the latter continues the action. The first line should remain in order of battle in rear of the second, till the latter is enabled to retire; and this alternate retreat of the lines should be continued till the army can be thrown into columns of march, when the retreat may be protected by detachments of light troops. In general the retreat should be made in one body, as thus it can more easily protect itself against the enemy in pursuit: if however the centre is broken, the army may be obliged to retire by different and even by diverging routes; and provided there are in the rear strong posts by which it may be protected, the risk of being cut off during such a retreat is small.

When there are narrow defiles in rear of the field of battle, the retreat through them becomes extremely dangerous, for the army may be overtaken before it can get through; and if they are already occupied by the enemy's detachments, the retiring army may be annihilated or compelled to surrender. It has been observed that the situation of the British army at Waterloo would have been very critical if it had been compelled to retreat; for in its rear there was only one road by which it could have retired. In order to pass a defile in safety, it ought to be previously occupied by troops: artillery and a reserve corps should also be stationed so as to defend the approaches on the advance of the enemy towards them.

If, when not in action, an army is to retreat from a position which it occupies, the movement is usually concealed from the knowledge of the enemy, and, for this purpose, it frequently takes place at night. On such occasions the outposts remain at their stations as long as possible; and fires are left burning on the ground, as if the army were still in the position: after it is dark the main body moves off, and the rest of the troops follow by degrees.

The approach of winter, and the necessity of taking repose after the fatigues of a campaign, render it necessary for armies, whether on the defensive or otherwise, to take up positions where they may remain during the season of inaction. These positions, called winter-quarters, should be chosen by the commander of the army on the offensive, so that he may be able to preserve the ground which he has gained; and by him who is on the defensive, so as to be secure against the attacks of the enemy. The principles by which a choice of quarters is determined are the same as those which regulate the occupation of ground for a field of battle. The quarters should be covered in front and on the flanks by rivers or other natural impediments to the approach of an enemy, or by forts constructed for defence.

A great extent of ground in front is therefore a disadvantage, as some part may be ill-guarded, and liable to be surprised, and the troops will be too much disseminated. If it is traversed by great roads perpendicular to its front, it is also disadvantageous, as the enemy may then easily march into the quarters.

Several battalions of infantry and squadrons of cavalry are quartered in villages along the front of the position; the whole or a division of a company or of a squadron at each place: these posts may be strengthened by redoubts palisades, or abatis; retrenchments also should be executed, to defend roads by which the enemy may approach, and bridges over the streams should be destroyed. The troops in each of these stations furnish the men necessary to constitute the advanced posts of the chain. A stronger force should occupy villages and towns within the first chain, and from these are sent such bodies of troops as may be requisite to support those in their front. The great body of the troops ought to be near a central point of the position, in order that succours sent from that body may easily reach any part that may be threatened.

When an army is in quarters, there are established alarm-posts, at which the troops should be appointed to assemble. These are frequently in the vicinity of a fortress, that the corps may be protected by the latter till all have assembled; but they should be in commanding situations, that, in the event of the enemy attempting a surprise, his movements may be easily seen. Each division, or corps of the army, should have its own alarm-posts, and there should be, besides, the general place of rendezvous for the whole army: the latter place should be so situated that all the divisions may be drawn up there before the enemy could arrive at it, and it should be protected by a fortress which may contain the provisions for the support of the troops.

A system of signals, for day or night, is determined on, by which intelligence may be conveyed to all the different posts, of the approach of the enemy. Should an alarm be given by any outpost of the chain, the bodies of troops which are appointed to support that post take arms, attach the horses to the artillery, and prepare to march immediately to the point of danger; but the judgment of

the commander, and the information which he may receive from spies or deserters, must enable him to form an opinion whether a demonstration made by the enemy is true or false.

(Bulow, *Esprit du Systeme de Guerre Moderne*, 1801; Guibert, *Œuvres Militaires*, 1803; Jomini, *Traité des Grandes Operations Militaires*, 1811, with the continuation; Rogniat, *Considérations sur l'Art de la Guerre*, 1817; Lallemand, *Traité des Operations Secondaires de la Guerre*, 1825.)

TACTICS, NAVAL. This branch of the art of war is in some respects similar to that by which the operations of armies on land are regulated: the 'orders' preserved by ships in sailing correspond to those of a land march on a plain, and the orders of attack in both services may alike be divided into *parallel* and *oblique*.

The antients, previously to the commencement of a naval action, drew up the ships in each fleet abreast of each other, and in that order one of the fleets moved on, or waited for the attack: for each ship being propelled by oars, and armed with a beak of iron or brass projecting before the bows, efforts were generally made to direct it so as by an oblique impulse to destroy the oars on one side of a ship of the enemy, and thus render it unmanageable, or so as with the beak to pierce a side, and thus sink the ship; and hence, in the antient manœuvres, each commander always endeavoured to keep the prow of his ship presented to the ship which was opposed to him. But since the employment of gunpowder in naval warfare, each ship in two hostile fleets is manœuvred so as to bring one of its sides to bear against the bows or against a side of its opponent, in order that it may have the power of pouring into the latter the greatest quantity of fire; and since it is the object of both commanders to avoid being raked, a general action can take place only when the hostile fleets are drawn up in two lines parallel to each other, the keels of the ships in each being in the direction of the line. In the treatise of Père L'Hoste on naval evolutions, this mode of engaging is said to have been first employed at the battle of the Texel (1665), when James II., then duke of York, commanded the English fleet.

The order of sailing for a fleet should obviously be such that the several ships may be as near together as possible, both for the sake of mutual support, and that the signals which may be made by the admiral may be distinctly seen: it depends also necessarily on the order of battle, since it is of importance that the fleet should be enabled, with the utmost facility, to pass from either of these states to the other.

Writers on naval tactics distinguish five different orders of sailing, the wind continuing to blow in one direction, and the keels of the ships remaining constantly parallel to one another; in other words, all the ships steering the same course. The first order is that in which all the ships are abreast of each other in a line perpendicular to the direction of the wind; and the second is that in which the ships are arranged so that a line joining all their mainmasts is oblique to that direction; but in this order the line may have two different positions with respect to the wind, for each ship may be on the starboard (the right hand) side, or on the larboard (left hand) side of that which is to leeward of it. As in either of these two dispositions each ship in the line has that which is next to it on one side, opposite to one of its bows, and that which is next to it on the other side, opposite one of its quarters, this order of sailing is frequently called the *bow and quarter* line. In the first and second orders, if the ships are numerous, the line is inconveniently extended.

The third order of sailing is that in which, all the sails being *close-hauled*, the ships are formed in two lines making with each other an angle of about 12 *points*, or 135°; the admiral's ship being in the centre.

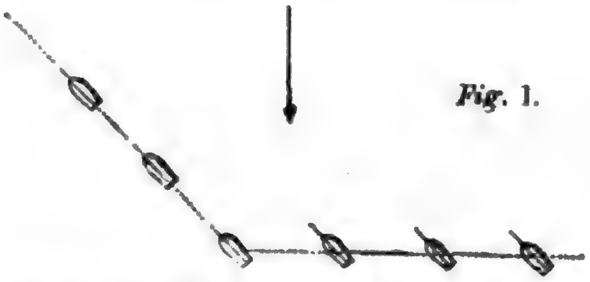


Fig. 1.

N.B. By the expression close-hauled is to be understood such a disposition of the sails that the ship may advance as nearly as possible towards the part of the horizon from whence the wind blows. In general, the line of direction of the wind makes then, on the side next to the ship's head, an angle of about 6 *points*, or 67° 30′, with a vertical plane passing through the keel; and, on the side next to the ship's stern, an angle of about 2 *points*, or 22° 30′ with the plane of the sails.

The fourth order is that in which the ships, steering with the wind on one and the same *quarter*, are formed in several lines, divisions, or squadrons, and as much concentrated as possible. The ships of the commanders are ahead of the several divisions, and a line joining the mainmasts of all the ships in each is supposed to be in the direction of the wind. This order is very convenient for a convoy, but it presents great difficulties to the formation of the line of battle. In the fifth order, the fleet, if not very numerous, is divided into three squadrons, the ships of which sail in as many parallel lines: if numerous, each squadron may be divided into two or more parts, so that the whole may constitute six or nine parallel lines, the number of ships being equal in all. The ships in this order are supposed to be close-hauled, and the keel of each ship coincides with the direction of the line to which it belongs, or the ships of each line sail in each other's wake; while the corresponding ships in the different divisions may be either abreast of each other or in bow-and-quarter position. A line drawn through the mainmasts of the corresponding ships in the different divisions may be supposed to coincide with the direction of the wind. This order of sailing is that which is considered the most advantageous on account of the facility which it affords for forming the line of battle. Generally, the fleet consisting of three divisions, the vanguard of the line constitutes the weather division, and is commanded by the vice-admiral; the centre division is commanded by the admiral himself; and the leeward or rear division, by the rear-admiral. If the fleet consists of more than three divisions, those which are not commanded by the admirals are under the direction of commodores, or senior-captains, and each commander is in the centre of his own line frigates, store-ships, &c. are kept to windward of the line of battle-ships.

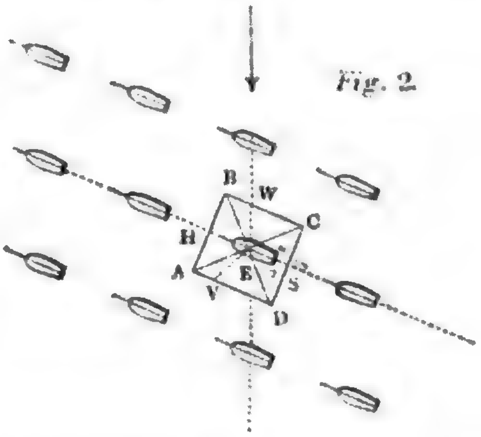


Fig. 2.

The first and second orders of sailing are easily formed, however irregular may be the previous dispositions of the ships; for the ship which is appointed to lead in the formation may get to leeward of the whole fleet, and then hauling her wind (disposing her sails so that she may move in a line making the given inclination to the direction of the wind), she may sail in the proposed direction: the other ships then, according to their positions, follow successively in her wake, and when all are proceeding in one line, each veers [VEERING] or bears away, steering in the prescribed course, and still preserving the general line. The third order of sailing is formed after all the ships have got into one line, steering in each other's wake as above mentioned, and the line making an angle of about 10 *points*, 112° 30′, with the direction of the wind (reckoning from the latter direction towards the bows of the ship). The van ships, which are those to leeward of the admiral, who is supposed to be in the centre, successively haul their wind and steer in the proposed direction; and when the admiral's ship has hauled her wind, the sternmost or windward ships do the same, and each proceeds in a direction parallel to that of the other ships. The fourth and fifth orders of sailing are formed by the leading ships of the different divisions getting abreast of each other, or in bow-and-quarter position, at the prescribed distances; and then the ships of the respective squadrons taking their places in each other's wakes.

In the orders of sailing, the distance of one ship from another, in line, should be such that any danger of running foul of each other may be avoided: in general that distance may be considered as equal to two or three cables' length (each = 120 fathoms). And, with respect to the distances between the several lines in the fifth order of sailing, it has been determined, the ships being close-hauled, by supposing that a line joining the headmost ship of one of the leeward divisions, and the sternmost ship of the next division to windward, should be at right angles to the direction of the wind; or that the angle which such line makes with each division should be equal to 2 *points*, or 22° 30′. In general this interval may be considered as equal to six or nine cables' length; and it is of importance that the distances prescribed by the admiral of the fleet should be strictly preserved.

In order that the commander of any one ship may readily ascertain and preserve his relative position in a fleet when in order of sailing, the ingenious device called the *naval square*, which was invented by Père L'Hoste, may be employed. It consists in tracing upon the quarter-deck a great square ABCD (diagrams No. 2 and 3), having two sides, AD and BC, parallel to the ship's length: the diagonals AC and BD intersecting each other in E, and the line HES being drawn vertically over the ship's keel; also the point H being towards the head of the ship. Now, if a ship were sailing in the direction SH, close-hauled on the starboard tack, as in the cut No. 2, so that BD coincides with the plane of the sail, and WE (bisecting the angle HEC) with the direction in which the wind is blowing; then, after having tacked and become close-hauled upon the larboard tack, since the directions of the vertical planes passing through the keel and sail make angles with the direction of the wind equal to those which they made before tacking, the line SH, that is, the line on which the ship will be sailing, will coincide with, or be parallel to, the position of EC in the diagram. In like manner, if a ship be sailing in the direction SH, close-hauled on the larboard tack, so that AC coincides with the plane of the sail, and VE with the direction in which the wind is blowing; then, after having tacked and become close-hauled on the starboard tack, the line SH on which the ship will be sailing will coincide with or be parallel to the position of ED in the diagram.

Hence, if a fleet be in three parallel divisions, the ships sailing abreast of each other, those in each line will be in the direction SH, and the corresponding ships in the different divisions will be in the directions AB or DC. If the fleet sails close-hauled, and, for example, on a starboard tack as in No. 2, the ships in each line will be in a direction coincident with or parallel to SH, and the corresponding ships in the several lines will be in a direction coincident with or parallel to WE, which is that of the wind. Again, if the fleet is in three divisions, and the ships are sailing in parallel directions not coinciding with those of the divisions; if, for example, the ships should be sailing on the larboard-line of bearing while close-hauled on the starboard tack, as in the subjoined diagram, the ships in each line will be in the direction of one of the diagonals of the square; and the corresponding ships in the different divisions will be in that of the other.

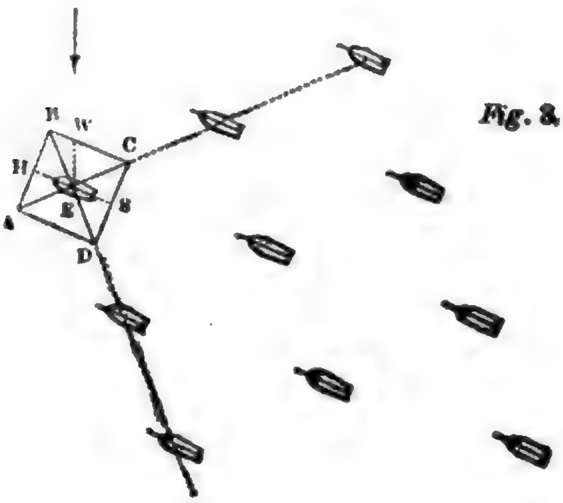


Fig. 3.

The order of battle consists in the ships being drawn up in each other's wake, or in one right line with which the directions of all their keels coincide: they are usually about 50 fathoms from one another, and are nearly close-hauled. The frigates, store-ships, &c. are in lines parallel to that of the line-of-battle ships, and on the side opposite the enemy. A line of ships close-hauled is particularly advantageous as an order of battle both for a fleet to windward, and also for that which is to leeward of its opponent. If a windward fleet were in any other state, the enemy might, by manœuvring, gain the weather-gage, or he might, by being able to approach as near as he pleased, compel the windward fleet to come to an action. And a leeward fleet which is close-hauled is always prepared either to take advantage of any change of wind in its favour, or to avoid an action. In a close-hauled line also, the sails are disposed so that the ships remain nearly stationary during the action; on which account the line is steadily preserved, and any ship on becoming disabled can be easily replaced by one of those which are in the reserve line.

When the ships of a fleet are in the first or second order of sailing, and it is intended to form the line of battle, it is evident that by simply hauling the wind, or by tacking [Tacking] or veering [Veering], as the case may require, the ships may get into each other's wake in any proposed direction of the line. If it be intended to form the line of battle from the third order, the ships in that wing which is already in a line, in the direction of their keels, must simply haul their wind and get into each other's wake in the proposed direction of the line; each ship in the other wing is then brought into a position nearly at right angles to the direction of the wind, and, as those of the first wing advance, these fall successively into their wake.

When the line of battle is to be formed from the fourth or fifth order, all the ships being supposed to be close-hauled, the formation may take place upon any one of the divisions; the ships of this division are then brought *to*, (their motion stopped by bracing some sails so as to be taken aback by the wind while others are kept full,) and the other ships are made to take up their proper positions in the prolongation of the line thus formed. If, for example, the fleet consists of ships sailing in three divisions close-hauled, and the line is to be formed upon the centre division, as in the subjoined diagram; then, as soon as this squadron is brought *to*, the ships in the weather division bear away and steer till they get ahead of the centre, when they haul their wind; the lee division tacks and sails on till it gets astern of the centre, and when these ships have hauled their wind the line of battle is formed. In this formation the weather division or column has been made to constitute the van, and the lee column the rear of the line; but it is sometimes thought necessary to make the columns change places, by causing that which

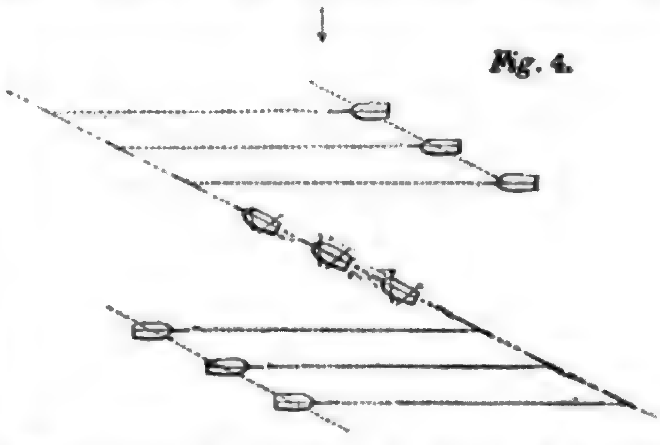


Fig. 4.

as on the weather side of the fleet to become the centre or rear column, or by making the centre or lee column constitute the van of the line. A like interchange of the places of the van, centre, and rear divisions is also, occasionally, made when the fleet is in the order of sailing; and various other evolutions are performed by the ships of a fleet, both while sailing and in the line of battle: the principal of these consist in the several ships tacking, or veering, in succession, and in turning to windward; and there are, besides, the series of movements which are necessary in order to restore the line of battle when disordered in consequence of a shifting of the wind. But the details of these evolutions can be studied with advantage only in works which are expressly written on naval tactics.

From the order of battle it is necessary to return to some one of the orders of sailing; and with respect to the three first of these, it will be merely necessary for the ships in the line to tack, or bear away, in the assigned directions increasing or diminishing sail, so that they may arrive in their proper positions nearly at the same time. In returning to the fifth order of sailing, there are two cases, which consist in performing the manœuvres on the same and on the opposite tack. In the first case, should it be required that the van may become the weather squadron, the van and centre tack together and stand on, while the rear proceeds in its actual course; then, when the rear comes successively abreast of the centre and van squadrons, these re-tack, and thus three parallel columns are formed. In the second case, the van being to form the weather squadron, the ships in the van first tack in succession, then the ships in the centre, and lastly those in the rear. All then keep on, till the corresponding ships in the different squadrons get abreast of each other, when the order is formed. The evolutions differ, of course, from those just mentioned when the van is to form the lee, and when it is to form the centre squadron.

In the order of retreat before the wind, the ships are drawn up in two equal divisions, in lines making an angle of 135 degrees with each other; the admiral's ship remaining to windward of the rest of the fleet, and being at the angular point.

If a fleet is much superior in force to that of the enemy, it will be of little moment whether it comes to action on the windward or the leeward side; and each of these situations when taken, either by a fleet or a single ship, has both advantages and defects. The advantages of gaining the weather-gage, as it is called, are that in such a situation a fleet may approach that of the enemy, and it may commence the engagement when it shall appear most convenient: ships may be detached to the rear in order to turn the enemy's line and put it in confusion, and a ship may board its opponent almost at will: in firing also, the windward ships are but little incommoded by the smoke. On the other hand, the disadvantages of being to windward are, the difficulty of retreat without passing through the enemy's line; disabled ships cannot quit the line without disordering the rest of the fleet, and in stormy weather the lower-deck ports can seldom be opened. When a fleet is to leeward of that of the enemy, the ships which may be dismasted can be readily drawn away, and the whole fleet may retire if unable to contend against a superior force.

If a fleet to leeward of the enemy's line should attempt to gain the windward side, it should manœuvre so as to delay the engagement for a time in the hope that a change of wind in its favour may take place, and it must then endeavour to take advantage of such change. In these circumstances the commander must however keep the enemy in sight, or at least he must obtain a knowledge of his manœuvres by means of frigates detached for the purpose. If unable to succeed in getting to windward, it should be drawn up on a line as short as possible, in which case, that of the enemy being more extended, some of the ships in it must either take no part in the engagement, or, leaving their line in order to bear down, they will lose the advantage of the wind. On the other hand, a weather fleet should be manœuvred so as always to keep that which is to leeward quite abreast of it; since then, unless the wind should shift, it will continue to hold its position.

When it is desired to bring on an action against a fleet in line on the leeward side, the general rule is that the weather fleet should get abreast of the other, then bear down upon it till within the proper distance, and form in order of battle. Should the leeward fleet bear away at a certain angle with the wind in order to avoid the engagement, the other may bear away at a still greater angle; then, according to the relation between the distance of the fleets from one another and the extent of the weather line of ships, the latter will cut the other in some particular part of its length, and thus compel it to fight in disadvantageous circumstances. Again, if being to leeward of the enemy, it be necessary to avoid an engagement, the only resource is to bear away in order of retreat. If to windward, the fleet should, if possible, in retreating, keep constantly on one tack, in order to avoid the loss of time occupied in going about; but if from want of room it be necessary to change the course, the fleet may be kept on one tack during all the time that the enemy is on the other: for thus the two fleets will be constantly diverging from one another.

It is observed by Mr. Clerk, in his 'Essay on Naval Tactics,' that when an enemy's fleet is to leeward, and in that situation is to be brought to action, both fleets being in line of battle, if the ships in the weather-line bear directly down upon the others, those in the van are liable to be disabled in their rigging; and thus, their motion being retarded, disorder must ensue in the dispositions of the ships which follow them. Precisely the same disadvantages, he adds, attend the method of coming with the whole fleet, in line of battle, obliquely upon the line of the enemy; and to these faulty modes of attack he ascribes the damages which have so frequently been sustained by British fleets at the commencement of actions. The method proposed by that writer for coming to an engagement against a fleet to leeward is similar to that of an attack in oblique order on land, and consists in detaching a squadron for the purpose of attacking some of the rear ships in the enemy's line: the squadron should engage the ships broadside to broadside while the rest of the fleet is at a distance, prepared to send support if necessary. Then, should the van and centre of the enemy's fleet continue its course in order to avoid a general action, those rear ships will be taken: if any of the van ships should tack successively in order to support the rear, some other ships of their line will be in danger of being taken by a second squadron detached from the windward fleet; and if the whole line should tack together, the disorder thence arising might cause the loss of more ships, or might bring on a general action at a disadvantage to the leeward fleet. Lastly, if this fleet should veer, and bear away, the ships would become exposed to a raking fire in their retreat.

The manœuvre of doubling an enemy's line of battle consists in sending ships round by either of its extremities for the purpose of placing some of those in that line between two fires. In order to double a fleet, the ships should advance beyond its van, or fall in its rear, when by tacking or veering according as they are to leeward or windward of the line, they may get into the required position on its opposite side. It is right to observe however that this manœuvre ought to be attempted under favourable circumstances only, as the doubling ships are liable to be separated so far from their own fleet as to be prevented from rejoining it; and it is, on the whole, considered more advantageous to double a fleet by its rear than by its van, since in the event of some of the enemy's ships being damaged, and unable to keep up with the rest, such ships may be taken by those which are performing the manœuvre of doubling: should any of these last be separated from their fleet, they can remain in the rear without risk, till an opportunity is offered of rejoining it. At the battle of the Nile (1798), Admiral Nelson doubled the van of the French line, and attacked it on both sides, while the other ships of that line, the whole fleet being at anchor, could afford no assistance. In order to avoid being turned, the largest ships of a fleet ought to be in the van and rear of its line when in order of battle; and the rate of sailing for each should be such that the rear ships may never be astern of the enemy. Care should also be taken that the ships are as close together as possible, that the enemy may not pass between any two of them, and thus break the order of battle.

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It is well known, from the records of naval history, that the manœuvre of cutting through the line of an enemy's fleet during an engagement has been several times performed by English commanders since the middle of the seventeenth century. In an action with the Dutch, in the year 1652, Sir George Ayscue is said to have charged from the leeward through the fleet of the enemy; and in that between the English and Dutch fleets in 1665, the earl of Sandwich cut through the centre of the Dutch line, and caused the disorder which ended in its total defeat: again in May, 1672, Sir Joseph Jordan, of the Blue squadron, having the advantage of the wind, pierced the Dutch fleet and threw it into confusion. But the action which first gave notoriety to the manœuvre was that in which Admiral Rodney gained the important victory over the French fleet commanded by the Comte de Grasse: this action was fought in 1782. The battle in which the brilliant career of Lord Nelson terminated with a decisive victory (1805) owed the success with which it was crowned to the employment of a like mode of attack.

The honour of having been the first to demonstrate fully the principles on which the manœuvres of an attack against fleets to windward or to leeward depend, is generally ascribed to Mr. Clerk of Eldin, who published the first edition of his 'Essay on Naval Tactics' in 1782; and it has been asserted (Playfair's *Memoir of Mr. Clerk*) that Clerk had, in conversation, communicated to Sir Charles Douglas (Rodney's flag-captain) his whole system of tactics in the year preceding that in which the battle with the Comte de Grasse was fought. The accuracy of this assertion has been however disproved by Sir Howard Douglas, in his 'Memoir on Naval Evolutions;' and from an account of the circumstances under which the manœuvre of breaking the French line was performed, as they have been given by Sir Charles Dashwood (one of Admiral Rodney's aides-de-camp on the day of the action), it appears that the idea of the manœuvre was, at the moment, suggested to the admiral by Sir Charles Douglas on perceiving an opening in the French line between two of the ships near its centre. The French fleet was formed in line on a larboard tack, and tended to gain the windward side of the British line, which from the leeward side advanced obliquely towards the fifth ship from the van of the enemy. Signals were then made for the British ships to close up in their line, and the action commenced as the two fleets ranged in opposite directions alongside of each other. When the centre of the British fleet came opposite the third or fourth ship of the French line, Admiral Rodney's ship began a close action within half musket-shot against the ships of the enemy with which it came successively abreast; and then the opening appearing as above mentioned, the opportunity was seized of passing through it: this was done so near the enemy, that the admiral's ship almost touched the French ship on each side. The ships astern of the admiral followed him closely, and these kept up a powerful raking fire against the ships in the rear division of the enemy's fleet, which, being driven to leeward as the van of the British fleet passed them, broke into two divisions, and made sail before the wind to escape. As soon as the van of the French fleet was left beyond the rear of the still advancing line of British ships, it also broke into two divisions, which retreated in different directions; and then the signal being made for the ships to close up, the British fleet followed in pursuit of that division with which the French admiral had retired. At the battle of Trafalgar (1805), the combined French and Spanish fleets were drawn up in one line, of a crescent form, the convex part being to leeward of the wings, while the fleet of Lord Nelson bore up against it in two lines, in the order of sailing: the leading ships of the lines broke through the fleet of the enemy in two places, and were followed by those of their respective divisions.

The manœuvre of breaking the line of a fleet, like that of attacking in column the line of an army, may not always succeed; and in the action, June 3, 1665, several squadrons passed through and through the Dutch fleet without gaining any advantage. If the line of the enemy is strong, the ships which would pierce it may be placed between two fires, or may be cut off from the rest of their fleet; and perhaps the manœuvre ought not to be attempted unless the line to be broken is already disordered by the action, or unless a favourable opportunity should present itself from negligence or want of skill in the enemy.

Should sufficient reasons exist for performing the manœuvre by a fleet which is to leeward of its enemy, the ships of that fleet should close up as much as possible, and by a press of sail get rapidly through the opening without attempting to engage the ships between which they pass; or each should give the fire of a broadside to one only, reserving the other broadside for the ship with which it is to engage in the new position: this position the ships should of course gain as soon as possible. On the other hand, an attempt to break the line of battle may be counteracted by causing all the fleet, as soon as some of the enemy's ships have got through, to put itself on the same tack as these; by which means some of them will be engaged between two fires, and others will be cut off from all connection with the fleet to which they belong.

When the commander of a ship intends with that ship to come to action with one of the enemy to leeward, he should bear down obliquely towards the latter till he gets nearly into its wake; and when at a proper distance, he may either run up alongside, or having shot a-head, veer and run down on the weather bow: the ship attacked should never be allowed to bring her broadside to bear except when both ships are in parallel positions.

In chasing an enemy's ship which is to windward, the chaser being presumed to sail better than the ship she pursues, it is recommended that the former should stand *on* close-hauled till abreast of the chase; she should then tack, and stand on close-hauled till again abreast; and so on. The ship chased, on the other hand, should, in order to avoid loss of time, continue constantly, if possible, on one course; but it is evident, from the supposed inferiority of her sailing, that she must at length be overtaken by her pursuer.

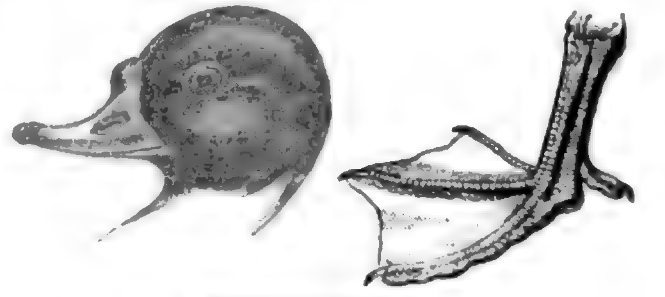
(*Traité des Evolutions Navales*, par P. Paul Hoste, 1690. A Translation of the same, by Captain Boswall, R.N., 1834; Clerk's *Essay on Naval Tactics*, 1790; *Naval Evolutions*, by Major-Gen. Sir H. Douglas, 1832; *L'Art de Guerre en Mer*, par M. le Viscomte de Grenier.)

TADCASTER. [Yorkshire.]

TADEO, SAN, river. [Patagonia.]

TADMOR. [Palmyra.]

TADORNA, Dr. Leach's name for a genus of *Ducks*, having the bill very much flattened towards the extremity, and elevated into a protuberance or projecting boss at its base.



Head and foot of Tadorna.

Example, *Tadorna vulpanser*, Leach. [Sheldrake.]

TADPOLE. [Frogs; Salamandridæ.]

TÆ'NIA (Tape-Worm). [Entozoa.]

TÆNIA. [Mouldings.]

TÆNIO'PTERA. [Tæniopterinæ.]

TÆNIOPTERI'NÆ, Mr. G. R. Gray's name for his second family of Muscicapidæ.

The *Tæniopterinæ* comprise the following genera:

Tænioptera, Bonap. (*Xolmis*, Boie; *Nengetus*, Sw.; *Blechropus*, Sw.; *Lanius*, Linn.; *Fluvicola*, Sw.; *Pepoaza*, Azara; 'Xolmus, Boie,' Sw.; *Tyrannus ?* Steph.; *Tyrannus*, 3rd div., Vieill.; *Muscicapa*, Spix; *Orsipus*, Norden).

Lichenops, Comm. (*Ada*, Less.; *Perspicilla*, Sw.; *Motacilla*, Gm.; *Sylvia*, Lath.; *Fluvicola*, D'Orb. et Lafr.).

Knipolegus, Boie (*Platyrhynchus*, Spix; *Blechropus* et *Ptilogonys*, Sw.; *Hirundinea*, D'Orb. et Lafr.; *Muscicapa*, Licht.; *Ada*, Less.; *Tænioptera*, Bonap.).

Fluvicola, Sw. (*Œnanthe*, Vieill.; *Entomophagus*, Pr. Max.; *Muscipeta*, Cuv.; *Xolmis* (Boie), Sundev.; *Platyrhynchus*, Vieill.

Arundinicola, D'Orb. et Lafr. (*Todus*, Pall.; *Platy-*

rhynchus, Vieill.; *Alectura*, D'Orb. et Lafr.; *Muscipeta*, Cuv.

Alecturus, Vieill. (*Alectura*, Sw.; *Yetapa*, Less.; *Xenurus*, Boie; *Gallita*, Vieill.; *Platyrhynchus*, Spix; *Muscipeta*, Cuv.; *Muscicapa?* Steph.; *Muscipipra*, Less.).

Gubernetes, Such. (*Muscicapa*, Licht.; *Tyrannus*, Cuv.). The *Tæniopterinæ* are placed between the *Querulinæ* and *Tyranninæ*. (*List of the Genera of Birds*, 2nd edition.)

TAFFI, A'NDREA, born at Florence, in 1213, deserves mention as having been the first who introduced among his countrymen the art of painting in mosaic. Having heard of some eminent Greek artists who were executing paintings in mosaic in the church of St. Mark at Venice, he went to that city and formed an intimate friendship with Apollonius, one of the principal of those artists, and prevailed on him to accompany him to Florence, to teach him the best manner of working in mosaic, and the method of compounding the most durable kind of cement. On their arrival at Florence they executed together several works, which were highly admired. Taffi's chief performance was a Dead Christ, of large dimensions, in a chapel at Florence. He died in that city, in 1294, at the age of eighty-one.

TAFILET. [MAROCCO.]

TAGANROG is a town in European Russia, in the government of Ekaterinoslaf, near the north-eastern extremity of the Sea of Azof, in 47° 12′ N. lat. and 48° 40′ E. long. It stands on the summit of a lofty promontory, commanding an extensive prospect of the Sea of Azof and of all the European coast to the mouth of the Don. Azof itself is visible from the heights of the citadel in fine weather. It was founded in 1688, by Peter the Great, and became a very flourishing place till he was obliged to abandon it to the Turks by the peace concluded with Russia in 1711. Catherine II. intended to revive the plans of Peter the Great, but the works were not commenced and completed till the reign of Alexander. It is most advantageously situated for carrying on an extensive commerce, but the bay or road is so shallow that only ships of moderate burden can enter it, and even these must be lightened of part of their cargo at Kertsch or Feodosia. Besides this, it is only during a few months in the year that any trade can be carried on, because the Sea of Azof being frozen in the winter from December to March, the sea from the mouth of the Don to Taganrog is covered with such thick ice that sledges cross it in safety to Azof and Tcherkatsk. Notwithstanding these impediments the commerce of Taganrog is very great; for it is the chief place for all the intercourse between the provinces on the Donetz and the Don and foreign countries; the Volga too is so near, that goods are brought by land-carriage from that river at no great expense. The exports from Taganrog are corn, Siberian iron, leather, caviar, and fish. Previously to the year 1833, the number of merchantmen that arrived at Taganrog was between 300 and 400 annually. By a ukaze, issued in 1833, all ships liable to quarantine were prohibited from entering the Sea of Azof, and the number of arrivals is reduced to less than 100; notwithstanding this, the exportation to foreign countries has increased, the number of coasting-vessels being more than double what it was before. It must be observed that in speaking of the trade of Taganrog, that of the two neighbouring towns of Rostoff and Nakhitchevan is included, all the boats going to those three places being registered at one station. Taganrog has now about 17,000 inhabitants, chiefly Greeks, a gymnasium, ten churches, three of which are of stone, dockyards, large and numerous warehouses, and many very handsome private dwellings. The climate is temperate and remarkably healthy; the surrounding country is fertile, and produces excellent fruits and culinary vegetables; wheat sown in unmanured land yields from twenty to thirty fold. The vine and the mulberry flourish, but the country is destitute of wood. The emperor Alexander died here, on the 1st of December, 1825.

(*Odessa Journal*; *Conversations Lexicon*; Schnitzler, *La Russie, la Pologne, et la Finlande*; Lloyd, *Life of the Emperor Alexander*; Hassell; Cannabich; Stein.)

TAGUS, called *Tajo* by the Spaniards, and *Tejo* by the Portuguese, is the largest river of the Spanish Peninsula, which is divided between these two nations. The rivers by the confluence of which the Tagus is formed originate in the highest part of the table-land which occupies the interior of the peninsula, between 40° 25′ and 41° 5′ N. lat., and 1° 30′ and 3° 30′ W. long. In the elevated mountain-masses of the Sierra Molina and Sierra Albaraçin rise three rivers, the Molina or Gallo, the Tagus, and the Guadiela, which flow west-north-west between high ridges and in narrow valleys. The Molina and Tagus unite on the boundary-line of the provinces of Soria and Cuença, and, running south-west, they are joined by the Guadiela, where the three provinces of Cuença, Guadalajara, and Madrid meet. The united river continues to flow in a south-west direction until it enters the more open country of the plain, when it turns to the west, and is joined by the river Jarama, or Xarama. This river is formed by three rivers, which rise in the range that divides the table-land of New Castile from that of Old Castile, the Tajuna, Henares, and Jarama or Xarama. The last-mentioned river, the Xarama, is the most western, and originates on the Soma Sierra, near Buytrago. It runs south, and is first joined by the Henares, which flows south-south-west, and then by the Tajuna, which runs from its source to its mouth nearly parallel to the Henares and the Tagus, in the tract which divides those two rivers. The Tajuna joins the Xarama a few miles above its confluence with the Tagus. The country which is traversed by these branches of the Tagus is not much elevated above the watercourses, possesses a considerable degree of fertility, and is the most populous tract on the table-land of Spain. The Xarama joins the Tagus a little below Aranjuez, and at this place the river flows through a wide level plain very little elevated above its bed, and so fertile, that it is justly called the Garden of Castile. From this place the general course of the Tagus, as far as it lies within Spain, is nearly due west. Below Aranjuez the bed of the river gradually sinks deeper beneath the surrounding country its banks are steep, and composed of rocks, which in some parts rise from the water abruptly to the height of 200 feet. The adjacent country is uneven and somewhat broken, but not hilly: but after having encompassed the hill on which the town of Toledo stands, the river again enters a level country, which extends for many miles westward, and in which it is joined by the rivers Guadarama and Alberche from the north. Below the town of Talavera de la Reina the Tagus enters a hilly country, where it flows with great rapidity in a deep bed filled with rocks, and is joined from the north by the rivers Tietar and Alagon, which descend from the hign ridge that divides the table-land of the two Castiles. The Alagon originates in the icy masses which cover the summit of the Sierra de Griegos all the year round; and the volume of water which this river brings down is so considerable, that from the place of confluence at Alcantara the Tagus becomes navigable. Though the Tagus has run above 350 miles before it reaches Alcantara, no part of it is navigable, which is partly to be ascribed to the great rapidity of its current through the plain of Castile. Besides this, the greater part of its course is through narrow valleys, between steep hills, from which heavy masses of rocks have fallen down, which in many places greatly encumber the bed of the river, and cause rapids, which continue for several miles; but the greatest impediment to the navigation of the river is the small volume of water. The soil of the table-land absorbs a great quantity of moisture without forming springs, and at the same time the quantity of rain which falls on this region is much less than what falls in other parts of Europe; consequently the river is very scantily supplied with water, except during the few months when the rains are more abundant.

At Alcantara the level of the river is probably less than 300 feet above the sea, and it has still a course of about 200 miles to its mouth. Its course below Alcantara and as far as Abrantes, or rather the mouth of its tributary the Zezere, is nearly due west. For about 20 miles it constitutes the boundary-line between Spain and Portugal. In this part of its course the river is navigable, but the navigation is extremely tedious and not without danger, as the sandbanks are numerous and subject to change. It can only be navigated by small flat-bottomed boats. The Zezere, in which the numerous rivulets unite which collect the waters originating on the southern declivity of the rocky masses of the Serra de Estrella, always brings a considerable volume of water to the Tagus, and from this point downwards the river may be navigated by vessels of 150 tons burden. In this part of its course numerous islands occur, which at first are small and rocky, but lower down are larger and alluvial. The larger islands are called Lizerias. Below these islands the river expands into a lake-like basin, which extends from north-east to south-west, in the direction of the course of the river, nearly thirty miles, and is mostly about twelve miles wide, but in several places it is narrowed to six miles by projecting headlands. The country north-west of the basin is covered with gently-sloping hills, the offsets of the Serra da Cintra, and on the south-east of it is the sandy plain of Alemtejo. The most western part of the basin constitutes the harbour of Lisbon, which is spacious enough to contain all the fleets of Europe. Where the town of Lisbon terminates on the west, the Tagus turns westward, and a broad rocky headland, consisting of high hills, advances northward, and narrows the basin to about one mile or a little more in width. At the same time the offsets of the Serra da Cintra come close up to the river on the north, so that the Tagus passes to the sea between two rocky masses. The whole course of the Tagus exceeds 550 miles, and the area of the country drained by the river probably does not fall short of 40,000 square miles.

Tagus is the name of this river in the Roman writers, which has been adopted in our language.

(Miñano's *Diccionario Geografico de España y Portugal*; Link's *Travels in Portugal*, *&c.*; Semple's *Observations on a Journey through Spain and Italy*, *&c.*)

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THE PENNY CYCLOPÆDIA

OF

THE SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE.

TAI-WAN (*Tuywan*) is the Chinese name of an island which in Europe is known by the name of Formosa, and Hermosa, and, according to the Dutchman Valentyn, is called by the aborigines Pekan or Pæk-and. It lies between 21° 58′ and 25° 15′ N. lat., and between 120° and 122° E long., and extends from south by west to north by east about 240 miles. In width it varies much. From its most southern point, where it is only about four miles wide, it increases gradually, so that at 23° N. lat. it is 60 miles wide, and at 24° N. lat. nearly 100 miles. Its northern portion decreases in width, but very slowly, for near its northern end it is still 60 miles wide. A rough calculation gives the surface an extent of about 14,000 square miles, which is about half the area of Ireland, and 3000 square miles more than that of Sicily.

The north-western point of Taï-wan is only about 80 miles from the coast of the Chinese province of Fukian, or Fokian; but farther south the channel of Fokian, as the sea between Taï-wan and China is called, grows wider. In the parallel of Amoy, 24° 40′ N. lat., it is 150 miles across, and still wider south of that parallel. This part of the China Sea contains several banks, and the soundings are also extremely irregular, especially in the vicinity of the Ponghu or Phenghu Islands, called also Pescadores, or Fisher Islands. The southern extremity of Taï-wan is divided from the Bashee Islands, which are south-east of it, by the channel of Formosa, which is nearly 80 miles wide, and has also very irregular soundings.

The broad promontory which terminates the island on the south, and forms the south-east and south-west cape, is a low flat, but at the distance of about two miles the country suddenly rises into mountains, which continue to run in an unbroken chain northward nearly through the middle of the island to its northern extremity, terminating with high cliffs at the north-east cape. As it is certain that this range of mountains, which is called Ta Shan, or Great Mountain, is nearly the whole year round covered with snow, its elevation has been estimated by Humboldt at about 12,000 feet above the sea. The declivities of these mountains, with the exception of the crests of the most elevated portion, are covered with fine trees and pasture-grounds, and thus the island, when seen from the sea, presents a very pleasing appearance, whence it was called Hermosa by the Europeans who advanced thus far into the Indian Sea. These mountains have never been visited by Europeans, but from the accounts of the Chinese geographers, which have been collected by Klaproth, it appears that there is more than one volcano on this island. The Tshykang (Red Mountain), south of the town of Fung-shan-hian, was once an active volcano, and there is still a lake of hot water on Shin Mountains. The Phy-nan-my-shan, south-east of Fung-shan-hian, emits in the night-time a brilliant lustre. The Ho-shan (Fire-Mountain), south-east of Tshu-lo-hian, is said to contain many wells from which flames issue. There are some other mountains which exhibit traces of volcanic action, and sulphur constitutes an important article of export.

The mountains have a steep declivity on both sides, but on the west side they terminate at a considerable distance from the sea, so as to leave a wide tract between them and the shore. This tract has an undulating surface, and terminates on the sea in a low sandy beach. The adjoining sea is full of sand-banks and shoals, and can only be approached in a few places by vessels drawing more than eight feet of water. On the east of the Ta-shan range the mountains seem to occupy nearly the whole space between the crest of the range and the sea, and high rocks line the shore. There are no soundings along this coast. This circumstance, united to the strong current which sets along this side from south to north, is probably the reason why this part of Taï-wan has never been visited by European vessels; nor does it appear that Japanese or Chinese vessels have any intercourse with this part of the island. It is an unknown portion of the globe.

Rivers are numerous on the west side, but as they originate in a very elevated region, from which they descend in continuous rapids and cataracts, they bring down a considerable quantity of earthy matter, which they deposit at their mouths, forming bars, which have so little water as to admit only small vessels: this however seems to be no great disadvantage, as there are numerous islands along the shore, between which junks of ordinary size (about 200 tons burden) find good anchorage. Some of the rivers however are said to be navigable for a considerable distance inland, especially the Tan-shuy-khy, which falls into the Tan-shuy-kiang Bay, which lies in the narrow part of the channel of Fukian. The rivers also offer the great advantage of an abundant irrigation, though they are sometimes destructive to the crops by their inundations.

No portion of the ocean is subject to such violent gales as the sea surrounding Taï-wan on the west and east. Both monsoons, the north-eastern and the south-western, blow in the direction of the channel of Fukian, and as they are confined between two high mountain-ranges, the mountains of Fukian and of Taï-wan, their violence is much increased. At the change of the monsoons the most violent gales come on suddenly, and are accompanied by typhons, whirlwinds, and waterspouts. Many Chinese vessels are annually lost at these seasons. The Japan Sea, which lies north of Taï-wan, is noted for its terrible tempests. In the vicinity of the island the north-eastern monsoon generally lasts nine months, as it continues to blow to the beginning of June. In other respects the climate of the island is very temperate, neither the heat nor the cold being excessive on the plains along the western coast. The island is subject to earthquakes, and they are sometimes very violent. In 1782 the whole lower portion was laid waste, and the sea inundated the country to the base of the mountains for twelve hours. A great part of the capital was destroyed, and some hundreds of junks were lost.

The soil of the lower tracts and the more gentle slopes of the mountains is very fertile, and produces abundance of corn, which is exported to the harbours of Fukian, of which the island is said to be the granary. It produces rice of excellent quality; also wheat, millet, maize, and several kinds of vegetables, among which are truffles. The sugar-cane is extensively cultivated, and the sugar made in the island goes to China, as far as Peking. Orchards are carefully attended to. They produce oranges, pine-apples, guavas, cocoa-nuts, areca-nuts, jack-fruit, and other fruits found in the East Indies; also peaches, apricots, figs, grapes, pomegranates, and chestnuts. Melons are also much grown. Only green tea is cultivated, and it is stated that it forms an article of export to China, where it is used as a medicine. The blossoms of the wild jasmine are dried and exported to China, where they are used to give a scent to the tea. Other articles of export are camphor, pepper, aloes, and timber. Timber abounds in the large forests in the northern districts of the island. It is also stated that coffee, cotton, and silk are produced to a small amount.

The domestic animals are cattle, buffaloes, horses, asses, and goats, but sheep and hogs are rare. The horses are small, and the Chinese find them unfit for their cavalry. It is said that on the eastern unknown portion of the island there are many beasts of prey, as tigers, leopards, and wolves, but they are not found on the western side, where wild hogs, deer, monkeys, pheasants, and game are very abundant. Salt is made to a great extent, and, together with sulphur, forms a large article of export.

The population consists of Chinese settlers and of aborigines. The Chinese are only found on the west side of the island, where they first settled a hundred and eighty years ago (1662). Their number many years ago was stated to be about 500,000 individuals. They are mostly from Fukian, and have preserved the customs of their original country, and the spirit of industry and enterprise by which their countrymen are distinguished. A considerable number of aborigines are settled among the Chinese, to whom they are subject, and are obliged to pay a tribute in corn and money. The collectors of the tribute are Chinese, who are required to know the language of the aborigines for the purpose of explaining to them the orders of the court. It is said that the oppression to which the aborigines are subject from these interpreters frequently causes them to rise in rebellion. These aborigines are of a slender make, and in complexion resemble the Malays, but they do not differ from the Chinese in features. Their language shows that they belong to the widely spread race of the Malay nations; and it is said that they greatly resemble the Horaforas of the Moluccas. Their religion resembles what is called Shamanism. The Dutch took some steps to convert them to Christianity, but their sway on the island was too limited and of too short a duration to produce any lasting effect. Nothing is known of the aborigines who inhabit the east side of the island. They are not subject to the Chinese, and are said to be continually at war with them. Inhabiting a country covered with lofty mountains, they are said to subsist mostly on the produce of the chase and by fishing.

The Chinese portion of Taï-wan is divided into four districts, which, from south to north, are Fung-shan-hian, Taï-wan-hian, Tshul-lo-hian, and Thang-hua-hian. The capital, Taï-wan-fu, is a considerable place, and has a garrison of 10,000 troops. The wall was built in 1725. The streets are straight, and intersect one another at right angles: they are full of shops, which are abundantly provided with all articles of Chinese industry. The largest building is that which was erected by the Dutch during their short sway in Taï-wan. There is still a small church built by the Dutch. It is stated that 1000 junks can anchor in the harbour; but as the single entrance, at spring-tides, has but from nine to ten feet of water, only vessels of moderate size can enter it. There was formerly another entrance, which had a greater depth of water, and for the protection of which the Dutch had built the fortress of Zelandia; but it is said that this entrance has been filled up with sand. The commerce of this place with China is considerable. Wu-teaou-kiang, which was visited by Lindsay in 1832, has a harbour, which was then crowded with junks and numerous coasting vessels which brought the produce of the country, especially rice and sugar, to this place. Tan-shuy-kiang, at the embouchure of the river Tan-shuy khy, is at the innermost recess of a fine bay, which is large enough for a numerous fleet, but has not been visited by Europeans. The best harbour is near the northern extremity of the island, and is called Ky long-shai: the Dutch call it Quelong. It is capacious enough to contain 30 large vessels, and is the station of the Chinese navy at the island. An active commerce is carried on at this place.

The commerce of the island is limited to that with the eastern provinces of China, especially Fukian, to which it sends its agricultural produce, with sulphur and salt, and from which it imports tea, raw silk, woollen and cotton stuffs, and other manufactures. It is stated that the number of junks that annually enter the ports amounts to more than 1000. The navigation of the channel of Fukian, though difficult on account of the gales and the rough sea, is rendered much less so by the situation of the Ponghu Islands, which offer a safe refuge in time of danger. These rocky islands are thirty-six in number, most of them very small, and a few somewhat larger. The largest has an excellent harbour, in which vessels of between nine and ten feet draught may anchor in security. The Chinese have erected some fortifications on them, as they have occasionally been taken possession of by pirates, who frequently infest the adjacent coast of China.

Opposite the southern extremity of the eastern coast of Taï-wan is the island of Botol Tabago-xima. It is elevated, and about ten miles in circumference. It is surrounded by a sea without soundings, and no navigator has ever landed on it. It is said to be very populous.

It appears that the island of Taï-wan was known to the Chinese and Japanese at an early period, but they did not settle on it nor subject it to their sway. When the Dutch appeared in these seas, following the track of the Portuguese, they found no Chinese settlement either on the Ponghu Islands or on Taï-wan. They erected some fortification on the Ponghu Islands, and in 1634 they built the fortress of Zelandia at the entrance of the harbour of Taïwan-fu, where there was then a small town. They built also a small fortress at the harbour of Ky-long-shaï. The protection which was thus offered to emigrants induced a large number of families from Fukian to settle in the island, and the colony rose rapidly in importance. Meanwhile China was laid waste by the wars which terminated in the overthrow of the Ming dynasty and the establishment of the present family on the throne. The adherents of the former dynasty maintained their footing longest in eastern and southern provinces, Chekiang, Fukian, and Quangtun, but being pressed by their enemies, they abandoned the mainland, and continued the war on the sea. One of their chiefs, Tshing-tshing-kung, called by the Europeans Koxinga, sailed, after the loss of a battle, to the Ponghu Islands, and occupied them. Hence he proceeded to Taï-wan, and finding only a very weak garrison in the Dutch fortress, he took it, after a siege of four months, in 1662. Thus the Dutch lost the island, after having been in possession of it for twenty-eight years. Tshing-tshing-kung, the new king of Taï-wan, favoured the settling of his countrymen, the inhabitants of Fukian, and thus the island in a short time was converted into a Chinese colony. He was also favourable to the English, who had, during his reign, a commercial establishment on the island, from which they carried on an active commerce with Amoy. The province of Fukian, which continued its opposition to the victorious Mantchoos longer than any other part of China, had been compelled to submit to their sway; and as Tshing-tshing-kung had died, and the throne of Taï-wan was occupied by a minor, a Chinese fleet in 1682 took possession of the Ponghu Islands. The Chinese were also preparing a descent on Taï-wan, when, in 1683, the council which governed in the name of the young prince thought it most prudent to surrender the island to the court of Peking without a war.

(Père du Mailla, *Lettres édifiantes et curieuses*, vol. xviii.; Klaproth's *Description de l'Isle de Formose, extraite de livres Chinois*, in *Mémoires relatifs à l'Asie*; La Pérouse, *Voyage autour du Monde*; and Lindsay's *Voyage of the vessel Amherst along the coast of China*, in *Parliamentary Reports*, 1831.)

TALAPOINS is the name given by the Portuguese, and after them by other European nations, to the Buddhist priests, or rather monks, of Siam, and is supposed to be derived from the fan which they always carry, usually made of a leaf of the palmyra-tree, and hence, says Crawfurd (*Journal of Embassy to Siam*, p. 358), denominated by the Sanscrit word *Talpat*. Tal is the common Indian name for the palmyra; and the older travellers give Talapa as the Siamese word for a fan. In the Pali (or learned tongue) the Talapoins of Siam are said to be called Thaynka; but in the common language of the country they are spoken of, as well as to, simply by the term Chau-cou, or Chau-ca, which signifies My lord (or literally Lord of me), the first of the two forms being that commonly used, the other that employed to express extraordinary inferiority on the part of the speaker. (La Loubere, *Du Royaume de Siam*, i. 407.) Mr. Crawfurd states that they are called Phra, which he says is a Pali word signifying Lord, applied also to Gautama or Buddha, to the king, to the white elephant, to the idols of Buddha, &c. By the Burmese the Talapoins are said to be called Rahans, whence seems to come the name Raulins, given to them by the Mohammedans; as by the Chinese they are called Ho-changi; in Tibet, Lama-seng or Lamas; and in Japan, Bonzes. (Prevost, *Histoire Générale des Voyages*, vi. 328; and Dr. Fr. Buchanan, 'On the Religion and Literature of the Burmas,' in *Asiatic Researches*, vol. vi.) In Ceylon the name for the ordinary priests is stated to be Tirounnanse; but, as the novices are said to be styled Saman Eroo Ounnanse, and certain inspectors, exercising a general superintendence over the temples, Naïke Ounnanse and Mahanaïke Ounnanse, it would seem that the name for priests of all kinds is Ounnanse. (Joinville, 'On the Religion and Manners of the People of Ceylon,' in *Asiatic Researches*, vol. vii.) Samana, or Somona, according to Dr. Buchanan, is a title given in Burma both to the priests and to the images of Buddha; whence the Buddhists are often called Samanians. It is derived, he says, from the Sanscrit word Saman, signifying gentleness or affability.

Ample information on the subject of the Talapoins is given by La Loubere, who visited Siam in 1687-8, in quality of envoy from the French king, in his work entitled 'Du Royaume de Siam,' 2 vols. 12mo., Amsterdam, 1691, vol. i., chaps. 17, 18, 19, 21, pp. 341-368 and 381-426; and by Mr. Crawfurd, in his 'Journal of an Embassy from the Governor-General of India to the Courts of Siam and Cochin China' (in 1821-22), 4to., London, 1828, pp. 350, &c. They are, as has been stated, a species of monks living in communities of from ten to some hundreds, and employing their time in devotion, religious study, and meditation, and in begging, or rather receiving alms, for they are not permitted actually to solicit charity. Their monasteries, in which each monk has his separate cell, are always adjoining to some temple; but it does not appear that the Talapoins officiate as priests or ministers of religion in our sense of the term. Neither are they considered as forming or belonging to the literary or learned class: the pursuit of any secular study is looked upon as unseemly and profane in a Talapoin; and in fact they are mostly very ignorant. Yet the instruction of youth in the elements of learning appears to be chiefly or exclusively in their hands. Every Siamese, we are told, becomes a Talapoin for some time. 'Every male in the kingdom,' says Mr. Crawfurd, 'must at one period or another of his life enter the priesthood, for however short a time. Even the king will be a priest for two or three days, going about for alms like the rest, and the highest officers of the government continue in the priesthood for some months.' Usually, it may be supposed, a man goes through the ceremony of getting himself made a talapoin without any intention of permanently forsaking the world; but if he enters one of the sacred communities a second time, he cannot again withdraw from it. The Talapoins are said to be very numerous; but they seem to consist for the greater part of mere temporary members of the order, and of persons who have thus entered it for the second time in advanced life. Its advantages, or temptations, are, a life of idleness, exemption from taxation and from the conscription, security of subsistence and comfortable raiment, together with the ceremonious marks of respect with which a talapoin is everywhere treated. All the monasteries are endowed by the government, or by wealthy individuals, under whose protection they are considered to be. La Loubere has given a drawing of one; and another is described in Finlayson's account of 'The Mission to Siam and Hué in 1821-22,' p. 110. In their dresses of yellow cotton or silk, which are of the same fashion with those of the Buddhist priests in Ava and Ceylon, the Talapoins of Siam present a highly favourable contrast to the rags and squalidity of the general population. On the other hand, a talapoin is not only separated from society by being condemned to celibacy, and is prohibited from possessing property, but is expected to observe very strictly several of the precepts of the national religion which are very little attended to by anybody else, especially the prohibitions against the slaying of animals (although they will eat them when slain), stealing, adultery, lying, and drinking wine. There are different orders of Talapoins, and La Loubere says there are also female Talapoins, whom he calls Talapouines; but these, according to Crawfurd, are only a few old women who are allowed to live in the unoccupied cells of some of the monasteries. The national head of the Talapoins, styled the Son-krat, is appointed to that dignity by the king, and always resides in the royal palace.

TALAVE'RA DE LA REYNA, or LA REAL, a large town of Spain, formerly in the province of Toledo, but now, since the late division of the Spanish territory, the capital of the province of its name. It is situated on the right bank of the Tagus, at the end of an extensive and well cultivated plain, 38° 52′ N. lat., 6° 39′ W. long. It was called by the Romans Ebora Talabriga, as the inscriptions and remains found in its territory show. It has a fine Gothic church, the foundation of the celebrated Rodrigo Ximenez, archbishop of Toledo, the author of a history of the Arabs and a Latin chronicle of Spain, about the beginning of the thirteenth century. The town is badly built, and the streets are narrow and crooked. The population does not exceed 12,000, who are chiefly occupied in the manufacture of pottery and hardware, for which Talavera is famous all over Spain. A large silk manufactory, which belongs to the government, employs also many of the population. In July, 1809, Talavera was the scene of a battle between the British under Wellington (then General Wellesley) and the French commanded by Jourdan. The battle was long and obstinately contested, but it ended in the complete defeat of the French. The exhausted condition of the English troops, who were without provisions, prevented them from following up their advantage and pursuing the enemy. There is another town, in La Mancha, called Talavera la Vieja, or 'the old.'

TALC, a mineral which occurs crystallized and massive, and it is probable that some distinct species of minerals have been so called. Primary form of the crystal a rhomboid, but usually occurs in the secondary form of hexagonal laminæ, and sometimes in long prisms. Cleavage distinct, perpendicular to the axis. It is easily separable into thin plates, which are flexible, but not elastic. It is easily scraped with a knife, and the powder is unctuous to the touch. Colour white, green, greyish, and blackish-green and red. Becomes negatively electrical by friction; lustre pearly. Transparent; translucent; opaque. Specific gravity 2·713.

Crystallized talc is mostly white, or of a light green colour; is met with in serpentine rocks in small quantity, with carbonate of lime, actinolite, steatite, and massive talc, &c. It is found in the mountains of Salzburg and the Tyrol: it occurs in many other parts of the world, as in Cornwall, in Kynan's Cove, where a bed of it underlies serpentine. It also occurs in Scotland, in Glen Tilt, Perthshire; and in Saxony, Silesia, and Piedmont, &c.

The *massive varieties* of talc are less flexible than the crystallized: they are principally of an apple-green colour, and sometimes of a radiated structure. It is met with in considerable quantity in beds in micaceous schistus, gneiss, and serpentine.

Some of the varieties of talc are infusible; others become white, and yield a small button of enamel with borax.

Indurated talc is massive, of a greenish grey colour; the structure is schistose and curved: it is of a shining and sometimes of a pearly lustre, and somewhat translucent. It is soft and rather unctuous to the touch. Its specific gravity is 2·9.

It occurs in primitive mountains in clay slate and serpentine, in several countries on the continent of Europe; in Britain, in Perthshire and Banffshire in Scotland, and in the Shetland Islands.

According to Vauquelin, lamellar talc consists of

Silica	62
Magnesia	27
Alumina	1·8
Oxide of iron	3·2
Water	6
	100·

Steatite, chlorite, and other magnesian minerals are nearly allied to mica, and they are by some mineralogists considered as varieties of the same substance.

TALEGALLA. Mr. G. R. Gray makes the *Megapodiinæ* the third and last subfamily of his *Palamedeidæ* (PALAMEDEA, Linn.).

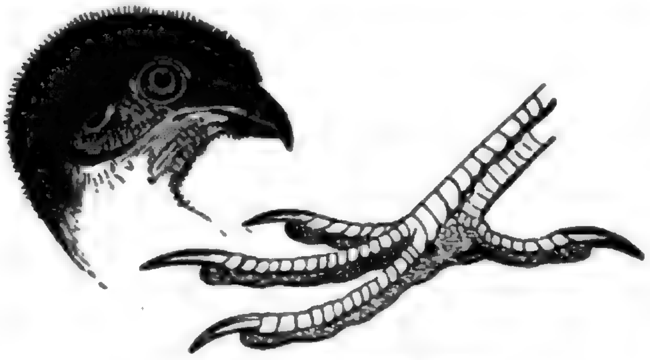
The *Megapodiinæ* comprise the following genera:—*Talegalla*, Less. (*Alectura*, Lath.; *Talegallus*, Less.; *Numida*, James; *Catheturus*, Sw.); *Megapodius*, Quoy et Gaim. [MEGAPODIIDÆ; CRACIDÆ, vol. viii., p. 132]; *Mesites?* J. Geoffr.; *Menura*, Shaw (*Parkinsonius*, Bechst.; *Megapodius*, Wagl.) [MÆNURA]; *Alecthelia*, Less. (nec Swains.) [CRACIDÆ, vol. viii., p. 133].

We proceed in this article to notice the genera *Talegalla*, *Leipoa*, and *Megapodius*, the natural history of which, especially with regard to their habits and nidification, has lately been satisfactorily made out.

And first of

Talegalla.

Generic Character.—Bill very robust, very thick, one-third of the length of the head compressed above, with the upper mandible convex; nostrils basal, lateral, oval-oblong, pierced in a large membrane; lower mandible less high but wider than the upper, nearly straight below, with smooth edges, the branches widened at the base, and that width filled up by a feathered membrane; cheeks entirely naked; head and neck furnished with feathers with simple barbules. Wings rounded, moderate, the first quill very short, the second rather longer, the third longest of all, the fourth and fifth diminishing in length after the third. Tail rather long, rounded; tarsi rather robust, moderately long, furnished with large scutella in front; toes rather long, the middle longest, the external shortest; the three front toes furnished at their origin with a membranous border, which is widest between the external and middle toes; claws convex, flattened below, slightly curved and moderately robust; the hind-toe long, resting entirely on the ground, and furnished with an equally robust claw. (Lesson.)



Head and foot of Talegalla. (Gould.)

Example, *Talegalla Lathami*.

Latham, in his *General History of Birds* (vol. i.), described and figured this bird under the name of the *New Holland Vulture;* but, correcting his error, he, in the tenth volume, placed it among the Gallinaceous Birds, with the generic name of *Alectura*, which had been previously employed to designate a group of Flycatchers.

M. Lesson places the genus at the end of the *Phasianidæ*.

Mr. Swainson, in his *Classification of Birds* (vol. i., 1836), treating of the *Vulturidæ*, notices this species, under the name of the New Holland Vulture, as being so like a rasorial bird, that some authors have hesitated (not having seen a specimen) as to what order it really belonged. 'So completely indeed,' says he, 'has nature disguised this rare and extraordinary vulture in the semblance of that type which it is to represent in its own family, that it has even been classed by one writer with the *Menura* of the same Continent; and it must be confessed that if clear conceptions of the difference between analogy and affinity are not entertained, such a classification has some plausible reasons to recommend it. In fact, the feet of the two birds are formed nearly on the same principle; but, then, so are those of *Orthonyx*, a little scansorial bird not much bigger than a robin. All three genera, in short, are remarkable for their large disproportionable feet, long and slightly curved claws, and the equality of length, or nearly so, of the outer and the middle toe. It is by instances such as these that we perceive the full extent of those unnatural combinations which result from founding our notions of classification from one set of characters, and forgetting to look at the full consequences of carrying those notions into extended operation. Nor is this the only peculiarity of the New Holland Vulture; for, unlike all others of its family, it possesses eighteen feathers in its tail. 'An examination of the bill,' Mr. Swainson gives a cut of it, 'which is decidedly raptorial, joined with many other considerations, shows that all these are but analogical relations to the *Rasores*, while the real affinities of the bird are in the circle of the *Vulturidæ*, of which it forms the rasorial type. A perfect specimen of this very rare vulture, now before us (procured by Mr. Allan Cunningham in the forests adjoining Van Diemen's Land), enables us to speak of its structure from personal examination.' In the synopsis to Mr. Swainson's second volume (1837), we find it in the family *Vulturidæ*, under the name of *Catheturus* (which cannot be retained), between *Neophron* and *Gypaetus*, recorded as the rasorial type of the *Vulturidæ*. And yet it is no bird of prey at all. Latham, in his tenth volume, and Lesson, were right in considering it a rasorial species.

Mr. Gould, to whom we are indebted for a full and satisfactory account of the habits of this extraordinary bird, to which we shall presently advert, modestly says:—'After all the facts that have been stated, I trust it will be evident that its natural situation is among the *Rasores*, and that it forms one of a great family of birds peculiar to Australia and the Indian Islands, of which *Megapodius* forms a part; and in confirmation of this view I may add, that the sternum has the two deep emarginations so truly characteristic of the *Gallinaceæ;* at all events it is in no way allied to the *Vulturidæ*, and is nearly as far removed from *Menura*.' It seems to us that *Talegalla Lathami* may be considered, in a degree, as the representative of the turkey in Australia.

Description.—Adult *male:* whole of the upper surface, wings, and tail, blackish-brown; the feathers of the under surface blackish-brown at the base, becoming silvery-grey at the tip; skin of the head and neck deep pink-red, thinly sprinkled with short hair-like blackish-brown feathers; wattle bright yellow, tinged with red where it unites with the red of the neck; bill black; irides and feet brown.

Female about a fourth less than the male in size, but so closely the same in colour as to render a separate description unnecessary. She also possesses the wattle, but not to so great an extent. (Gould.)

Size about that of a turkey.

Mr. Gould gives the following synonyms:—*New Holland Vulture*, Lath.; genus *Alectura*, ibid.; *Alectura Lathami*, J. E. Gray; *New Holland Vulture*, *Catheturus Australis*, Sw.; *Meleagris Lindesargii*, Jameson; *Brush Turkey* of the colonists; *Weelah* of the aborigines of the Namoi.

Habits, Nidification, &c.—Mr. Gould describes *Talegalla Lathami*, or the *Wattled Talegalla*, as a gregarious bird, generally moving about in small companies, much after the manner of the *Gallinaceæ*, and, like some species of that tribe, as very shy and distrustful. When it is disturbed, he states that it readily eludes pursuit by the facility with which it runs through the tangled brush. If hard pressed, or where rushed upon by their great enemy, the native dog, the whole company spring upon the lowermost bough of some neighbouring tree, and, by a succession of leaps from branch to branch, ascend to the top, and either perch there or fly off to another part of the brush. They resort also to the branches of trees as a shelter from the sun in the middle of the day, a habit which Mr. Gould notices as greatly tending to their destruction; for the sportsman is enabled to take a sure aim, and the birds, like the ruffed grouse of America, will allow a succession of shots to be fired till they are all brought down.

But the most remarkable circumstance connected with the economy of this bird is its nidification, for it does not hatch its eggs by incubation. It collects together a great heap of decaying vegetables as the place of deposit of its eggs, thus making a hot-bed, arising from the decomposition of the collected matter, by the heat of which the young are hatched. Mr. Gould describes this heap as the result of several weeks' collection by the birds previous to the period of laying, as varying in quantity from two to four cart-loads, and as of a perfectly pyramidical form. This mound, he states, is not the work of a single pair of birds, but is the result of the united labour of many: the same site appeared to Mr. Gould to be resorted to for several years in succession, from the great size and entire decomposition of the lower part, the birds adding a fresh supply of materials on each occasion previous to laying.

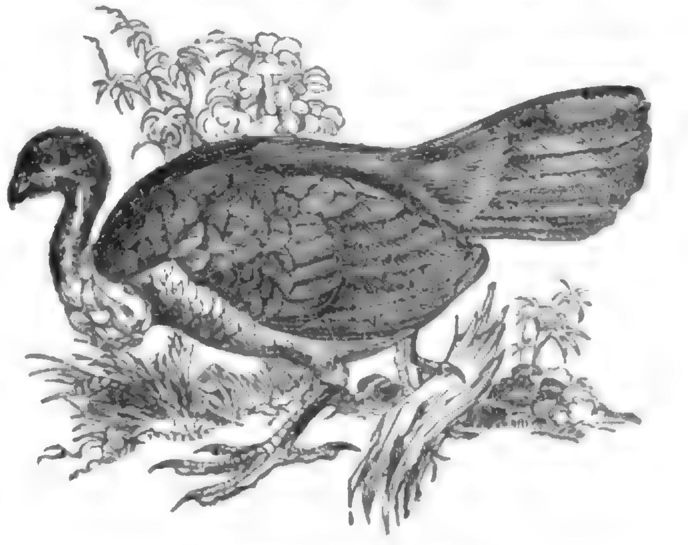
'The mode,' says Mr. Gould in continuation, 'in which the materials composing these mounds are accumulated is equally singular, the bird never using its bill, but always grasping a quantity in its foot, throwing it backwards to one common centre, and thus clearing the surface of the ground for a considerable distance so completely, that scarcely a leaf or a blade of grass is left. The heap being accumulated, and time allowed for a sufficient heat to be engendered, the eggs are deposited, not side by side, as is ordinarily the case, but planted at the distance of nine or twelve inches from each other, and buried at nearly an arm's depth, perfectly upright, with the large end upwards: they are covered up as they are laid, and allowed to remain until hatched. I have been credibly informed, both by natives and settlers living near their haunts, that it is not an unusual event to obtain nearly a bushel of eggs at one time from a single heap; and as they are delicious eating, they are eagerly sought after. Some of the natives state that the females are constantly in the neighbourhood of the heap about the time the young are likely to be hatched, and frequently uncover and cover them up again, apparently for the purpose of assisting those that may have appeared; while others have informed me that the eggs are merely deposited, and the young allowed to force their way unassisted. In all probability, as nature has adopted this mode of reproduction, she has also furnished the tender birds with the power of sustaining themselves from the earliest period; and the great size of the egg would equally lead to this conclusion, since in so large a space it is reasonable to suppose that the bird would be much more developed than is usually found in eggs of smaller dimensions. In further confirmation of this point, I may add, that in searching for eggs in one of the mounds, I discovered the remains of a young bird, apparently just excluded from the shell, and which was clothed with feathers, not with down, as is usually the case: it is to be hoped that those who are resident in Australia, in situations favourable for investigating the subject, will direct their attention to the further elucidation of these interesting points. The upright position of the eggs tends to strengthen the opinion that they are never disturbed after being deposited, as it is well known that the eggs of birds which are placed horizontally are frequently turned during incubation. Although, unfortunately, I was almost too late for the breeding-season, I nevertheless saw several of the heaps, both in the interior and at Illawarra: in every instance they were placed in the most retired and shady glens, and on the slope of a hill, the part above the nest being scratched clean, while all below remained untouched, as if the birds had found it more easy to convey the materials down than to throw them up. In one instance only was I fortunate enough to find a perfect egg, although the shells of many from which the young had been excluded were placed in the manner I have described. At Illawarra they were rather deposited in the light vegetable mould than among the leaves, which formed a considerable heap above them. The eggs are perfectly white, of a long, oval form, three inches and three-quarters long by two inches and a half in diameter.' (*Birds of Australia.*)

The same author relates that these birds, while stalking about the wood, frequently utter a loud clucking noise; and, in various parts of the bush, he observed depressions in the earth, which the natives informed him were made by the birds in dusting themselves. The stomach is stated by Mr. Gould to be extremely muscular; and he found the crop of one which he dissected filled with seeds, berries, and a few insects.

The composure with which these birds sit to be shot at, as above noticed, must, as Mr. Gould observes, lead to an early extinction of the race; an event, he remarks, much to be regretted, since, independently of its being an interesting bird for the aviary, its flesh is extremely delicate, tender, and juicy. There is no doubt that this species may be domesticated, and it would make a noble addition to those foreign denizens of the poultry-yard which enrich our homesteads and tables. Mr. Gould saw a living specimen, which was in the possession of Mr. Alexander M'Leay for many years. 'On my arrival at Sydney,' says Mr. Gould, 'this venerable gentleman took me into his garden and showed me the bird, which, as if in its native woods, had for two successive years collected an immense mass of materials similar to those above described. The borders, lawn, and shrubbery over which it was allowed to range presented an appearance as if regularly swept, from the bird having scratched to one common centre everything that lay upon the surface: the mound in this case was about three feet and a half high, and ten feet over. On placing my arm in it, I found the heat to be about 90° or 95° Fahr. The bird itself was strutting about with a proud and majestic air, sometimes parading round the heap, at others perching on the top, and displaying its brilliantly coloured neck and wattle to the greatest advantage: this wattle it has the power of expanding and contracting at will; at one moment it is scarcely visible, while at another it is extremely prominent.'

Before Mr. Gould left New South Wales, this bird, which, during the greater part of the period when it was in Mr. M'Leay's possession, was at large, and usually associated with the fowls in the poultry-yard, was unfortunately drowned in a tank or water-butt. On dissection it was found to be a male, thereby proving, as Mr. Gould remarks, that the sexes are equally employed in forming the mound for the reception of the eggs.

Locality.—Mr. Gould states that the extent of the range of this species over Australia is not yet satisfactorily ascertained. It is known, he says, to inhabit various parts of New South Wales from Cape Howe on the south to Moreton Bay on the north; but the cedar-cutters and others, who so frequently hunt through the brushes of Illawarra and Maitland, have nearly extirpated it from those localities, and it is now most plentiful in the dense and little-trodden brushes of the Manning and Clarence. Mr. Gould was at first led to believe that the country between the mountain-ranges and the coast constituted its sole habitat; but he was agreeably surprised to find it inhabiting the scrubby gullies and sides of the lower hills that branch off from the great range into the interior. He procured specimens on the Brezi range to the north of Liverpool Plains, and ascertained that it was abundant in all the hills on either side of the Namoi. (*Ibid.*)



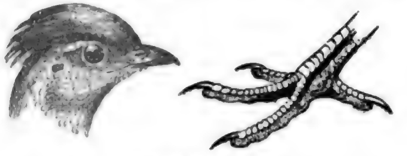
Talegalla Lathami. (Gould.)

M. Lesson describes the species from New Guinea, which serves as the type of his genus *Talegalla Cuvieri*, figured in the *Zoologie de la Coquille*, as entirely black, of the size of a common small hen, and recalling to the observer some of the forms of the *Porphyriones*. [RALLIDÆ, vol. xix., p. 281.]

The history of *Talegalla* affords a striking instance of the futility of classification based upon reasoning which has no sufficient data for its foundation: most of the errors of our zoological systems may be traced to the same source.

Leipoa. (Gould.)

Generic Character.—*Bill* nearly as long as the head, slender, tumescent at the base, the edges undulated and incurved at the base, the nostrils ample, oblong, covered with an operculum, and placed in a central hollow. *Head* subcrested. *Wings* ample, rounded, concave; fifth primary quill the longest; the tertiaries nearly as long as the primaries. *Tail* rounded, tail-feathers fourteen. *Tarsi* moderate, robust, covered with scuta anteriorly, and posteriorly with scales which are rounded and unequal. *Toes* rather short; lateral toes nearly equal. (Gould.)



Head and Foot of Leipoa.

Example, *Leipoa ocellata*, *Ocellated Leipoa*. (Gould.)

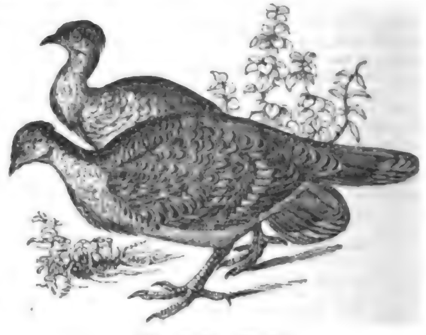
Description.—Head and crest blackish-brown; neck and shoulders dark ash-grey; the fore part of the neck from the chin to the breast marked by a series of lanceolate feathers, which are black with a white stripe down the centre; back and wings conspicuously marked with three distinct bands of greyish white, brown and black near the tip of each feather, the marks assuming an ocellated form, particularly on the tips of the secondaries; primaries brown, their outer webs marked with two or three zigzag lines near their tip; all the under surface light buff, the tips of the flank feathers barred with black; tail blackish-brown, broadly tipped with buff; bill black; feet blackish-brown. (Gould.)

In size this beautiful bird is inferior to *Talegalla Lathami*, and it is more slender and more elegantly formed. According to Mr. Gould, it is the *Ngow* of the aborigines of the lowland; *Ngow-oo* of the mountain districts of Western Australia; and *Native Pheasant* of the colonists of Western Australia.

Habits, Food, Nidification, &c.—Mr. Gould, in his *Birds of Australia*, gives an account, collected by Mr. John Gilbert, from G. Moore, Esq., advocate-general, Mr. Armstrong, the aboriginal interpreter, and some of the more intelligent natives of Western Australia. The *Ocellated Leipoa* is there described as a ground-bird, never taking to a tree except when closely hunted: when hard pursued, it will frequently run its head into a bush, and is then easily taken. Food generally consisting of seeds and berries. The note mournful, very like that of a pigeon, but with a more inward tone. Eggs deposited in a mound of sand, the formation of which is the work of both sexes. According to the natives, the birds scratch up the sand for many yards around, forming a mound about three feet in height, the inside of which is constructed of alternate layers of dried leaves, grasses, &c., among which twelve eggs and upwards are deposited, and are covered up by the birds as they are laid; or, as the natives express it, 'the countenances of the eggs are never visible.' Upon these eggs the bird never sits, but when she has laid out her lay, as the henwives say, the whole are covered up, when the mound of sand resembles an ant's nest. The eggs, which are white, very slightly tinged with red, and about the size of a common fowl's egg, are hatched by the heat of the sun's rays, the vegetable lining retaining sufficient warmth during the night; they are deposited in layers, no two eggs being suffered to lie without a division. The natives, who are very fond of the eggs, rob these hillocks two or three times in a season; and they judge of the number of eggs in a mound by the quantity of feathers lying about. If the feathers be abundant, the hillock is full; and then they immediately open and take the whole. The bird will then begin to lay again, again to be robbed, and will frequently lay a third time. Upon questioning one of the men attached to Mr. Moore's expedition, he gave to Mr. Gilbert a similar account of its habits and mode of incubating; adding, that in all the mounds they opened, they found ants almost as numerous as in an ant-hill; and that in many instances that part of the mound surrounding the lower portion of the eggs had become so hard, that they were obliged to chip round them with a chisel to get the eggs out; the insides of the mounds were always hot.

Captain Grey, of the 83rd regiment, who had just returned from his expedition to the north-west coast, informed Mr. Gould that he had never fallen in with the nests but in one description of country, viz. where the soil was dry and sandy and so thickly wooded with a species of dwarf *Leptospermum*, that if the traveller strays from the native paths, it is almost impossible for him to force his way through. In these close scrubby woods small open glades occasionally occur, and there the Ngow-oo constructs its nest,—a large heap of sand, dead grass and boughs, at least nine feet in diameter and three feet in height; Captain Grey had seen them even larger than this. Upon one occasion only he saw eggs in these nests: they were placed some distance from each other, and buried in the earth. Captain Grey states that he is not sure of the number, but the account given by the natives led him to believe that at times large numbers were found.

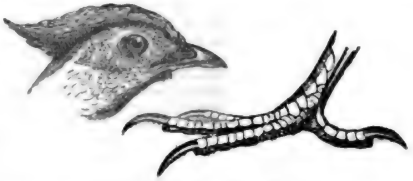
Locality.—Western Australia. Mr. Moore saw a great many of them about sixty miles north of Perth; but its most favourite country appears to be the barren sandy plains of the interior, 100 miles north and east of York. The farthest point north at which Captain Grey saw the breeding-places was Gantheaume Bay. Captain Grey states that the natives of King George's Sound say that the same or a nearly allied species exists in that neighbourhood. (*Birds of Australia.*)



Leipoa Ocellata. (Gould.)

Megapodius.

In the article Cracidæ (vol. viii., p. 132) the generic character of *Megapodius* and an account of *Megapodius Duperreyi* is given. It is there stated that it would seem that the Megapodius of the Philippines leaves its eggs to the fostering heat of the sun. Mr. Gould, in the great work from which we have already drawn such interesting accounts of this extraordinary group of birds, has, from the notes of Mr. Gilbert, laid before the public a most satisfactory statement relative to the habits of *Megapodius Tumulus*



Head and foot of Megapodius. (Gould.)

Description.—Head and crest very deep cinnamon-brown; back of the neck and all the under surface very dark grey; back and wings cinnamon-brown; upper and under tail-coverts dark chestnut-brown; tail blackish-brown; irides generally dark brown, but in some specimens light reddish-brown; bill reddish-brown, with yellow edges; tarsi and feet bright orange, the scales on the front of the tarsi from the fourth downwards, and the scales of the toes, dark reddish-brown. (Gould.)

Size about that of a common fowl.

This is the *Ooregoorgā* of the aborigines of the Cobourg Peninsula; the *Jungle-fowl* of the colonists of Port Essington.

Habits, Food, Nidification, &c.—On Mr. Gilbert's arrival at Port Essington his attention was attracted to numerous great mounds of earth which were pointed out to him by some of the residents as being the tumuli of the aborigines. The natives, on the other hand, assured him that they were formed by the Jungle-fowl for the purpose of hatching its eggs. But this last statement appeared so extraordinary, and so much at variance with the general habits of birds, that no one in the settlement believed them, and the great size of the eggs brought in by them as the produce of this bird strengthened the doubt of the veracity of their information. Mr. Gilbert however, knowing the habits of *Leipoa*, took with him an intelligent native, and proceeded about the middle of November to Knocker's Bay, a part of Port Essington harbour comparatively but little known, and where he had been informed a number of these birds were to be seen. He landed beside a thicket, and had not advanced far from the shore when he came to a mound of sand and shells, with a slight mixture of black soil, the base resting on a sandy beach, only a few feet above high-water mark: it was enveloped in the large yellow-blossomed *Hibiscus*, was of a conical form, twenty feet in circumference at the base, and about five feet high. On asking the native what it was, he replied, 'Oregoorgā Rambal' (Jungle-fowl's house or nest). Mr. Gilbert scrambled up the sides of it, and found a young bird in a hole about two feet deep; the nestling, apparently only a few days old, was lying on a few dry withered leaves. The native assured Mr. Gilbert that it would be of no use to look for eggs, as there were no traces of the old birds having lately been there. Mr. Gilbert took the utmost care of the young bird, placed it in a moderate-sized box, into which he introduced a large portion of sand, and fed it on bruised Indian corn, which it took rather freely. Its disposition was wild and intractable, and it effected its escape on the third day. While it remained in captivity, it was incessantly employed in scratching up the sand into heaps, and Mr. Gilbert remarks that the rapidity with which it threw the sand from one end of the box to the other was quite surprising for so young and small a bird, its size not being larger than that of a small quail. At night it was so restless that Mr. Gilbert was constantly kept awake by the noise it made in endeavouring to escape. In scratching up the sand the bird only employed one foot, and having grasped a handful as it were, threw the sand behind it with but little apparent exertion, and without shifting its standing position on the other leg: this habit, Mr. Gilbert observes, seemed to be the result of an innate restless disposition and a desire to use its powerful feet, and to have but little connection with its feeding; for, although Indian corn was mixed with the sand, Mr. Gilbert never detected the bird in picking any of it up while thus employed.

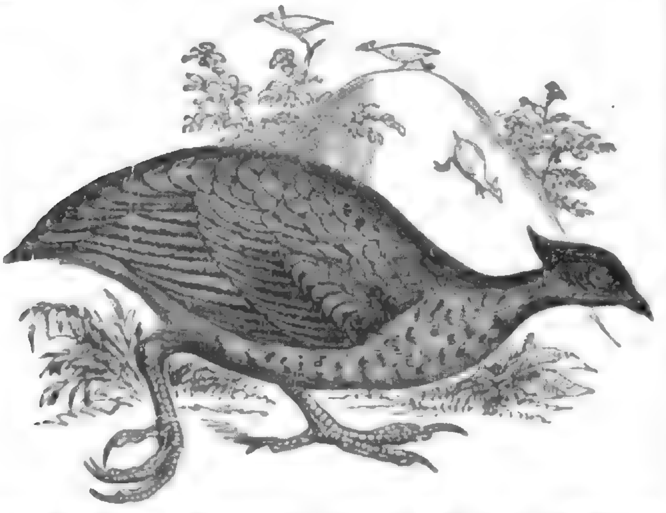
Mr. Gilbert continued to receive the eggs without any opportunity of seeing them taken from the ground until the beginning of February, when, on again visiting Knocker's Bay, he saw two taken from a depth of six feet, in one of the largest mounds he had met with. In this instance the holes ran down in an oblique direction from the centre towards the outer slope of the hillock, so that although the eggs were six feet deep from the summit, they were only two or three feet from the side. 'The birds,' says Mr. Gilbert in continuation, 'are said to lay but a single egg in each hole, and after the egg is deposited the earth is immediately thrown down lightly until the hole is filled up; the upper part of the mound is then smoothed and rounded over. It is easily known when a Jungle-fowl has been recently excavating, from the distinct impressions of its feet on the top and sides of the mound, and the earth being so lightly thrown over, that with a slender stick the direction of the hole is readily detected, the ease or difficulty of thrusting the stick down indicating the length of time that may have elapsed since the bird's operations. Thus far it is easy enough; but to reach the eggs requires no little exertion and perseverance. The natives dig them up with their hands alone, and only make sufficient room to admit their bodies, and to throw out the earth between their legs; by grubbing with their fingers alone they are enabled to follow the direction of the hole with greater certainty, which will sometimes, at a depth of several feet, turn off abruptly at right angles, its direct course being obstructed by a clump of wood or some other impediment. Their patience is however often put to severe trials. In the present instance the native dug down six times in succession to a depth of at least six or seven feet without finding an egg, and at the last attempt came up in such a state of exhaustion that he refused to try again; but my interest was now too much excited to relinquish the opportunity of verifying the native's statements, and by the offer of an additional reward I induced him to try again: this seventh trial proved successful, and my gratification was complete when the native with equal pride and satisfaction held up an egg, and, after two or three more attempts, produced a second: thus proving how cautious Europeans should be of disregarding the narrations of these poor children of nature, because they happen to sound extraordinary or different from anything with which they were previously acquainted.'

Upon another occasion Mr. Gilbert and his native, after an hour's excessive labour, obtained an egg from the depth of about five feet. It was in a perpendicular position. The holes in this mound (which was fifteen feet high and sixty in circumference at the base, and, like the majority of those that he had seen, so enveloped in thickly foliaged trees as to preclude the possibility of the sun's rays reaching any part of it) commenced at the outer edge of the summit and ran down obliquely towards the centre: their direction therefore, Mr. Gilbert observes, is not uniform. The mound was quite warm to the hands.

How the young effect their escape does not appear; some natives told Mr. Gilbert that the nestlings effected their escape unaided; but others said that the old birds at the proper time scratched down and released them. The natives say that only a single pair of birds are ever found at a mound at a time. Our space will not permit a more detailed account of these highly curious mounds; but the reader should consult Mr. Gould's highly valuable work for other particulars: we can only spare room for Mr. Gilbert's description of the general habits of this interesting species.

'The Jungle-fowl is almost exclusively confined to the dense thickets immediately adjacent to the sea-beach: it appears never to go far inland, except along the banks of creeks. It is always met with in pairs or quite solitary, and feeds on the ground, its food consisting of roots which its powerful claws enable it to scratch up with the utmost facility, and also of seeds, berries, and insects, particularly the larger species of Coleoptera. It is at all times a very difficult bird to procure; for although the rustling noise produced by its stiff pinions when flying away be frequently heard, the bird itself is seldom to be seen. Its flight is heavy and unsustained in the extreme; when first disturbed it invariably flies to a tree, and on alighting stretches out its head and neck in a straight line with its body, remaining in this position as stationary and motionless as the branch upon which it is perched: if however it becomes fairly alarmed, it takes a horizontal but laborious flight for about a hundred yards with its legs hanging down as if broken. I did not myself detect any note or cry, but from the native's description and imitation of it, it much resembles the clucking of the domestic fowl, ending with a scream like that of the peacock. I observed that the birds continued to lay from the latter part of August to March, when I left that part of the country; and, according to the testimony of the natives, there is only an interval of about four or five months, the driest and hottest part of the year, between their seasons of incubation. The composition of the mound appears to influence the colouring of a thin epidermis with which the eggs are covered, and which readily chips off, showing the true shell to be white: those deposited in the black soil are always of a dark reddish-brown; while those from the sandy hillocks near the beach are of a dirty yellowish white: they differ a good deal in size, but in form they all assimilate, both ends being equal: they are three inches and five lines long by two inches and three lines broad.' (*Birds of Australia.*)

Mr. Gould has thus given the history of these three nearly allied genera, forming, as he observes, part of a great family of birds whose range will be found to extend from the Philippines through the islands of the Indian Archipelago to Australia. *Megapodius Tumulus* is, according to him, rather numerously spread over the whole of the Cobourg Peninsula on the north coast of the Australian continent, where the British settlement of Port Essington is now established; and he thinks that future research will require us to assign to it a much wider range, probably over the whole extent of the north coast.



Megapodius Tumulus, Mound-raising Megapode, with nest in the distance. (From Gould.)

TALENT (*τάλαντον*) was the highest denomination of Greek weights and money, and was also commonly used by Greek writers as the translation of words signifying a certain weight in other languages. It is necessary to observe that the talent is properly only a denomination of *weight*. There was no coin of that name; and when used in reference to money, it meant originally a talent-weight of gold or silver, and afterwards a certain quantity of current money, the weight of which (supposing the real and nominal value of the coin to be the same) amounted to a talent.

I. THE HEBREW TALENT, or KIKKAR (כִּכָּר), contained 3000 shekels, and, according to Mr. Hussey's computation, its weight was 93 lbs. 12 ozs. avoirdupois, and its value as *silver*-money 396*l*. 5*s*. 10*d*. [SHEKEL.] The Hebrews had no gold money of their own.

II. THE GREEK TALENT.

The following were the principal denominations of weight and money among the Greeks:—*ὀβολός, δραχμή, μνᾶ, τάλαντον*, of which the *ὀβολός* was the smallest. Their relative proportions are shown in the annexed table:—

Obol			
6	Drachma		
600	100	Mina	
36,000	6000	60	Talent.

This system prevailed throughout Greece, but the actual values of the talent varied in different states. Most of these variations may be included under two chief standards, namely, the Attic and the Aeginetan.

1. *The Attic Talent*.—The value of the Attic talent before the time of Solon is a matter on which we possess hardly any historical information, though we may perhaps arrive at a very probable result. Looking then at the system after Solon had remodelled the coinage [SOLON], we find that the Attic silver money was celebrated for its purity; and therefore from the coins of that period which still exist we may determine the value of the standard with tolerable certainty. Now the chief coin was the drachma of silver, the average weight of which, from the time of Solon to that of Alexander the Great, is found to be 66·5 grains. From this we get the following values in avoirdupois weight:—

	lb.	oz.	gr.
Obol . . .	..	.	11·08
Drachma . .	..	..	66·5
Mina . .	..	15	83·75
Talent . .	56	15¾	100·32

This was the standard always used for silver money, and was therefore called 'the silver standard.'

Besides this there was another standard, the chief weight of which was called *the commercial mina* (ἡ μνᾶ ἡ ἐμπορική), and contained 138 drachmae, 'according to the standard weights in the silver mint' (see a decree in Böckh, *Corp. Inscrip.*, i. 123, § 4); that is, not that a commercial mina contained 138 *commercial* drachmae, but that this was quite a different standard from that used for silver money, its unit being to that of the latter in the ratio of 138 : 100; while the *relative* proportions of the weights were the same in both systems. The following table shows the value of the Attic commercial standard:—

	lb.	oz.	gr.
Obol . . .	..	..	15·29
Drachma . .	..	..	91·77
Mina . .	1	4¾	93·69
Talent . .	75	5¾	14·69

These weights were used for all commodities, except such as were expressly required by law to be sold by the silver standard.

This commercial standard is most probably, as Böckh has shown, the real antient Attic standard, as it existed before the time of Solon. The purpose of Solon's change was to lower the value of money, in order to relieve debtors. The only direct information we have of the nature of the change is the statement of Plutarch, that 'Solon made the mina of 100 drachmae, which had formerly contained 73,' which is probably a mistake made by Plutarch, through not understanding the words of Androtion, whose authority he follows. The true meaning seems undoubtedly to be, that *out of the same quantity of silver* which in the antient standard made 73 drachmae, Solon coined 100, or a mina; that is, that he lowered the standard in the ratio of 100 : 73. Now the ratio of the commercial to the silver standard is 138 : 100 = 100 : 72$\frac{32}{69}$. Hence the commercial standard and the old Attic only differed by a small fraction.

Still this ratio of 100 : 73 is a very singular one for Solon to have adopted. The most probable explanation is that Solon meant to lower the standard by a quarter, that is, in the ratio of 100 : 75, and that the new coinage (by an accident of not uncommon occurrence in minting) was found, when actually made, to be a little too light, namely, in the ratio of 72$\frac{32}{69}$: 100, or, in round numbers, 73 : 100 to the old money, instead of 75 : 100; and that then, to preserve the purity of the Attic mint, this, its actual value, was adopted as its nominal value.

This view is strongly confirmed by a reference to another standard mentioned by Greek writers, namely, *the Euboïc talent*. This talent was often reckoned as equal to the Attic (compare Herod., iii. 89, with Pollux, ix. 6); but it is also described with greater precision by Aelian (*Var. Hist.*, i. 22), as having to the Attic the ratio of 72 : 70, which is the same as 75 : 72$\frac{11}{12}$. Now if we suppose that the *intended* value of Solon's talent had to its *real* value the ratio of 75 : 72$\frac{32}{69}$, we have this intended value equal (neglecting a very small fraction) to the Euboïc talent. Hence it is inferred that Solon, proposing to lower the Attic standard, and perceiving the advantage of assimilating it to that of the neighbouring island of Euboea, intended to adopt the latter for his new standard, but that in fact a slight difference was caused by accident.

The Romans reckoned both the Attic and Euboïc talents as equal to 80 Roman pounds (compare Polyb. xxi. 14, with xxii. 26, and Liv. xxxvii. 45, with xxxviii. 38).

The Attic commercial standard underwent an alteration by the edict above referred to, which made

its mina = 150 drachmæ (silver)
its 5 minæ = 6 minæ (commercial)
its talent = 65 minæ (commercial)

In this new standard the five-minæ weight was equal to 7 lb. 13¾ oz. 14·96 grs., and the talent to 85 lbs. 2¾ oz. 70·7 grs.

The Athenians took the greatest care of their standards of weight. The principal set were lodged in the Acropolis, and there were other sets in the Prytaneum, at Piræus, and at Eleusis.

The highest coin used by the Athenians was the tetradrachm, or piece of four drachmae; the mina and talent were never coined, but were paid in drachmae, oboli, &c. The following table shows the value of all the denominations of Attic silver money, according to the computation of Mr. Hussey:—

	£	s.	d.	farthings.
Chalcus (of copper) .				·8125
¼ Obol				1·625
½ Obol				3·25
Obol			1	2·5
Diobolon . . .			3	1
Triobolon . . .			4	3·5
Tetrobolon . . .			6	2
Drachma . . .			9	3
Didrachm . . .		1	7	2
Tetradrachm . . .		3	3	
Mina	4	1	3	
Talent	243	15		

2. *The Aeginetan talent.* It is a disputed question what was the ratio of the Aeginetan to the Attic talent. Pollux (ix. 76, 86) says that the Aeginetan talent contained 10,000 Attic drachmae, and the Aeginetan drachma 10 Attic obols, which would give the ratio of 5 : 3 for that of the Aeginetan to the Attic talent. According to this statement, the Aeginetan drachma weighed 110 grains English. Now the existing coins give an average of only 96 grains; and the question therefore is whether we are to follow Pollux or the coins. Mr. Hussey takes the latter course, explaining the statement of Pollux as referring to the debased drachma of later times, which was about equal to the Roman denarius. Böckh adheres to the statement of Pollux, explaining the lightness of the existing coins by the well-known tendency of the antient mints to depart from the full value. He has supported his view by some very strong and ingenious arguments, and on the whole he appears to be right.

There were other talents used by the Greeks and Romans, most of which seem to have been derived from one of these two standards, but the accounts of antient writers respecting them are very contradictory. Their values are discussed at length by Böckh and Hussey.

The most important variations of the Aeginetan standard were those used in Macedonia, Corinth, and Sicily.

The above talents were all reckoned in silver money. There was also a talent of gold, which was much smaller. It was used chiefly by the Greeks of Italy and Sicily, whence it was called the *Sicilian talent* as well as the *gold talent.* It was equal to 6 Attic drachmae, that is, about ¾ oz. and 71 grs. It was divided by the Italian Greeks into 24 *nummi*, and afterwards into 12, each nummus containing 2½ *litrae.* When Homer uses the word *talent*, we must always understand by it this small one of gold. In other classical writers the word generally means the Attic talent.

(Böckh, *Metrolog. Untersuch.*; Hussey, *Antient Weights and Money*; *Dictionary of Greek and Roman Antiquities*, 1842.)

TALE'S. At common law, when the number of jurymen in attendance was so small, or so much diminished by challenges that a full jury could not be had, a writ (then in Latin) issued to the sheriff, commanding him to summon *such* (tales) other fit persons, &c. for the purpose of making up the jury. The jurors so procured were called talesmen, from the Latin word used in the writ. By the statute 35 Hen. VIII., c. 6, the defect of jurors might, at the request of the plaintiff or defendant in an action, be supplied from *such* other able persons of the said county then present, and these were ordinarily called, from the words in the Latin writ, 'tales de circumstantibus.' Subsequent statutes extended and regulated the application of this statute. But the act now in force is 6 Geo. IV., c. 50; the 37th section, which contains the existing law on the subject, and is in the following words:—'Where a full jury shall not appear before any court of assize or Nisi prius, or before any of the superior civil courts of the three counties palatine, or before any court of great sessions, or where, after appearance of a full jury, by challenge of any of the parties, the jury is likely to remain untaken for default of jurors, every such court, upon request made for the king by any one thereto authorised or assigned by the court, or on request made by the parties, plaintiff or defendant, demandant or tenant, or their respective attorneys, in any action or suit, whether popular or private, shall command the sheriff or other minister, to whom the making of the return shall belong, to name and appoint, as often as need shall require, so many of *such* other able men of the county then present as shall make up a full jury; and the sheriff or other minister aforesaid shall, at such command of the court, return *such* men duly qualified as shall be present, or can be found to serve on such jury; and shall add and annex their names to the former panel, provided that where a special jury shall have been struck for the trial of any issue, the talesman shall be such as shall be empannelled upon the common jury panel to serve at the same court, if a sufficient number of such men can be found; and the king, by any one so authorised or assigned as aforesaid, and all and every the parties aforesaid, shall and may, in each of the cases aforesaid, have their respective challenges to the jurors so added and annexed, and the court shall proceed to the trial of every such issue with those jurors who were before empannelled, together with the talesmen so newly added and annexed, as if all the said jurors had been returned upon the writ of precept awarded to try the issue.' (2 Williams's Saunders, 349 n. (1).) [JURY.]

TALIACOTIUS, GASPAR, TAGLIACOZIO, or TAGLIACOZZI, was professor of anatomy and surgery at Bologna, where he died in 1553, at the age of 64 years. His name is now known chiefly through his reputation for restoring lost noses; but during his life he was equally celebrated for his knowledge of anatomy and his excellence as a lecturer. These last are indeed the only qualities for which he is praised in a tablet put up after his death in one of the halls of the school at Bologna. A statue erected in the amphitheatre formerly recorded his skill in operating by representing him with a nose in his hand.

Some writers have spoken of the original Taliacotian operation as a mere fable, pretending that it never could have been followed by success. But several credible witnesses have recorded that they either saw Taliacotius operating, or saw patients to whom he had restored noses which very closely resembled those of natural formation. The truth is that the operation which Taliacotius really performed is not commonly known; the generally-entertained notion of it being derived from the accounts of those who had some reason to misrepresent it. It will therefore be worth while to give a somewhat detailed account of it.

The work in which it is described was first published forty-four years after Taliacotius' death, with the title 'De curtorum chirurgia per insitionem libri duo, Venetiis 1597, folio.' It is divided into two parts, of which the first is chiefly devoted to a disquisition upon the dignity of the nose, lips, and ears, and upon their offices and general construction, and the theory of the operation, which he considers to be exactly analogous to that of grafting upon trees. In the second book he describes the mode of operating, dwelling first at great length upon the necessary number and character of the assistants, the kind of bed to be used, its position with regard to light, &c., and several other minor matters, on all which he speaks like one thoroughly experienced in surgery. In the operation itself he used the following plan:—A part of the skin of the upper arm of the proper size, and bounded by two longitudinal parallel lines, being marked out over the middle of its fore part, was seized between the blades of a very broad pair of nippers. Each blade was about three inches broad, so that it might include the whole length of the portion of skin to be removed, and had a long slit near its edge through which a narrow knife could be passed. The portion of skin of which the new nose was to be formed being raised up by the assistant who held it in the nippers, Taliacotius with a long spear-shaped knife transfixed it through the slits in the blades of the nippers, and cut it through the whole length of the latter from above downwards. Through the aperture thus made, which might be compared to a very broad incision for a seton, a band covered with appropriate medicines was passed, and by being drawn a little every day, the wound was kept open like a seton wound. When all the inflammation had passed away, which was usually in about fourteen days, the flap of skin was cut through at its upper end, and thus a piece bounded by three sides of a parallelogram was raised from the arm, and remained attached to it by nothing but its fourth side or lower end. In this state it was allowed to cicatrize all over, till it acquired the character of a loose process of skin. This being, after some days, completed, and the piece of skin having become firm and hard, it was deemed ready for engrafting. The head therefore being cleanly shaved, a dress and bandage of singular construction, intended for the maintenance of the arm in its due position, were carefully fitted on. Then these being laid aside, the seat of the old nose was scarified in a triangular space till it had a smooth bleeding surface. A pattern of this surface, being taken on paper, was transferred to the inner surface of the piece of skin on the arm, and a portion of the latter, of the same form and size, was in the same manner made raw. Sutures were placed in corresponding parts of the edges of both these wounds, and they were brought together, the arm being held up with its fore part towards the face, and the palm of the hand upon the head, by the dress and bandage already mentioned. The parts were thus retained in apposition for about twenty days, at the end of which, the surfaces having united, the bandages were taken off, and the portion of skin which was now affixed to both the face and the arm was cut away from the latter. It almost directly became white and cold, but it did not slough, and gradually increased in vascularity and heat. In about fourteen days it was usually firm and secure in its place; and as soon as this was evident, the skin was shaped into the resemblance of a nose by cutting it according to carefully-measured lines and by forming the nostrils in it. A tedious succession of operations were performed upon it before the repair was deemed complete; but at length it is said that in general the restoration was truly admirable. Taliacotius himself however admits that it had, even in the best cases, several defects.

After this account, no one can reasonably doubt that Taliacotius's operation was very often successful. That it should be superseded by the Indian method, as it is called, in which the skin for the new nose is taken from the forehead, is due to the latter being a less tedious and less painful operation, rather than to its being more certain of success. The number of instances in which later attempts to imitate the Taliacotian operation have failed, are due to its having been performed not according to the original method, but according to some of the plans which Taliacotius is erroneously supposed to have followed.

The indecent joke which Butler has made popular in his 'Hudibras' has little foundation. Taliacotius does indeed discuss the propriety of taking the skin for a new nose from the arm of another person; and he concludes that for several reasons it would, if it were possible, be better to do so: but he says he cannot imagine how it would be possible to keep two persons fastened together for the necessary time and with the necessary tranquillity, and that he never heard of the plan being attempted. The tale of the nose falling of when the original proprietor of the skin died, is founded on an absurd story which Van Helmont relates to prove at how great a distance sympathy can act. A gentleman at Brussels, he says, had a new nose made for him by Taliacotius from the arm of a Bolognese porter; and about thirteen months afterwards, as he was walking in Brussels, it suddenly became cold and dropped off, at the very instant at which the porter died at Bologna. Similar stories are told by Campanella, Sir Kenelm Digby, and others; but, as already shown, they are not even fair satires, for Taliacotius never attempted to transfer the skin of one man to the body of another.

(Brambilla, *Storia delle Scoperte fatte dagli Uomini Illustri Italiani*, vol. ii.; Sprengel, *Geschichte der Chirurgie*, Zweiter Theil, p. 195.)

TALIESSIN. [Welsh Language.]

TALIO'NIS, LEX, the law of retaliation; the notion of which is that of a punishment which shall be the same in kind and degree as the injury. This punishment was a part of the Mosaic Law: 'breach for breach, eye for eye, tooth for tooth: as he hath caused a blemish in a man, so shall it be done to him again' (*Levit.*, xxiv. 20). The name 'talio' occurs in the provisions of the Twelve Tables: it is not there defined what it means, but the signification of the term may be collected from other places. The word contains the same element as the word *talis*, 'such,' or 'like.'

TALIPAT or **TALIPOT PALM.** [Corypha.]

TALISH. [Georgia.]

TALISMA'N an Arabic word, supposed to be derived from the Greek *telesma* (τέλεσμα), is a figure cast in metal or cut in stone, and made with certain superstitious ceremonies, when two planets are in conjunction, or when a certain star is at its culminating point. A talisman thus prepared is supposed to exercise an influence over the bearer, preserving him from disease, rendering him invulnerable in battle, and so forth. They were probably used originally to avert disease, for we find them mentioned in the history of medicine among all antient nations. The Egyptians made use of figures of sacred animals, such as the ibis and the scarabæus, which they wore generally suspended from their necks. The Arabs and the Turks did the same, when they were idolaters; but after their conversion to Islam, they used sentences from the Koran, taken chiefly from the surah, or chapter, entitled 'The Incantation.' These they wore inscribed on rolls of vellum or paper, enclosed in a silver box, and suspended from their neck; or else engraven upon a signet ring. Military men used similar sentences from the Koran on the hilt or blade of their swords; on their shields, helmets, and other pieces of armour; or woven into their garments. Christian nations even were not exempt from this superstition. In the middle ages, relics of saints, consecrated candles, and rods, rosaries, &c. were employed, and still are, in Spain and in some parts of Italy. The African negroes have their *fetich*, and the American Indians their *medicine*.

(Reinaud, *Monuments Mussulmans du Cabinet du Duc de Blacas*, Paris, 1826.)

TALLAGE is derived, according to Lord Coke, from the law Latin word *tallagium* or *tailagium*, which, as he says, 'cometh of the French word *tailer*, to share or cut out a part, and metaphorically is taken when the king or any other hath a share or part of the value of a man's goods or chattels, or a share or part of the annual revenue of his lands, or puts any charge or burthen upon another; so as *tallagium* is a general word, and doth include all subsidies, taxes, tenths, fifteenths, or other burthens or charge put or set upon any man.' It was generally however confined in its sense to taxes received by the king. The most important statute on the subject is entitled 'De Tallagio non concedendo,' which was passed in the 34th year of Edward III. to quiet the discontent then universal throughout the kingdom. It had arisen among the commons in consequence of the king having taken a tallage of all cities, boroughs, and towns without the assent of parliament. He was embroiled also with the nobles and landowners, from having attempted, unsuccessfully however, to compel all freeholders of land above the value of twenty pounds to contribute either men or money towards his wars in Flanders. The first chapter of the statute is the most important: 'Nullum tallagium vel auxilium per nos, vel hæredes nostros in regno nostro ponatur, seu levetur sine voluntate, et assensu archiepiscoporum, episcoporum, comitum, baronum, militum, burgensium, et aliorum liberorum communium de regno nostro' ('No tallage or aid may be set or levied by us or our heirs in our kingdom without the good will and assent of the archbishops, bishops, counts, barons, knights, burgesses, and other free men of the commons of our kingdom').

These words, as Lord Coke says, are 'plain without any scruple, absolute without any saving;' and, if there could have been perfect reliance on their operation, must have been entirely satisfactory. But the same king had just violated almost the same engagements entered into by himself only six years before. (25 Edward I., c. 5, 6, 7, 'Confirmationes Chartarum;' 2 *Inst.*, 530.) [Subsidy.]

TALLEYRAND-PERIGORD, CHARLES MAURICE DE. This extraordinary man is, and must long, perhaps for ever, continue a mystery. In the éloge of M. de Reinhard, pronounced by M. de Talleyrand, in the Académie des Sciences Morales et Politiques, only three months before his own death, he said: 'A minister for foreign affairs must possess the faculty of appearing open, at the same time that he remains impenetrable; of being in reality reserved, although perfectly frank in his manners.' The precept was his own portrait. His power of concealing his opinions, and his steady adherence to the principle of allowing attacks upon his character to dissipate by time for want of opposition, have had the effect of keeping his contemporaries ignorant of his real character. This taciturnity has frequently occasioned his being subject to imputations which he did not deserve; at times it has beyond a doubt acquired for him a reputation for ability greater than he deserved. It is believed that M. de Talleyrand has left memoirs of his life, or at least of the most important transactions in which he was engaged, but with strict injunctions that they shall not be published until thirty years shall have elapsed from the time of his death. If this be true, even when the public shall have been put in possession of the contents of these papers, it will only have acquired another statement in addition to those previously in its possession, by the comparison of which it must have to guess at the truth. At present however, while these memoirs continue a sealed book, and scarcely any of M. de Talleyrand's intimate friends have yet contributed their fragments of information, no resource is left to the biographer but by collating his writings, his ostensible share in the politics of his age, and the incidental communications of himself or his acquaintances to estimate as near as he can what probable foundation in reality there is for the accounts of M. de Talleyrand, which have been compiled from what may be called public gossip.

Charles Maurice de Talleyrand-Périgord was born on the 13th of February, 1754, the eldest of three brothers. His family was antient and distinguished; but he was neglected by his parents, and placed at nurse in one of the faubourgs of Paris. The effects of a fall when about a year old rendered him lame for life, and being on this account unfit for the military career, he was obliged to renounce his birthright in favour of his second brother, and enter the church. The contempt and aversion for him, which his parents did not attempt to conceal, impressed a gloomy and taciturn character on the boy. From the charge of his nurse he was transferred to the Collège d'Harcourt, and thence successively to the seminary of St. Sulpice and to the Sorbonne. In all of these institutions he maintained the character of a shy, proud, bookish lad. He showed in after-life a taste for literature, and such an extensive acquaintance with and appreciation of science as sits gracefully on the statesman; and the taste and knowledge must have been acquired at an early age, for his turbulent career after he was fairly launched into busy life left little leisure for that purpose.

By the time he had attained his twentieth year his reputation for talent and his confirmed health appear to have reconciled the vanity of his parents to the necessity of acknowledging him. They introduced him to the society of his equals in rank for the first time at the festivities with which the coronation of Louis XVI. was celebrated (1774), under the title of the Abbé de Périgord. His opinions and tastes, and his temperament, combined to render the clerical profession an object of detestation to him, but he could not escape from it. He availed himself to the full extent of the indulgence with which his age and country regarded the irregularities of the young and noble among the priestly order; but the pride and reserve with which twenty years of undeserved neglect had inspired his confident and strong character served him in part as a moral check. He was a strict observer of the appearances exacted by the conventional morality of society; and this good taste exerted a powerful influence over his whole future career. Thrown back upon himself from the beginning, he had necessarily become an egoist; vigorous both in mind and body, he had a healthy relish of pleasure, and he engaged with eagerness in the pursuits of pleasure; but the enjoyments of the mere voluptuary were insufficient for one of his intellectual character and fastidious tastes.

In 1776 Voltaire visited Paris. M. de Talleyrand was introduced to him, and the two interviews he had with him left such a deep impression that he was accustomed to talk of them with a lively pleasure till the close of his life. Voltaire and Fontenelle were M. de Talleyrand's favourite authors; upon whom he formed his written and still more his conversational style. Conversational talent was in great demand at Paris when he entered the world, and both his love of pleasure and his love of power prompted him to cultivate that which he possessed. That he did so with eminent success the concurrent views of the best judges of his age declare. Excellence of this kind is like excellence in acting: it is impossible to convey an adequate impression of it to posterity. The reporters of flashes of wit and felicitous turns of conversation uniformly communicate to them something of their own inferiority, and vulgarise them in the telling. Again, superior excellence in conversation is an art; the artist is and ought to be judged not by his materials, but by the success with which he uses them. Written *bon mots* are necessarily estimated by their originality, the quantity and quality of thought expressed in them: they are judged as we judge the writings of a poet: whereas the person who introduces them with effect in conversation ought to be judged as we judge the actor, of whom we do not think less because he merely says what the poet has put into his mouth.

The robust and healthy Epicurean who requires the stimulus of intellectual in addition to physical pleasures, is almost inevitably driven to seek the former in the pursuits of ambition. M. de Talleyrand was no exception to the general rule. And the Abbé de Périgord must have displayed, even when he was apparently, when perhaps he believed himself to be, living only for pleasure, qualities which inspired a belief in his business capacity; for in 1780, while yet only in his twenty-sixth year, he was appointed general agent of the clergy of France. He discharged the functions of this important office for eight years. The Gallic church was all along the most independent in its relations to the Papal chair of any church that remained in communion with Rome. It was also a powerful church viewed in its relations to the state, of which it formed an element. Its revenue derived from landed property was large, that derived from other sources perhaps still larger: it had regular assemblies in which it legislated for itself, determined what contributions it ought to pay to the state, and in what proportions its members were to be assessed. Here was a wide field for cultivating experimentally a talent for administration. Nor was this all: the dignified clergy of France took an active part in secular politics. There is a passage in the éloge of M. de Reinhard already alluded to, which seems an echo of the impressions received by M. de Talleyrand in this period of his life:—'I will hazard the assertion that his (M. de Reinhard's) first studies had been an excellent preparation for the diplomatic career. The study of theology in particular had endowed him with a power, and at the same time with a dexterity of ratiocination, which characterise all the documents which have proceeded from his pen. To guard myself against the charge of indulging in paradox, I must here enumerate the names of some of our most distinguished statesmen, af. theologians, and all distinguished in history for the success with which they conducted the most important political transactions of their times.' And he follows up the remark with a very respectable list. The general agent of the clergy was their minister of state: and M. de Talleyrand, while he continued to fill the office, was a powerful subject, and occupied a conspicuous place in the eye of the public. In 1788 he was appointed bishop of Autun.

The commencement of his political career, in the strict acceptation of the term, is synchronous with this promotion. An article upon M. de Talleyrand in an early number of the 'Edinburgh Review'—the materials for which were furnished by Dumont,—asserts that he owed his advancement to the see of Autun to a 'Discours sur les Loteries,' which he pronounced in his capacity of agent for the clergy of France, in the Assembly of Notables which met at Versailles, in February, 1787. As bishop of Autun he was a member of the Etats Généraux convoked in May, 1789, which continued to sit as an Assemblée Constituante till it dissolved itself on the 30th of September, 1791. The interval from the meeting of the Notables till the dissolution of the Assembly is an important one in any attempt to solve the problem of M. de Talleyrand's real character.

Previously to the meeting of the States-General, M. de Talleyrand indicated the course he intended to pursue, in a discourse which he addressed to the assembled clergy of his diocese; and in which he advocated the equality of all citizens in the eye of the law, and free discussion. When the three orders, by assenting to meet as one body, had enabled the Assembly to proceed to business, the precise directions given by many of the bailliages to their deputies were found an impediment in the way of practical legislation: M. de Talleyrand moved that they should be entirely disregarded, and carried his motion. A constituent committee was appointed immediately after the capture of the Bastille, and he was the second person nominated a member of it. In this capacity he was called upon to take part in maturing measures which have had a lasting influence upon the progress of affairs in France: the first of these was the re-distribution of the national territory into districts better adapted than the old provinces for the purposes of government; the second was, the organization of a system of finance. In the financial discussions which took place in the committee and Assembly, M. de Talleyrand retained his dislike of lotteries. He supported all or most of the various loans proposed by Necker; and seconded Mirabeau's exhortations to keep faith with the national creditor. He suggested practical measures with a view to this end, and among others the sale of church lands (he had previously supported the abolition of tithes), reserving however a competent provision for the priesthood, and even improving the condition of the poorer clergy. He also proposed to establish a 'caisse d'amortissement,' as an additional guarantee to the state's creditors. The task of making arrangements for levying the part of the revenue derived from taxes upon persons exercising professions, and upon transfers of property, devolved upon M. de Talleyrand. Connected with his labours in preparing a new territorial division of France, and a new method of collecting the national revenue, was the motion which he made and carried in the Assembly, in August, 1790, to the effect that the king should be intreated to write to his Britannic majesty, to engage the parliament of England to concur with the National Assembly in fixing a natural unit of weights and measures; that, under the auspices of the two nations an equal number of commissioners from the Academy of Sciences and the Royal Society of London might unite to determine the length of the pendulum in the latitude of 45°, or in any other latitude that might be thought preferable, and to deduce from thence an invariable standard of weights and measures. At the same time that he was taking part with his colleagues of the Constituent Committee in these labours he was charged by them with the important task of preparing the report upon national education, which was read to the Assembly on the 10th, 11th, and 19th of September, 1791. The basis of the system advocated in this report was the secularization of instruction: education was to be the gift of the state, not of the church; the state was to provide instruction for those who proposed to enter the church, exactly as it was to provide instruction for those who proposed to enter any of the other learned professions. Equal stress was laid upon the establishment of elementary schools in every canton; and of a higher class of schools, for the benefit of those who were not destined to embrace a learned profession, in the chief town of every district. Two acts of M. de Talleyrand, which have been much commented upon, appear to be as it were necessary corollaries of the principles avowed in the legislative career we have been passing in review:—his appearance as principal actor in the theatrical celebration of the anniversary of the capture of the Bastille; and his taking upon him the office of consecrating the national clergy.

It is absolutely necessary that some estimate be formed of the conduct and character of M. de Talleyrand while a member of the first National Assembly, as a guide to an appreciation of his far more enigmatical subsequent career. M. de Talleyrand entered the Assembly with the reputation of a dexterous negociator, which he had acquired in his discharge of the office of agent to the clergy. He had then, and he retained in after-life, the character of a self-indulgent man, of a man with a large instinct of self-preservation, but also of a humane man. The disciple of Voltaire and Fontenelle could scarcely be a very zealous Christian, but M. de Talleyrand had always been a respecter of conventional morality: his was precisely that kind of disposition and intellect that supports a church not from belief, but as a useful engine for preserving order in society. M. de Talleyrand, like all the literati of his day, had a theoretical belief in the equality of men; at the same time that with regard to the privileges of the nobility, he was inclined to support them in the same way that he did the authority of the church—as a useful political engine. But involuntarily and perhaps unconsciously M. de Talleyrand was a warmer partisan of the aristocracy than the clergy: he was noble by birth and attached by taste to the habits of a select society, whereas the ecclesiastical character forced upon him against his will had something repulsive to him. In short, M. de Talleyrand saw clearly the rottenness and the absurdity of many of the old institutions of his country: he was willing, desirous, that government should be organized and act in a manner to promote the general happiness; but he had no faith in the capacity of men for self-government; and he had been educated in a church, many of whose members were at that time obliged to reconcile their consciences to remaining in it by adopting the maxim that they were deceiving men for their own good. M. de Talleyrand's idea, and he entertained it in common with a considerable number, was, that the Revolution might be guided, checked, and rendered useful by approximating the constitution of the French to that of the English government. He cared little for the creed of the church, but he wished to preserve the church, and to render it in France what the established church was in England. Hence his care, even while laying hands on the property of the church for the exigencies of the state, to retain an adequate provision for the clergy. hence his anxiety to identify the clergy with the nation. His anxiety to establish a constitution modelled upon that of England was always avowed. His views (the views he adopted, it is not meant to attribute originality to them), regarding territorial divisions and the organization of local government, finance, and education, though overborne for a time in the storm of the Revolution, have revived and been adopted by the Empire, the Restoration, and the present dynasty. The recklessness as to the means by which he attained his ends which he displayed even at this period of his career is no evidence of insincerity, but merely of the want of faith in men, which the treatment he had experienced in early life, and his observation of the society he habitually mixed in, had instilled into him. It was his weakness through life to pride himself in the display of his power of refined mockery, regardless of the enemies it created: he gave vent to his spirit of raillery in actions as well as in words; and thus lent a grotesque colouring to his *coups d'état*, which rendered them more startling than if they had been as prosaic as those of other men. The world is perhaps less startled with the atrocity of passion in a statesman, than with a laughing air which shows his contempt for it. The most startling of his devices is his solemn inauguration of the constitutional monarchy by the religious celebration of the 14th of July. But the love of theatrical presentation and the delusive belief that good may be effected by it is strong in every man at some period of his life. Talleyrand in all likelihood looked forward at that moment to being the founder and future primate of a church which should be to France what the Anglo-Episcopal has been to England. The means to which he was driven to have recourse in order to carry through the installation of the national bishops, undeceived him, and brought back his early disgust for the profession with redoubled force. He not long after resigned his bishopric of Autun, and at the same time renounced his ecclesiastical character.

The history of M. de Talleyrand from the dissolution of the Constituent Assembly, in September, 1791, till the overthrow of the monarchy, on the 10th of August, 1792, would be instructive were it merely as a demonstration of the folly of the self-denying ordinance with which that body terminated its career. Its members were declared ineligible to the next assembly, and also incapable of receiving any appointment from the crown until two years had elapsed from the date of its dissolution. The consequence was, that M. de Talleyrand among others was rendered incapable of any legislative or ministerial office. It was at that time an object with all who desired that the Revolution should have fair play, to preserve peace with England, which, although still ostensibly neutral, was every day presenting additional symptoms of alienation. The court party hated M. de Talleyrand for having taken part frankly with the Revolution; the republicans hated him for his advocacy of a limited monarchy; all parties distrusted him on account of his eternal sneer; but all parties agreed that he was the only man whose talents fitted him for the delicate mission to England. And it was impossible to appoint him to it. He was dispatched however, in January, 1792, without any ostensible diplomatic character, to sound the English ministry, and attempt to commence negociations. His want of an official character allowed the queen to indulge her feelings of personal dislike to the ex-bishop of Autun by turning her back upon him when he was presented at St. James's; and this reception at once ensured his exclusion from general society, and rendered him powerless. After the accession of the Gironde to office, the attempt to ensure at least neutrality on the part of England was renewed: Chauvelin was sent to England as nominal, and along with him Talleyrand as real ambassador. By this time however the French government had become as obnoxious to the general public of England as to the court circles: the torrent was probably too strong to have been stemmed by Talleyrand, even though he had been in a condition to act directly and in person. He could do nothing, forced as he was to act by the instrumentality of a man too jealous and opiniative to conform honestly to the directions of one whose authority necessarily made him feel himself a mere puppet. Talleyrand's good faith at this period in labouring to preserve peace between England and France, as the only means of rendering a constitutional monarchy possible in the other country, and the steadiness with which he pursued his object, undaunted by the most gross personal insults, are satisfactorily established by the narrative of Dumont.

Talleyrand was at Paris when the events of the 10th of August put an end to the monarchy; and it required all his dexterity to enable him to obtain passports from Danton, to enable him to quit Paris. He fled to England, and having saved little of his property, he was obliged to sell his library there to procure himself the means of support. The English government, jealous of his presence, after some time ordered him to leave the country in twenty-four hours; and proscribed in France, he was obliged, with a dilapidated fortune, to seek refuge in America, when he had almost attained his fortieth year.

Madame de Staël has claimed, and apparently with a good title, the credit of instigating Chenier to demand the recall of M. de Talleyrand after the fall of Robespierre and the termination of the reign of terror. The National Institute was founded about this time, and M. de Talleyrand had in his absence been appointed a member of the class of moral and political science. At the first sitting of this society which he attended he was elected secretary, an office which he held for six months. During this period he read two papers, afterwards published in the 'Mémoires de la Classe des Sciences Morales et Politiques de l'Institut National,' which are justly considered not only as the most able and original of his published writings, but as those which are most indisputably his own. The first of these is entitled 'Essai sur les Avantages à retirer de Colonies Nouvelles dans les Circonstances présentes;' the second, 'Mémoires sur les relations Commerciales des Etats-Unis avec l'Angleterre.' The latter is, properly speaking, a supplement—perhaps rather a 'pièce justificative' appended to the other. The great object of both is to point out the importance of colonies to a country like France, in which the revolutionary fervour, though beginning to burn dim, was still sufficiently powerful to prolong the reign of anarchy and suffering, unless measures were adopted to neutralize it. There can be no mistake as to the views being those of M. de Talleyrand himself. They are such as could only occur to a person entertaining the political opinions he had advocated in the Constituent Assembly, who having been exiled by the 'reign of terror' which decimated his countrymen, was living in a country where a successful revolution had quietly and speedily subsided into a settled form of government; in a country where he felt that 'an Englishman becomes at once a native, and a Frenchman remains for ever a foreigner.' Not satisfied with pointing out in what manner colonies might be rendered powerful assistants in tranquillising France, the essayist entered deeply into the principles of colonization, explaining the advantages to be derived from colonies, and the law by which their economical advantages might be perpetuated even after their political relations with the mother-country had ceased. In his treatment of his subject he evinces a clear and deep insight into the structure of society both in France and America, and just and extensive views in political economy.

It was not however so much the political talent displayed in these essays, as M. de Talleyrand's skill in employing the reviving influence of the *salons* of Paris, that obtained him the appointment of foreign minister under the Directory. Here again he was indebted to Madame de Staël, who assisted him through her influence with Barras. M. de Talleyrand accepted office under this unprincipled government with a perfect knowledge of its character and its weakness. His conviction that a Frenchman could never feel at home in America prompted him to grasp at the first opportunity of returning to his native country: his shattered fortune and taste for expensive luxuries rendered employment necessary for him, and political business was the only lucrative employment for which he was qualified. There is nothing in his life to contradict the belief that he again engaged in politics with a desire to promote what was right and useful as far as he could; but he engaged in them aware that he might be ordered to do what he disapproved of, and prepared to do it, under the plea that his functions were merely ministerial, and that the responsibility rested upon his employers. His position under the Directory was consequently an equivocal one. He was engaged, so long as he occupied it, in intrigues which had for their aim the maintenance of himself in office, even if his employers should be turned out; and he was obliged to do their dirty work. The part which he took in the attempt to extort money, as a private gratification, from the American envoys who arrived in Paris in October 1797, was probably forced upon him by the directors: had it been his own project, it would have been conceived with more judgment, and the Americans would not have been driven to extremes, for he understood their national character. But allowing himself to be used in such a shabby business betrays a want of self-respect, or a vulgarity of sentiment, or both. He had his reward; for when public indignation was excited by the statements of the American envoys, the minister of foreign affairs was sacrificed to the popular resentment.

Having adopted a profession in which success could only be expected under a settled government, believing a monarchical government to be the only one which could give tranquillity to his country, and anxious with many others to run up a make-shift government out of the best materials that offered, he naturally attached himself to the growing power of Bonaparte. When the future emperor returned from Egypt, M. de Talleyrand had been six months in a private station; though, had he still retained office, he might with equal readiness have conspired to overturn the Directory. Bourrienne is not the best of authorities, but the earlier volumes of the memoirs which pass under his name are less falsified than the later; and an anecdote which he relates of Talleyrand's interview with the first consul, after being reappointed minister of foreign affairs, is so characteristic, that its truth is highly probable:—'M. de Talleyrand, appointed successor to M. de Reinhart at the same time that Cambacérès and Lebrun succeeded Siéyes and Roger Ducas as consuls, was admitted to a private audience by the first consul. The speech which he addressed to Bonaparte was so gratifying to the person to whom it was addressed, and appeared so striking to myself, that the words have remained in my memory:—"Citizen Consul, you have confided to me the department of foreign affairs, and I will justify your confidence; but I must work under no one but yourself. This is not mere arrogance on my part: in order that France be well governed, unity of action is required: you must be first consul, and the first consul must hold in his hand all the main-springs of the political machine—the ministries of the interior, of internal police, of foreign affairs, of war, and the marine. The ministers of these departments must transact business with you alone. The ministries of justice and finance have, without doubt, a powerful influence upon politics; but it is more indirect. The second consul is an able jurist, and the third a master of finance: leave these departments to them; it will amuse them; and you, general, having the entire management of the essential parts of government, may pursue without interruption your noble object, the regeneration of France." These words accorded too closely with the sentiments of Bonaparte to be heard by him otherwise than with pleasure. He said to me, after M. de Talleyrand had taken his leave, "Do you know, Bourrienne, Talleyrand's advice is sound. He is a man of sense." He then added smilingly:—"Talleyrand is a dexterous fellow: he has seen through me. You know I wish to do what he advises; and he is in the right. Lebrun is an honest man, but a mere book-maker; Cambacérès is too much identified with the Revolution: my government must be something entirely new."'

Napoleon and Talleyrand may be said to have understood each other, and that in a sense not discreditable to either. The good sense of both was revolted by the bloodshed and theatrical sentiment, the blended ferocity and coxcombry of the Revolution; both were practical statesmen, men with a taste and talent for administration, not mere constitution-makers. Like most men of action, neither of them could discern to the full extent the advantage an executive government can derive from having the line of action to a considerable extent prescribed by a constitution; but Talleyrand saw better than Napoleon that the laws which protect subjects by limiting the arbitrary will of the ruler, in turn protect him by teaching them legitimate methods of defending their rights. In another respect they resembled each other—neither was remarkably scrupulous as to the means by which he attained his ends; though this laxity of moral sentiment was kept in check by the natural humanity of both. Their very points of difference were calculated to cement their union. The observant self-centred mind of Talleyrand was lamed by its want of power to set others in motion: it is only through sympathy that the contagious love of action can be conveyed. The impassioned and imaginative soul of Napoleon was made to attach others to him and whirl them along with him; and this power was often too strong for itself: Napoleon, though capable of reflection, was too often hurried away by his instinctive impulses. Each of these men felt that the other was a supplement to himself. Talleyrand really admired and appreciated Napoleon. If he flattered him, it was by the delicate method of confirming him in the opinions and intentions which met his approbation. He dared to tell the First Consul truths which others were afraid to utter; and he ventured to arrest at times the impetuosity of Napoleon, by postponing the fulfilment of his orders until he had time to cool. He opposed, as long as there was any prospect of success, the divorce from Josephine; but his virtue gave way in the business of the Duke d'Enghien, for even though we exculpate him from participation in the execution of that prince, to gratify his master he sanctioned the violation of a neutral territory. This was however the only instance, in so far as Bonaparte is concerned, of his sacrificing the duty of a friend to flattery that can be brought home to him. Napoleon's frequent recurrence, in his conversations at St. Helena, to the subject of Talleyrand's defection, his attempts to solve the question at what time that minister 'began to betray him,' show his appreciation of the services he had received from him.

For a time their alliance continued harmonious, and that was the time of Napoleon's success. The arrangement of the Concordat with the pope was the basis of the future empire, and that negociation was accomplished by Talleyrand. The treaty of Luneville, secularising the ecclesiastical principalities of Germany; the treaty of Amiens, recognising on the part of England the conquests of France, and the new form given to the Continental states by the Revolution; the convention of Lyon, which gave form to the Cisalpine republic; all bear the impress of the peculiar views of M. de Talleyrand. And the minister of foreign affairs was fully aware of his own consequence. In 1801, when obliged by the state of his health to use the waters of Bourbon l'Archambaud, he wrote to Napoleon:—'I regret being at a distance from you, for my devotion to your great plans contributes to their accomplishment.' After the battle of Ulm, Talleyrand addressed to the emperor a plan for diminishing the power of Austria to interfere with the preponderance of France, by uniting Tyrol to the Helvetian republic, and erecting the Venetian territory into an independent republic interposed between the kingdom of Italy and the Austrian territories. He proposed to reconcile Austria to this arrangement by ceding to it the whole of Wallachia, Moldavia, Bessarabia, and the northern part of Bulgaria. The advantages he anticipated from this arrangement were that of removing Austria from interfering in the sphere of French influence without exasperating it, and that of raising in the East a power better able than Turkey to hold a balance with Russia. Napoleon paid no attention to the proposal. After the victory of Austerlitz, Talleyrand again pressed it upon his notice, but equally without effect. No change in the feelings of the emperor and his minister can positively be traced to this event; but we see on the one hand a pertinacious repetition of a favourite proposal, and on the other a silent and rather contemptuous rejection of it. We find at a much later period Napoleon complaining of the pertinacity with which Talleyrand was accustomed to repeat any advice which he considered important; and we find Talleyrand speaking of Napoleon as one who could not be served because he would not listen to advice. And we cannot but see in the difference of opinion just mentioned the commencement of that coolness which induced Talleyrand, on the 9th of August, 1807, to resign the portfolio of foreign affairs and accept the nominal dignity of vice-grand-elector of the empire in addition to the titles of grand-chamberlain and prince of Benevento, which had previously been conferred upon him. An unprecedented career of victory had rendered Napoleon impatient of success; the consciousness of important services had rendered Talleyrand impatient of neglect; and the alienation thus originated was increased and confirmed by the dashing but vulgar soldiers, who formed such an influential part of the emperor's court, and their silly and vulgar wives, who could not pardon M. de Talleyrand his superior refinement, and who had all in turn smarted under his insupportable sarcasm. Napoleon in exile is said to have represented the resignation of M. de Talleyrand as involuntary, and rendered necessary by his stock-jobbing propensities. It is not impossible that the minister may have speculated more deeply in the funds than was altogether proper; but had there been no other reason for his dismissal, Napoleon could, and often did, wink at more flagrant pecuniary delinquencies. M. de Talleyrand, in his character of grand-chamberlain, did the honours of the imperial court at Erfurt; and was on more than one occasion privately consulted by the emperor, who one day said, 'We ought not to have parted.' In 1809 however the ex-minister was so loud and unreserved in his condemnation of the Spanish expedition, that Napoleon, on his return from the Peninsula, deprived him of the office of chamberlain. The last five years of the empire elicited many caustic criticisms from M. de Talleyrand, which were duly carried to the ears of the emperor, who retorted by sallies of abuse which irritated the prince without rendering him less powerful. In 1812 M. de Talleyrand is said to have predicted the overthrow of the empire. In 1813 overtures were made to him with a view to his resuming the portfolio of foreign affairs, but without success. In 1814 he re-appeared on the stage of active life on his own account.

In 1814, as vice-grand-elector of the empire, he was a member of the regency, but was prevented joining it at Blois by the national guard refusing to allow him to quit Paris—not much against his will. When Paris capitulated, the emperor Alexander took up his residence in the house of the prince of Benevento. The words attributed by the Memoirs of Bourrienne to Talleyrand, in his conversations with those in whose hands the fortune of war had for the time placed the fortunes of France, are characteristic, true, and in keeping with his opinions and subsequent conduct:—'There is no other alternative but Napoleon or Louis XVIII. After Napoleon there is no one whose personal qualities would ensure him the support of ten men. A principle is needed to give consistency to the new government, whatever it may be: Louis XVIII. represents a principle. Anything but Napoleon or Louis XVIII. is an intrigue, and no intrigue can be strong enough to support him upon whom it might confer power.' This view lends consistency to the conduct of M. de Talleyrand at the close of Napoleon's career. Their alliance had long been dissolved; they stood confronting each other as separate and independent powers. M. de Talleyrand had advocated a limited monarchy, until the old throne was violently broken up and overturned; he had lent his aid to construct a new monarchy and a new aristocracy out of the fragments of old institutions which the Revolution had left; he saw France again without a government, and, with his principles, he might have consistently taken office under any government, holding, as he did, the opinion that any government is better than none, and that any man may hold office under it provided he take care to do as much good and as little harm as he can. But M. de Talleyrand did more: he exerted the influence he possessed over Alexander to obtain the combination of constitutional forms with the recognition of legitimacy. Louis XVIII. saved appearances by insisting upon being allowed to grant the charter spontaneously, but it was M. de Talleyrand's use of the remains of the revolutionary party that made him feel the necessity of this concession. As minister Talleyrand insisted upon its observance with a precision that rendered him as much an object of annoyance to the courtiers of the Restoration as ever the pedantic Clarendon was to the gay triflers who surrounded Charles II. When he set out for the congress of Vienna, in September, 1814, the court of France is said to have presented the aspect of a school at the commencement of the holidays. The powers who had refused to concede to Napoleon at the head of a victorious army anything beyond the limits of France in 1792, gave more favourable terms to M. de Talleyrand, the representative of a nation upon which they had just forced a king. He baffled the emperor Alexander, who said angrily, 'Talleyrand conducts himself as if he were minister of Louis XIV.' On the 5th of January, 1815, he signed, with Lord Castlereagh and Prince Metternich, a secret treaty, having previously obliged Prussia to remain contented with a third of Saxony, and Russia to cede a part of the grand-duchy of Warsaw. The imbecility of the Bourbons, by inviting the descent of Napoleon at Frejus, again unsettled everything. M. de Talleyrand dictated the proclamation of Cambray, in which Louis XVIII. confessed the faults committed in 1814, and promised to make reparation. He suggested the more liberal interpretation of the charter, announced from the same place. He obtained an extension of the democratic principle in the constitution of the Chamber of Deputies, recommended the rendering the peerage hereditary, and induced the king, restored for a second time, to institute a cabinet council, of which he was nominated the first president.

The constitutional monarchy, the object of his earlier wishes, was now definitively established; but the part he was destined to perform in it was that of a leader of opposition. In his note of the 21st of September, 1815, he protested, as prime minister, against the new terms which the allies intended to impose upon France. He said they were such conditions as only conquest could warrant. 'There can only be conquest where the war has been carried on against the possessor of the territory, that is, the sovereign; possession and sovereignty being identical. But when war is conducted against a usurper in behalf of the legitimate possessor, there can be no conquest; there is only the recovery of territory. But the high powers have viewed the enterprise of Bonaparte in the light of an act of usurpation, and Louis XVIII. as the real sovereign of France: they have acted in support of the king's rights, and ought to respect them. They contracted this engagement by their declaration of the 13th and their treaty of the 25th of March, to which they admitted Louis XVIII. as an ally against the common enemy. If there can be no conquest from a friend, much more can there be none from an ally.' His argument was fruitless: Louis XVIII. bowed to the dictation of his powerful allies; and M. de Talleyrand resigned office two months before the conclusion of the treaty which narrowed the frontiers of France and amerced her in a heavy contribution. By this step M. de Talleyrand enabled himself to contribute essentially to strengthening the constitutional monarchy, to which, if he had any principle, he had through life preserved his attachment. Had he been a party to the treaty, he must have shared with the elder branch of the Bourbons the odium which attached to all who had taken part in it; and hence thrown the opposition into the hands of the enemies of the constitution. By resigning office, he obtained a voice potential in the deliberations of the opposition; and no English nobleman born and bred to the profession could have discharged more adroitly the functions of an opposition leader. For fourteen years his *salon* was a place of resort for the leaders of the liberal party; in society he aided it by his conversational talents; in the chamber of peers he lent it the weight of his name and experience. He defended the liberty of the press in opposition to the censorship; he supported trial by jury in the case of offences of the press; and he protested against the interference of France in the internal affairs of Spain in 1823. By this line of conduct he was materially instrumental in creating a liberal party within the pale of the constitution; and to the existence of such a party was owing in no small degree the result of the revolution of 1830, in which, though the dynasty was changed, the constitution survived in its most important outlines. That revolution also placed Prince Talleyrand in a condition to realise what had been one of his most earnest wishes at the outset of his political career—an alliance between France and England as constitutional governments. To accomplish this he had laboured strenuously in 1792; to accomplish this was one of the first objects he aimed at when appointed minister for foreign affairs under the consulate: he accomplished it as representative of Louis Philippe.

M. de Talleyrand was appointed ambassador extraordinary and minister plenipotentiary to the court of Great Britain on the 5th of September, 1830; and he held the appointment till the 7th of January, 1835, when he was succeeded by General Sebastiani. During these four years M. de Talleyrand, besides obtaining the recognition of the new order of things in France by the European powers, procured a similar recognition of the independence of Belgium, and concluded the quadruple alliance of England, France, Spain, and Portugal, for the purpose of re-establishing the peace of the Peninsula.

After his return from the mission to England, M. de Talleyrand retired from public life. The only occasion on which he again emerged from domestic retirement was when he appeared at the Académie des Sciences Morales et Politiques, to pronounce the éloge of Count Reinhard, only three months before his own death. He died on the 20th of May, 1838, in the eighty-fourth year of his age.

The object of this sketch has been to present, as far as the very imperfect materials which are attainable would permit, a view of this very extraordinary man undistorted by any partisan feeling either with regard to his person or principles. It must be admitted in favour of M. de Talleyrand that he was warmly beloved by those who were his intimate friends, and by all who were at any time employed under him. It must also be allowed that when his life is contemplated as a whole, it bears the imprint of a unity of purpose animating his efforts throughout. Freedom of thought and expression, the abolition of antiquated and oppressive feudal forms and the most objectionable powers of the church, the promotion of education, the establishment of a national religion, and a constitutional government compounded of popular representation and an hereditary sovereign and aristocracy—these were the objects he proposed for attainment when he entered the arena of politics. He attempted to approach this ideal as far as circumstances would admit at all periods of his long career; and he ended by being instrumental in establishing it. No act of cruelty has been substantiated against him; and the only charges of base subserviency that appear to be satisfactorily proved, are his participation in the attempt to extort a bribe from the American envoys, and in the violation of an independent territory in the seizure of the Duc d'Enghien. His literary was subordinate to his political character. It is difficult to say how much of the writings published in his name were really his own. Latterly, we are informed upon good authority, he was in the habit of explaining his general views on a subject to some one whom he employed to bring this communication into shape; and when the manuscript was presented to him, he modified and retouched it until it met his views, throwing in a good deal of that wit which gave zest to his conversation. The domestic life of M. de Talleyrand has not been alluded to; for almost every statement regarding it is poisoned by the small wit of the coteries of Paris.

The report upon education of 1791; a report to the first consul upon the best means of re-establishing the diplomatic service of France; the essays upon colonization, and the commercial relations of England and America; and the *éloge* of M. de Reinhard—may all be regarded as his own composition. The first is the most commonplace; the other three are master-pieces in their different ways. They bespeak an elegant and accomplished mind, a shrewd insight into character and the structure of society, and a felicitous and graphic power of expression. The wit of M. de Talleyrand was the wit of intellect, not of temperament. It was often full of meaning; always suggestive of thought; most frequently caustic. His reserve, probably constitutional, but heightened by the circumstances of his early life, and cultivated upon principle, was impenetrable. In advanced life it seemed even to have affected his physical appearance. When at rest, but for his glittering eye, it would have been difficult to feel certain that it was not a statue that was placed before you. When his sonorous voice broke upon the ear, it was like a possessing spirit speaking from a graven image. Even in comparatively early life, his power of banishing all expression from his countenance, and the soft and heavy appearance of his features was remarked as contrasting startlingly with the manly energy indicated by his deep powerful voice. Mirabeau in the beginning, Napoleon at the close of the Revolution, threw him into the shade; but he outlasted both. The secret of his power was patience and pertinacity; and his life has the appearance of being preternaturally lengthened out when we recollect the immense number of widely removed characters and events of which he was the contemporary. It may be said on the one hand that he accomplished nothing which time did not in a manner bring about; but on the other it may be said, with equal plausibility, that scarcely any of the leading events which have occurred in France in his day would have taken the exact shape they assumed had not his hand interfered to give them somewhat of a bias or direction. Next to Napoleon, he certainly is the most extraordinary man the revolutionary period of France has given birth to.

(*Etudes et Portraits Politiques*, par A. Mignet, Bruxelles, 1841, pp. 131-194; *Rapport sur l'Instruction Publique fait au nom du Comité de Constitution à l'Assemblée Nationale, les* 10, 11, *et* 19 *Septembre*, 1791, par M. de Talleyrand, Paris, 1791-4; *Edinburgh Review*, vols. vi. and vii.; *Mémoires* par Etienne de Dumont; *Correspondence between the Envoys of the American States and M. de Talleyrand, Minister for Foreign Affairs in France*, London, 1798, 12mo.; *Considérations sur les principaux évènements de la Révolution Française*, par Mme. la Baronne de Staël; *Dix Années d'Exil*, par la même; *Mémoires* par A. L. F. de Bourrienne, Paris et Londres, 1831; *Mémorial de St. Helène; Mémoires pour servir à l'Histoire de France sous Napoléon*, par MM. les GG. Montholon et Gourgaud; *Eloge de M. le Comte de Reinhard prononcé à l'Académie des Sciences Morales et Politiques*, par M. le Prince de Talleyrand, *dans la Séance du* 3 *Mars*, 1838, Paris, 1838.)

TALLIS, THOMAS, who is considered the patriarch of English cathedral music, was born at about the same period as the famous Italian ecclesiastical composer Palestrina, whose birth took place in the year 1529.

It has been stated, but most probably erroneously, that Tallis was organist to Henry VIII. and his successors. He undoubtedly was a gentleman of the chapel to Edward VI. and Mary; and under Elizabeth the place of organist was added to his other office. He seems to have devoted himself wholly to the duties of the church, for his name does not appear to anything in a secular form. His entire Service, including prayers, responses, Litany, and nearly all of a musical kind comprised in our liturgy, and in use in our cathedrals, appears in Dr. Boyce's Collection, together with an anthem which has long been in high repute with the admirers of severe counterpoint. But for the smaller parts of his Service he was indebted to Peter Marbeck, organist of Windsor, who certainly is entitled to the credit of having added those solemn notes to the suffrages and responses which, under the name of Tallis, are still retained in our choirs, and listened to with reverential pleasure. [MARBECK.]

In 1575 Tallis published, in conjunction with his pupil, Bird (or Byrde), *Cantiones Sacræ*, master-pieces of their kind; and these are rendered the more remarkable from having been protected for twenty-one years by a patent from Queen Elizabeth, the first of the kind that ever was granted. One of these, 'O sacrum convivium,' was adapted by Dean Aldrich to the words 'I call and cry,' and is the above-mentioned anthem, which still continues to be frequently performed in most of our cathedrals. Two more of his anthems are printed in Dr. Arnold's Collection.

Tallis died in 1585, and was buried in the parish church of Greenwich, in the chancel of which Strype, in his continuation of Stowe's *Survey*, tells us he saw a brass plate, on which was engraved, in old English letter, an epitaph, in four stanzas of four lines each, giving a brief history of this renowned composer. The plate was carried away, and most likely sold by weight, by some barbarian, when the church was repaired about a century ago. The verses are to be found in Hawkins, Burney, and most other publications relating to English church music.

TALLOW. [FAT.]

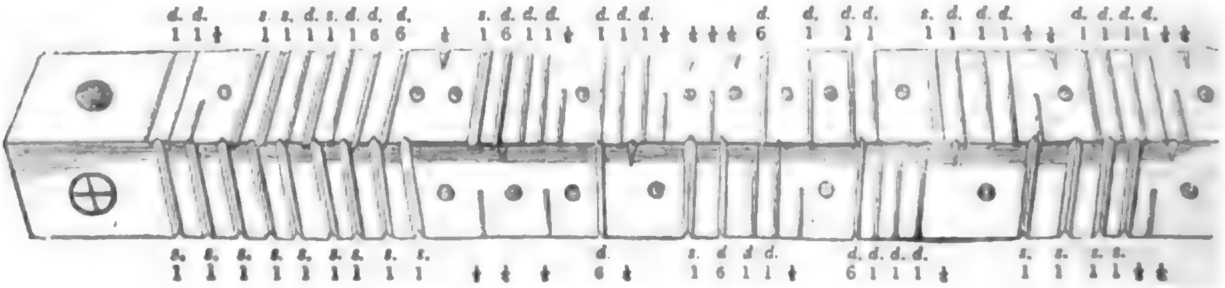
TALLOW, MINERAL or MOUNTAIN. [HATCHETINE.]

TALLOW-TREE. [STILLINGIA.]

TALLY. This word appears to be derived from the French *taille*, or *tailler*, each of which expresses the idea of cutting or notching.

The use of notched sticks or tallies may be traced to a very remote period, and there is reason to believe that they were among the earliest means devised for keeping accounts. Some writers conceive that the Greek symbolum (σύμβολον) was in some cases a species of tally, which was used between contracting parties; being broken in two, and one-half given to each. In the 'Pictorial Bible' (note on *Ezek.* xxxvii. 20), much curious information is brought together on the subject of writing or marking with notches upon sticks. The writer of that note refers to the tablets of wood called *axones*, upon which the Athenians inscribed the laws of Solon, and to the practice of the antient Britons, who, he says, 'used to cut their alphabet with a knife upon a stick, which, thus inscribed, was called *Coelbren y Beirdd*, "the billet of signs of the bards," or the Bardic alphabet.' 'And not only,' he continues, 'were the alphabets such, but compositions and memorials were registered in the same manner.' These sticks, he adds, were commonly squared, but were sometimes three-sided; each side, in either case, containing one line of writing. A cut which accompanies the note from which we quote, shows the manner of mounting several such inscribed sticks in a frame, so that they might be read conveniently. Another illustration, of later date, is the clog-almanac described by Dr. Plot, in 1686, as still common in Staffordshire. Such calendars, which had the various days marked by notches of different forms and sizes, were sometimes made small enough to carry in the pocket, and sometimes larger, for hanging up in the house. Similar calendars are said to have been formerly used in Sweden. Perhaps the most curious of the illustrations collected in the note referred to is the Saxon Reive-Pole, which either is, or has been down to a recent period, used in the Isle of Portland for collecting the yearly rent paid to the king as lord of the manor. This rent, which amounts to 14*l*. 14*s*. 3*d*., is collected by the reive, or steward, every Michaelmas; the sum which each person has to pay being scored upon a squared pole, a portion of which is represented in the subjoined cut, with figures to mark the amount indicated by each notch. 'The black circle at the top,' observes the work from which we quote, 'denotes the parish of Southwell, and that side of the pole contains the account of the tax paid by the parishioners; each person's account being divided from that of his neighbour by the circular indentations between each. In the present instance the first pays 2¼*d*., the second 4*s*. 2*d*., the next one farthing, and so on.' The other side of the pole which is represented in the cut is appropriated to the parish of Wakem, of which the cross within a circle is the distinctive mark.

Fig. 1.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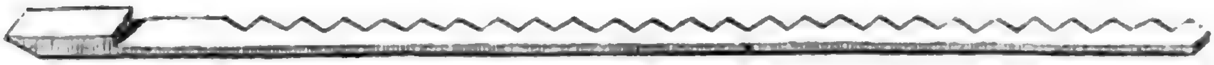
Saxon Reive-Pole used in the Isle of Portland.

Fig. 2.



Exchequer Tally.

The tallies used in the Exchequer (one of which is represented by *fig.* 2) answered the purpose of receipts as well as simple records of matters of account. They consisted of squared rods of hazel or other wood, upon one side of which was marked, by notches, the sum for which the tally was an acknowledgment; one kind of notch standing for 1000*l*., another for 100*l*., another for 20*l*., and others for 20*s*., 1*s*., &c. On two other sides of the tally, opposite to each other, the amount of the sum, the name of the payer, and the date of the transaction, were written by an officer called the writer of the tallies; and, after this was done, the stick was cleft longitudinally in such a manner that each piece retained one of the written sides, and one-half of every notch cut in the tally. One piece was then delivered to the person who had paid in the money, for which it was a receipt or acquittance, while the other was preserved in the Exchequer. Madox observes respecting these rude and primitive records, 'The use of them was very antient; coeval, for aught I know, with the Exchequer itself in England.' They were finally discontinued at the remodelling of the Exchequer in 1834; and it is worthy of recollection that the fire by which the Houses of Parliament were destroyed was supposed to have originated in the over-heating of the flues in which the discarded tallies were being burnt. Clumsy as the contrivance may appear, tallies were effectual in the prevention of forgery, since no ingenuity could produce a false tally which should perfectly correspond with the countertally preserved at the Exchequer; and no alteration of the sum expressed by the notches and the inscription could pass undetected when the two parts of the stick were fitted together. A correspondent of the 'Gentleman's Magazine' for November, 1834 (p. 480), states that forgeries were attempted immediately after the discontinuance of tally receipts. The officers of the Exchequer commonly called *tellers* (talliers), as well as several other functionaries, derived their name from the word tally.

Many different kinds of tally are used in gardens and arboretums, to bear either numbers referring to a catalogue, or the names of the plants near which they are placed. Loudon describes several sorts, of wood, metal, earthenware, brick, &c., in his 'Encyclopædia of Gardening.' Wooden tallies are sometimes marked by notches instead of writing or painting; particular forms or combinations of notches being used to represent either Arabic numerals or the Roman letters commonly employed in numeration. Tallies formed of brick-earth, with a recess for containing a printed card, which is sheltered by a piece of glass, have been introduced of late years, and are particularly recommended for use in arboretums. Instead of being stuck in the ground, like tallies of wood and metal, these brick tallies are formed with a broad base, which rests upon its surface.

(*Pictorial Bible*, note on Ezek. xxxvii. 20; Madox's *History of the Exchequer*, *&c.* A popular history of tallies is given in vol. xxiv. of the *Mirror* (pp. 325 and 341), partly condensed from the *Times* newspaper.)

TALMA, FRANÇOIS JOSEPH, an eminent French tragedian, was born in Paris, January 15th, 1763. His father, who was a dentist, went to England shortly after the birth of his son, and practised his profession for some years in London. At nine years of age young Talma returned to France, and was placed in a school at Chaillot, which was kept by Monsieur Lamarguière, a great admirer of the drama, who delighted to discover and encourage a similar taste in any of his pupils. A year after Talma had joined the school he was intrusted with a part in an old tragedy, called 'Simois, Fils de Tamerlane,' which Monsieur Lamarguière had selected for performance by his scholars; and so deeply did the future tragedian enter into the feeling of the character, that he burst into a flood of tears at the recital of the sorrows of the hero, whose brother he represented. At the age of twelve he wrote a little drama, in the composition of which he further developed his knowledge of the stage. He again visited London, and returned a second time to Paris at the latter end of the year 1781, when he commenced the study of logic in the Collège Mazarin. In 1783 he made a *coup d'essai* at the Théâtre de Doyen, in the character of Seide, in the tragedy of 'Mahomet.' A council of friends, appointed by himself, to judge of his performance, pronounced it a failure: 'He had not *le feu sacré*.' Talma deferred to this unfavourable opinion, and quietly resumed the study of his father's profession; but a few years afterwards the very same friends were called upon to reverse their judgment and confess their mistake. On the 21st of November, 1787, he made his début at the Théâtre Français, and in 1789 created a great sensation by his performance of Charles IX. At the commencement of the French Revolution he nearly fell a prey to a severe nervous disorder. On his recovery and the retirement of Larive, Talma became the principal tragic actor. He reformed the costume of the stage, and first played the part of Titus in a Roman toga. During the reign of Napoleon he enjoyed the emperor's friendship; and was no less honoured or esteemed by Louis XVIII. In 1825 he published some 'Reflections' on his favourite art; and on the 11th of June, 1826, appeared for the last time on the stage in the part of Charles VI. During his last illness the audiences of the Théâtre Français every evening called for an official account of the state of his health previously to the commencement of the performances. He died on the 19th of October following, and was buried in the cemetery of Père la Chaise, in presence of an immense crowd. MM. Arnault, Jouy, and Lafour pronounced orations over his grave. The Théâtre Français remained closed for three evenings, and the Opéra Comique and Odéon were also closed on the day of his funeral. The actors of the Brussels theatre (of which company he was an associate) wore mourning for him for forty days, and a variety of honours were paid to his memory at the principal theatres throughout France and the Netherlands. Talma is said to have created seventy-one characters, amongst the most popular of which were those of Orestes, Œdipus, Nero, Manlius, Cæsar, Cinna, Augustus, Coriolanus, Hector, Macbeth, Hamlet, Othello, Leicester, Sylla, Regulus, Danville (in 'L'Ecole des Vieillards'), Leonidas, Charles VI., and Henry VIII. He has been accused, remarks one of his biographers, of having spoken the verse of tragedy as though it were prose; but this avoidance of the jingle of rhyme was one of the greatest improvements which he introduced upon the French stage. In person he was about the middle height, square-built, and with a most expressive and noble countenance. His voice was exceedingly fine and powerful, his attitudes dignified and graceful. In private life he was distinguished for his manly frankness, his kind disposition, and unaffected manners. He spoke English perfectly, and was a great admirer of England and her institutions. He was the friend and guest of John Kemble, and was present in Covent Garden Theatre when that great actor took his leave of the stage.

(*Almanach des Spectacles*, 1827; *Biographie Nouvelle des Contemporains*; *New Monthly Mag.*; Personal Recollections.)

TALMUD. [Hebrew Language.]

TALPA. [Talpidæ.]

TALPASO'REX, M. Lesson's name for a genus of Sorecidæ, comprising the *Shrew-mole*. [Vol. xxii., p. 265.]

TA'LPIDÆ, the family of *Moles*.

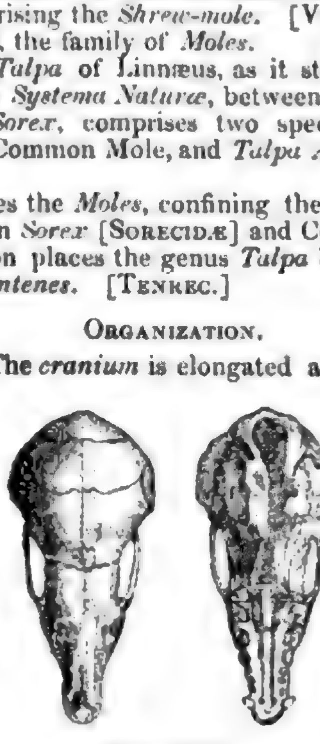
The genus *Talpa* of Linnæus, as it stands in the 12th edition of the *Systema Naturæ*, between the genera *Didelphis* and *Sorex*, comprises two species only, *Talpa Europæa*, the Common Mole, and *Talpa Asiatica*. [Chrysochloris.]

Cuvier places the *Moles*, confining them to the genus *Talpa*, between *Sorex* [Sorecidæ] and Condylura.

Mr. Swainson places the genus *Talpa* between *Chrysochloris* and *Centenes*. [Tenrec.]

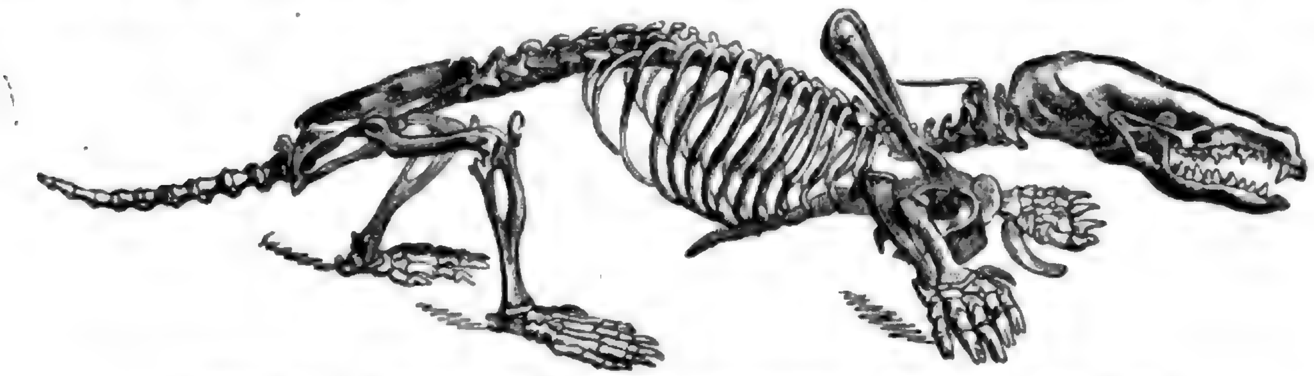
Organization.

Skeleton.—The *cranium* is elongated and pointed, and there is a peculiar bone for the support and working of the muzzle. The part which extends from the internal



Skull of Mole.

side of the jaws terminates in three points, the one in the middle larger and more distant from the external edge than the other two. The very short arm attached by means of a long bladebone, and sustained by a vigorous clavicle, carries an extremely wide hand, the palm of which is always turned outwards or backwards. No known living form has the compressed phalangeal bones seen in *Glyptodon* except the mole. The second phalanx of the anterior digits or fingers of the mole is the only known living analogue of the similar bone in the hind-foot of *Glyptodon*. The sternum, like that of the birds and bats, has an elevation or crest affording room for the large pectoral muscles. The pelvis and hinder extremities are comparatively feeble. The bones of the pubis are not joined.



Skeleton of Mole. (De Blainville.) The nuchal bone and accessory carpal sabre-shaped bone are here shown.

This bony framework is set in motion by very powerful muscles. Those of the anterior extremities, the chest, and the neck are most vigorous, and in the cervical ligament a peculiar bone is even formed. The wide hand, which is the great instrument of action, and performs the offices of a pickaxe and shovel, is sharp-edged on its lower margin, and, when clothed with the integuments, the fingers are hardly distinguishable, but the terminating claws project long, strong, flat, and trenchant.

Let us compare for a moment the bats with the moles with reference to their locomotion. Both are insectivorous, but how widely different in their conformation. The bat has to winnow its way through the air: the mole, like the bat, has to react against a given medium, a very different one, certainly; and is endowed with a power of moving through that medium by means of a modification of the locomotive organs beautifully adapted to its density. Instead of the lengthened bones of the forearm that so well assist the bat to make its way with outstretched wing through the air, all in this part of the organization of the mole is short and compact, to enable it to bore through the dense medium where it is to live and move and have its being. The development is all anterior: the fore part of the mole forms an elongated cone; the posterior part is narrow and small, and the whole of its proportions are admirably fitted to assist it, so to speak, in flying through the earth. The long and almost round scapula, the expanded humerus, the enormous power, in short, of the anterior extremities, and the great strength and compactness of the fingers, are all fitted for the digging duty they have to do. Add to this a soft short-cut velvety coat, to which no particle of soil ever adheres, and you have the perfection of organization for rapid progress through the ground.

Nor is it void of interest to observe the niceties of adaptation according to circumstances. The CHRYSOCHLORIS (*Talpa aurea* of the older authors) is an inhabitant of Africa, and burrows in sand. This medium required a modification of organization different from that required to permeate the heavier soils, and we have it. Though some of the bones are strong, the general strength is less than in the common Mole. The principal burrowing instrument is the great double anterior toe (ring-finger), and there is an enormous development of the pisiform bone.

In the museum of the Royal College of Surgeons, in London, No. 282 G, of the *Physiological Series*, shows the anterior half of the body of a Mole (*Talpa Europæa*, Linn.), in which the diaphragm and principal muscles of the right extremity are dissected and exposed, as illustrative of one of the principal structures for burrowing.

Nervous System and Senses.—(*Touch.*)—The muzzle of the mole is evidently a delicate organ of touch, and that sense is considerably developed in the large and broad hands and feet. Neither is the tail without a considerable share of sensation, to give notice to the animal of the approach of any attack from behind.

Taste and Smell.—The gustatory and olfactory nerves, especially the latter, appear to be very sensitive.

Sight.—Almost rudimentary. The little eye is so hidden in the fur, that its very existence was for a long time denied. It appears to be designed for operating only as a warning to the animal on its emerging into the light; and indeed more acute vision would only have been an incumbrance. No. 1772 (*Mus. Coll. Reg. Chir., Phys. Series*) is the anterior part of a mole (*Talpa Europæa*, Linn.), showing the minute circular palpebral orifices defended by the short thick fur.

Hearing.—But if the sight be imperfect, the sense of hearing is very highly developed, and the tympanum very large, though there is no external ear, or rather, no projecting concha. No. 1608, in the department of the museum of the Royal College of Surgeons above referred to, exhibits the anterior part of a mole (*Talpa Europæa*, Linn.), from which the hair has been removed, to show the external orifices of the ears and eyes, in both of which bristles are placed. No. 1609 is also the anterior part of the same animal with the fur left on, showing the entrance to the meatus auditorius externus unprovided with a projecting concha, or external ear, which would be an impediment in the act of burrowing, and an unnecessary appendage: the meatus is defended in this animal, which lives habitually in the soil, by the smallness of the external opening. John Hunter, in his *Manuscript Catalogue*, introductory of this part of the series, observes that an external concha is not to be found in many animals whose life is principally led underground, such as the mole; and perhaps because the earth assists considerably in vibration.

There is nothing that calls for any particular notice in the *Digestive System* of the Mole. The alimentary canal is short, simple, without a cæcum. The voracity of the mole corresponds with the activity and rapidity of its digestive powers.

Generative and Urinary Systems.—No. 2505 of the Physiological Series in *Mus. Coll. Reg. Chir.* exhibits a mole with the abdomen laid open to show the testes as they appear in winter. They are lodged in large cremasteric pouches in the perinæal region, making no projection externally. The right testis is drawn into the abdomen by the side of the bladder, and its posterior extremity may be seen attached to the inverted cremaster: the left testis has its anterior extremity projecting into the abdominal cavity. The prostatic glands, which consist of an aggregate of cæcal tubes, are just visible behind the bladder. No. 2506 is a mole killed in February, and prepared to show the increased size of the testes, and the commencing sexual development of the prostatic cæca. No. 2507 is a mole killed in the beginning of March, and prepared to show a further increase of the testes and accessory prostatic glands: the latter have now advanced forwards on each side of the urinary bladder, so as to encompass its neck: the left testis has been drawn back into the abdomen, and its attachment to the inverted cremasteric pouch displayed. No. 2508 is a mole killed about the latter end of March, and dissected to show the complete development of the testes and prostatic glands. The long penis and its two crura, surrounded by the erectores muscles, are also shown. No. 2509 is a mole which was killed in autumn, prepared to show the collapsed state of the testes, and the atrophied condition of the prostatic glands; but the testes in this case had not yet returned to the small size which they exhibit in winter. No. 2510 is a preparation showing a side view of the male organs of generation; and No. 2511 exhibits the male organs of *Chrysochloris capensis*. (*Cat.*, vol. iv.)

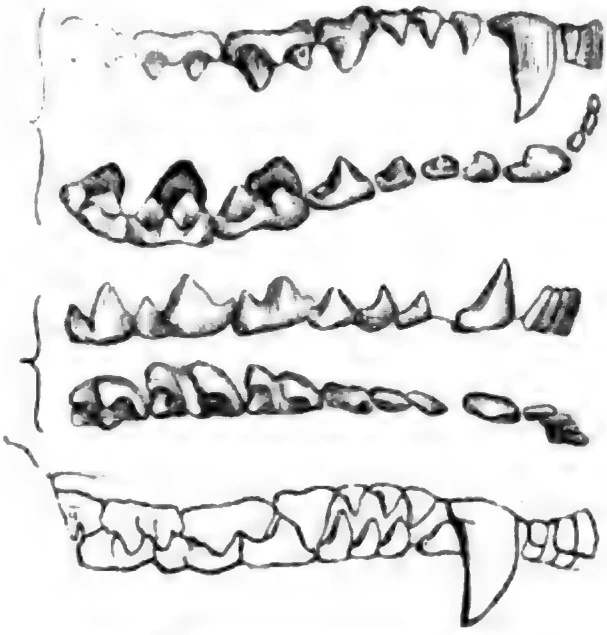
The increase and decrease of the testes in **Birds** and **Frogs** are well shown in preparations in the same noble museum; the first in Nos. 2457 to 2462 (both inclusive), the second in Nos. 2412 and 2411. John Hunter, in his 'Animal Œconomy,' observes that these seasonal or periodical changes are common to all animals which have their seasons of copulation. 'In the buck,' says that great physiologist, 'we find the testicles are reduced to a very small size in winter: and in the land-mouse, mole, &c. this diminution is still more remarkable. Animals, on the contrary, who are not in a state of nature, have no such change take place in their testicles; and not being much affected by seasons, are consequently always in good condition, or in a state to which other animals that are left to themselves can only attain in the warmer season. Therefore in man, who is in the state we have last described, the testicles are nearly of the same size in winter as in summer; and nearly, though not exactly, the same thing may be observed in the horse, ram, &c., these animals having their seasons in a certain degree. The variation above taken notice of is not confined to the testicles, but also extends to the parts which are connected with them: for in those animals that have their seasons for propagation the most distinctly marked, as the land-mouse, mole, &c., the vesiculæ are hardly discernible in the winter; but in the spring they are very large, varying in size in a manner similar to the testicle. It may however be alleged that the change in these bags might naturally be supposed to take place, even admitting them to be seminal reservoirs; but what happens in the prostate gland, which has never been supposed to contain semen, will take off the force of this objection; since in all animals which have such a gland, and which have their season for propagation, it undergoes a limited change. In the mole the prostate gland is hardly discernible, but in the spring becomes very large, and is filled with mucus.'

No. 2807 exhibits the posterior part of a mole (*Talpa Europæa*), with the female generative and urinary organs exposed. The uterus is turned to the right side, principally to display the course and attachments of the ovarian and uterine ligaments. The ovarian ligament commences anterior and external to the kidney, and carries forward with it a fold of the peritoneum as it advances to the ovarium. The uterine ligament, or ligamentum rotundum, is continued from the extremity of the cornu uteri, and runs along the posterior edge of the preceding fold to the part corresponding to the abdominal ring in the male, where it expands upon the fascia. The left ovary and oviduct, the cornua and corpus uteri, are also exhibited. The ovary is tuberculate, and inclosed in an almost complete peritoneal capsule. The oviduct is attached to this capsule, and pursues a wavy course to the horn of the uterus. No. 2808 displays the female organs of a mole *in situ*, the ventral parietes of the abdomen and chylopoietic viscera having been removed. The cornua uteri, cylindrical tubes, describe three abrupt curves before joining the corpus uteri, with which they form almost a right angle. The body of the uterus is continued without any constriction or interruption into the vagina: the whole canal is somewhat flattened, and is disposed in two or three vertical curves or folds before it leaves the abdomen. No. 2809 is also the posterior half of a mole, with the female organs similarly displayed, but minutely injected. The cornua uteri are divaricated, to display the extent of the broad ligaments. No. 2810 is a section of a mole, in which the left ovary, oviduct, and uterine horn, and the left side of the uterus and vagina, have been removed, but exposing the remainder of the generative apparatus *in situ*, and exhibiting its relative position to the urinary bladder, the rectum, and the pelvis. The contracted area of the uterine cavity, the absence of any os tincæ dividing it from the vagina, and the distinct muscular and internal membranous tunics of the flattened tortuous utero-vaginal canal, are clearly displayed. A bristle is inserted into the right horn of the uterus, and another is passed through the clitoris, which is perforated by the urethra. 'Thus,' continues Professor Owen, the author of the catalogue, 'the urethra, vagina, and rectum open by distinct orifices on the exterior of the body, and all three canals lie anterior to the pubic bones, and consequently outside the pelvis.'

No. 1224 of the same series exhibits the kidney of a mole injected and longitudinally divided. The uninjected tubuli may be plainly seen extending through the cortical substance, as is shown in the injections of the kidney of the horse, Nos. 1209 to 1214, both inclusive. (*Cat.*, vol. ii.)

Generic Character.—Body stout and thick, furry; head elongated, pointed; muzzle cartilaginous, strengthened by the snout-bone; eyes very small; no external ears; anterior feet short and wide, with five united toes armed with trenchant nails proper for digging; posterior feet with five toes also, but weak; tail short.

Dental Formula:—Incisors $\frac{6}{8}$; canines $\frac{1-1}{0}$; molars $\frac{7-7}{7-7}$; $=44$.



Teeth of Mole, considerably enlarged. (F. Cuv.)

Example, *Talpa Europæa*, the common mole.

This well-known animal, so familiar to all that it would be a needless waste of space to describe it, is *La Taupe* of the French, *Talpa* of the antient and modern Italians, *Topo* of the Spanish, *Toupeira* of the Portuguese, *Maulwerf* of the Germans, *Mol* of the Dutch, *Mulvad* and *Surk* of the Swedes, *Muldvarp* of the Danes; *Mole, Mole-warp, Moldwarp*, and *Want* of the modern British; and *Gwadd* and *Twrch daear* of the antient British.

Habits, Food, Reproduction, &c.—'A subterraneous life,' says Pennant, speaking of the mole, 'being allotted to it, the seeming defects of several of its parts vanish; which, instead of appearing maimed or unfinished, exhibit a most striking proof of the fitness of their contrivance. The breadth, strength, and shortness of the fore-feet, which are inclined sideways, answer the use as well as the form of hands, to scoop out the earth, to form its habitation, or to pursue its prey. Had they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working, or have impeded its course: the oblique position of the fore-feet has also this advantage, that it flings all the loose soil behind the animal.

'The form of the body is not less admirably contrived for its way of life: the fore-part is thick and very muscular, giving great strength to the action of the fore-part, enabling it to dig its way with great force and rapidity, either to pursue its prey or elude the search of the most active enemy. The form of its hind parts, which are small and taper, enables it to pass with great facility through the earth that the fore-feet had flung behind; for had each part of the body been of equal thickness, its flight would have been impeded and its security precarious.

'The skin is most excessively compact, and so tough as not to be cut but by a very sharp knife; the hair is very short and close-set, and softer than the finest silk; the usual colour is black, not but that there are instances of these animals being spotted, and a cream-coloured breed is sometimes found in my lands near Downing.

'The smallness of the eyes (which gave occasion to the antients to deny it the sense of sight[*]) is to this animal a peculiar happiness; a small degree of vision is sufficient for an animal ever destined to live underground; had these organs been larger, they would have been perpetually liable to injuries by the earth falling into them; but nature, to prevent that inconvenience, hath not only made them very small, but also covered them very closely with fur. Anatomists mention (besides these) a third very wonderful contrivance for their security, and inform us that each eye is furnished with a certain muscle, by which the animal has the power of withdrawing or exerting them, according to its exigencies.

'To make amends for the dimness of its sight, the mole is amply recompensed by the great perfection of two other senses, those of hearing and of smelling: the first gives it notice of the most distant approach of danger; the other, which is equally exquisite, directs it in the midst of darkness to its food: the nose also, being very long and slender, is well formed for thrusting into small holes in search of the worms and insects that inhabit them. These gifts may with reason be said to compensate the defect of sight, as they supply in this animal all its wants and all the purposes of that sense.

'It is supposed that the verdant circles so often seen in grass-grounds, called by country-people *fairy rings*, are owing to the operations of these animals, who, at certain seasons perform their burrowings by circumgyrations, which, loosening the soil, give the surface a greater fertility and rankness of grass than the other parts within or without the ring.

'The mole breeds in the spring, and brings four or five young at a time: it makes its nest of moss, and that always under the largest hillock, a little below the surface of the ground. It is observed to be most active, and to cast up most earth, immediately before rain, and in the winter before a thaw, because at those times the worms and insects begin to be in motion and approach the surface: on the contrary, in very dry weather this animal seldom or never forms any hillocks, as it penetrates deep after its prey, which at such seasons retires far into the ground. During summer it runs in search of snails and worms in the night time among the grass, which makes it the prey of owls. The mole shows great art in skinning a worm, which it always does before it eats it; stripping the skin from end to end, and squeezing out the contents of the body.'

Thus far Pennant: but the most diligent and instructive historian of the mole is Henri Le Court, who, flying from the terrors that came in the train of the French revolution, buried himself in the country, and, from the attendant on a court, became the biographer of this humble animal. The discoveries of this indefatigable observer have been laid before the public in the work of De Vaux (1803), and a summary of them by Geoffroy St. Hilaire, in the *Cours d'Histoire Naturelle des Mammifères*. The latter visited Le Court for the purpose of testing his observations, and appears to have been charmed by the facility and ingenuity with which Le Court traced and demonstrated the subterranean labours of this obscure worker in the dark.

One of the experiments which Le Court made afforded ample proof of the rapidity with which the mole will travel along its passages. He watched his opportunity, and when the mole was out on its feed at one of the most distant points from its sanctuary or fortress, to which point the mole's high road leads, Le Court placed along the course of that road between the mole and the fortress several little camp-colours, so to speak, the staff of each being a straw and the flag a bit of paper, at certain distances, the straws penetrating down into the passage. Near the end of the subterraneous road he inserted a horn, the mouth-piece of which stood out of the ground. When all was ready, Le Court blew a blast loud enough to fright all the moles within hearing from their propriety, and the little gentleman in velvet, whose presence at the spot he had well ascertained, was affected accordingly. Down went the little flags in succession with an astonishing celerity, as the horrified mole, rushing along towards his sanctuary, came in contact with the flag-straws; and such mettle had terror put into the animal's heels, that the spectators affirmed that its swiftness was equal to the speed of a horse at a good round trot.

This experiment was perfectly satisfactory as to the auditory and travelling powers of the mole; but another made by Le Court equally proved that the amount of vision possessed by the animal is amply sufficient for its wants, and that, with all the imperfections of this sense, its sight warns it of danger. Le Court took a spare water-pipe or gutter open at both ends. Into this pipe he introduced several moles, successively. Geoffroy St. Hilaire stood by to watch the result, at the farther end of the tube. As long as the spectators stood motionless, the introduced mole made the best of his way through the pipe and escaped; but if they moved, or even raised a finger, the mole stopped and then retreated. Several repetitions of the experiment produced the same results.

But we must describe the mole's domain. The principal point is the habitation, or, as it has been termed, the fortress, and is constructed under a considerable hillock raised in some secure place, often at the root of a tree, under a bank, or any shelter that offers protection. The fortress is domed by a cement, so to speak, of earth which has been beaten and compressed by the architect into a compact and solid state. Within, a circular gallery is formed at the base, and communicates with a smaller upper gallery by means of five passages, which are nearly at equal distances. Within the lower and under the upper of these galleries is the chamber or dormitory, which has access to the upper gallery by three similar passages. From this habitation, we should here observe, the high road by which the proprietor reaches the opposite end of the encampment extends, and the various galleries or excavations open into this road, which the mole is continually carrying out and extending in its search for food, and which has been termed its hunting-ground. But to return to the chamber. From it another road extends, the direction of which is downward at first, and that for several inches, when it again rises to open into the high road of the territory. Some eight or nine other passages open out from the external circular gallery, but the orifices of these never come opposite to the passages which connect the external gallery with the internal and upper gallery. The extent of these passages is greater or less, according to circumstances, and they each return by an irregular and semicircular route, opening at various distances from the habitation into the high road, which differs considerably from all the other passages and excavations, both in construction and with regard to the use to which it is applied. From the habitation this road is carried out nearly in a straight line and forms the main passage of communication between the habitation, the different portions of the encampment, and the alleys leading to the hunting-ground which open into it on each side. In diameter it exceeds the body of a mole, but its size will not admit of two moles passing each other. The walls, from the reiterated pressure of the mole's sides against them, become smooth and compact, and its course is remarkable for the comparative absence of mole-hills, which are frequent in connection with the alleys and quarries, as they have been termed, in constructing which the earth is removed out of the way to the surface. Sometimes a mole will lay out a second or even a third road in order to the extension of its operations. Sometimes several individuals use one road in common, though they never trespass on each other's hunting-grounds. In the event of common usage, if two moles should happen to meet, one must retreat into the nearest alley, unless both should be pugnacious, in which case, the weakest is often slain. In forming this tunnel, the mole's instinct supplies the place of science, for he drives it at a greater or less depth, according to the quality of the soil, or concurrent circumstances. When there is nothing superincumbent threatening a disturbance of its security, it is often excavated at a depth of some four or five inches; but if it is carried under a road or a stream, a foot and a half of earth, sometimes more, is left above it. Thus does the little animal carry on the subterraneous works necessary for his support, travelling, and comfort; and *his* tunnels never fall in.

The alleys opening out from the sides of the high road have generally a somewhat downward inclination from their commencement towards their end. It has been observed that when, on opening one of these alleys, a plentiful supply of food is found, the mole proceeds to work out branch alleys from its termination, up-heaving new mole-hills as it advances in quest of prey: should however the soil be barren of the means of existence, the animal commences another alley at a different part of the high road. The quality and humidity of the soil, which regulate the abundance of earth-worms, determine the greater or less depth of the alleys.

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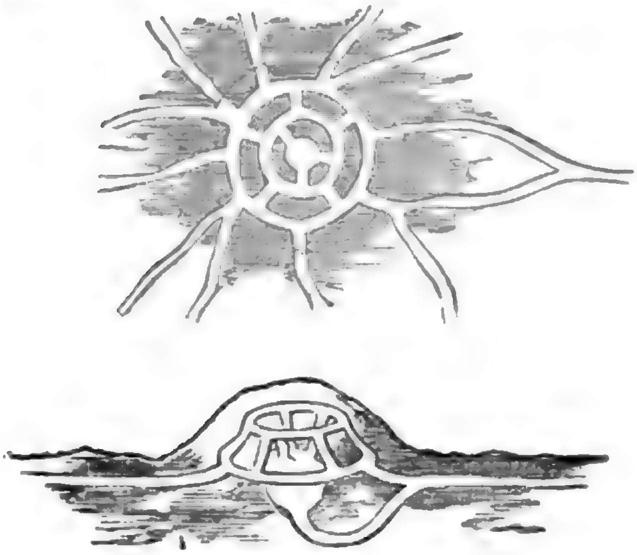
[*] 'Aut oculis capti fodere cubilia talpæ.' Virg., *Georg.* i., 183.



Habitation or fortress of Mole.

The main road being the highway of communication to its different hunting-grounds, it is necessarily passed through regularly in the course of the day, and it is in this road that the mole-catcher sets his traps or practices his devices to intercept the animal between its habitation and the alley where it is carrying on its labours. Some mole-catchers will tell you that the hours when the moles move are nine and four, and others that, near the coast, their movements are influenced by the tides; to which statements the hearer is at liberty to give as much credence as he chooses. Besides the various traps which are set for them, there is, or very lately was, a man who travelled the country with a dog and destroyed them without any trap at all, by the following process: Taking his station at the proper time and place, attended by his dog, and armed with a spear or spud, he waits till the dog indicates the presence of the mole, and then spears or spuds the animal out as it moves in its run. Pointers will stop at moles as steadily as at game, when the latter are straying on the surface.

Besides the excavations already noticed, the moles pursue another mode of hunting in light loose soils, newly sown, when gentle rains have led the earth-worms towards the surface, along which they follow the worms up, rapidly digging a shallow trench in the superficial layer of the soil. The female, when with young, is said to be principally addicted to this easier method of subsistence.

All the animal passions are strong in the mole, and it is a most voracious animal. It has been supposed that it was a vegetable as well as an animal feeder, and, as a proof of the former, the fragments of roots, &c., found in its stomach have been appealed to; but there can be no doubt that these vegetable matters had been conveyed into the stomach with the earth-worms (their favourite food) and the larvæ of insects. The structure of its teeth indicates that its food should be animal, and indeed mice, lizards, frogs, and even birds have been known to fall victims to its voracity; but it eschews toads even when pressed by hunger, deterred probably by the acrid secretion of their skin. [Frogs, vol. x., p. 493.] All doubts as to the carnivorous nature of the mole have however been removed by the experiments of M. Flourens, who found that moles restricted to carrots, turnips, various kinds of herbs, and vegetable substances which were abundantly supplied to them, died of hunger. The mole indeed appears to require much nourishment, and a short fast proves fatal to it.

We must not omit to notice the provision of this animal to secure a supply of water, for its voracity makes it a great drinker. If a pond or ditch be at hand in those cases where many moles use the same common highway, a run is always formed to the reservoir: when it is too distant, the animal sinks little wells in the shape of deep perpendicular shafts, which hold water. These wells have sometimes been seen brim-full.

During the season of love, at which time bloody battles are fought between the males, the male pursues the female with ardour through numerous divaricating superficial runs wrought out with great rapidity, termed 'coupling runs' and 'rutting angles' by our mole-catchers, and 'traces d'amour' by the French. The sexual attachment appears to be very strong in the moles. Le Court often found a female taken in his trap, and a male lying dead close to her. The period of gestation is two months at least, and the young are generally produced in April, but have been found from that month to August. From four to five is the general number, though from three to six have been recorded, and in one case seven* in one nest. The nest is distinct, usually distant from the habitation, and not always crowned with a hillock; but when a hillock exists, it is much larger than an ordinary mole-hill. It is constructed by enlarging and excavating the point where three or four passages intersect each other; and the bed of the nest is formed of a mass of young grass, root-fibres, and herbage. In one case, Geoffroy St. Hilaire and Le Court counted two hundred and four young wheat-blades.

In the Museum of the Royal College of Surgeons in London, No. 3573 of the Physiological Series is the posterior half of a pregnant mole, with the uterus and three fœtuses, each about half an inch in length, exposed *in situ:* the ovarium is contained in a thin and transparent peritoneal capsule, around which the oviduct may be observed passing in the form of an opaque, white, narrow band: the uterine dilatation next the left ovarium remains open, and the fœtus is exposed inclosed in its membranes; the other uterine dilatations are left entire; they resemble blind pouches developed from one side of the uterine tube. No. 3574 is the posterior extremity of the trunk of a pregnant mole, with the uterus and five fœtuses displayed *in situ;* one of the dilated chambers of the left uterine horn is laid open, and the fœtus is exposed with its membranes. The placenta is a spongy, vascular substance, in the form of an oblong flat band, with its long axis parallel to that of the fœtus. One of the uterine chambers, with the corresponding chorionic sac, is laid open in the right horn of the uterus, and the fœtus is displaced. No. 3575 presents the female organs of a pregnant mole with four fœtuses, each one inch and a quarter in length; one of these is exposed *in situ* in the uterine sac, two others hang suspended by their membranes and the placentæ from the parietes of the uterus: in the lower of these embryos the fœtal placenta is partly separated from the maternal portion, showing the fine areolar structure of the latter, which receives the fœtal placentary filaments: the maternal placenta is minutely injected, but no portion of injection has passed into those fœtal filaments which are here exposed; the capacity of the chorion is very little larger than the fœtus which it contains. In the embryo which has been displaced from the chorionic sac, the short umbilical cord, and the characteristic form of the short and strong fossorial anterior extremities, may be discerned: the external apertures of the eyes and ears are completely closed. The canal leading from the uterine horns to the external opening of the vagina is laid open, showing the absence of any os tincæ dividing the uterus from the vagina: a bristle is passed into the urethra, which is continued through the clitoris. The author of the catalogue (Professor Owen) observes that the peculiar position of the vagina of the mole, on the outside of the pelvis, is well displayed in No. 2810, above noticed, and that by this modification the contracted pelvis offers no impediment to parturition. (*Cat.*)

Heavy charges have been brought against the mole by agriculturists and horticulturists, and the more grave accusation of being ancillary to the destruction of dykes has been in some instances proved upon it. Mr. Bell, in his interesting *History of British Quadrupeds*, sums up the evidence against it and in its favour thus:—'In order to arrive at a true solution of the question, it is necessary to divest our minds as well of the prepossessions of the naturalist as of the prejudices of the agriculturist; for we shall probably find, as in most other cases, that the truth lies between the two extremes. According to its accusers, there is no portion of its labours, no peculiarity of its habits, no function of its organization, that is not the means or the cause of ravage and devastation to our cultivated grounds. The soil, say they, is rendered dry and sterile by its subterranean roads; the crops are killed by the exposure or the destruction of the roots; the plants themselves are overthrown by the construction of the mole-hills, or they perish from their roots being eaten, or they are dug up and scattered by the superficial furrows which the animal ploughs up either in search of food or in pursuit of its mate; large quantities of young corn too are carried off by it to form its nest; and, finally, its abandoned fortress becomes the resort of the field-mouse and other noxious animals. Thus the field and the meadow, the garden and the plantation, are alike the scenes of its ravages; and De Vaux calculates that the loss which it occasions to the spring corn alone may be calculated at one-eighth of the whole produce. Then, on the other hand, these prejudiced judges allow nothing for the benefit which arises from the destruction of innumerable worms, and of insects both in the larva and perfect state: this advantage is in fact denied by De Vaux, who declares that the mole feeds only on the most harmless of those animals, the earth-worm, and that it refuses those which are injurious to mankind. Its more benevolent advocates, on the other hand, contend not only that the injury which it perpetrates is slight, but that it is more than counterbalanced by the benefit which it produces by turning up and lightening the soil, and especially by its immense destruction of earth-worms and many other noxious animals which inhabit the superficial layer of the ground, and occasion great injury to the roots of grass, corn, and many other plants. If we examine the real nature and degree of its injuries on the one side, and its utility on the other, we shall probably find that both parties are erroneous. The fact of its devastations cannot be denied, it is only in the degree and extent of them that the estimation is incorrect; and whilst its utility in clearing the ground of worms and similar causes of injury must also be allowed, it can scarcely be sustained that the lightening of the soil by the turning up of its hillocks is, at most, more than a very equivocal source of advantage.'

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* Loudon's 'Magazine of Nat. Hist.,' vol. viii.

Thus we see that 'much may be said on both sides.' We have heard advocates for the mole declare that in great sheep-walks whence they have been rooted out, the whole character of the feed has been altered, and the exterminators have been obliged to introduce them again, and we have heard such stories denied. Too much stress however may be laid on its services as a destroyer of the earth-worm; for it may be well doubted whether it aids the agriculturist by the destruction of an animal that does so much for the soil. [Lumbricus, vol. xiv., p. 196.]

Whatever may be the merits of the case, the persecution of these animals in cultivated countries amounts almost to a war of extermination. The numbers annually slaughtered are enormous. Mr. Bell states that Mr. Jackson, a very intelligent mole-catcher, who had followed the craft for thirty-five years, had destroyed from forty to fifty thousand. But all mole-exterminators must yield to Le Court, who, in no large district, took, in five months, six thousand of them.

Moles are good swimmers, and their bite is very sharp: when their blood is up, their ferocity is great, and they keep their hold like a bull-dog.

As to the question whether the species under consideration is the *aspalax* (ἀσπάλαξ) of Aristotle, who describes his animal as blind, see the article Muridæ, vol. xv., p. 516.

Geographical Distribution.—The common mole is found throughout the greater part of the continent of Europe and its larger islands. In Greece it is said to be comparatively rare. We are overrun with it in most parts of England and Wales, but it does not appear to have been found in the northern extremity of Scotland, though it is frequent enough in the south. There is no record of its having been seen in the Orkney Isles, Zetland, or Ireland.

The Prince of Musignano has well figured, in his excellent work, *Iconografia della Fauna Italica*, the species under consideration and the *Talpa cæca*, which may be the *Aspalax* of Aristotle. In this last species the middle incisive teeth are longer than the rest; in the common mole they are all equal, and De Vaux states that there is some difference, though not great, in the habits and architecture of the two species. Mr. Bell suggests that as both species are inhabitants of Europe, the original trivial name *Europæa* should be dropped, and Brisson's name, *vulgaris*, be adopted for the common species.

For Dr. Richardson's account of the true moles brought from America, see the article Sorecidæ, vol. xxii., p. 265.

Fossil Moles.

The fossil remains of the mole have been found in the bone-caverns; as, for example, in the cave at Köstritz and at Paviland (see Buckland, *Reliquiæ Diluvianæ*). They have also been found in the bone-caverns in Belgium (Schmerling).

Bones of moles have been obtained from the brown clay of Norfolk: they were, we understand, first taken for the remains of lizards.

The questions which arise upon this discovery are:—

1st. Were they true fossils of that formation or subsequently introduced? and this their condition might determine.

2nd. Are the fossil remains identical with the bones of the common mole?

An inspection of the remains themselves might convey a solution of both these questions, and we are informed that the fossils are, through the kindness of Professor Sedgwick, about to be sent up to Professor Owen.

But throughout this inquiry it will be necessary to bear in mind that though this quadruped is a denizen of the earth, performing all its functions, with little exception, below the surface, and though we might for that reason be led to expect the frequent occurrence of its remains in a fossil state, *true* fossil bones of the mole have not hitherto been described. The danger to be guarded against with regard to those specimens found in the newer and superficial strata is that a burrowing animal may have penetrated into those fossiliferous beds subsequently to their formation and the deposit of their organized contents. We therefore look forward to Professor Owen's opinion upon the *condition* of these remains and their specific distinction with much interest.

TALUS, or **TALUT**, probably from 'taglio,' Ital., a cut, is a term used chiefly by writers on fortification, in speaking of a rampart or parapet, to signify a surface which is inclined to the horizon. Thus the upper surface of a parapet is called the superior talus or slope; and that surface of a rampart or parapet which is towards the country, or towards the town, is called the exterior, or the interior, talus of the work (*fig.* 2, Bastion).

The superior talus of a parapet is usually formed in a plane which, if produced towards the country, would nearly meet the top of the counterscarp before it, in order that the defenders of the rampart may be able to fire into the covered way in the event of the latter being occupied by the enemy, their muskets being laid upon that slope. The exterior or the interior talus of any work of earth usually forms, with the horizon, an angle of 45 degrees; such being the inclination at which the surface of earth, of medium tenacity, will stand unsupported.

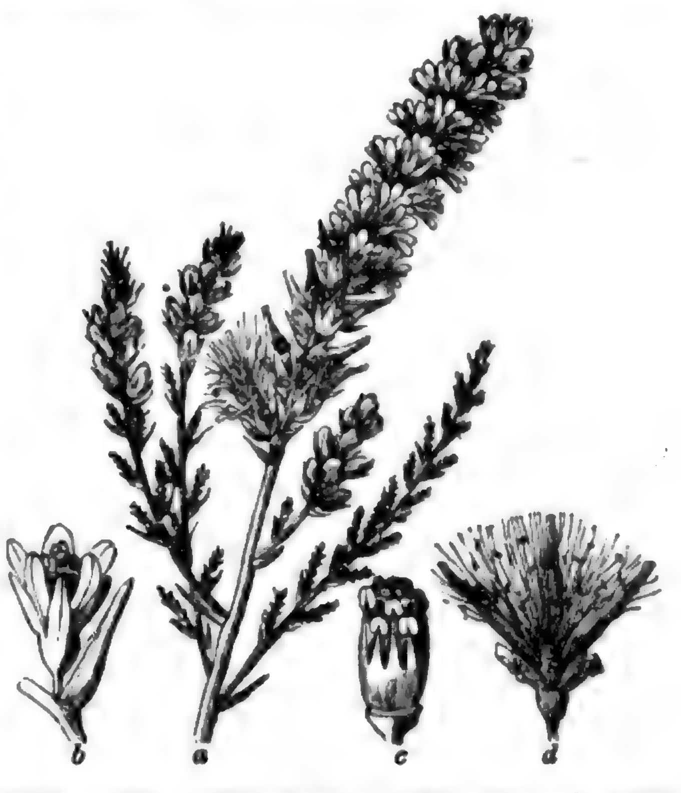
TAMAN, a peninsula, or rather a delta-island, is formed by the main branch of the river Kuban, which empties itself into the Black Sea, and a small branch of the same river, which flows into the Sea of Azof north of the old fortress of Temruk. The western or large part of the island stretches between the sea of Azof on the north and the Black Sea on the south, and is bounded on the west by the Strait of Yenikále, the antient Bosporus Cimmerius, and the Bay of Taman. The island resembles the open claws of a lobster, embracing the Bay of Taman. Its length is 57 miles, and its greatest breadth 22 miles, but the real surface is far from corresponding to these dimensions, the middle of the island being occupied by the large Temrukskoi Liman, or Lake of Temruk, and the whole of the remaining part being notched by creeks and bays in such a manner as to present rather the skeleton of an island than a real island. The south-western part of Taman, the antient peninsula of Corocondama (Pomp. Mela, i. 19; Strabo, p. 494. Casaub.) presents a solid mass traversed by several ranges of hills from 150 to 180 feet high: they run from west to east, and near the village of Sennaya-Balka form a bifurcation. One branch runs between the Kubanskoi Liman, or the lake formed by the Kuban before it reaches the sea, and the lake of Temruk, and terminates in a slip of land which divides this lake into two unequal parts. The other branch, the direction of which is north-east, forms the isthmus between the lake of Temruk on the east, and the bay of Taman on the west, and terminates before it reaches the isthmus between the lake of Temruk and the Sea of Azof. The north-western part of Taman, or the peninsula between the Sea of Azof and the bay of Taman, is no less elevated above the sea, but although it is a continuation of the mainland, it is separated from the eastern hills by a flat sandy isthmus, which seems to have been covered by the sea at a period not very remote from our own times. All these hills are mere masses of sand and pebbles cemented with clay. The higher part of them is barren, but the slopes, and the low grounds between them and the sea or the lakes, are covered with soil and fit for agriculture. They also make rich pasture-grounds. The isthmus between the Temrukskoi Liman and the bay of Taman, and principally that between the lake of Temruk and the Kubanskoi Liman, have a very pleasant aspect, being covered with the neat farmhouses of the Cossacks; and on the meadows there are numerous flocks of cattle, some of which are sent thither across the strait from the neighbouring coast of the Crimea. The eastern part of Taman is formed by two flat and narrow isthmuses, and a somewhat broader tract of lowland between the two branches of the Kuban. The whole of this country is marshy, partly covered with pastures and partly with a luxuriant vegetation of rushes and reeds, which, in the neighbourhood of Kaláus, as Dr. Clarke states, attain a height of from sixteen to twenty feet. Everywhere there is a struggle between land and water; gulfs become creeks and lakes, creeks are changed into marshes, and as soon as these get a continental aspect, the waters again swallow them up. In the rainy season, says Pallas, all this country is overflowed by the waters of the Kuban, and the higher part of Taman is separated from the continent by an immense lake which extends from one sea to the other; but notwithstanding the apparently overwhelming power of the waters, the solid element makes constant progress. Thus M. Dureau de la Malle is correct when, in his 'Géographie Physique de la Mer Noire,' he says that all the lakes on the shore of the Sea of Azof, which are separated from the sea only by flat and narrow isthmuses, have once been bays and gulfs, and that the barriers between them and the open sea are a deposit formed by the astonishing masses of mud and sand carried into this sea by the Don and its tributary rivers. As to the whole eastern part of the island of Taman, it is also a mere recent production of the immense quantities of clay and mud which the Sea of Azof and the Kuban have deposited before the mouth of this river. The western and elevated part however in its whole geognostical structure belongs to the opposite continent of the Crimea, from which it has apparently been separated by the current of the Cimmerian Bospòrus. Two characteristic peculiarities of this latter part are the Sewernaya Kossa, a long but very flat and narrow slip of land which stretches from the north-west extremity of the northern peninsula in a south-west direction to the middle of the mouth of the bay of Taman; and the cluster of small islands, the principal one of which was known to the Byzantines by the name of Atech, which extend from Point Yunaya north-west till they reach the centre of the strait. These islands will probably become a continuous land, and by joining the opposite Sewernaya Kossa, will separate the whole bay of Taman from the Bosporus. Numerous small craters are situated on the ridge of the hills around the Bay of Taman, as well as along the lake of Temruk. They present all the external appearances of volcanoes; though the matter which they throw out is not lava, but a thick mud of a deep black colour, which they discharge at irregular periods. The largest of these craters is situated on the southern extremity of the north-west peninsula, and a description of the most remarkable eruption of it is given by Pallas in the work cited below. This traveller attributes these phenomena to the burning of an extensive layer of coals, upon which indeed the whole island of Taman seems to repose. The apparition of an island, which, on the 5th of September, 1799, suddenly rose from the Sea of Azof, near the coast of Temruk, a phenomenon which was preceded and accompanied by a kind of earthquake, and all the other symptoms of a volcanic eruption, was undoubtedly the effect of the same subterraneous cause. The new island however soon disappeared in the sea.

The Greeks knew this remarkable island under the name of Eion (Ἠιών), and founded several colonies in it. The most considerable of them were—Phanagoria, a famous commercial town, which contained a beautiful temple of Aphrodite of Apaturon (Strabo, p. 495. Casaub.); Kepos, or Kepi, a colony of the Milesians; Hermonassa, founded by the Ionians; and Achilleion: some ruins and marbles are the only traces that remain of their antient splendour. The island belonged for a long period to the kingdom of Bosporus, and was afterwards conquered by Pharnaces, the son of Mithridates. At the beginning of the middle ages it belonged to the dominions of the Goths, and afterwards of the Khazars, a Turkish people, renowned for their industry and commerce. It was then known under the name of Tamatarkha. In the tenth century a Russian prince founded there the petty kingdom of Tmutarakan; the greater part of the inhabitants however were Tsherkessians and Turks, and, from the time of the invasion of the Mongols, the Tartars remained the only masters of it. Numerous old tombs still attest their long residence on the island. They were at last driven out by the Russians, who repeopled the country with Cossacks in order to defend it against the invasions of the Tsherkessians beyond the Kuban. There are now only two towns: Tmútarakán, the Tamatarkha of the middle ages and the Phanagoria of the Greeks; and the present town of Phanagoria, which was built by the Russians on the shore of the bay of Taman, three miles east from Tmútarakán, on account of its harbour being deeper than that of the latter town.

(Pallas, *Bemerkungen auf einer Reise in den Südlichen Provinzen des Russischen Reiches*; Dr. Clarke, *Travels in Russia*. The best map of the island of Taman is contained in the great Atlas of Russia published at St. Petersburg; the map in Pallas's *Bemerkungen* is also good; that of Dr. Clarke has some interest for lovers of antiquities, but is far from being geographically exact.)

TAMA'NDUA. [ANT-EATER, vol. ii., p. 65.]

TAMARICA'CEÆ, a small natural order, belonging to the syncarpous group of polypetalous Exogens. The species are either shrubs or herbs, having straight rod-like branches, with alternate entire leaves, resembling scales; the flowers are in dense spikes or racemes. The calyx is 4-5-parted, persistent; the petals inserted into the calyx, both with imbricate æstivation; stamens hypogynous, distinct or united, equal in number with the petals or twice as many; ovary superior, with a short style and 3 stigmas; fruit a capsule, 3-valved, 1-celled, with numerous seeds, which are comose; embryo straight with an inferior radicle.



Tamarix germanica. *a*, cutting, showing the straight branches and scale-like leaves; *b*, single flower; *c*, flower with calyx and corolla removed showing monadelphous stamens; *d*, capsule with comose seeds escaping.

This order is placed by De Candolle with those which have perigynous stamens, but there is no doubt now that it has hypogynous stamens, although closely related to the perigynous order Illecebraceæ. It has also affinities with Portulaceæ, Lythraceæ, Onagraceæ, and Reaumuriaceæ.

The species are found only in the Old World; the greatest number being met with in the basin of the Mediterranean. According to Ehrenberg, the order is bounded on the south by the 8th or 9th parallel of N. lat., and on the north by that of 50° and 55°, in Siberia, Germany, and England

The plants of this order are innocuous, and all are more or less astringent; and their ashes after burning are remarkable for possessing a large quantity of sulphate of soda. Myricaria Germanica is recommended as a diuretic. [Tamarix.]

TAMARINDS, *Medical Properties of.* Of the two varieties of the only species of this genus, the fruit is much larger in the East Indian than the West Indian. The shell being removed, there remains the flat square hard seeds, imbedded in a pulp, with membranous fibres running through it. In the East Indies the pulp is dried, either in the sun, and this is used for home consumption, or with salt added, and dried in copper ovens, which kind is sent to Europe. (Crawfurd's *Indian Archipelago.*) This sort, called natural tamarinds, is much darker and drier than the West Indian, which are called prepared tamarinds.

The West Indian tamarinds reach maturity in June, July, and August, when they are collected, and the shell being removed, they are put into jars, either with layers of sugar put between them, or boiling syrup poured over them, which penetrates to the bottom. Prepared tamarinds therefore contain much more saccharine matter than the others. According to Vauquelin, prepared tamarinds contain per cent. citric acid 9·40, tartaric acid 1·55, malic acid 0·45, bitartrate of potash 3·25, sugar 2·5, gum 4·7, vegetable jelly (pecten) 6·25, parenchyma 34·35, water 27·55. This prepared pulp has a pleasant acid astringent taste, with a somewhat vinous odour.

It presents an example of one of those natural combinations of gummy, saccharine, and acid principles which are of such great utility in hot climates. It is used not only in India, but in Africa, as a cooling article of food, and the travellers across the deserts carry it with them to quench their thirst. In Nubia it is allowed to stand in the sun till a kind of fermentation takes place: it is then formed into cakes, one of which dissolved in water forms a refreshing drink. In India a kind of sherbet is made with it, and by the addition of sugar it becomes a source whence vinegar is readily obtained. In the fevers and bilious complaints, and even dysenteries of these climates, it proves highly serviceable; in small quantity it acts as an astringent, but in larger it proves laxative. Boiling water poured over tamarinds yields a drink which is very grateful in the inflammatory complaints of our own country, particularly in the bilious fevers of autumn. An agreeable whey may be made with it, by boiling two ounces of tamarind-pulp with two pints of milk. Tamarinds are frequently given along with senna, but they are said to lessen its purgative property. They form an ingredient in the confectio sennae and confectio cassiae.

In times of scarcity in India the seeds are eaten, being first toasted and then soaked for a few hours in water, when the dark skin comes easily off; they are then boiled or dried, and taste like common field-beans.

TAMARINDUS, the name of a genus of plants belonging to the Rectembryous division of the natural order Leguminosæ. It possesses the following characters:—calyx cleft, tubular at the base, the three upper lobes are reflexed, the two lower ones joined together, but usually indentate at the apex; petals 3, alternate with the three upper lobes of the calyx, the middle one cucullate and the lateral ones ovate; the stamens are 9 or 10 in number, two or three of which are longer than the others, united at the base, and bearing anthers, whilst the remainder are sterile; the fruit is a legume seated on a pedicel, 1-celled, compressed, with from 3 to 6 seeds, and the valves filled with pulp between the endocarp and epicarp, their inner and outer lining; the seeds are ovato-quadrate in form, possessing cotyledons unequal at the base.

There are only two species belonging to this genus, both of which are trees with abruptly pinnate leaves, bearing many pairs of small leaflets and racemes of flowers.

The *Tamarindus Indica*, the East Indian Tamarind, was the earliest known species, for a knowledge of which, in Europe, we are indebted to the Arabians. Dr. F. Hamilton, in his commentary on the Hortus Malabaricus, remarks on the specific designation of this plant, that it is 'a vile pleonasm,' the fact of its being Indian being referred to in the generic name *Tamar-Indus*, whence our word Tamarind. The Indian Tamarind is distinguished by its elongated legumes, which are six times or more longer than they are broad. It is a native of various districts in the East Indies and also of the tropical parts of Africa. It forms a handsome tree with spreading branches bearing leaves of a light colour and flowers with a straw-coloured calyx and yellow petals, streaked with red: the filaments of the stamens are purple and the anthers brown. The timber of this tree is very firm, hard, and heavy, and is applied to many useful purposes in building.

The second species is the *Tamarindus Occidentalis*, the West Indian Tamarind, which is distinguished from the other by possessing short legumes not more than three times longer than they are broad. It is a native of South America and the West India Islands, forming also a large spreading tree, with yellowish flowers streaked with red and purplish stamens.

These plants may be grown in this country, by sowing the seeds, which can be easily obtained, in a hot-bed, and when the young plants obtain a height of two or three inches, planting them out in separate pots. For the medical and dietetic properties of the tamarind see Tamarinds.

TAMARIX, the name of a genus of plants, the type of the natural order Tamaricaceæ. It has a 4- or 5-parted calyx; 4 or 5 petals; 4 or 5 stamens alternating with the petals, united at the base; a tapering ovary with 3 stigmas; erect tufted seeds, the tuft being composed of a number of hairs proceeding from the apex of the seed. The species have generally paniculated spikes of small flowers of a red colour.

T. gallica, the French Tamarisk, is a glabrous glaucous shrub, with minute acute leaves clasping the stem, with slender lateral spikes of flowers, five times longer than broad. This species is a native of France, and also along the Mediterranean: it is also a native of the coasts of Cornwall, Hampshire, and Sussex, in England. Ehrenberg has described a great number of varieties of this species, one of which, the *T. g. mannifera*, known by its glaucous powdery appearance, he says, produces the manna of Mount Sinai. This manna however does not contain any crystallizable mannite, but, according to Mitscherlich, consists of nothing more than a mucilaginous sugar. This is one of the species of this genus remarkable for the large quantity of sulphate of soda which its ashes contain.

T. Indica, the Indian Tamarisk, is a glabrous greenish plant, with stiff twiggy branches; short ovate acute leaves with white edges; elongated spikes of flowers, with bracts shorter than the flowers and longer than the pedicels, and stamens longer than the corolla. This plant is a native of the East Indies. It is subject to the attacks of a cynips, which produce galls that possess astringent properties, and, according to Dr. Royle, they are on this account used in medicine by the native doctors of India. The same property also renders them valuable in dyeing. Other Indian species of the Tamarisk produce galls, which are used for the same purposes as those of *T. Indica*.

T. Africana, the African Tamarisk, is a glabrous glaucous shrub, with lanceolate imbricated leaves, with dense, scaly, simple, sessile racemes, with ovate chaffy bracts, and a 3-valved capsule. This is a native of the sands along the shores of the Mediterranean. It is found in Mauritiana, around the Bay of Naples, in Egypt, and in the Levant. It has very much the appearance of *T. Gallica*, but its flowers are larger, and bark darker. Like *T. Gallica*, its ashes yield a large quantity of sulphate of soda. The bark, as in most of the species, is slightly bitter and astringent, and has been used in medicine as a tonic.

T. Orientalis, the Eastern Tamarisk, is a tree attaining a height of from 10 to 20 feet: it is glabrous all over, with minute, distant, sheathing, mucronate leaves, with slender lateral spikes of flowers, and a 4-valved capsule. This is a native of Arabia, Persia, and the East Indies, and is one of the largest and most elegant of the species of the Tamarisk. One of the finest specimens of this tree existing is at Babylon. The *T. Chinensis* appears to be a variety of this plant.

Nearly all the species are elegant and delicate shrubs deserving a prominent position in the shrubbery. The hardy species do not require much care in their cultivation. They will grow in almost any soil or situation, and may be propagated by cuttings planted out in the open ground either in the spring or autumn, where they will readily strike root. Those requiring heat and protection thrive best in a soil composed of loam and peat, and may also be propagated by cuttings placed in sand under a hand-glass.

TAMA'TIA, Cuvier's name for the *Puff-Birds*.

Mr. Swainson, in addition to his description in the *Zoological Illustrations*, speaking of these birds in his *Classification*, says, that they sit for hours together on a dead or withered branch, from which they dart upon such insects as come sufficiently near, and that the Hermit birds (*Monassa*, Vieill.) have similar habits. [BARBETS, vol. iii., p. 434; KINGFISHERS, vol. xiii., p. 227.]

TAMAULIPAS. [MEXICAN STATES.]

TAMBOW, a province of Great Russia, is situated between 51° 30′ and 55° 20′ N. lat., and between 39° 40′ and 43° 40′ E. long. The area is 24,200 square miles, and the population 1,600,000. It is bounded on the north by Nischnei-Novgorod, and for a very small distance on the north-west by Wladimir; on the south by Woronesh; on the west by Riasan, Tula, and Orel (by the two last for a very small distance); and on the east by Penza.

This government is a uniformly level country, without mountains, large rivers, or considerable lakes: on the north there are great forests and on the south extensive steppes. The soil in the northern half is sandy, marshy, and poor: in the southern part it mostly consists of loam or black mould, and is fertile and productive. The steppes produce excellent pasturage, and when they have been brought under cultivation, make good arable land: they are designated as steppes only because they are destitute of wood. The river Oka enters the government from Riasan, but passes only through one circle, where it is joined by the Mokscha, a considerable stream of which the Zna is a tributary. The Oka runs northwards to join the Volga. Another great Russian river, the Don, passes through a small part of the government. In the forests on the north there are marshes which might easily be drained. The mineral-waters at Lepetzk are celebrated and much frequented. The climate is temperate and healthy, but colder in winter than in Tula and Riasan, which seems to be owing to the slope of the open plains being towards the north.

The northern part of Tambow has a poor soil, but the south is very fertile, and this province ought to be a corn country if a better system of cultivation were introduced. In the south the land does not require to lie fallow, and needs no manure, but acquires from the feeding of cattle sufficient strength to produce fresh crops, which generally yield from five to ten fold. In the north the land is indeed not manured, but after yielding five or six crops must be fallow for some years; and then it produces from three to five fold. All kinds of corn usually grown in Russia are raised, wheat, rye, oats, millet, and buckwheat, peas and other pulse; poppies, great quantities of hemp, but barley, flax, and hemp are cultivated only in some circles. Horticulture is in a very backward state, for though there are many gardens, only the most ordinary vegetables are cultivated; some hops are grown in the gardens, but there is little fruit, and that of the most ordinary kinds. Though the forests are so extensive, it is only in the northern circles that there is sufficient wood for fuel and building. The crown forests supply timber for the navy: in their vicinity the inhabitants are for the most part carpenters, coopers, and cartwrights, or employed in making pitch, tar, lamp-black, and charcoal. The breeding of cattle is carried on to a very great extent in the fine pastures and meadows of the steppes. The steppe from Tambow to Nova Khopertskaja-Krepost is covered with immense herds of oxen and horses. Oxen are used for draught, and great numbers are fattened for exportation. Sheep and swine are bred in great numbers, but the wool of the sheep is coarse: of late years the breed has been improved by the importation of merinos. Domestic poultry suffices for the consumption of the inhabitants. there is little game, and fish is by no means plentiful. Among the wild animals are the marmot and the hamster. Great quantities of bees are kept. The mineral products are lime, freestone, iron, and some saltpetre.

The manufactures of this government are unimportant: the peasantry barely make their own clothing: in some parts they manufacture wooden utensils, and agricultural implements, which they take to the fairs. A great advance has however been made within the last twenty-five years. The brandy-distilleries are numerous. The export trade in the products of the country is very considerable. The principal articles are wheat (1,200,000 chetwerts, or 864,000 English quarters), cattle, honey, tallow (400,000 poods, or about 500 English cwt.), butter, cheese, wool, hemp, iron, brandy, hides, coarse cloth, and wooden wares. Properly speaking there is no great commercial town. Tambow, Selatma, and Morschansk alone have some commerce with foreign countries.

The great majority of the inhabitants are Russians. There are some thousands of converted Tartars and Mordwins, and a few gypsies. These Tartars and Mordwins live in the same manner as the Russians, but retain their own dialect, and live apart from the Russians, and generally intermarry with their own people. The religion of the Mohammedan Tartars requires a different mode of life. Among these various nations the Tartars are the most civilised, have the most knowledge, and the purest morals, and enjoy the most prosperity.

Education is at a low ebb. According to Schnitzler, only 1 out of 325 of the population receives any school instruction. The only printing-office belongs to the government.

The Greek church is under, the bishop of Tambow and Schazk, who has in his diocese 739 parishes and 6 monasteries. The Mohammedan Tartars have their mosques, imams, and teachers.

TAMBOW, the capital of the government, is situated nearly in the centre of the province, on the river Zna, in 52° 44′ N. lat. and 41° 45′ E. long. It is a large town, with 20,000 inhabitants, and was founded in 1636, as a bulwark against the Nogay Tartars. Scarcely any traces of the antient fortifications now remain. There is nothing remarkable in the town, which has however been much improved in its appearance since the beginning of this century. Almost all the houses are built of wood: the principal buildings are the monastery of Our Lady of Casan, in which there are two churches; seven stone and six wooden churches, the gymnasium, and the civil hospital. There is a military school, founded and endowed by the nobility in 1802, a seminary for priests, and a district school. The bishop resides in this city. The inhabitants manufacture shawls, kersey, sailcloth, cordage, and woollen cloth; and there is an Imperial alum and vitriol manufactory. The inhabitants carry on some trade, but their chief occupation is agriculture.

The following are the other chief towns. Jelatma, the most northerly town in the government, situated on the left bank of the Oka, carries on by means of that river a very great trade with Moscow: it has ten churches, eight of which are of stone: the inhabitants, 6000 in number, have some manufactures of woollen cloth, vitriol, and sulphur. Koslow, situated on the Leanoi Woronesh, has above 8000 inhabitants, who follow various trades and professions: near the town is the convent Troitzkoi, where a great annual fair is held. There are eight churches, of which five are of stone: the principal trade of the town is in oxen, salt meat, and hides. Lipetsk, on the Woronesh, near the north extremity of the government of that name, a town with 6500 inhabitants, is celebrated for its mineral-waters, which were first used in the reign of Peter the Great. Morschansk, a town of 6000 inhabitants, situated on the Zna, has manufactures of linen, sail-cloth, cordage, and tallow, and a brisk trade in corn, cattle, and honey. (Hassel, *Geography*; Stein; Hörschelman; Schubert; Schnitzler.)

TAMBURI'NI, PIETRO, born at Brescia, in 1737, studied in his native town, took holy orders, and was made professor of philosophy, and afterwards of theology, in the episcopal seminary of Brescia. After filling those chairs for twelve years, he was invited to Rome, where Clement XIV. (Ganganelli) made him director of the studies of the Irish College, in which situation he remained for six years. In 1778 he was recalled to Lombardy by the empress Maria Theresa, and appointed professor of theology in the university of Pavia, and at the same time director of the studies of the German Hungarian college in that city, and also censor of the press. In 1795 he was made Professor Emeritus, with a pension. In 1797, when the French invaded Lombardy, Tamburini was obliged by the new government to resume active duties at Pavia, as professor of moral philosophy and of 'jus naturæ,' an arduous tax in those times of confusion of ideas and of barefaced licentiousness. Tamburini boldly fulfilled his duties, and effected some good by proclaiming wholesome principles from his chair. Shortly afterwards his chair was suppressed, but he was appointed rector of the lyceum of his native town, Brescia. When Bonaparte assumed the government in France and North Italy, Tamburini was sent again to Pavia as professor of moral philosophy and of 'jus naturæ et gentium,' in which chair he continued for eighteen years, till some years after the Restoration, when the emperor Francis made him again Professor Emeritus and præsul of the faculty of law and politics in the university of Pavia. Tamburini was also a knight of the order of the Iron Crown. He died at Pavia, in March, 1827, at ninety years of age, a few days after the death of his brother professor, Volta. His remains were buried with the greatest honours, being followed to the grave by the whole of the professors and above six hundred students, with marks of sincere respect and deep regret.

The work for which Tamburini is mostly known is 'Idea della Santa Sede,' published anonymously at Pavia, in 1784. An extract from the author's preface will convey some idea of the nature of this work: 'It very often happens that to the most common and hacknied expressions a vague and indeterminate meaning is attributed. A word was originally fixed upon to signify a certain thing. The idea of it was perhaps clear and precise in its origin, but as in the course of time the ideas of men change, the word is still retained, though people attach to it different meanings. Hence obscurity and confusion and interminable disputes arise, and still the sound of the disputed word is kept up, without conveying any distinct idea of what it means. Numberless examples might be quoted of such an occurrence. For instance, in our own times everybody speaks of the Holy See, the Apostolic See, the chair of St. Peter, the Roman church, which are so many expressions signifying the same thing, and which in antient times expressed a simple and clear idea, but which now convey to the minds of people the most vague and indeterminate notions. Things the most disparate are identified; people confound one subject with another, the see with the incumbent, the chair with the court of Rome, the court with the church; and from this medley arises a confusion of ideas through which every decree that proceeds from Rome becomes invested with the most respectable authority of the chair of St. Peter, of the Apostolic See, of the church of Rome—a confusion followed by the most pernicious consequences not only to local churches, but also to the universal church, and to the Apostolic See itself. In order to support certain decretals which emanated from Rome, some shortsighted theologians have attributed to the Roman See new prerogatives unknown to the earlier ages of the church, and they have had recourse to a supposed infallibility. . . . Other men have contested these prerogatives, and in the warmth of the controversy the real claims of the Holy See have been overlooked and forgotten. . . . One party has maintained that, on the plea of infallibility, every decision emanating from Rome ought to be received with blind obedience, whilst the other party has imagined that by overthrowing the privilege of infallibility every authority ascribed to it can be boldly denied. . . . Both these extremes proceed from the want of just and exact notions on the nature, the character, and the properties of the Holy See. The present work is intended to establish these notions. A little French book fell into my hands, entitled 'Dissertation Canonique et Historique sur l'Autorité du Saint Siège, et les Décrets qu'on lui attribue." In the first part the author has well explained the idea of the Holy See and of the Congregations sitting at Rome; and in the second part he has maintained the primacy of that see. I have adopted the most important principles of this little work, compressing or enlarging its various parts, and fitting the whole to the wants of our times and country. I have explained also the essential rights annexed to the primacy of the Roman see, and have given some general rules in order to calculate the value and merit of the Roman decretals, and to make our own conduct practically harmonize with the obedience which we owe to the authority of the see of Rome.'

At the appearance of Tamburini's work it was stigmatized as Jansenistical, although the author has not gone perhaps so far as some of the French Jansenists, or as Bishop Ricci and his synod of Pistoia. [Jansenists; Pius VI.] The reasoning is closely argumentative, and supported by numerous references. Several refutations of it were published at Rome and other towns of Italy. The other works of Tamburini are—1, 'Introduzione allo Studio della Filosofia Morale,' Milan, 1797; 2, 'Lezioni di Filosofia Morale e di Naturale e Sociale Diritto,' 4 vols., Pavia, 1806-12; 3, 'Elementa Juris Naturæ,' Milan, 1815; 4, 'Cenni sulla Perfettibilità dell' Umana Famiglia,' Milan, 1823; in which the author refutes the exaggerated notions of indefinite perfectibility and universal happiness in human societies. The philosophy of Tamburini is of the Eclectic kind.

(Defendente Sacchi, *Varietà Letterarie*, vol. i.; Maffei, *Storia della Letteratura Italiana*, b. vi., ch. 13; *Antologia di Firenze*, Nos. 39, 76.)

TAME, River. [Staffordshire.]

TAMER, River. [Cornwall.]

TAMERLANE. [Timur.]

TA'MIAS. [Squirrels, vol. xxii., pp. 398, 399, &c.]

TAMMEAMA. [Sandwich Islands.]

TAMPI'CO. [Mexican States.]

TAMUL. [Hindustan, p. 228.]

TAMUS, the name of a genus of plants belonging to the natural order Dioscoreaceæ. This genus is diœcious, the stamens growing on one plant, and the pistils on another. The flowers are alike in having a perianth, which is 6-parted, the calyx and corolla being undistinguishable. In the male flowers there are 6 stamens. In the female flowers the remains are seen of 6 abortive stamens; the ovary is trilocular; the style trifid, with 3 stigmas; the fruit a berry. This genus is supposed to be the *Uva Taminia* of Pliny: hence its present name.

Tamus communis, the common Black Briony, has undivided cordate, acuminate leaves, and is a very common plant in hedges and thickets throughout Europe. It is a frequent plant in England. It has a long twining stem, spreading in all directions, and reaching from branch to branch of hedges and thickets: its flowers are greenish-white; the fruit is of a red colour, and hangs in bunches from its trailing branches. The berries are likely to be plucked and eaten by children: they are not however poisonous, although the whole plant contains a bitter acrid principle, which renders it unwholesome. This acrid principle is destroyed by heat; and as the roots of this plant contain a great deal of starch or fecula, a wholesome and nutritious food may be obtained from them by washing and boiling. On the surface of the roots are found blackish tubercles, which contain a larger quantity of acrid principle than the rest of the plant, and these should be removed previous to preparing the roots for eating. The young shoots of this plant taste, when boiled, like asparagus, and are eaten by the Moors with oil and salt.

TAMWORTH, a municipal and parliamentary borough on the border of Staffordshire and Warwickshire: the municipal borough, which includes the greater part of the town, and the parish, which is far more extensive, having an area of 12,920 acres, are divided between the two counties: the parish is partly in the northern and partly in the southern division of Offlow hundred in the county of Stafford, and partly in Hemlingford hundred in Warwickshire. The church is in Staffordshire, on which account the town is commonly described as being in that county. Tamworth is 102 miles in a direct line north-west of the General Post-office, London, or 129 miles by the London and Birmingham Railway to Hampton in Arden, and from thence by the Birmingham and Derby Junction Railway.

The town first comes into notice in the time of the Heptarchy: several of the Mercian kings appear, from the date of charters granted by them, to have had their residence at Tamworth. In the Danish wars a fort was built here in the reign of Edward the Elder (A.D. 913) by his sister Ethelfleda, lady of Mercia, who died at Tamworth, A.D. 920, and Mercia passed under the direct dominion of Edward, who received the submission of the Tamworth men, A.D. 922. Shaw (*Hist. of Staffordshire*) ascribes to

Ethelfleda the mound on which the present ruins of the castle stand, but the ruins themselves are of later date. An old ditch, yet visible, called 'the king's dyke,' which surrounds the town on three sides, is supposed by Shaw to be of yet greater antiquity than the time of Edward. In the Saxon 'Chronicle' the town is called Tamaweorthige, Tameweorthige, Tamanweorthe, or Tamweorthe: in other antient writings the orthography is still further varied. The place is not described in 'Domesday;' but the 'burgenses' (burgesses) of Tamworth, are mentioned in that record, in the notice of other places.

After the Conquest, the castle and adjacent territory were granted to Robert Marmion, hereditary champion to the dukes of Normandy; and afterwards, on the extinction of the male line of his family in the time of Edward I., passed to the family of Frevile. The castle now belongs to Marquis Townshend. Sir Walter Scott has enumerated 'Tamworth tower and town' among the possessions of his fictitious Marmion: but the family had become extinct long before, as observed by Sir Walter in the Appendix to his poem.

The town stands on the north bank of the rivers Tame and Anker, just at their junction, and consists of several streets not very regularly laid out. The streets are paved, but had not been lighted when the Municipal Boundary Commissioners' Report was drawn up (*Parl. Papers for* 1837); the inhabitants were however about to assess themselves for the purpose. 'The church is a large and handsome edifice, with a fine tower, and a crypt under part of the church. Some portions are of decorated date, and some perpendicular, and both good: some of the windows have had very fine tracery. In the tower is a curious double staircase, one from the inside and one from without, each communicating with a different set of floors in the tower.' (Rickman's *Gothic Architecture.*) The remains of the castle are on a mound close to the Tame: they are of various periods, and some modern buildings have been added to adapt the whole to the purposes of a modern residence: the castle commands a fine prospect. There are some Dissenting places of worship; an almshouse, founded by Guy, the founder of Guy's Hospital in Southwark; a town-hall, with a small and inconvenient gaol beneath; and two bridges, one over the Tame, the other over the Anker.

The population of the municipal borough in 1831 was 3537, that of the whole parish (containing several hamlets and townships) 7182. Some manufactures are carried on; but the whole number of men employed in them in the parish was, in 1831, only 38. Some coals and brick-earth are dug in the neighbourhood, and bricks and tiles are made. The market is on Saturday: there are three chartered fairs for cattle and merchandise, and several new fairs for cattle only; some of them held at Fazeley in the parish. The Coventry Canal passes near the town.

Tamworth was a borough by prescription; but the town having declined and ceased to be regarded as a corporation, was incorporated anew by letters patent of Queen Elizabeth: the governing charter is one of Charles II. By the Municipal Reform Act the borough has four aldermen and twelve councillors, but is not to have a commission of the peace except on petition and grant. The criminal jurisdiction of the corporation had fallen into disuse before the passing of that act, as well as the court of record: quarter-sessions were held, but for civil purposes only.

Tamworth first sent members to parliament in the reign of Elizabeth: it still returns two members. The number of voters on the register in 1835-6 was 531: in 1839-40, 501.

The living of Tamworth is a perpetual curacy, of the clear yearly value of 170*l.*, with a glebe-house. There are in the parish the perpetual curacies of Fazeley, Wigginton, and Wilnecote, of the clear yearly value of 235*l.* (with a glebe-house), 92*l.* and 90*l.* respectively: the curate of Tamworth presents to Wigginton and Wilnecote. There are also in the parish two chapelries, Amington and Hopwas.

There were in the borough, in 1833, three endowed and three unendowed day-schools, with 183 children, namely 142 boys, 21 girls, and 20 children of sex not stated; and three Sunday-schools, with 203 children, viz. 97 boys and 106 girls. In the rest of the parish were one infant-school, partly supported by subscription, with 88 children, namely 41 boys and 47 girls; ten day-schools of all kinds, with 96 boys, 80 girls, and 80 children of sex not stated, making 256 children in all; and three Sunday-schools, with 288 children, namely 150 boys and 138 girls. (Shaw's *Staffordshire; Parliamentary Papers.*)

TANA-ELF. [TRONDHEIM.]

TANACETUM, a genus of plants belonging to the natural order Compositæ, and the suborder Corymbiferæ or Asteraceæ. The involucre is imbricated and hemispherical. The receptacle is naked; the flowers of the ray are 3-toothed, those of the disk 5-toothed, tubular, and hermaphrodite. The fruit, an achenium, is crowned with a membranous margin, or pappus. The flowers are yellow.

The most common species is the *Tanacetum vulgare*, common *Tansy*. It has bipinnatifid leaves, with serrated sections or laciniæ. This plant is abundant in Great Britain and throughout Europe, on the borders of fields and road-sides. It possesses in a high degree the bitterness of the whole order Compositæ, which, in the section Corymbiferæ, is combined with a resinous principle. It is recommended and has been extensively used in medicine as an emmenagogue and anthelmintic. Although the flavour and smell of this plant are both at first disagreeable, a taste for it may be acquired, and it has been used in cookery for the purpose of flavouring puddings and sauces. The young shoots yield a green colouring-matter, and are used by the Finlanders for the purpose of dyeing their cloths of that colour. It is said that if meat be rubbed with the fresh leaves, it will not be attacked by the flesh-fly.

TA'NAGERS. The genus *Tanagra* of Linnæus stands, in the 12th edition of the *Systema Naturæ*, between *Emberiza* and *Fringilla*, in the order *Passeres*.

Cuvier characterises the genus as having a conical bill, triangular at its base, slightly arched at its *arête*, and notched towards the end: wings and flight short. He observes that they resemble our sparrows in their habits, and seek for seeds as well as berries and insects. The greater part, he remarks, force themselves upon the attention of the spectator of an ornithological collection by their vivid colours. He places the genus between the Drongos (*Edolius*, Cuv.) and the Thrushes (*Turdus*, Linn.), thus subdividing it:—

1. The Euphonous or Bullfinch Tanagers (*Euphones, ou Tangaras Bouvreuils*).

These have a short bill, presenting, when it is seen vertically, an enlargement on each side of its base: tail short in proportion.

Examples, *Tanagræ violacea*, *Cayennensis*, &c.

2. The Grosbeak Tanagers.

Bill conic, stout, convex, as wide as it is high; the back of the upper mandible rounded.

Examples, *Tanagræ magna*, *atra*, &c.

3. Tanagers, properly so called.

Bill conic, shorter than the head, as wide as it is high, the upper mandible arched and rather pointed.

Examples, *Tanagræ Talao*, *tricolor*, &c.

4. Oriole Tanagers (*Tangaras Loriots*).

Bill conic, arched, pointed, notched at the end.

Examples, *Tanagræ gularis*, *pileata*, &c.

5. Cardinal Tanagers.

Bill conic, a little convex, with an obtuse projecting tooth on the side.

Examples, *Tanagræ cristata*, *brunnea*, &c.

6. Ramphocele Tanagers.

Bill conic, with the branches of the lower mandible convex, backwards.

Examples, *Tanagræ Jacapa*, *Brasilia*, &c.

The views of Mr. Vigors on the subject of this group will be found in the article FRINGILLIDÆ.

Mr. Swainson remarks that the *Tanagrinæ*, or *Tanagers*, form that group which is probably the most numerous, as it certainly is the most diversified of all those in the comprehensive family of the *Fringillidæ*. As the dentirostral division of that family, it is, he observes, typically distinguished from all the others by the bill having a distinct and well-defined notch at the end of the upper mandible, the ridge or culmen of which is much more curved than the gonys; or, in other words, the culmen is more curved downwards than the gonys is upwards: this inequality, he further states, as in the genus *Ploceus*, very much takes off from that regular conic form of bill so highly characteristic of the greater number of the finches; so that the combination of these two characters is, he thinks, perhaps the best distinction of the whole group. Another peculiarity, he adds, of these birds consists in their geographic range; for the whole, as far as has hitherto been ascertained, are natives of the warmer parts of America, being most abundant in those regions nearest to the equinoctial line. 'They are,' says Mr. Swainson in continuation, 'in general small birds, the largest being intermediate between a sparrow and a thrush, while the majority do not exceed the size of a linnet; some few are even smaller. It is quite evident, from the great strength of bill possessed by some, and the notch which is conspicuous in all, that these birds feed upon seeds and creeping insects picked from the branches of trees, for very few of them are ever seen upon the ground. Their colours in general are bright; and, in a large number, particularly rich and beautiful. The little birds forming the genus *Aglaia*, in fact, are ornamented with the most vivid hues or glossed with rich reflections of gold, rendering them inferior only to the Humming Birds. Some possess considerable vocal powers; and the notes of the subgenus *Euphonia*, as its name implies, are said to be particularly musical. The impossibility however of providing the Tanagers with their native sweet food has prevented them from ever being brought alive to the European menageries, to which their beauty would render them the greatest ornaments.'

Mr. Swainson then dwells on the obscurity which attends the examination of this group, which he states to be one of the most difficult to be understood in the whole circle of ornithology. He points out, for instance, that the comparative strength of the bill is so variable in the same subgenus, that such variation, indicative of genera in other families, is in this no more than a discrimination of sections or species. Nothing, according to him, can illustrate this fact more than the affinity between *Pitylus* and *Tardivola*. Looking to the types of each, he observes, we should say that they did not belong even to the same subfamily; for the bill of the first is nearly as large as in the hawfinches (*Coccothraustes*, **Hawfinch**), while that of *Tardivola* is so comparatively slender that it seems more akin to the **Larks** than to the Tanagers; and yet, he remarks in continuation, between these two extremes or types, he had, when he wrote, before him such a perfect series of graduated forms, wherein not only the bill, but all the other subordinate characters of the two groups, progress in such a perpetual and almost imperceptible manner, that he was actually at a loss to know where *Tardivola* ends and *Pitylus* begins. The foregoing affinity being admitted, and it should be remembered that some of the best ornithological writers have placed it as a genus in a totally different family, Mr. Swainson next proceeds to inquire into the cause of so remarkable a variation in the bill of such closely-united species. He first states that nearly the whole of the seed-eating birds of Tropical America are composed of the Tanagers, which, in those regions, supply the place of the other finches so abundant in all parts of Europe. The innumerable small and hard fruits produced in the American forests are, he observes, the appointed food of the Tanagers, the parrots living principally upon the larger nuts, and the bill of the former birds is constructed accordingly. After noticing the disparity of the bills in the finches, taking the common linnet and the hawfinch for example, he remarks how little reliance can be placed on such diversity in determining genera: but this, he observes, will not explain the great difference which often exists in the size and plumage of species which all writers agree in arranging within the limits of the same subgenus; and he takes the restricted genus *Pitylus*, Cuv., as an example. Some of the species of that genus are green, some black, others grey; and in size they vary from the dimensions of a sparrow to those of a small thrush.

The doubts which, in Mr. Swainson's opinion, hang over the correctness of the views which he entertained with respect to the natural affinities of these birds, may, he says, be said to hinge almost entirely upon his not having been able to examine specimens of *Fringilla Zena*, which has certain peculiarities which lead him to expect that it forms the type of one of the principal divisions among the Tanagers, or that it connects his genus *Aglaia* with *Pipillo*. On the first supposition, *F. Zena* would, according to Mr. Swainson, constitute the passage from the true sparrows (*Pyrgita*) to the subgenus *Tanagra* proper; while by the second, *Pipillo* would stand intermediate between *Aglaia* and *Tanagra*, and thus constitute the rasorial genus of the whole subfamily; and this latter arrangement appears to him to be the natural one. He considers that the two typical groups or genera are *Tanagra* and *Phænisoma*; while those which he thinks aberrant are *Nemosia*, *Aglaia*, and *Pipillo*. It was only between the two last of these that he had not as yet discovered any affinity sufficiently strong to justify the belief that these five genera form a circle more or less complete; the difficulty being how to connect *Aglaia* with *Pipillo*. He then takes a review of the genera, for which we must refer our readers to the work itself; and, in the *Synopsis* at the end of the volume, makes the *Tanagrinæ*, which he places between the *Coccothraustinæ* and the *Fringillinæ*, consist of the following genera and subgenera, all of which he characterizes:—

Tanagrinæ.

Subfamily Character.—Bill equally conic; the upper mandible more or less arched, and very distinctly notched. Feet formed for perching. Claws broad and fully curved.

Genera.

Tardivola, *Tanagra* (with the subgenera *Pitylus*, *Tanagra*, and *Ramphopis*). *Phænisoma* (with the subgenera *Phænisoma*, *Tachyphonus*, and *Leucopygia*). *Nemosia*. *Aglaia* (with the subgenera *Euphonia* and *Tanagrella*). And *Pipillo* (with the subgenus *Arremon*). (*Classification of Birds*.)

The Prince of Canino (*Birds of Europe and North America*) places the *Tanagrinæ* between the *Fringillinæ* and the *Emberizinæ*. *Pyranga* is the only genus recorded as belonging to the *Tanagrinæ*.

Mr. G. R. Gray makes the *Tanagrinæ* the third subfamily of the *Fringillidæ*, arranging it between the *Coccothraustinæ* and *Fringillinæ*. The following genera are enumerated by Mr. Gray as belonging to the third subfamily:—

Emberizoïdes, Temm.; *Pipilo*, Vieill.; *Embernagra*, Less.; *Arremon*, Vieill.; *Cissopis*, Vieill.; *Pitylus*, Cuv., *Tanagra*, Linn.; *Saltator*, Vieill.; *Spindalis*, Jard. and Selby; *Ramphopsis*, Vieill.; *Lamprotes*, Sw.; *Pyranga*, Vieill.; *Lanio*, Vieill.; *Tachyphonus*, Vieill.; *Nemosia*, Vieill.; *Tanagrella*, Sw.; *Euphonia*, Desm.; *Calaspiza*, G. R. Gray; *Stephanophorus*, Strickl.; *Cypsnagra*, Less.

Mr. Gray, with his usual industry, gives the numerous synonyms of each genus. (*List of the Genera of Birds*, 2nd edition, 1841.)

We select Nuttall's description of the *Scarlet Tanager, or Black-winged Summer Red-Bird*, *Tanagra rubra*, Linn. (subgenus *Pyranga*).

The male is scarlet-red, with the wings and notched tail black: the base of the plumage is ash, then white. The female, young, and male in autumn, are dull green, inclining to yellow in the latter; yellow beneath; wings and tail dusky. Length about six inches and a half; alar extent ten inches and a half.

'This splendid and transient resident,' says Nuttall, 'accompanying fine weather in all his wanderings, arrives from his winter station in tropical America from the beginning to the middle of May, and extends his migrations probably to Nova Scotia as well as Canada. With the shy, unsocial, and suspicious habits of his gaudy fraternity, he takes up his abode in the deepest recesses of the forest, where, timidly flitting from observation, he darts from tree to tree like a flashing meteor. A gaudy sylph, conscious of his brilliance, and the exposure to which it subjects him, he seems to avoid remark, and is only solicitous to be known to his humble mate, and hid from all beside. He therefore rarely approaches the habitations of men, unless perhaps the skirts of the orchard, where he sometimes however builds his nest, and takes a taste of the early and inviting, though forbidden cherries.'

'Among the thick foliage of the tree in which he seeks support and shelter, from the lofty branches, at times, we hear his almost monotonous *tship-witee, tship-ĭdee*, or *tshŭkadee, tshŭkadee*, repeated at short intervals, and in a pensive under-tone, heightened by the solitude in which he delights to dwell. The same note is also uttered by the female when the retreat of herself and young is approached; and the male occasionally utters, in recognition to his mate, as they perambulate the branches, a low whispering *'tait*, in a tone of caution and tenderness. But besides these calls on the female, he has also, during the period of his incubation, and for a considerable time after, a more musical strain, resembling somewhat, in the mellowness of its tones, the song of the fifing Baltimore. The syllables to which I have hearkened appear like *'tshoove 'wait 'wait, 'vehŏwit wait*, and *'wait, 'vehŏwit vea wait*, with other additions of harmony, for which no words are adequate. This pleasing and highly musical meandering ditty is delivered for hours, in a contemplative mood, in the same tree with his busy consort. If surprised, they flit together, but soon return to their favourite station in the spreading boughs of the shady oak or hickory. This song has some resemblance to that of the Red-eyed Vireo in its compass and strain, though much superior, the *'wait 'wait* being whistled very sweetly in several tones, and with emphasis; so that, upon the whole, our *Pyranga* may be considered as duly entitled to various excellencies, being harmless to the farmer, brilliant in plumage, and harmonious in voice.'

Nest, Food, &c.—The same author describes the nest (which is built about the middle of May, on the horizontal branch of some shady forest-tree, commonly an oak, but sometimes in an orchard tree) as but slightly put together, and usually framed of broken rigid stalks of dry weeds or slender fir-twigs, loosely interlaced together, and partly tied with narrow strips of Indian hemp (*Apocynum*), some slender grass-leaves, and pea-vine runners (*Amphicarpa*), or other frail materials; the interior being sometimes lined with the slender, wiry, brown stalks of the Canadian cistus (*Helianthemum*), or with slender pine-leaves; the whole so thinly platted as to admit the light through the interstices. The three or four eggs are dull blue, spotted with two or three shades of brown or purple, most numerous towards the larger end. As soon as their single brood, which is fledged early in July, is reared, they leave for the south, generally about the middle or end of August.

'The female,' says this interesting author in continuation, 'shows great solicitude for the safety of her only brood; and, on an approach to the nest, appears to be in great distress and apprehension. When they are released from her more immediate protection, the male, at first cautious and distant, now attends and feeds them with activity, being altogether indifferent to that concealment which his gaudy dress seems to require from his natural enemies. So attached to his now interesting brood is the Scarlet Tanager, that he has been known, at all hazards, to follow for half a mile one of his young, submitting to feed it attentively through the bars of a cage, and, with a devotion which despair could not damp, roost by it in the branches of the same tree with its prison.'

The food of this species consists mostly of winged insects, such as wasps, hornets, and wild bees, the smaller kind of beetles, and other *Coleoptera*. Seeds are supposed to be sometimes resorted to, and they are very fond of whortle and other berries.

It is in August that the moult of the male, when 'he exchanges his nuptial scarlet for the greenish-yellow livery of the female,' commences. (*Manual of the Ornithology of the United States and of Canada.*)

TANAGRI'NÆ. [Tanagers.]

TA'NAIS. [Don.]

TANARO. [Po.]

TANCRED, of Hauteville in Normandy, was a feudal baron who lived in the latter part of the tenth and beginning of the eleventh century. After doing military service for some years under Richard the Good, duke of Normandy, he retired to his hereditary mansion, where he lived poor, and reared up a numerous family of twelve sons and three daughters. All his sons were remarkable for their comeliness, their great strength, and their courage. The eldest, Serlon, followed William the Bastard in his conquest of England, and the others went successively to seek their fortune in Apulia, where Rainulf, another Norman adventurer, had already obtained the countship of Aversa from Sergius, duke of Naples. William, one of Tancred's sons, called 'Fier à bras,' or strong of arm, became count of Apulia, and after his death, his brother Robert, called Wiskard, or 'the wise,' became duke of Apulia and Calabria, and the founder of the Norman dynasty of Sicily. [Sicilies, Two, *History of.*] Their father Tancred died at a very great age at Hauteville. Traces of the château of Tancred, according to old popular tradition, were still seen a few years since in a pretty valley near Hauteville, four miles north of the town of Marigny, in the arrondissement of Coutances department of La Manche. (Gaultier d'Arc, *Histoire des Conquêtes des Normands en Italie, en Sicile, et en Grèce.*)

TANCRED, son of Eudes, a Norman baron, and of Emma, sister of Robert Wiskard, duke of Apulia, according to some (Gaultier d'Arc, *Histoire des Conquêtes des Normands en Italie, en Sicile, &c.*), and nephew of Bohemund, son of Wiskard, and prince of Tarentum according to others (Giannone and the authorities he quotes), was serving with Bohemund under Roger, duke of Apulia, son and successor of Wiskard, at the siege of Amalfi, A.D. 1096, when the report of the great crusade which was preparing for the East determined Bohemund, who was not on good terms with Duke Roger, to join the Crusaders. Tancred followed him with a vast number of men from Apulia and Calabria. The exploits, true or fabulous, of Tancred, in Syria and Palestine, have been immortalized by Tasso in his poem of 'La Gerusalemme.'

TANCRED, king of Sicily. [Sicilies, Two, *History of.*]

TANGENT. In the article Contact we have given the first notion on this subject, which we now resume in a somewhat more general manner, annexing the usual details of formulæ, but without proof.

It is usual to apply the word tangent to the tangent *straight line* only, on which see Direction: generalizing the definition, it will be as follows:—Of all curves of a given species, or contained under one equation, that one (B) is the tangent to a given curve (A) at a given point, which passes through that given point, and is nearest to the curve (A): meaning that no curve of the given species can pass through the given point, so as to pass between (B) and (A), immediately after leaving the point at which the two latter intersect.

To ascertain the degree of contact of two curves which meet in a point, proceed as follows. Let $y=\phi x$ and $y=\psi x$ be the equations of the curves, and a the abscissa at the point of contact; so that $\phi a=\psi a$. At the point whose abscissa is $a+h$, the difference of the ordinates of the curves is, by Taylor's theorem,

$$(\phi'a-\psi'a)\ h+(\phi''a-\psi''a)\frac{h^2}{2}+(\phi'''a-\psi'''a)\frac{h^3}{2.3}+\ldots.$$

as to which, generally speaking, it will be found that h can be taken so small that the series shall be convergent: if this be not so, the method of arresting the series given in Taylor's Theorem must be employed. Now of two series of the form $Ah^m+Bh^{m+1}+\ldots.$ the value of that in which m is the greater will diminish without limit as compared with the other, when h diminishes without limit. Consequently, every curve $y=\psi x$, which has $\psi'a=\phi'a$, will approach, before the point of contact is attained, nearer to $y=\phi x$ than any other in which $\psi'a$ is not $=\phi'a$. Again, when $\phi'a=\psi'a$, those cases of $y=\psi x$ in which $\psi''a=\phi''a$, will approach nearer to $y=\phi x$ than any in which $\phi''a$ is not $=\psi''a$; and so on. Hence, to make $y=\psi x$ have the closest possible contact with $y=\phi x$ when $x=a$;—give such values to the constants in $y=\psi x$ as will satisfy as many as possible of the equations $\phi a=\psi a$, $\phi'a=\psi'a$, $\phi''a=\psi''a$, &c. consecutively from the beginning. This is a brief sketch, which can be filled up from any elementary work; and the following are the principal results:—

1. When the string of equations is satisfied up to $\phi^{(n)}a=\psi^{(n)}a$, the contact is said to be of the nth order.

2. In contact of the nth order, the deflection $\phi(a+h)-\psi(a+h)$ diminishes with h^{n+1}, and vanishes in a finite ratio to it.

3. In contact of an even order, the curves intersect at the point of contact; in contact of an odd order, they do not intersect at that point.

4. When curves have a contact of the nth order, no curve, having with either a contact of an order inferior to the nth at the same point, can pass between the two.

5. A straight line, generally speaking, can have only a contact of the first order with a curve; and the equation to the tangent straight line of the curve $y=\phi x$, when $x=a$, is $y-\phi a=\phi'a(x-a)$. But if it should happen that $\phi''a=0$, $\phi'''a=0$, &c., up to $\phi^{(n)}a=0$, then for that point the tangent has a contact of the nth order. Thus, at a point of contrary flexure the tangent has a contact of the second order, at least, with the curve.

6. A circle, generally speaking, can be made to have a contact of the second order with a curve, and the equation

of the most tangent circle, or circle of Curvature, to the curve $y=\phi x$, at the point $x=a$, is

$$\left(x-a+\frac{\phi'a(1+\overline{\phi'a}^2)}{\phi''a}\right)^2+\left(y-\phi a-\frac{1+\overline{\phi'a}^2}{\phi''a}\right)=\frac{\left(1+\overline{\phi'a}^2\right)^3}{\overline{\phi''a}^2}$$

This circle cuts the curve, generally speaking: if not, as for example, at the vertices of an ellipse, it is evidence that the circle has a contact of some higher and odd order. The centre of the circle of curvature is a point on the normal, being that at which the normal touches the evolute. [Involute and Evolute.]

Not only is the term tangent most generally applied to the closest straight line only, but frequently only to that portion of the straight line which falls between the point of contact and the axis of x. Again, the normal is a straight line perpendicular to the tangent, drawn through the point of contact: but this term also is frequently applied only to that portion which falls between the point of contact and the axis of x. It is with reference to this limitation that the terms subtangent and subnormal are to be understood: the first meaning the distance from the foot of the tangent to the foot of the ordinate; the second that from the foot of the ordinate to that of the normal. The formula for the subtangent is $\phi a \div \phi' a$; that for the subnormal $\phi a \times \phi' a$.

Let β be the angle made by the tangent with the axis of x; usually the angle made by that part of the tangent which has positive ordinates with the positive side of the axis of x. Then β, at the point whose abscissa is x, is determined by the equation

$$\tan\beta=\frac{dy}{dx};\text{ and subtangent}=y\frac{dx}{dy},\text{ subnormal}=y\frac{dy}{dx}.$$

If we take the more general mode of measurement proposed in Sign, this equation remains equally true. Now, keeping strictly to that mode, let β be the angle made by the tangent with the axis of x, θ the angle made by the radius vector r with the axis of x, and μ that made by the tangent with the radius vector. It will be found, then, that in all cases

$$\mu=\beta-\theta \quad , \quad \tan\mu=r\frac{d\theta}{dr}.$$

Unless the mode of attributing signs be carefully attended to, these last equations, though always considered as universally true, are not so in reality.

We now come to the consideration of a surface. The mode of defining contact of a given order resembles that adopted with reference to a curve. Thus if $z=\phi(x,y)$ and $z=\psi(x,y)$ be the equations of two surfaces coinciding when $x=a$, $y=b$, so that $\phi(a,b)=\psi(a,b)$, then if the point be taken at which $x=a+h$, $y=b+k$, the contact of the two surfaces is of the nth order, when the deflection

$$\phi(a+h,\ b+k)-\psi(a+h,\ b+k)$$

being developed in powers of h and k by Taylor's Theorem, shows no terms lower than those of the form $Ah^n+Bh^{n-1}k+\ldots+Mk^n$. This is tantamount to the following: two surfaces have a contact of the nth order when any plane whatever drawn through the point of contact cuts the surfaces in two curves which have a contact of the nth or a higher order.

Every surface has at every point a plane which has a complete contact of the first order. If $z=\phi(x,y)$, and x, y, z be the co-ordinates of the point of contact, and ξ, η, ζ those of any point in the tangent plane, then the equation of the tangent plane is

$$\zeta-z=\frac{dz}{dx}(\xi-x)+\frac{dz}{dy}(\eta-y).$$

But if the equation be given in the form $\phi(x,y,z)=0$, it is

$$\frac{d\phi}{dx}(\xi-x)+\frac{d\phi}{dy}(\eta-y)+\frac{d\phi}{dz}(\zeta-z)=0.$$

In the first case, the equations of the normal, a line drawn through the point of contact perpendicular to the tangent, are

$$\xi-x+\frac{dz}{dx}(\zeta-z)=0,\quad \eta-y+\frac{dz}{dy}(\zeta-z)=0.$$

In the latter case, they are

$$\frac{\xi-x}{\frac{d\phi}{dx}}=\frac{\eta-y}{\frac{d\phi}{dy}}=\frac{\zeta-z}{\frac{d\phi}{dz}}.$$

The tangent plane may 1. not cut the surface at all, as in a sphere: 2. coincide with the surface throughout a whole line, as in the cone or cylinder: 3. cut the surface, as in the case of an hyperboloid made by revolution of an hyperbola about the minor axis (the figure of a common dice-box). The criterion of distinction between these cases depends on the value of

$$\frac{d^2z}{dx^2}\cdot\frac{d^2z}{dy^2}-\left(\frac{d^2z}{dxdy}\right)^2,\text{ say U,}$$

at the point of contact. Imagine a plane to pass through the normal, cutting the surface in the curve (C) and the tangent plane in the straight line (L). Then, while the plane revolves about the normal, (L) is always tangent to (C).

1. Let U be positive. Then (L) has never more than a contact of the first order with (C), the surface nowhere passes through the tangent plane, and we have only such contact as is seen at any point of a sphere or ellipsoid.

2. Let U=0. Then (L) has never more than a contact of the first order with (C), except when the plane is in one position, in which there is a contact of a higher order. If U=0 at the point of contact only, and begin to take value at all adjacent points, nothing more would appear than in the last case, except that in one particular direction from the point of contact, and in its opposite, the surface would seem to grow nearer to the tangent plane than in any others. But if U=0 at all points of this surface, this approach to the tangent plane in one particular direction becomes more marked, for the surface lies on that plane in a straight line, that is to say, every tangent plane meets the surface in a straight line infinitely extended both ways; and the plane is tangent to the surface at every point of that straight line. Such surfaces, namely those in which U is always =0, are developable, or can be unrolled without any overlapping, rumpling, or tearing. Cones and cylinders are instances. Again, if U=0, not throughout the whole surface, but throughout one particular line upon it, that line will be a plane curve, and its plane will be tangent to the surface at every point in which it meets the surface.

3. Let U be negative. Then (L) has never more than a contact of the first order with (C), except in two different positions, in both of which there is contact of a higher order. Draw lines marking out these two positions of (L), and consequently dividing the tangent plane into four parts, with four angles round the point of contact. In one pair of the opposite angles, the surface lies on one side of the tangent plane, and in the other on the other.

Again, as the plane which revolves round the normal takes its different positions, the curvature of the section (C) changes. The two positions of the revolving plane in which the curvatures are greatest and least (algebraically) are at right angles to one another. We shall not enter into the mathematical formulæ connected with this subject, but shall only endeavour to give a popular illustration of this remarkable point.

Suppose an eggshell, unbroken, to be placed with either vertex uppermost. The descent will be equally rapid in all directions, or the curvature at the highest point of all the vertical sections will be the same. But suppose the shell to be so placed that some point intermediate between the two vertices is uppermost. The descent will not then be equally rapid in all directions, or the curvatures of the vertical sections will not be the same. The direction of most rapid descent will be at right angles to that of least rapid descent. The tangent plane has here a contact of the first of the three kinds above mentioned. If there be a contact of the second kind, all the circumstances are the same, except that the direction of least rapid descent gives, comparatively speaking, no descent at all at the first instant. If we take a cylinder, or other developable surface, and make a tangent plane horizontal, there is absolutely no descent in one direction, or, by going along the tangent plane, we can remain entirely on the surface, in one certain direction, as before observed. And the direction of most rapid descent is at right angles to this direction of no descent.

To put a case of the third kind, suppose a saddle placed on a horse, and we take the lowest point of the seat. The tangent plane then cuts through the saddle horizontally. In some directions there is descent, in others ascent, with two directions in which there is, comparatively speaking, neither ascent nor descent. The direction of most rapid ascent, which is from the lowest point of the seat directly towards the head or tail of the animal, is at right angles to the direction of most rapid descent. Mathematically speaking, the curvatures of the vertical sections are sometimes positive, and sometimes negative, and the direction of the greatest negative (or algebraically least) curvature is at right angles to the direction of the greatest positive (or algebraically greatest) curvature.

As to points connected with the apparent physical character of the tangent, which have been in various places referred to this article, it will be more convenient to consider them under the word Velocity.

TANGHI'NIA, the name of a genus of plants belonging to the natural order Apocynaceæ. This name was given by Aubert du Petit Thouars to the plant which produces the celebrated Tanghin poison of Madagascar. The genus possesses an infundibuliform corolla, with a clavate tube, and 5-toothed throat: the anthers are subsessile; the fruit is a drupe, with a fibrous ligneous putamen or stone, which contains one or two seeds. The specific name T. venenifera was given to the plant which yields the poison. It has dense leaves, with erect branches, and paniculated terminal flowers. At the time Du Petit Thouars described this plant, he stated that it was closely allied to the Cerbera Manghas; and since its cultivation by Mr. Telfair in the Mauritius, there can be no doubt of its belonging to the genus Cerbera, and the plant is now called C. Tanghin. In its native island this plant attains the size of a tree, and has a hard wood which may be used for many kinds of carpentry. But the part which yields the poison is the kernel of the fruit. Although this kernel is small, not much larger than an almond, Mr. Telfair says that it contains enough poison to kill twenty persons. Its great use in Madagascar was as a means of trial, the innocent being supposed able to resist its action, whilst the guilty suffered under its influence. Radama, the late king of Madagascar, was desirous of abolishing its use, but found great difficulty in doing so on account of the prejudices of the natives. Mr. Telfair witnessed a sad instance of its use. The king Radama was taken ill, and got well by the use of mercury; but this medicine affected his mouth, so that the impression produced upon his 'skid,' or physician, was that the king had been poisoned. He therefore insisted that the Tanghin should be administered to himself and all the servants of the household, in order to ascertain the guilty party. The king protested against the procedure, but in vain. The whole household were shut up during the night without food, and in the morning were brought out for trial. The presiding 'skid,' or physician, then pounded the Tanghin bean to a pulp between two stones, and applied a small quantity to the back of the tongue of each individual. The effects varied in different individuals. In some it produced vomiting, and the poison being ejected from the stomach, they recovered. In others convulsions were brought on with violent efforts at vomiting, which soon destroyed life. (*Botanical Magazine*, fol. 2968.)

TANGIER. [Marocco.]

TANGLE. [Sea-Weeds.]

TANGUT is the historical name of a country in Asia, which occupies the centre of the eastern, more extensive, and more elevated table-land of that continent [Asia, vol. ii., p. 464], where a nation, which originally inhabited Tibet, and was called Tang, founded an empire in the seventh century, which was very powerful for a long time, and was overthrown by Genghis Khan in 1227. The country still goes by the name of Tangut, though at present a part of it is incorporated in the Chinese province of Kansi, whilst another is mostly in possession of two Mongol nations, the Olöth Tshoros and the Torbod Mongols.

Tangut borders on China Proper on the north-west, extending between 33° and 42° N. lat., and between 94° and 107° E. long. To the south of it is Tibet; to the west Chinese Turkistan, or the government of Thian-Shan Nanlu; and to the north Mongolia, of which also a portion is included within the lately erected province of Kansi. As the boundary-lines of the country are not politically determined, it is not possible to give an estimate of the area.

The southern portion of Tangut, or that which lies south of 38° N. lat., is one of the most mountainous tracts on the globe, and extends over the upper course of the river Hoang-ho and the basin of the lake of Khookhoo-nor. Along its southern border there is a very elevated range, which divides the upper courses of the rivers Hoang-ho and Yan-tse-kiang, and is called the Bayan Khara range. [Bayan Khara Mountains.] Another elevated range traverses the country in the same direction from east to west near 38° N. lat. This range rises at a short distance from the banks of the Hoang-ho north of the town of Lan-tcheou, and in its eastern part is called Kilian Shan; but farther west it takes the name of Nan Shan (or Southern Chain). It rises to a great elevation, especially towards the west, where many of their summits are covered with snow and united by extensive glaciers. This mountain-chain is supposed to be connected with the Kuenluen range near 92° E. long. These two ranges above mentioned occupy a great portion of the country between 33° and 38° N. lat., and nearly the whole of the remainder of the country is filled up by a third range, which connects these two ranges, and extends from south-east to north-west, being on the north united to the Nan Shan, and on the south to the Bayan Khara Mountians. This chain bears the name of Siue Shan, or Snowy range, on account of the numerous summits which rise above the snow-line. The river Hoang-ho breaks through this range, but the huge rocky masses compel the river to make a great bend towards the west between 34° and 36° N. lat., and the circuit which the river makes shows the immense extent of these masses of rock. In this part of its course the river is said to be hemmed in by lofty mountains, so that no communication can be established along the banks. Its course above this bend is very imperfectly known, and the fabulous accounts of its sources show that they have never been visited even by Chinese geographers. The river enters a wide valley by a narrow gorge formed by two very elevated mountains a little above the town of Ho-cheou (36° N. lat. and 102° E. long.). At the opening of this gorge is a fortress, called Tsy-shy-kuan.

Tangut is separated from China Proper by a fourth range, the mountains of Sifan, which run south and north, being connected at their southern extremity with the Bayan Khara Mountains and the Siue Shan by an extensive mountain-knot, which is in the country formerly called Sifan, whence the chain has obtained its name. Though this range is less elevated than the Siue Shan, it rises in several places above the snow-line, and occupies a considerable width. It is supposed to terminate near the banks of the Hoang-ho, a few miles south of 38° N. lat. Opposite to it and on the northern banks of the river rises another chain, which may be considered as the continuation of the mountains of Sifan; but this range, which continues along the western bank of the river as far north as 42° N. lat., rises only to a moderate elevation, and is stated to occupy in many places only three or four miles in width: it is called Holang Shan, and slopes on the west down into the steppe of the Olöth Tshoros. This range is distinguished from all the other ranges of Tangut by being thickly wooded on its eastern declivity.

Only a small portion of the countries enclosed by these mountain masses is fit for cultivation. It does not appear that there is any cultivation in the upper valley of the Hoang-ho above the fortress of Tsy-shy-kuan. Below that place and as far as Lan-tcheou, the valley is wider, and narrow tracts along the banks of the river are cultivated and fertile. This part of the valley is compared with that of the Adige in Tyrol. Farther down, and as far as the neighbourhood of Ning-hia, a town built on the western banks of the Hoang-ho, at the eastern declivity of the Holang Shan (38° 32′ N. lat.), the valley has not been visited by Europeans. At this place the river runs in a wide valley, which has been rendered fertile by numerous canals, which are fed by the waters of the river, and in which rice is extensively cultivated. There are also numerous plantations of fruit-trees. The soil contains much saltpetre. The town of Ning-hia, the antient capital of Tangut, is of considerable extent, being fifteen li (equal to five miles) in circuit. It has some very good manufactures of carpets and paper, and a considerable commerce with the nomadic tribes who wander about in the country west of the Holang Shan. Below the town of Ning-hia the valley of the Hoang-ho grows wider, as the range of the Holang-shan retires farther west, but its fertility decreases. About eighteen miles from Ning-hia the canals cease and no rice is cultivated. Other grain is still grown about 30 miles farther north, where the country gradually changes into a sandy, arid desert, interspersed with hills, swampy tracts, and pastures.

The lateral valley of Si-ning-tcheou opens to the Hoang-ho from the west above the town of Lan-tcheou between the Kilian Shan and the most elevated portion of the Siue Shan. The valley is not extensive, but appears to be fertile: it contains the town of Si-ning-tcheou, which is not quite as large as Ning-hia, but a much more commercial place, as the road which connects northern China with Hlassa in Tibet passes through it. This road leads from Si-ning-tcheou westward over a chain to the lake of Khookhoo-nor, which is of great but unknown extent. It is an alpine lake enclosed by high mountains, and has no outlet. The remainder of the road lies partly over numerous large mountain-masses, furrowed only by narrow glens and ravines, and partly over rocky and sandy table-lands, and the whole is described as a desert, in which only a small number of nomadic mountaineers are met with, and where the traveller for forty days' journey finds no other accommodation than the tents of the poor mountaineers. In spite of the difficulties, the road, as it appears, is much travelled, and the bazars of Si-ning-tcheou are well provided with provisions and articles of luxury. Even coffee and dates may be got there. This town is also the depôt of the Turkish rhubarb, which grows, as it appears, only on the more elevated parts of the Siue Shan and Kilian Shan, and is sent from Si-ning-tcheou to all parts of the world. Before the commerce between China and Siberia was established, this article was brought to Europe through Turkistan, Persia, and Turkey, and therefore is still called Turkey rhubarb, though at present it comes through Kiachta and Russia. When the Jesuits, who had been sent to these countries by the emperor Kang-hi, were at Si-ning-tcheou, they were astonished at seeing the quantity of rhubarb which, during the months of October and November, was daily brought from the adjacent mountains to the town.

The northern part of Tangut, with the exception of the valley of the Hoang-ho, is occupied by a wide desert plain, which constitutes a portion of the Gobi. [GOBI, vol. xi., p. 286.] The steep declivities of the Kilian and Nan Shan however do not come close to the desert, but are separated from it by a hilly tract from 30 to 50 miles wide, which contains some extensive tracts fit for cultivation, and in which some large towns have been built, as the great commercial route which connects China with the countries of Western Asia runs longitudinally through this hilly tract, and is confined to it by the extensive sandy desert on the north, and the still less practicable mountain-desert which bounds it on the south. According to our best information, the ranges of the Kilian Shan, and especially of the Nan Shan, are covered with eternal snow, and one would imagine that they give origin to rivers which bring down a great volume of water, but that is not the case. The volume of water is very moderate: a part of it is consumed in irrigating the adjacent fields, and the remainder is absorbed by the sandy soil, as soon as it reaches the plain, after having left the hilly tract. This evidently shows that the watershed of the mountains must be at a very moderate distance from the Gobi. The surface of the hilly tract consists of an alternation of high lands and of depressions, running from the mountains northward to the border of the desert. The high lands are of considerable extent, their upper surface broken and rocky, and only occasionally covered with a thin layer of earth unfit for the growth of trees. In general the rocks are bare. The depressions between these high grounds are less extensive, but exhibit a considerable degree of fertility where they are irrigated. Even in those parts which are beyond the reach of irrigation, they are chiefly cultivated. To protect this hilly region, and the great commercial road which runs through it, against the nomadic tribes of the Gobi, the Chinese have continued the Great Wall along its northern border westward to 98° E. long., and along the wall are built the fortresses which protect the line and the towns through which the road runs. The road leaves the valley of the Hoang-ho at the town of Lan-tcheou [CHINA, vol. vii., p. 80], the capital of Kansi, and runs in a north-north-west direction over a stony and hilly country to the town of Liang-tcheou, a considerable place, of which however nothing is reported, except that the district in which it is situated is fertile, and contains a great number of villages. From Liang-tcheou the road runs north-west to Kan-tcheou-foo, a large and well-built town, which has many manufactures of woollen stuffs and felts, which articles are in great demand among the nomadic tribes of the Olöth Tshoros, who inhabit the contiguous part of the Gobi, and bring to the place their wool, horses, cattle, and sheep. It receives also large quantities of rhubarb from the Kilian Shan. From Kan-tcheou-foo the road continues in a north-west direction to So-tcheou, a large and well fortified town, with numerous bazars, well provided with provisions and manufactured articles. The town is divided into two sections, one of which is occupied by the Chinese, and the other by the foreign merchants from Bokhara and Turkistan. The latter is divided from the former by a separate wall, the gates of which are shut at night: in other respects foreigners do not experience any different treatment from natives. As So-tcheou is the last large place through which the caravans pass before they enter the desert between Tangut and Thian-shan-nahr: the commerce is very great, especially in provisions. About 50 or 60 miles west of So-tcheou is the most western gate of the Great Wall, called Kia-yu-kooan, or the gate of the You-stone (jasper), through which the caravans pass to enter the desert of Han-hai, which must be traversed in order to reach Hami in Thian-Shan-Nanlu. The last-mentioned town is 960 li, or 320 miles, from the gate of Kia-yu-kooan, and that is the width of the Gobi at this place, which is considered the narrowest part of it.

The towns hitherto noticed lie along the great caravan-road, but farther west the Chinese geographers mention other places of importance. The largest, as it seems, is Ngan-si-foo, a town of the first rank, and the capital of the whole district. North-west of it, and on the border of the desert, is the town of Yu-men-kiang, which is built near a pass between high hills, through which a road leads northward to Hami, of which we have no information. South-west of Ngan-si-foot are the towns of Toong-hooang-kiang, and Sha-tcheou. The last-mentioned place, whose name means Sandtown, seems to be the last inhabited place towards the west. It has not been visited by Europeans, except by Marco Polo, who describes it as rather a large place: he says that the inhabitants live on the produce of their fields and orchards, and have little commerce. From his account, and that of a Chinese traveller, it is evident that two roads run north-west and west from this place. Marco Polo reached it after traversing the desert of Lop, by a thirty days' journey, having departed from the town of Lop, which is on the banks of the lake of the same name. The intermediate tract was mostly covered with sand, but in some places the soil consisted of bare and broken rocks. A Chinese traveller departing from Sha-tcheou, and taking the western route, seems to have traversed a still worse country, until he reached the town of Khotan. [THIAN-SHAN-NANLU.]

That portion of the Gobi which lies north of the Great Wall contains many tracts which are covered with grass, and supply pasture to the Olöth Tshoros, but others have a sandy or stony soil, and are quite barren. In some places there are extensive swamps, especially where the rivers are lost, which descend from the Kilian Shan, among which the Etzina probably runs more than 200 miles. But the Han Hai, or that portion which lies between the gate of Kia-yu-kooan and Hami, is nearly uninhabited, as water is rarely met with, and the grassy tracts are still less frequent. The sand with which the surface is covered is very fine, and frequently raised into the air by strong winds.

Our information respecting the climate of Tangut is very scanty. The cold in winter is intense, and lasts for several months. The Jesuits found the Hoang-ho near 40° N. lat., at the end of November, covered with thick ice, so that the caravan was able to pass over it, though the river was more than 300 yards wide. At Ning-hia a heavy fall of snow was experienced in the middle of April. In summer the heat is great, but much less than in the low countries of China; the climate is considered as extremely healthy.

We are no better acquainted with the productions of

Tangut. Every kind of grain is grown in the few tracts whose soil is fit for cultivation, and rice is raised where irrigation is practicable. The nomadic nations have numerous herds of camels, horses, and cattle, and large flocks of sheep and goats. In the mountain-region is found the yak or mountain-cow, whose tail gives the chowry. It is used for riding as a saddle-horse. In the desert are numerous wild animals, such as wild hogs, deer, the argali, and hares. It is also said that in the woods of the Holang Shan there are wild horses. Wild cattle are found on the declivity of the Kilian Shan. No mines are worked. In the desert some extensive tracts are covered with agates, cornelians, and other precious stones, which are collected by the nomadic tribes and sent to China.

The inhabitants of Tangut are a very mixed race. Mongol tribes inhabit the Gobi, and occupy also the mountain-ranges north of Lake Khookoo-nor, but the mountaineers who are in possession of the mountain-region south of Lake Khookoo-nor, derive their origin from Tibet. It is even supposed that in this part there may still exist small tribes of the Miotse and Yuet-shi, who are considered as the aborigines of this region, but have been nearly exterminated by the wars with their neighbours the Mongols and the inhabitants of Tibet. It is not known if that Turkish nation which is called Sobko, and which inhabits the western part of the Kuen-luen mountains [TIBET], extends over the western districts of Tangut. The agricultural population is mostly composed of Chinese and their descendants, among whom a small number of families of Turkish origin are settled. But in the towns the number of Turkish settlers seems to be considerable. They are Mohammedans, and there are mosques in the larger towns of Tangut, especially in those which lie along the caravan road. All the other inhabitants are Buddhists. In the time of Marco Polo there were also Nestorian Christians in the towns, but they have disappeared.

The Chinese emperors subjected the country of Tangut probably during the dynasty of Han, shortly before the birth of Christ, and maintained their authority over this and the countries farther west to the eighth century, in spite of their long protracted wars with the Hiongnu, a Turkish nation which then was in possession of the desert north of Tangut. In the middle of the seventh century they extended their dominion even over Western Turkistan to the eastern banks of the Caspian Sea. But in the eighth century Tangut was occupied by a nation of Tibetan origin, which founded in these parts the empire of Thufan; and though it was overthrown by the Chinese, and some Turkish tribes, their allies, in the ninth century, the Tibetans erected in the following century the empire of Tangut or Hia, which maintained its power till it was destroyed by Genghis Khan, in 1227, and by its overthrow the conqueror opened to his countrymen the road to China, of which they took possession a few years afterwards. With the downfall of the dynasty of the Mongols (1341), the best part of Tangut remained under the sway of the emperors of the dynasty of Ming, though the Mongols after their retreat from China had occupied the northern and more desert portion of it, where they maintained their independence to the end of the seventeenth century. In the wars of the Galdan of the Olöth [SONGARIA, vol. xxii., p. 245], a tribe of the Olöth Mongols expelled the Khalkas from the country west of the Hoang-ho, and took possession of it. But after the defeat of the Goldan, they submitted to the Chinese emperor in 1690, and since that time the whole of Tangut has been annexed to China. The Chinese government is very assiduous in promoting agriculture in Tangut, and in increasing the agricultural and commercial population, this being considered the most efficacious mode of restraining the nomadic tribes which inhabit the northern and southern districts of Tangut. To give to its measures greater stability and to forward their extension, it has converted the greater part of Tangut, with some of the adjacent countries, into a province of China Proper, under the name of Kansi. (Du Halde's *History of China*; Ritter's *Erdkunde von Asien*, vol. i.)

TANJORE, a district in Southern Hindustan, was formerly a small independent kingdom or principality, and though now under British superintendence, is still governed by its raja. The district is included in the province of the Carnatic and presidency of Madras: it is bounded on the east by the Bay of Bengal, and extends from Point Calymere, 10° 18′ N. lat., to the mouth of the Coleroon, 11° 25 N. lat. To the north and west it is bounded by the Coleroon and the district of Trichinopoli; and to the south and west by the sea and the territory of the Polygars.

The river Cavery, near Trichinopoli, separates into two branches, of which the northern is called the Coleroon, and falls into the sea a little to the north of Devicotta; the southern branch retains its name of Cavery. These two streams however, after flowing about twenty miles at some distance, again approach each other, and are only prevented by a narrow neck of land from re-uniting and discharging the whole river by the channel of the Coleroon. To prevent this junction large mounds have been formed and are kept in repair at a considerable expense. The Cavery, thus separated from the Coleroon, flows through the flat territory of Tanjore, and divides into a number of smaller streams, which are conducted into reservoirs and canals for the purpose of irrigation: by this means nearly the whole district, which would otherwise be a sandy desert, is rendered one of the most fertile in Hindustan. From Devicotta to the salt swamp near Point Calymere, and from the Bay of Bengal to the city of Tanjore, the whole country, with its rich covering of alluvial soil, has the appearance of a garden: from Tanjore to Trichinopoli it is like a desert.

The principal product of the district is rice, of which two crops are obtained annually; the next in importance is indigo: both are exported to Madras in considerable quantities, besides cocoa-nuts, grain, paddy, and lamp-oil.

The district of Tanjore has never been in the actual occupation of the Mohammedans. Its Hindu religious structures are therefore uninjured, and in no part of Hindustan are they so numerous, so large, and so imposing. There is hardly a village without its brick pagoda and lofty gateway. Almost all the principal offices are in the hands of the Brahmins, and they are also the chief landholders.

Besides the capital, Tanjore, the principal towns are the following:—Carrical, 10° 55′ N. lat., 79° 55′ E. long. Combooconam, 11° N. lat., 79° 25′ E. long., is the antient capital of the rajas of Tanjore: there are remains which indicate its former splendour, and its pagodas and tanks are still very fine: it is chiefly inhabited by Brahmins. Devicotta (*Devicata*, the fort of the goddess), 11° 20′ N. lat., 79° 55′ E. long. Nagore, 10° 49′ N. lat., 79° 55′ E. long., a sea-port with a considerable export and import trade. NEGAPATAM. TRANQUEBAR. The villages are numerous, and the population dense.

The antient sovereigns of Tanjore were the Chola dynasty, who probably gave to the whole district the name Chola Mandala (corrupted into Coromandel), the former term in Sanscrit signifying an orbit or circle, and thence a region or tract of country. The kingdom of Tanjore was wrested from its original Hindu sovereigns by the Mahratta chief Eccojee, the brother of Sevajee, in 1675. It has ever since been retained by the Mahratta race; so that, though the language of the inhabitants is Tamul, the language of the court is Mahratta. In 1771 a dispute broke out between Mohammed Ali, the nabob of the Carnatic, and Tuljajee, the raja of Tanjore, with respect to the keeping in repair the mounds which prevent the stream of the Cavery from falling into the Coleroon. The mounds are in the territory of Trichinopoli, and the nabob, as sovereign of that territory, claimed the right of repairing, and consequently of neglecting to repair, by which a portion of the nabob's territory might have been fertilized, and nearly the whole of Tanjore rendered a desert. The raja had been compelled to pay tribute to the nabob, but had never been subject to him, and appealed to the British to protect him in his right to repair, which had always been exercised by the rajas of Tanjore, and for which, he contended, he paid his tribute. The British however took the part of the nabob. On the 20th of August, 1773, the siege of the city of Tanjore was commenced, and a passage twelve feet wide having been completed across the wet ditch which surrounds the walls of the forts, on the 16th of September, when the sun was in the meridian and the raja's troops were taking repose, the British unexpectedly made the assault, and carried the fortress, with hardly any resistance, the raja and his family being taken prisoners. The raja was then made subject to the nabob; but in consequence of the disapprobation which these proceedings met with in England, on the 11th of April, 1776, the restoration of the raja to his former independence was proclaimed by the British. In 1790 the territory of Tanjore was subjected by treaty to British authority. The raja retains the forts of Tanjore, which are garrisoned by him, subject however to the condition of placing them in the hands of the British in case of war in the province. He has a clear allowance of a lac of rupees annually, and one-fifth of the surplus revenue of the territory, after payment of the civil and military establishments, which amounts to at least a lac more. He also retains his palaces, and also a tribute paid to him by Tranquebar.

The present raja is Sewajee, the son of Sarbojee, who was adopted by the previous raja Tuljajee, or Julia Maha, and who was intrusted by him at his death to the missionary Schwarz. Of the circumstances under which the sovereign power was ultimately obtained by Sarbojee from Ameer Sing, the half-brother of Tuljajee, an account is given in the article SCHWARZ.

(Hamilton's *East India Gazetteer;* Malcolm's *Travels in Hindustan and China in* 1836-7; Mill's *History of British India,* by H. H. Wilson.)

TANJORE, the capital of the district of Tanjore, in 10° 47′ N. lat. and 79° 13′ E. long., is about 40 miles east from Trichinopoli, and about 57 miles west from the Bay of Bengal, direct distances. The city is situated not far from the south bank of the Cavery, and is five or six miles in circumference, including the suburbs. It is a place of great strength, being defended by two forts, which are connected, and both are surrounded by walls built of large stones, and by broad and deep wet ditches. The city is in a flourishing state: it is regularly built, and is said to contain a larger proportion of good houses than any other town in Southern Hindustan. The population is probably not less than 70,000 or 80,000. The palace of the raja, where he resides, is in the larger fort: in one of the halls of audience is a colossal statue of Sarbojee, by Flaxman, which was executed by commission from Sarbojee himself. The pagodas of Tanjore are very large, with paved yards and extensive gardens: one of the largest in Hindustan is situated in the smaller fort: it contains a bull finely sculptured in black granite. The Protestant Mission church was built at the expense of the missionary Schwarz: it is a spacious and handsome structure, and has been thoroughly repaired by the present raja. Schwarz was buried behind the pulpit; the spot is marked by a slab, on which is an inscription in English poetry, ascribed to the raja Sarbojee. Service is performed in the church on Sundays both in Tamul and in English. The Protestant communicants belonging to the Tanjore mission amount to about 750, and there are also between 400 and 500 Roman Catholic converts, under priests who are chiefly Jesuits from Goa.

(Hamilton's *East India Gazetteer;* Malcolm's *Travels in Hindustan and China.*)

TANK, a reservoir for water or other fluids. The name is sometimes applied to large open receptacles, or ponds, formed by excavating the ground and disposing the removed earth in the form of banks to retain the water; but the tanks which will here be especially treated of are the smaller covered reservoirs used to collect and retain water and liquid manure for domestic and agricultural purposes. Respecting the construction of ponds it will be sufficient to refer to EMBANKMENT, vol. ix., p. 373, for the method of forming the retaining banks, and to CANAL, vol. vi., p. 219, for a description of the process of *puddling* with clay, which is always necessary in forming a reservoir in a porous soil, unless the more expensive method of paving or lining with chalk, bricks, stone, or timber, be resorted to. See also SLUICE, vol. xxii., p. 142, for a notice of the means used to regulate the drawing off of water from ponds, and to prevent accident from their becoming over-filled.

In high mountainous pastures, tanks are indispensable to supply both men and cattle with water; and they ought to be very carefully constructed of such materials as are at hand. In the pastures of the Jura, between France and Switzerland, the tanks are usually made of wood, in the following manner: a square excavation is made in the ground, which, if necessary, is lined with a coating of clay or impervious earth to prevent the escape of the water; fir-trees, deprived of their bark, are then laid close together and fastened with wooden pins, so as to form the floor, and the sides are lined in a similar manner. The tank is covered with a roof of the same materials; but this, instead of rising from the sides to a point or ridge, according to the form usually adopted in roofing, is made in the shape of an inverted hollow pyramid, so that it acts as a funnel to conduct all the rain-water which falls upon it into the tank, at the same time that it keeps the tank cool, and prevents evaporation. Such tanks are usually placed at a small distance from the habitation and cowhouse, if there be one; and the water from their roofs is conducted, in spouts made of small trees sawn in two and roughly hollowed out, to the funnelled roof of the tank. They are usually of a cubical form, from 15 to 20 feet square; but if a larger size be required, an oblong shape is preferred, the depth and width seldom exceeding 20 feet. After being once filled, these tanks seldom fail to afford an abundant supply of water, although, in summer, thirty or forty head of cattle may have to be supplied exclusively from them.

The importance of collecting rain-water for domestic purposes, especially in districts where springs are deficient or lie at a great depth, has been much overlooked in this country. Waistell, in the work referred to at the end of this article, urges the importance of placing spouts round all the buildings of a farm to collect the rain-water which falls upon them into a tank or tanks; observing that, besides the value of the supply of water thus obtained, the buildings will be benefited by the walls and foundations being kept drier than when the water from the roof is suffered to fall upon them. He states that the quantity of water that falls annually upon every hundred superficial feet or square of building (in Great Britain) is about 1400 imperial gallons; and this statement appears to be fully borne out by the observations recorded in the article RAIN, vol. xix., p. 270. If therefore the external surfaces of roofs were adapted to the collection of the rain-water which falls upon them, and means were provided for conveying it to covered tanks, in which it might be preserved from evaporation, and kept free from any admixture of impurities, almost every house might be readily and cheaply supplied with a quantity of wholesome water sufficient for the ordinary wants of its inhabitants. The extensive roofs of churches and other public buildings might be employed in like way to collect water for the supply of ponds or tanks for public use. In some cases even the drainage of lands might also be made available, as the water may be submitted to any required process of filtration before it is allowed to enter the tank.

Tanks or cisterns to hold water for domestic purposes may be conveniently situated beneath the surface of the ground, so that, being paved over, they occupy no valuable space. They are formed of stone slabs grooved into each other and set in cement; of Welsh slate; of large paving-tiles bedded in cement; of brick-work; of plates of cast-iron; or of thick wooden planks, protected by charring and pitching, or lined with sheet-lead. The brick tanks described by Waistell are circular, the sides being built like a well, with bottoms of an inverted dome-shape, of very slight convexity. The top is also dome-shaped, and has an opening in the centre large enough to receive a man, in order that the tank may be thoroughly cleaned out when necessary. This opening, which may be upon the surface of the ground, or a little above it, should be covered with an oak flap pierced with a number of holes, or with an iron grating. The depth and width of the tank should, it is stated, be nearly equal. If necessary, a smaller brick chamber may be constructed alongside of the tank, in which the water may be filtered through gravel, sand, charcoal, &c. before entering it. It is recommended to make the opening by which water enters the tank near the top. Brick tanks of this description may be rendered water-tight by laying the inner course of bricks in cement, and plastering the whole of the inside with the same to the thickness of about three-quarters of an inch. To enable them without injury to bear the great weight of water when nearly full, the earth should be rammed closely round the brickwork, and it should be allowed to settle thoroughly before any great quantity of water is admitted. Loudon describes another kind of brick tank, contrived by Mr. Mallet to save expense in construction, by adopting a figure of maximum capacity and minimum surface. Mallet proposes, when the tank is large, to adopt the spherical form; and when of less than five or six feet in diameter, that of a short vertical cylinder with hemispherical ends. By puddling with clay roundabout the tank, the necessity for the use of Roman cement is avoided.

In the forty-ninth volume of the 'Transactions' of the Society of Arts (part ii., p. 12), is a communication from Mrs. Davies Gilbert respecting a cheap method of constructing tanks for receiving water from the roofs of cottages, which has been successfully practised at Eastbourn, in Sussex. A reservoir having been dug seven feet deep and about the same wide, the bottom was covered with flints laid in liquid mortar composed of one measure of grey chalk lime (made of chalk marl) well beaten up with three measures of clean sea-sand. The side walls were built of the same materials, leaving a small space at the back of the wall, which space was filled up with the same sort of grout or liquid mortar. The tank was then roofed over with a dome, formed, without any centering, of smaller flints well bedded in mortar. A hole was left in the centre, and covered with a hood, within which was hung a pulley with a rope and bucket for drawing water from the tank. This account was published in 1833, and in 1837 an article appeared in the 'Labourers' Friend Magazine,' in which it is stated that such tanks had been found very useful during three dry summers. One, less than seven feet deep and wide, had supplied two labourers' families during that time, while most of the springs in the neighbourhood were dry. This paper describes a brick tank with sloping sides, the diameter at the base being smaller than at the top, and with a dome-shaped top formed by making each row of bricks project one-third beyond that immediately below it, and balancing the weight by filling up the back with earth as the work proceeds. One of the flint tanks, constructed as above described, at the Eastbourn workhouse, is twenty-three feet deep and eleven feet wide. Only ninety bushels of lime were allowed for its construction, including two coats of plaster, and the work was executed at ten shillings per hundred square feet.

In the article last quoted from, it is observed that a current of air has been supposed to promote the purity of the water preserved in tanks. If so, it may be easily provided for. Where the prevailing winds do not blow soot and leaves upon the roof, the water is found to remain good, even for drinking, without clearing out the rubbish more than once a year.

In addition to tanks for water, every farm-yard should have one to collect the liquid portion of the manure, which is washed by the rain through the refuse litter, and also the urine of the stalled cattle. Though not yet generally adopted in England, in France, Germany, and especially in Belgium, such tanks are considered as necessary to a farm as any of its most common buildings. They are usually constructed of an oblong shape, of brick well cemented, with one or more divisions, and capable of containing at least ten times as many hogsheads as there are heads of cattle on the farm. They are vaulted over, having a small aperture, in which a pump is placed, sufficient to allow a man occasionally to clear out the sediment, when the liquid has been pumped up. The best shape to contain a large quantity in the smallest space would be like those before described; but they cannot conveniently be made sufficiently large, and a cubical form, or rather that of several cubes in succession, is preferred. A tank for a farm of 200 acres of arable land should be 15 feet wide, 15 deep, and 45 long, giving 3 cubes of 15 feet, or a cavity capable of containing upwards of 10,000 cubic feet of liquid. In this tank the urine is diluted with water to prevent too rapid decomposition, and also to retain the ammonia which is formed; for which purpose gypsum and sulphate of copper are sometimes put into the tanks.

If the soil be not sandy, clay will answer instead of mortar to connect the brickwork, and a plastering of lime or cement will be sufficient to keep out the worms: but in very porous soils the bottom and sides must be puddled, to keep in the liquid; and it may be advantageous to build the walls in cement altogether. The liquid from the yards and stables is carried into the tank by a main drain constructed of brick or stone, and which receives a number of smaller drains from every part of the yards and cattle-sheds. Thus the litter in the yard is always dry, and none of the richness of the manure is lost by evaporation.

Sometimes the tank is vaulted like a cellar under the cow-house and stables, which are washed out twice every day, and all the dung and water are swept into a cess-pool communicating with the tank. Thus a very diluted, but rich liquid soon fills the first division of the tank: a sluice is then shut, and the next washings run into a second division, and when that is full, into a third. In the meantime the contents of the first tank have undergone a certain fermentation, by which the caustic ammonia first evolved has become mild and impregnates the water. It is then in a fit state to be carried on the land in tubs or water-carts. When properly diluted, it accelerates vegetation in a surprising degree; but if put on fresh, it burns the grass or any vegetable it touches, because the ammonia is in a caustic state. If a cow drop her urine in a field in a hot summer's day, all the grass it has touched becomes yellow and is burned up: but if the same happen in rainy weather, the spot soon becomes very green, and the grass luxuriant; because, in this case, the urine is amply diluted and its caustic nature corrected. Those who live near gas-works may collect the ammoniacal gas-water in a tank, and, by the addition of sulphuric acid in very small quantities, they may produce a very fertilising liquid, which will stimulate vegetation, and be a very good manure.

The necessary concomitant of a tank, whether for water or manure, is a water-cart, that is, a large cask put upon wheels to bring water from some distance. When there are no means of bringing water in pipes, a water-cart is quite indispensable. It is simply a cask placed on the frame of a cart, with a plug-hole in the end or lower part, from which the water may be let out by a cock, or drop on a flat board or into a bucket with holes, so as to spread it about. The plug-hole is shut by a valve inside, which can be opened by means of a string, the pressure of the liquid keeping it close to the plug-hole.

Many of the artificial manures, of which a number have been lately proposed, would make excellent liquids by merely mixing them up with water in a tank, and allowing a certain degree of fermentation to take place. Thus nothing is lost, and all volatile substances are taken up by the water. The soluble portions are dissolved and the earthy matters diffused, so as to be more equally spread over the land. If it be true that the ammonia found in some plants is chiefly derived from the very small portion discovered in rain water, it follows that a scarcely perceptible impregnation with this salt may have most powerful effects on vegetation.

When a farm-yard is situated on a hill, and there are fields or pastures on a lower level, at no great distance from it, the liquid from the tank may be conducted by channels lined with clay, having small sluices to direct the streams to any particular field. It may thus be made to irrigate temporarily a considerable surface, which it will greatly enrich. It may be led into the common furrows between the lands or stitches in ploughed land, and allowed to soak in them, and then it can be spread with the earth of the furrow, by means of broad shovels, over the growing crops, and will greatly invigorate them. This species of irrigation is common in Lombardy, where much ingenuity is shown in the manner in which water is made to flow in small rivulets between the rows of growing vegetables. The water here is supplied by streams, but the same method would distribute the tank-liquor with great effect. A very small quantity of this liquor, allowed to flow into the main feeder of a water-meadow, will soon prove how great effects are produced by impregnations which are scarcely perceptible by chemical analysis.

Small as the experience has hitherto been in this country of the advantages of liquid-manure tanks, it has sufficiently proved their use to induce every man who constructs a farm-yard and erects buildings to take in the tank as an essential part of his plan; and even if it only collected the refuse fluids which are allowed to run off in common sewers from most houses, it would soon repay the cost of its construction, while it rendered the ditches in the neighbourhood less subject to noxious emanations from the corrupted matter which now flows into them. The passage of air into or out of a manure-tank, and the consequent exhalation of noxious vapours, may be prevented by the use of air-traps, similar in principle to those described under SEWERS, vol. xxi., p. 319, at the points where the drains enter it.

The use of metallic cisterns or tanks, in lieu of wooden casks, for containing a supply of fresh water for long voyages, is one of the great improvements effected of late years in naval economy. The nineteenth volume of the 'Transactions' of the Society of Arts contains an account of experiments on this subject, by General Samuel Bentham, in 1796 and the following years, the success of which induced the Society, in 1801, to present to him their gold medal. Large earthen jars have been tried for this purpose; but, while they keep the water very pure, they are not so convenient for general use as metallic tanks, which may be fitted to the shape of the vessel, so as to avoid any loss of room.

(Waistell's *Designs for Agricultural Buildings*; Loudon's *Encyclopædia of Cottage, Farm, and Villa Architecture*; *Transactions of the Society of Arts*, vols. xix. and xlix.; *Labourers' Friend Magazine*, 1837, p. 131.)

TANNAHILL, ROBERT, born at Paisley, in Scotland, on the 3rd of June, 1774, was the son of poor parents, by whom he was brought up to the occupation of a weaver, which he pursued in his native town and at Glasgow throughout the short period of his life. The earliest predilection of Tannahill was for poetry, and his taste was formed by the constant study of Allan Ramsay, Fergusson, and Burns. He failed to attain the spirit of these masters of Scottish song; but his pieces generally excel theirs in grace and sweetness. A specimen of this sweetness is found in his famous song, 'Gloomy winter's now awa:'

'Tow'ring o'er the Newton woods,
Lavrocks fan the snaw-white clouds;
Siller saughs, wi' downie buds,
  Adorn the banks sae brierie, O.
Round the sylvan fairy nooks
Feath'ry breckans fringe the rocks,
'Neath the brae the burnie jouks,
  Ilka thing is cheerie, O.'

'Jessy, the flower of Dumblane,' is his best-known effort. The 'Song of the battle of Vittoria' has the merit of redeeming from the degradation of worthless words one of the finest airs of Scottish minstrelsy, and restoring it from a whistled jig to the solemn tone of a triumphal song.

His songs were commonly inspired by the immediate occasion; were the unlaboured fruit of his imagination or feelings. Besides the charm of harmony and of a perfect mastery of his language, which is almost exclusively Saxon, they derive not a little of their effect from the vein of desponding melancholy which runs through them. This melancholy was in some degree constitutional in Tannahill, but it was aggravated by the neglect of the world, and a hopelessness of ever raising himself above circumstances so unfavourable to genius as those in which fortune had thrown him. A kindred spirit, the Ettrick Shepherd, made a long pilgrimage to visit him at Paisley. After a night spent in the most delightful interchange of feeling, Mr. Hogg took his departure. 'Farewell, we shall never meet again,' were the words emphatically pronounced on this occasion by Tannahill, and their meaning was shortly afterwards explained. He committed suicide by drowning himself, in his thirty-sixth year. His remains are interred at Paisley.

Tannahill's songs were published in Paisley, in his lifetime, in a small volume. They are in every modern collection of Scottish melodies, and are occasionally printed (under Tannahill's name) with selections from Burns. For his life, see Chambers's *Scottish Biography*.

TANNER, THOMAS, was the eldest son of the Rev. Thomas Tanner, vicar of Market Lavington, Wiltshire, where he was born, 25th January, 1674. In November, 1689, he was entered a student of Queen's College, Oxford; but after having taken his degree of B.A., he removed in January, 1694, to All Souls, and he was elected a fellow of that society, 2nd Nov., 1696. So early as 1693, when he was only nineteen, he had published proposals for printing all the works of the antiquary John Leland, from the original manuscripts; but this design, which was afterwards partially executed by Hearne, did not receive such encouragement as to induce him to proceed with it. The reputation he had very early acquired for his knowledge of English antiquities may appear from the fact that Anthony à Wood, at his death in 1695, left his papers to Tanner's care. That same year Tanner published at London his first work, an 8vo. volume, entitled 'Notitia Monastica, or a Short Account of the Religious Houses in England and Wales.' Having taken orders, he was soon after appointed by Dr. Moore, bishop of Norwich, one of his chaplains; and having, in 1701, married Rose, the eldest daughter of that prelate, he received various preferments from his father-in-law; the chancellorship of Norwich about the time of his marriage; the office of commissary for the archdeaconry of Norfolk in 1703; that of commissary for the archdeaconry of Sudbury in 1707; and, in 1713, a prebend in the cathedral of Ely, to which diocese Moore had been by this time removed. Meanwhile Tanner's wife had died, at the age of twenty-five, in 1706. In the same year he was presented by a friend to the rectory of Thorp, near Norwich; and he then married Frances, daughter of Jacob Preston, Esq., of London, whom however he lost in 1718. His next publication, a new edition of Wood's 'Athenae Oxonienses,' enlarged by the addition of 500 new lives from Wood's manuscripts, appeared at London, in 2 vols. fol., in 1721. In December that year Tanner, who had taken his degree of D.D. in 1710, was appointed by Dr. Green, bishop of Norwich, to the archdeaconry of Norfolk; and in 1723 he resigned his prebend at Ely, and was appointed canon of Christ's Church, Oxford. He was consecrated to the bishopric of St. Asaph, in January, 1732; and in May, 1733, he married Mrs. Elizabeth Scottow of Thorp, receiving with her a fortune of 15,000*l.*; but he did not long enjoy these accessions of wealth and honour, his death taking place at Oxford on the 14th of December, 1735. By his second wife he left one son Thomas, who died rector of Hadley and Monks' Ely in Suffolk, and prebendary of Canterbury, in 1760. His widow married Robert Britiffe, Esq., M.P., and survived to 1771. A new edition of the 'Notitia Monastica,' with large additions (in part by the editor), was published in a folio volume at London, in 1744, by the bishop's brother, the Rev. John Tanner, vicar of Lowestoft in Suffolk; and a third edition, considerably improved, by the Rev. James Nasmith, appeared at Cambridge, in the same form, in 1787. The greater part of this last impression having been consumed in a fire which happened in Mr. Nichols's printing-house, on the night of Monday, the 8th of February, 1808, the book is very scarce. But Tanner's literary reputation rests principally on his great biographical and bibliographical work, entitled 'Bibliotheca Britannico-Hibernica, sive de Scriptoribus qui in Anglia, Scotia, et Hibernia, ad Saeculi xvii. initium floruerunt, literarum ordine, juxta familiarum nomina, dispositis, Commentarius,' which had been the labour of his leisure for forty years, and which was published, in folio, at London, in 1748, under the care of the Rev. Dr. David Wilkins. It is a work of extensive research and great general accuracy. Bishop Tanner had made large collections of charters, grants, deeds, and other instruments relating to the national antiquities, which he bequeathed to the Bodleian Library. Some letters from him are published in Dr. Bliss's collection of 'Letters written by Eminent Persons,' &c., 2 vols. 8vo., Lon., 1813. (*Biographia Britannica*.)

TANNIC ACID, or TANNIN, a peculiar vegetable acid existing in every part of the bark of each species of quercus, but especially in the bark: it is found however in the greatest quantity in the gall-nut. The name of this substance is derived from its property of combining with the skins of animals, or in tanning, by which they are rendered impervious to water, and prevented from putrefying.

To prepare tannic acid, galls are to be reduced to coarse powder, and digested in a percolator in æther which has been previously mixed and shaken with water: in the lower part of the vessel two strata of liquid appear, the heavier of which is a strong solution of tannic acid, by evaporating which, and by subsequent purification, the acid is obtained possessing the following properties:—It is a colourless or slightly yellowish mass, which does not crystallize, but resembles dried gum. It is readily soluble in water; the solution has an astringent but not a bitter taste; it reddens vegetable blues, and decomposes alkaline carbonates with effervescence; weak alcohol dissolves it, but æther only slightly; when the aqueous solution is exposed to the air, especially if the temperature be high, oxygen gas is absorbed, and an equal volume of carbonic acid gas evolved, while the tannic acid is converted into gallic and elagic acids. Tannic acid precipitates gelatin from solution; the compound has been called *tannogelatin*, and when the acid is in excess a viscid elastic mass is formed, which contains about half its weight of tannic acid; when the liquid from which the gelatin is precipitated is heated to ebullition, the tannogelatin is redissolved; tannic acid also precipitates albumen and starch.

When dried at 212° tannic acid consists of

Eighteen equivalents of carbon . .	108
Five equivalents of hydrogen . .	5
Nine equivalents of oxygen . .	72
Equivalent .	185
With Three equivalents of water .	27

When exposed to a temperature of 240°, the water is expelled.

Tannic acid combines with the alkalis to form salts, which are called *tannates*, and it precipitates most metallic oxides from solution. The salts of protoxide of iron suffer no change when a solution of tannic acid is added to them; but by exposure to the air a deep bluish-black precipitate is formed. Tannate of peroxide of iron, formed by the action of the acid on a persalt of the metal, is the basis of writing-ink, and is a black pulverulent precipitate.

TANNIN, ARTIFICIAL. It has been shown by Mr. Hatchett, that when powdered charcoal has been digested for a considerable time in dilute nitric acid, it is dissolved, and a reddish-coloured liquid is obtained, which by careful evaporation yields a brown glossy substance, amounting to about 120 parts from every 100 of charcoal employed.

The properties of this substance are that its taste is astringent and bitter, is soluble in water and in alcohol, and forms with a solution of gelatin an insoluble precipitate, consisting, according to Mr. Hatchett, of 36 of tannin and 64 of gelatin in 100 parts. Sulphuric acid and hydrochloric acid, when added to a solution of artificial tannin, occasion brown-coloured precipitates, which are soluble in hot water; the alkalis combine with this tannin, and it forms a precipitate of difficult solubility when added to lime, barytes, or strontia water, and also with most metallic solutions. These precipitates are of a brown colour; unlike natural tannin, the artificial resists the action of nitric acid.

When camphor and various resins, as shell-lac, benzoin, and dragon's blood are digested in sulphuric acid till it becomes black, a variety of artificial tannin is procured; when the blackened acid is poured into water, a black powder is deposited, which, by digestion in alcohol, furnishes a brown matter soluble in water, and forming an insoluble compound with gelatin.

Although in certain respects the above artificial substance agrees with tannic acid, yet the late discoveries as to the real nature of this principle tend to the opinion that the natural compound is essentially different from the artificial.

TANNIN, PURE, or TANNIC ACID, *Medical Properties of.* This substance in combination with extractive has been long known under the name of tannin, and recognized as the active principle in almost all astringent vegetables. [ASTRINGENTS.] As many of these are powerful in restraining excessive discharges, whether bloody or otherwise, it was conjectured that the pure principle would be yet more efficacious than when in a state of combination. Accordingly it has been administered in some passive hæmorrhages, chiefly from the uterus and the bronchial tubes. To effect any good it requires to be given for several days in small doses. It is with difficulty absorbed into the circulation, being with great reluctance taken up by the lacteals, and producing very great constipation, from its direct astringent action over the intestinal canal, with which it is brought into contact. Tannic acid has been recommended in cases of incurable organic diseases affecting the uterus, accompanied with wasting discharges. These it may for a time moderate, but the constipation induced never fails ultimately to aggravate the disease and discomfort of the patient. There is little therefore to induce practitioners to employ it.

TANNING is the process of converting the skins of animals into leather, by effecting a chemical combination between the gelatin of which they principally consist, and the astringent vegetable principle called *tannin*. [BARK, vol. iii., p. 456; LEATHER, vol. xiii., p. 379; and the preceding chemical articles on TANNIN.] The object of the tanning process is to produce such a chemical change in skins as may render them, as observed by Dr. Ure, unalterable by the external agents which tend to decompose them in their natural state; and, in connection with the subsequent operations of dressing, or currying, to bring them into a state of pliability and impermeability to water which may adapt them for the many useful purposes to which leather is applied. Similar effects are produced by forcing oil or grease into the pores of the skin, or by preparation with alum; processes which may be briefly noticed in connection with the more immediate subject of this article.

The preparation of skins by tanning or other analogous processes has been practised from the earliest times; and, although it has engaged the attention of several scientific men, and has been the subject of many curious experiments, it has received less modification from recent improvements in chemical science than many other manufacturing processes. Several plans which have been suggested with a view to expediting the process, which, on the old system, is a very tedious one, have been found to deteriorate the quality of the leather, and have therefore been wholly or partially abandoned; and others, which appear to be more successful, are as yet adopted by a few manufacturers only. One of the probable causes of this comparatively slow progress of improvement in the leather manufacture is suggested in an interesting article on 'Tanning,' in the seventh edition of the 'Encyclopædia Britannica,' the author of which observes that, owing to the slow turning of money in consequence of the length of time occupied in tanning the heavier kinds of skins or hides, the tanner 'must have capital enough to pay for twelve months' hides, bark, &c., labour, and contingent expenses, besides keeping a stock of leather; and, when his capital has been turned at the end of twelve or more months, it must pay him, in one single profit, the interest, &c. of twelve months.' 'This,' he proceeds to say, 'has confined the trade to a few wealthy individuals, who look upon tanning as an investment for capital rather than as a business which might be improved by science; and, being in comfortable circumstances, they are not driven to personal exertion and close application, which would be required of less wealthy tradesmen.' 'It is,' he adds, 'from these circumstances, that tanning has been more stationary than any other manufacture, and that the few improvements which have been made in it have not been made by tanners.'

The larger and heavier skins operated upon by the tanner, as those of bulls, buffaloes, oxen, and cows, are technically distinguished as *hides*; while the name *skins* is applied to those of smaller animals, as calves, sheep, and goats. The process necessary to convert hides into the thick hard leather used for the soles of boots and shoes, and for similar purposes, will be first noticed. The hides are brought to the tanner either in a fresh state, when from animals recently slaughtered, or, when imported from other countries, dried or salted, and sometimes both, for the sake of preserving them from decomposition. In the former case the horns are removed, and the hide is scraped to cleanse it from any small portions of flesh or fatty matter which may adhere to the cutis; but in the latter it is necessary to soften the hides, and bring them as nearly as possible to the fresh state, by steeping them in water, and repeated rubbing or beating. After this the hair is removed; sometimes by steeping the hides for several days in a solution of lime and water, which has the effect of loosening the hair and epidermis, or outer skin; and sometimes by suspending them in a close chamber called a *smoke-house*, heated a little above the ordinary temperature of the atmosphere by means of a smouldering fire; in which case the epidermis becomes loosened by incipient putrefaction. In either case, when the hair and epidermis, or cuticle, are sufficiently loosened, they are removed by scraping with a curved knife, the hide being laid upon a convex bench, or 'beam.' The hides are prepared for the actual tanning, or immersion in a solution of bark, by steeping them for a few days in a pit containing a sour solution of rye or barley flour, or in a very weak menstruum consisting of one part of sulphuric acid mixed with from five hundred to a thousand parts of water. By this process, which is called 'raising,' the pores of the hides are distended and rendered more susceptible of the action of the tan, and the substance of the skin is apparently increased; but, as the process does not add to the gelatin of the skin, a hide which is much thickened by the raising process loses its substance when condensed by the shoemaker's hammer.

Different tanners vary much in the details of the above-described preparatory processes, as well as in those which follow, and which constitute the actual tanning, or conversion of the prepared 'pelt' into leather. Oak bark is the substance most commonly used to supply the astringent principle, and it is crushed or ground to a coarse powder in a bark-mill. The comparative efficiency of this and other vegetable substances used for the same purpose is stated under BARK, vol. iii., p. 457. In the old method of tanning, which is not yet entirely abandoned, the hides and powdered bark were laid in alternate layers in the tan-pit, which was then filled with water to the brim. After some months the pit was emptied and re-filled with fresh bark and water, and this process was repeated whenever the strength of the bark was exhausted. In this way the time required for impregnating the hides varied, according to their thickness and other circumstances, from one to four years. The process has been greatly expedited by the improvements introduced in consequence of the experiments of M. Seguin, a French chemist, which are detailed in Nicholson's 'Journal,' vol. i., p. 271 (quarto series, published in the year 1797), of tanning with concentrated solutions of bark, formed by passing water through a mass of powdered bark, until, by successive infiltrations, it is completely deprived of its soluble tanning principle. Seguin expected that, by the use of very strong solutions, hides and skins might be tanned in as many days as, under the old system, they would require months; but these expectations have been very imperfectly realised in practice, although the new system, which has been very extensively adopted, has been productive of an important saving of time. Without entering into a minute investigation of the objections to the use of concentrated tanning infusions, it may be sufficient to state that, as observed by the late Sir Humphry Davy, in his valuable paper on the operation of astringent vegetables in tanning, published in the 'Philosophical Transactions' for 1803, experience shows that skins which are quickly tanned, by the use of strong solutions, produce leather of less durable quality than that which is slowly formed. Dr. Ure, in reference to this important point, says (*Dict. of Arts*, &c., p. 1226):—'The older tanners, who prided themselves on producing a substantial article, were so much impressed with the advantages of slowly impregnating skin with astringent matter, that they employed no concentrated infusion (ooze) in their pits, but stratified the skins with abundance of ground bark, and covered them with soft water, knowing that its active principles are very soluble, and that, by being gradually extracted, they would penetrate uniformly the whole of the animal fibres, instead of acting chiefly upon the surface, and making brittle leather, as the strong infusions never fail to do.' In illustration of these remarks, he states that 100lbs. of skin, quickly tanned in a strong infusion of bark, will produce 137lbs. of leather, while the same weight of skin, slowly tanned in a weak solution, produce only 117½lbs.; the additional 19½lbs. in the former case tending to swell the tanner's bill, although it deteriorates the leather, and causes it to contain less of the textile animal solid. Leather so highly charged with tannin is, moreover, so spongy as to allow moisture to pass readily through its pores; but the saving of time and increase of product are strong temptations to the tanner to adopt the system of tanning with concentrated infusions.

The variations of practice among different tanners extend to the substance used as an astringent, as well as to the manner of applying it. Ground oak-bark, which was formerly the only material in common use, and is still the most general, produces good leather of a light-fawn colour. Valonia, of which considerable quantities are imported for the use of tanners, produces leather of great solidity and weight, the colour of which is inclined to grey, and which, according to the 'Encyclopædia Britannica,' is more impervious to water than that made with oak-bark. Valonia consists of the acorns of the *Quercus Ægilops* [QUERCUS, vol. xix., p. 214], and is brought from the Levant and the Morea. Catechu, or terra japonica, the inspissated extract of the *Acacia Catechu* [CATECHU, vol. vi., p. 367], produces leather of a dark reddish fawn colour, which is light, spongy, and very pervious to water. Another substance which has been used of late years is a kind of bean-pod called divi-divi. These substances may be used either individually or in various combinations. In the methods of preparing tanning solutions there is also considerable variety. Some tanners use cold water for the purpose, and others hot water or steam; others again, instead of pure water, employ ooze, or tanning liquid, which has been exhausted by use. A further point of difference is found in the strength of the solutions used, which vary exceedingly. When the impregnation of the hides with tannin is effected by laying them flat in the tan-pits, they are frequently taken out to renew the solution; and the skins which have lain near the top of one pit are laid near the bottom of the next, so as to equalize the amount of hydrostatic pressure. Sometimes the tanning is facilitated by suspending the skins vertically in the liquid, by which means they are penetrated quickly; but the plan requires considerable room; and, unless the skins are frequently moved, it occasions injurious folds in the leather. Another plan, which answers well for small light skins, that require but a short time for tanning, is to sew up the skin into the form of a bag, to fill it with tan-liquor, and then immerse it in the pit. The great space required is the principal objection to this plan. In whichever of the above ways the tanning is effected, the hide is subjected to the action of solutions increasing progressively in strength, until it is so perfectly penetrated, that when cut through it presents a uniform brown colour; any appearance of a light streak in the middle of its thickness being an indication of imperfect tanning. When the process is complete, the hides are hung up in a shed, and allowed to dry slowly; and, while they are drying, they are compressed by beating or rubbing, or by passing them between rollers, to give them firmness and density. A yellow deposit is now found upon the surface of the leather, to which the name of 'bloom' or 'pitching' is technically given; and, although this deposit is subsequently removed by the shoemaker in the operation of buffing, and forms a useless addition to the weight and cost of the leather, the prejudice of purchasers requires that it be left on the surface by the tanner. According to the explanation of the 'Encyclopædia Britannica,' this bloom consists of the finer portion of the gelatin from the interior of the skin, dissolved by the exhausted ooze which remains upon the surface by capillary attraction; and the waste and deterioration occasioned by its formation should be prevented by the careful removal, by pressure, of the exhausted ooze.

Although, owing to the many differences in the practice of tanning, no definite time can be stated for the various operations mentioned above, it may be observed that the usual period required for tanning such hides as are used for the soles of men's boots is from six to twelve months, and that from fifteen to eighteen months are required in preparing those of the thickest kinds, which are termed 'butts' or 'backs.' It remains, before noticing the processes of preparing the thinner kinds of leather, to advert to some of the methods which have been contrived for effecting a greater saving of time than could be accomplished by any of those previously mentioned.

Several schemes have been devised for forcing a tanning solution through the pores of the hide by mechanical pressure. Mr. Francis Spilsbury obtained a patent in 1823 for effecting this object in the following manner:—The hides, after being freed from hair, cleansed, and otherwise prepared in the usual manner, were to be carefully examined as to soundness, any accidental hole being then sewed up, so as to make the skin water-tight. Three frames were to be provided of similar shape, and of such a form and size that when laid upon each other, with two hides placed between them, the frames might be screwed together by bolts passing through projecting ears, so that the whole should form a flat water-tight chamber, circumscribed by the middle frame. This apparatus being then placed in a vertical position, tan-liquor was introduced into the chamber or cavity between the hides through a pipe inserted in the centre frame; the air being allowed to escape by another pipe, which should be closed as soon as the chamber became filled with the liquid. The tan-liquor being supplied from an elevated cistern, any required degree of hydrostatic pressure might be produced in the chamber:

the effect of which was to distend or swell out the sides, and to force the liquid through the pores of the skins, it making its appearance on the outer sides like drops of dew or perspiration. When the leather appeared to be sufficiently tanned, the liquor was drawn off by a stop-cock, the frames were unscrewed, and the compressed edges of the hide were cut off. Spilsbury's process was soon abandoned; the reason of its failure being, according to the author before quoted, in the 'Encyclopædia Britannica,' that a large excess of tannin dissolves gelatin; so that tannate of gelatin was found on the outer sides of the skins in the form of long masses of slime, while the leather had lost much in weight, was very porous, and unequally tanned, in consequence of the tan-liquor penetrating most readily the thinnest or weakest parts of the hide. The error of the principle of this method not being generally understood, several similar plans were subsequently contrived by different persons; but these, or most of them, have been found unsuccessful. Of these, allusion may be made to the process patented by Mr. Drake, which consisted in sewing two skins together (after they had received a slight tanning in the ordinary way), so as to form a water-tight bag, which was filled with tan-liquor. The bag thus formed was compressed between two vertical gridiron-like frames or racks, by which it was prevented from bulging at the sides, and the liquor was confined to a thin vertical stratum. As in the last process, the aqueous portion of the tan-liquor percolated through the hides; and this penetration of the leather was facilitated by heating the room so as to promote evaporation from the exterior surfaces of the bags or skins. To prevent the bars of the racks or frames from producing permanent indentations in the leather, it is necessary to shift the bags a little occasionally during the process. In another somewhat similar plan, contrived by Mr. Cox, the hides were to be sewed up in the form of bags, and supported by a casing of canvas; and in the process of Mr. Chaplin, the bags were laid in an inclined position, and turned periodically to equalize the action of the tan. With every precaution however, it is difficult to tan a hide equally by any such process; and the objection urged against Spilsbury's plan applies to all the modifications of it. In another plan, which has been tried under several forms, the tanning liquid is applied to both sides of the hides, which are placed in an air-tight vessel, and is forced into their pores by hydrostatic pressure, the air being previously pumped out. The operation may be repeated as often as necessary, with infusions gradually increasing in strength; air being allowed to fill the pores of the hide between each immersion. Another plan which may be alluded to here is that of an American tanner, Osmond Cagswell, described by Hebert (*Engineer's and Mechanic's Encyclopædia*, vol. ii., p. 64), from the 'Journal' of the Franklin Institute. It consists in laying the hides upon a quantity of sawdust, contained in shallow boxes, of which any required number may be arranged in a suitable framework, about twelve inches above one another. The hides are not laid flat, but have their edges a little raised, so that their upper surfaces form shallow troughs capable of holding a layer of the tanning solution, which must be replenished from time to time as it filters through the hide and the sawdust, or other soft porous substance upon which it is laid. The spent liquor runs off from the bottom of the box or trough, which is somewhat inclined for that purpose, into a vessel or channel provided for it. 'The improvement consists,' according to the specification quoted by Hebert, 'in applying a solution of oak or other bark to hides or skins in such manner as that when the glutinous (gelatinous) particles of the hide have absorbed and become mixed with the tanning or astringent principle, the other part of the solution (*i.e.* the water) may pass off, and leave the hide free to receive more of the solution; and so on till it is tanned.' The operation was performed, it is stated, in a very short time; but as the outer parts or edges of the hides were not perfectly tanned by it, it was necessary to immerse them in vats in the usual manner for three or four weeks, to complete the process. If the principle were found to be advantageous, this, which forms a great defect in Mr. Cagswell's scheme, might be readily avoided.

Still more recent than any of the above-mentioned plans is that patented by Messrs. Herepath and Cox, of Bristol; which, as far as present experience can show, appears to effect the desired object very completely. Their process, which was patented November 16, 1837, is founded upon the principle of washing a sponge, by alternately allowing it to imbibe water, and then forcibly expressing it. In the old system of tanning, the hide may be compared to a sponge, which, after being saturated in a weak solution, is removed to a stronger, without the fluid contained in its pores being squeezed out; while in the new plan the weak infusion, or ooze, is forced out of the pores of the hide before it is subjected to a stronger, so that the fresh ooze may be able to act more efficiently. This is effected by connecting a number of hides together by strings, so as to form a continuous belt, and passing them between rollers turned by steam or other power, while they are being removed from one solution to another. In order to produce a tolerably uniform belt or continuous sheet of hides, they are either placed alternately head to head and tail to tail; or, if laid across the belt, with the heads and tails towards each side alternately. In one of the arrangements described in the specification, the hides are united into an endless band, and are always passed between the rollers (of which a pair is erected over each pit) in one direction; but in another plan the ends of the belt are not connected together, and the motion of the rollers is reversed when necessary, so that the belt of hides may be delivered into the tan-liquor alternately on each side of the apparatus. The latter arrangement is that described in the recently published article in the 'Encyclopædia Britannica,' from which the following details are derived. The lower roller is about thirty inches in diameter, and is covered with horsehair cloth; and the upper roller, which is pressed against the lower one with any determinate degree of force by means of weighted levers, is only about eighteen inches in diameter, and is covered with woollen cloth. By this process a strong hide may, it is stated, be tanned through in from one to two months, and calf-skins and *kips* (the hides of young cattle) in from twenty to thirty days. Double the usual quantity of work is performed; one-half of the capital required in the common process is rendered unnecessary; the saving on bark, labour, and general cost of manufacture is about 1½*d*. per lb.; and the increase in the weight of butt leather, as compared with that made in the usual way, is as 34 lbs. to 28 lbs. The very thick hides, known as 'butts,' when prepared by the patent process, are sent to market within four months from the time of their delivery in the tanner's yard; and the profits arising from quick returns, great weight of leather produced, and reduced cost of production, are stated to be eight times as great as upon the old plan, the prices of hides, bark, and leather being the same. It should be further observed that the leather made in this way is more elastic and impervious to water than any other.

Although the general principles involved in the preparation of all kinds of leather are the same, and some of the processes above described are performed with little variation upon the skins of smaller animals as well as upon the thick hides of various kinds of oxen, the precise course of operations requires many modifications which cannot be here described. Of the preparation of several of the lighter and more ornamental kinds of leather, a familiar account is given in No. 652 of the 'Penny Magazine,' which is devoted to a sketch of the processes followed at one of the great leather-manufactories of Bermondsey. We have hitherto alluded chiefly to the preparation of the thick hides used for sole-leather, among which several varieties may be found, each distinguished by a different technical name, by which its thickness, quality, or mode of preparation is known; but the thinnest and weakest hides, as well as the skins of calves and other animals, are also prepared for use as upper-leathers, in which case it is necessary to reduce their thickness by shaving or paring them down upon the flesh or inner side, before they are subjected to the action of the tanning infusions. Such hides or skins also require, after leaving the hands of the tanner, to be rubbed, softened, and dressed by the currier, in order to bring them to the necessary degree of flexibility and smoothness. The currier also has recourse to shaving or paring with a peculiarly formed knife, to bring the skin to the requisite tenuity; and it is his office to blacken the surface, which, for common shoe-leather, is done on the flesh side, although for some purposes leather is blackened upon the outer or *grain* side. Horse-hides, which are comparatively weak and thin, are sometimes dressed in the latter way, under the name of *cordovan* hides, from the circumstance of such leather having been formerly made at Cordova in Spain. Calf-skins supply the quality of leather most generally preferred for the upper part of boots and shoes.

Of the thin skins prepared for ornamental purposes, many are tanned with a substance called sumach, prepared from a plant of the same name. [Rhus, vol. xix., p. 484.] At the establishment above referred to, which is commonly known as the Neckinger Mills, sumach leather is extensively prepared; the most important kind being that called 'Morocco,' which is made from goat-skins. In the routine of operations described in the paper from which we quote, the processes of cleansing the skins from fleshy impurities, and removing the hair, &c., present no material variation from those before described. During these processes, the lime employed to assist in the depilation enters the pores of the skin so completely, that it would impede the action of the tanning liquid if allowed to remain. It is therefore removed by immersion in an alkaline solution, which opens the pores in a way resembling the process of 'raising,' described in a previous column. The tanning is then performed by sewing up each skin into the form of a bag, with the grain or hair-side outwards, and nearly filling it with a strong solution of sumach in water. The bag is then fully distended by blowing into it, and the aperture is tied up; after which it is thrown into a large shallow vessel filled with hot water containing a little sumach. The distended bags float in this vessel, and are occasionally moved about with a wooden instrument, until the solution which they contain has thoroughly penetrated their substance. Owing to the thinness of the skins and the heat to which they are exposed, this operation is performed in a few hours. The process is expedited by taking the bags out of the solution and piling them upon a perforated bench or rack at the side of the tub, so that their own weight may force the confined liquid through the pores. When the tanning is completed, the bags are opened to remove the sediment of the sumach; the skins are washed, rubbed on a board, and dried; after which they are ready for dyeing and finishing with a ridged instrument, which imparts to the surface that peculiar grain by which morocco leather is distinguished. An inferior kind of leather, known as 'imitation morocco,' is prepared in a similar manner from sheep-skins. The wool is removed from these skins by the fellmonger; after which they are subjected to great pressure in a hydrostatic press, in order to remove the oleaginous or greasy matter which they contain in a much larger quantity than goat-skins. Surprising as it may appear, these, as well as larger and thicker skins, are often divided or split by a machine into two thicknesses, each of which may be made into leather suitable for some of the purposes to which it is applied, as the covering or lining of books, work-boxes, hats, &c.

Tawing is the name applied to the process by which the skins of sheep, lambs, and kids are converted into soft leather by the action of alum. Of this kind of leather gloves are usually made. Skins intended for tawing pass through a series of operations resembling those by which skins are prepared for tanning, but they are then subjected to a solution of alum and salt, to which, for the superior kinds of leather, flour and yolks of eggs are added, instead of a vegetable astringent solution. Sometimes the skins are put into a kind of barrel with the solution, and then the whole is made to rotate rapidly, by which the skins are quickly penetrated; and in other cases the impregnation is effected in an open tub, the skins being worked in the pasty liquid with the hands, or trampled upon by the naked feet of a man, until the emulsion is thoroughly incorporated with them. They subsequently require a good deal of stretching and rubbing over a kind of blunt-edged knife, and some other finishing operations, to give them the requisite smoothness and suppleness. Many of the gloves sold as kid are really made of lamb-skins, of which considerable numbers are imported from the shores of the Mediterranean. These are brought with the wool on; and, as it would be injured by the action of lime, it is loosened by inducing fermentation or incipient putrefaction in subterranean vaults or cellars; an operation which requires great nicety, since the pelt would be injured by allowing the fermentation to proceed too far. After the wool has been removed, and the skins have been scraped to free them from a slimy substance which exudes from the pores, the pelts are immersed in lime-water for a few days, to remove the grease which yet remains in them. The subsequent operations of removing the lime, tawing, &c., are similar to those required for other skins. In tawing sheep-skins with the wool on, for housings and similar articles, the wool side is carefully folded inwards, to protect it from the tawing liquid or paste, which is then applied to the flesh side only. Other skins are occasionally converted into leather without removing the wool or hair.

The only other kind of leather to be here noticed is that in which oil or grease is forced into the pores of the skin to take the place of the animal matter, which would tend to its decomposition by putrefaction. This kind of leather takes its name from a fine soft leather prepared from the skin of the chamois goat; and the process by which it is made is called shamoying or shammying. Such leather was formerly very much used as an article of clothing, especially by soldiers; and it is still applied to several useful purposes, for which its peculiar softness and pliability renders it valuable. Wash-leather may be cited as a common example of this kind of preparation. The skins of deer, goats, sheep, &c. are dressed in this way; and much shamoyed leather is made from the inferior or least regular portion of split skins, in cases where the grain side has been taken off carefully of a uniform thickness for preparation in a different way. In general, when whole skins are shamoyed, the grain surface is removed by scraping or rubbing with pumice-stone. After the usual preparation with lime-water, and subsequent washing in a sour infusion of bran or some similar liquor, to remove the lime and open the pores, the skins are made as dry as possible by wringing or pressing them, and, in the process practised at the Neckinger Mills, are then exposed to the action of fulling-stocks, which consist of heavy wooden hammers, faced with copper, and set in motion by connection with a revolving shaft. A wheel revolves near the head of each hammer, of which two are mounted together in one framework; and this wheel is made, during its revolution, alternately to raise the hammer about a foot, and to let it fall into a trough fitted to receive its head. The leather, or rather a roll of the skins which are to be made into leather, is placed in this trough, and beaten by the hammers until it is perfectly dry. Cod-oil is then poured upon the skins and forced into their pores by the action of the hammers or stocks; the form of the trough being such that the skins gradually turn themselves over and over during the operation, to render the beating uniform. When the oil is thoroughly beaten in, the skins are hung up to dry, after which they are returned to the trough to receive a fresh supply of oil and a repetition of the beating. This is repeated eight or nine times, until two or three gallons of oil have been imbibed by one hundred skins; and when they are sufficiently impregnated with it, they are placed in large tubs, or hung up in close heated chambers, in which they undergo a kind of fermentation, by which the pores are distended, and the action of the oil upon the fibres is completed; and finally they are immersed in a weak solution of potash, which removes whatever excess of oil may have remained in the leather, forming with it a saponaceous mixture. They are then hung up in the open air to dry.

(Dr. Ure's *Dictionary of Arts*, &c., art. 'Leather;' *Encyclopædia Britannica*, seventh edit., art. 'Tanning;' Hebert's *Engineer's and Mechanic's Encyclopædia*, art. 'Leather;' *Penny Magazine*, No. 652.)

TANSI'LLO, LUIGI, born of a noble family at Nola, in the kingdom of Naples, about the year 1510, wrote in his youth a licentious poem, entitled 'Il Vendemmiatore,' or 'the Vintager,' wherein he deals largely in the obscene jokes and scurrilities in which the peasantry of his country indulge during the vintage season, something after the manner of the antient Saturnalia. This poem, which the author did not intend for the press, was published by some friend through an abuse of confidence. In order to make amends, Tansillo wrote a pious poem, entitled 'Le Lagrime di San Pietro,' of which a part only was published before his death. A more complete edition of it was published in 1606. Malherbe made a translation, or rather wrote an imitation of it, entitled 'Les Larmes de St. Pierre, imitées du Tansille, au Roi Henri III.,' 1587. Tansillo resided chiefly at Naples, at the court of the Spanish viceroy

Don Pedro de Toledo and his son Don Garcia. He accompanied the viceroy in an expedition against the Barbary powers. He died about 1584. He wrote also a georgical poem, entitled 'Il Podere,' and another didactic poem, entitled 'La Balia,' besides sonnets, canzoni, and other lyric poems, in which he has displayed great poetical powers. He has been compared by some with Petrarca. A complete edition of Tansillo's works was published at Venice in 1738, in 4to. (Tiraboschi, *Storia della Letteratura Italiana*; Corniani, *Secoli della Letteratura Italiana*.)

TANSY. [TANACETUM.]

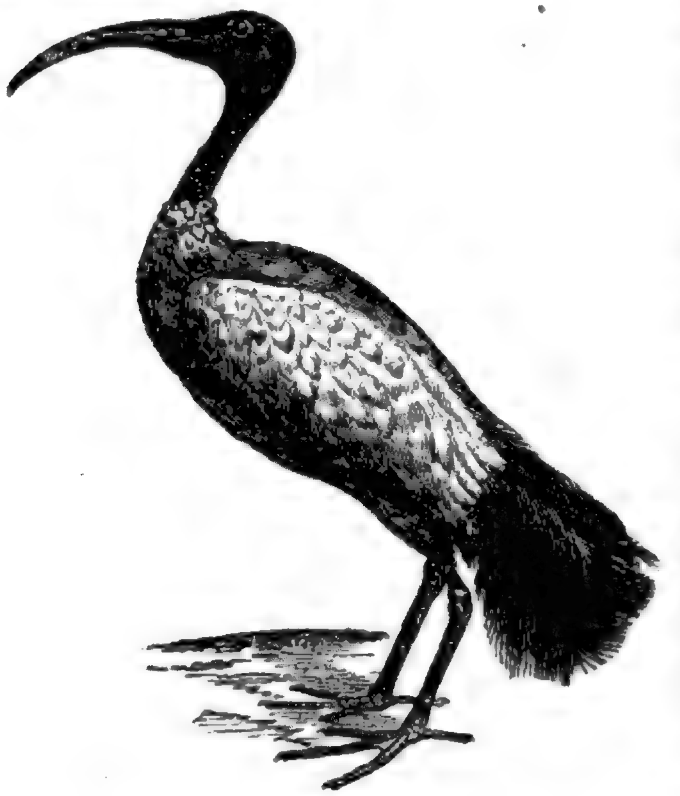
TANTA'LIDÆ, a family of Wading Birds. [GRALLATORES.]

The genus *Tantalus* of Linnæus stands between the genera *Ardea* and *Scolopax*, in the twelfth edition of the *Systema Naturæ*.

Cuvier places the genus *Tantalus* between the *Openbeaks* (*Hians*, Lacép.; *Anastomus*, Ill.) and the *Spoonbills* (*Platalea*, Linn.). He characterizes the genus as having the feet, the nostrils, and the bill of a stork; but the back of the bill is, he observes, rounded, and its point curved downwards and slightly notched on each side: a portion of the head, and sometimes of the neck, is, he adds, denuded of feathers. He notices the following species: the American Tantalus, *Tantalus loculator*, Linn.; the African Tantalus, *Tantalus Ibis*, Linn.; and the Ceylonese Ibis, *Tantalus leucocephalus*, the largest of all.

Of *Tantalus Ibis*, he remarks that it is white slightly clouded with purple on the wings, with a yellow beak, and the skin of the face naked and red, adding that it was for a long time regarded by naturalists as the bird so much revered by the antient Egyptians under the name of *Ibis*, but that recent researches had proved that the Ibis is a much smaller species, of which he intends to treat thereafter. This species, he states, is not commonly found in Egypt, but that it had been brought from Senegal. *Tantalus* he arranges in the family *Cultirostres*.

Ibis, Cuv., finds a place in the *Règne Animal*, as the second genus of Cuvier's *Longirostres*, between *Scolopax* and *Numenius*, Cuv.



Ibis religiosa, Cuv.—Adult.

Cuvier states that he has separated the Ibises from the *Tantali* of Gmelin, because their bill, arched like that of the *Tantali*, is nevertheless much more feeble, and without any notch at the point, whilst the nostrils, pierced towards the back of its base, are each prolonged into a furrow which continues to the tip. The bill, he adds, is rather thick, and nearly square at its base: there is always, he further remarks, some part of the head, or even of the neck, denuded of feathers. The external toes are notably palmated at their base, and the hind toe is sufficiently long to touch the earth. Some of the species, he observes, have the legs short and reticulated: these are the most robust and have the largest bill.

Of this genus Cuvier notices the following species:—

L'Ibis sacré (*Ibis religiosa*, Cuv.; *Abou-Hannes*, Bruce, pl. 35; *Tantalus Æthiopicus*, Lath.). For the adult of this species he refers to *Ossemens Fossiles*, tom. i., pl. 1 and 2 (skeleton and perfect bird); and for the young to Savigny, *Descrip. de l'Egypte*, *Hist. Nat. des Ois.*, pl. 7.

'This,' says Cuvier, 'is the most celebrated species: it was reared in the temples of antient Egypt, with veneration which approached to worship; and it was embalmed after its death, as some said, because it devoured the serpents which would otherwise have become dangerous to the country:—according to others, because there was a resemblance between its plumage and some of the phases of the moon: finally, according to other some, because its advent announced the rising of the Nile. For a long time it was thought that this Ibis of the Egyptians was the Tantalus of Africa: we now know that it belongs to the genus of which we are treating. It is as large as a hen, with white plumage, except the end of the wing-feathers, which is black; the last coverts have their barbs elongated, loose, black, with violet reflections, and thus covering the end of the wings and tail. The bill and the feet are black, as well as all the naked part of the head and neck: this part is covered in youth, at least on its upper surface, with small blackish feathers. The species is found throughout the extent of Africa.' [ABOU-HANNES.]

The other species noticed by Cuvier are—*L'Ibis rouge* (*Scolopax ruber*, Linn.; *Tantalus ruber*, Gm.) and *L'Ibis vert*, vulg. *Courlis vert* (*Scolopax falcinellus*, Linn.). (*Règne Animal*.)

The following is the description of *L'Ibis vert* (*Ibis falcinellus*):—Purpled chestnut, with deep green mantle. The young with the head and neck sprinkled with whitish. *Locality*, South of Europe and North of Africa. (*Règne Animal*.)

This, Cuvier observes, is to all appearance the species which the antients called the *Black Ibis*. [ABOU-HANNES, vol. i., p. 38.]

The views of Mr. Vigors with regard to the position of *Tantalus* will be found in the article HERONS, vol. xii., p. 165.

Mr. Swainson states that the *Tantalidæ*, or Ibises, are large and very singular birds, living almost entirely on the swampy banks of rivers and fresh waters, rarely, if ever frequenting open shores, like the more typical waders. He observes that their habits and structure seem compounded of those belonging to the HERONS on one side and to the *Rails* [RALLIDÆ] on the other: their flight and size, he says, remind us of the former, while their long toes and insectivorous nature are more in unison with the latter. He traces their analogy to the *Tenuirostres* in the metallic colours of their plumage and in their having their heads frequently bare of feathers, as in the *Ampelidæ* and other tenuirostral types. The majority, he remarks, live in tropical latitudes.

In the *Synopsis* the following characters of the family (which is placed between the *Ardeidæ* and *Rallidæ*) are given:—

Tantalidæ.

Family Character.—Size large. Bill hard, considerably lengthened, cylindrical, and curved from the base. Face and head more or less naked. Hinder toe on the same plane as the others. Plumage metallic.

Genera.

Anastomus, Ill. *Open beak.* Bill straight, hard, heavy, solid, compressed, marked with longitudinal wrinkles. Upper mandible very straight; the base thickened at the top and as high as the crown; the tip notched; the margin dentated: under mandible greatly curved upwards, and only touching the upper at the base and at the tip.

Example, *Anastomus lamelligerus*.

Tantalus, Linn. Bill nearly as thick at the base as the head; cylindrical and attenuated towards the tips, which are slender and slightly bent: margins entire. Upper mandible notched. Nostrils naked, vertical, basal, oval-oblong. Toes connected at the base.

Example, *Tantalus loculator*.

Ibis, Antiq. Bill much more slender; cylindrical, and arched from the base. Nostrils basal, lateral. Wings broad, ample: the second and third quills longest.

Example, *Ibis ruber*.

Aramus, Vieill. Bill lengthened, slightly curved towards the point, which is entire and inflexed. Under mandible curved from about the middle and angulated. Furrow of the nostrils long. Nostrils lateral, remote from the base, longitudinal. Feet long. Hallux elevated. Anterior toes divided at their base. Wings moderate; the two first quills shorter than the third, which is the longest. America.

Example, *Aramus scolopacius*. (*Classification of Birds.*)

The Prince of Canino places the *Tantalidæ* between the *Psophidæ* and *Scolopacidæ*, and arranges under the former the genera *Tantalus* and *Ibis*. (*Birds of Europe and North America.*)

Mr. G. R. Gray makes the *Tantalinæ* the fifth and last subfamily of the *Ardeidæ*, placing it next to the *Ciconinæ*, and arranging under it the following genera:—

Tantalus, Linn. *Ibis*, Mœhr. *Geronticus*, Wagl. *Cercibis*, Wagl. *Theristicus*, Wagl. *Phimosus*, Wagl. *Harpiprion*, Wagl. *Falcinellus*, (Ray) Bechst. *Aramus*, Vieill.

Mr. Gray gives the synonyms of all these genera. (*List of the Genera of Birds*, 2nd edit.)

We proceed to illustrate the Ibises of America by Nuttall's description of the *Scarlet Ibis*, *Ibis rubra* of Vieillot, *Tantalus ruber* of Linnæus, *Red Curlew* of Catesby.

This species is 23 inches in length and 37 in alar extent. Bill 5 inches long, thick, and of a somewhat square form at the base, gradually bent downwards and sharply ridged; black, except near the base, where it inclines to red. Iris dark-hazel. The face naked, slightly wrinkled, pale-red. Chin bare, wrinkled also. Plumage rich, glowing scarlet, except about three inches of the extremities of the four outer quill-feathers, which are deep steel-blue. Legs pale red; the three anterior toes united by a membrane as far as the first joint. (Nuttall.)

'This brilliant and exclusively American species, inhabits chiefly,' says Nuttall, 'within the tropics, abounding in the West India and Bahama Islands, and south of the equator, at least as far as Brazil. They migrate in the course of the summer (about July and August) into Florida, Alabama, Georgia, and South Carolina; but retire into Mexico, or the Caribbean Islands, at the approach of cool weather. They generally associate in numbers, frequenting the borders of the sea, and the banks and æstuaries of neighbouring rivers, feeding on small fry, shellfish, crustacea, worms, and insects, which they collect at the ebbing of the tide. They are said to be in the habit of perching on trees in companies; but they lay their eggs, which are greenish, on the ground, amidst the tall grass of the marshes, on a slight nest of leaves. When just hatched, the young are black, soon changing to grey, but are nearly white before they are able to fly; by degrees they attain their red plumage, which is not complete until the third year. The young and old associate in distinct bands. In the countries where they abound, they are sometimes domesticated, and accompany the poultry. The Ibis shows great courage in attacking the fowls, and will even defend itself from the insidious attacks of the cat. It is generally esteemed as good food; and its rich and gaudy plumage is used by the Brazilians for various ornaments.' (*Manual of the Ornithology of the United States and of Canada.*)

TANTALITE. [Columbium.]
TANTALUM. [Columbium.]
TA'NTALUS. (Ornithology.) [Tantalidæ.]
TANYSI'PTERA. [Kingfishers, vol. xiii., p. 232.]
TAORMI'NA. [Messina; Tauromenium.]
TAOS. [Mexican States.]
TAP ROOT. [Root.]
TAPAJOS. [Brazil.]
TAPE WORM. [Entozoa.]

TAPESTRY (French, *Tapisserie*; Italian, *Tappezzeria*). This name is most commonly applied to the textile fabrics, usually composed of wool or silk, and sometimes enriched with gold and silver, woven or embroidered with figures, landscapes, or ornamental devices, and used as a lining or covering for the walls of apartments. It is derived from the French 'tapis,' which is from the Latin 'tapetum,' 'tapes,' 'tapete.' The Latin word is the same as the Greek 'tapes' or 'tapis' (τάπης, τάπις). The Latin and Greek words signified a carpet or covering for a bed or couch. The French 'tapis,' though generally applied to carpets, is also used to express other figured cloths used as coverings, such as the coverings of tables; whence, most probably, we have the common expression 'on the tapis,' as applied to subjects under discussion or consideration. Of the use of the word tapestry in this more extended sense, there is an instance in Shakspere's 'Comedy of Errors,' act iv., sc. 1, where Antipholus of Ephesus sends to Adriana, informing her that

> 'in the desk
> That's covered o'er with Turkish tapestry,
> There is a purse of ducats,' &c.

Johnson, who cites this passage, gives also one from Dryden, in which tapestry is used in the sense of carpet:

> 'The casements are with golden tissue spread,
> And horses' hoofs, for earth, on silken tapestry tread.'

In this more general sense the term is used by M. Achille Jubinal, in his recently published work, entitled 'Recherches sur l'Usage et l'Origine des Tapisseries,' in which he extends his inquiry to worked or figured cloths (tapisseries à ymaiges) used for many other purposes than the covering of walls. To this work we are indebted for much of the following information respecting the history of tapestry.

The early history of the art of producing figured fabrics by the loom may be more conveniently treated of under Weaving than in this place; and it may be sufficient here to observe, that although the loom was employed from the earliest times by the Greeks and Romans for the production of ordinary tissues, its application to the weaving of ornamented or figured fabric swas chiefly Oriental. It is probable also that many of the early tapestries were embroidered by hand or worked with the needle. This kind of work, of which the Bayeux tapestry is a celebrated example, was continued long after the practice of weaving tapestry in the loom had become common. The ornamented curtains of the Jewish tabernacle, described in the twenty-sixth, thirty-fifth, and thirty-sixth chapters of Exodus, are generally considered to have been embroidered by the needle. Jubinal supposes that they were worked with a needle in thread of silk, gold, or wool, in such a manner as to imitate the brilliancy of the plumage of birds; but he conceives that the vail of the Holy of Holies, which is described in the English translation of the Bible as of 'cunning work' (*Exodus*, xxvi. 31; and xxxvi. 35), and which was ornamented with cherubim, was produced by the skill of the weaver, 'that is to say, executed by the shuttle with woofs of various colours, and in woven stuff.'

The Jews are supposed to have derived their skill in embroidery and other ornamental work of similar character from the Egyptians, who produced figured cloths both by the needle and the loom, and practised the art of introducing gold thread or wire into such work. Wilkinson observes (*Manners and Customs of the Antient Egyptians*, vol. iii., p. 128), 'Many of the Egyptian stuffs presented various patterns worked in colours by the loom, independent of those produced by the dyeing or printing process, and so richly composed that they vied with cloths embroidered by the needle.' Jubinal quotes several antient authors who refer to figured tissues as made and used by the Egyptians and other nations of antiquity. Tapestry was used by the Babylonians to represent the mysteries of religion, and to perpetuate historical facts. Philostratus, in his Life of Apollonius of Tyana, mentions Babylonian tapestry ornamented with silver and gold. The Greeks practised the art of embroidering figures upon cloth, and attributed its invention to Minerva. Homer alludes, in several passages of the 'Iliad' and 'Odyssey,' to embroidered stuffs of the character designated by Jubinal 'tapisseries à ymaiges,' among which he comprises even some articles of dress. Without attempting to pursue the investigation of this subject minutely, a general idea of the character of these ornamental tissues may be given by a reference to the article 'Peplum' in the 'Dictionary of Greek and Roman Antiquities,' edited by Dr. Smith; the author of the article 'Peplum' observes, that of all the productions of the loom, shawls were those upon which the greatest skill and labour were employed; and that the subjects represented upon them were so various and tasteful, that poets delighted to describe them. He adds that 'Euripides describes one which represented the sun, moon, and stars; and which, with various others containing hunting-pieces and a great variety of subjects, belonged to the temple of Apollo at Delphi, and was used to form a magnificent tent for the purpose of an entertainment (*Ion*, 1141-1162); for it is to be observed that stores of shawls were not only kept by wealthy individuals (Homer, *Odyssey*, xv., 104-108), but often constituted a very important part of the treasures of a temple (Euripides, *Ion*, 329, 330), having been presented to the divinity on numerous occasions by suppliants and devotees. (Homer, *Iliad*, vi., 271-304; Virgil, *Æneid*, i., 480, *Ciris*, 21-35.)'

Several substances appear to have been used by the antients as materials for the ornamental fabrics alluded to. Jubinal states that flax, wool, and byssus [Byssus, vol. vi., p. 81] entered into their composition; and that the richest colours, embroidery, precious stones, and gold, were used in them. It is not very clear in what form and manner gold was applied in many cases. In the third verse of the thirty-ninth chapter of Exodus, Moses speaks of beating gold into thin plates, and then cutting it into wires, to work it into the ephod with cunning work; and Wilkinson states that probably the gold thread used in Egyptian embroidery was formed in like manner, and rounded by the hammer. Beckmann (*History of Inventions*, vol. ii., p. 212, &c.) enters minutely into this question, and states that he had not met with a single passage in antient authors where mention is made of metal being wire-drawn; yet Jubinal thinks that gold was perhaps sometimes used in antient tapestry in the form of fine drawn wires, flattened and wound round threads in a manner resembling modern gold thread. He further supposes that gold was sometimes introduced subsequently to the weaving of the tissue, by loosening its texture, and inserting the gold between the threads.

Scanty as are the notices of tapestry in antient writers, our information respecting it during the middle ages is not much fuller. Jubinal observes that we find females engaged in working tapestry with the needle from the earliest epochs of the French monarchy. Gregory of Tours, writing towards the close of the sixth century, in his description of the rejoicings which followed the profession of Christianity by Clovis and his people, speaks of the streets being shaded with painted cloths or curtains (*velis depictis*), and the churches being adorned with hangings; and again, in describing the consecration of the church of St. Denis, he mentions tapestries embroidered with gold and garnished with pearls. The fabrication of tapestry-hangings by the loom appears to have been introduced into France, at the earliest, about the ninth century, until which time the needle had been used exclusively in their production; and, long after that period, the two processes were practised concurrently. At this time we often find embroidered cloths enumerated among the decorations of churches. Jubinal quotes Father Labbe for the statement that many tapestries were made for the church of Auxerre prior to the year 840; and he relates that, about 985, there existed in the abbey of St. Florent, at Saumur, a great manufactory of stuffs, especially tapestries, which were woven by the inmates. From contemporary notices, it is evident that there was a celebrated manufacture of tapestry at Poitiers as early as 1025. Nor was the manufacture of tapestry confined to France at this period. The inhabitants of the north of Europe also practised it, and English embroidery was much admired and highly prized on the Continent. In the East also, where the art had been cultivated from the earliest antiquity, fine embroidery was produced in the eleventh century. Much of the early Oriental tapestry was adorned with grotesque figures; and, long after it became usual to depict natural figures and scenery upon tapestry, such devices were often used in ornamental borders.

In the twelfth and thirteenth centuries the use of tapestry extended greatly. It passed from churches and monasteries, in which it had been used for curtains, palls, altarcloths, vestments, &c., to the residences of the nobility. Respecting this change, Jubinal observes:—'If, in the solitude of the cloister, the monks had, as we have seen, practised the weaving of wool and silk for the sake of occupation, ladies and their followers, shut up in their castles during the long evenings of winter, the tedium of which was interrupted only by the perusal of works of piety or chivalry, embroidered with their needles the glorious actions of our forefathers. The high walls of these cold rooms, built of stone, spoke far more effectually to the hearts and imaginations of those who lived under their protecting shelter, when they were covered with interesting histories, with important instruction, or with glorious remembrances of the past, than when nothing appeared to veil their nakedness.' The use of tapestry in this way was one of the luxuries introduced from the East in consequence of the increased intercourse occasioned by the crusades. The crusaders brought accounts of the Oriental practice of covering walls with prepared and ornamented skins, chiefly those of goats and sheep. These, which were probably at first used of their natural size and shape, were, at a later period, cut into rectangular pieces, about two feet high, and rather less in width, and united by sewing into very solid and handsome hangings, which were well adapted to resist damp. Such hangings, or leather tapestry, were manufactured much at Venice and Cordova, and were sometimes either gilt all over, or ornamented with gilt devices, in which case they bore the name of *d'or basané*. The Oriental origin of the more ordinary kind of tapestry is indicated by the name *Sarazins* or *Sarazinois*, which was frequently applied in France to the early manufacturers.

Numerous allusions to the use of tapestry in the fourteenth and fifteenth centuries, collected from contemporary documents, are given by Jubinal. It was then not only used to cover the nakedness of interior walls, but was also employed, on great occasions, as for instance on the public entries of princes, to decorate streets, and to impart a joyful appearance to towns and public places. It formed part of the decorations of festal halls, and was employed to ornament the galleries and other erections required at tournaments. Rich embroidery was also much employed in the decorations of the horses and men who formed the actors in those chivalric amusements; and the brilliant, though often grotesque devices of heraldry, which formed so important a part of the display upon such occasions, afforded extensive employment to the workers of tapestry and other ornamented tissues.

The art of making tapestry, for which the Flemings had been celebrated from the twelfth century, made considerable progress in Flanders in the fourteenth century, and attained its highest perfection there in the fifteenth. Guicciardini has ascribed the invention of tapestry to Flanders; but, if received at all, this statement must be supposed to refer merely to such as is produced by the loom. It is certain however that Europe is much indebted to the Flemings for the revival and improvement of tapestry, and for the production of many of the finest specimens yet existing. The countess of Wilton, whose interesting volume on 'The Art of Needlework' contains much information upon the subject of tapestry, is probably correct in assuming that the *weaving* of tapestry-hangings was not practised until they had become, from custom, a thing of necessity. 'Unintermitting and arduous,' she observes, 'had been the stitchery practised in the creation of these coveted luxuries, long, very long, before the loom was taught to give relief to the busy finger.' Tapestry manufactories were early established at Brussels, Antwerp, Oudenarde, Lisle, Tournay, Bruges, and Valenciennes; but that of Arras* was more celebrated than any other, and its productions were so highly prized, that the name *arras* became a common expression for the finest tapestry generally, whether made in that place or elsewhere. The hangings of Arras, as well as those of other manufactories in France, were, says Jubinal, for the most part executed in wool. Hemp and cotton were also used in them, but no silk or gold thread. The fabrication of tapestries formed of these substances was carried on chiefly at Florence and at Venice. The recollection of this difference is important in discovering where old tapestries were made, and Jubinal refers to instances of the difference in some of those engraved in his great work on this description of monuments. Writing of the period under consideration, he observes that the devices (*ymaiges*) of the tapestry were very various. We have seen that they sometimes represented scenes from antient history, from the fabulous stories of heroes, and from modern historical events; but the imagination of the tapestry-designers did not stop there. The hangings of the fourteenth century often represented hunts, fantastical animals, or the occupations peculiar to the different seasons of the year; and romantic and chivalric poems afforded a rich store of subjects for illustration. Jubinal quotes inventories of tapestries, receipts, &c., of the fourteenth century, in which tapestries of the above and of several other varieties are mentioned. The account given of those belonging to Charles V. of France is particularly curious. It is taken from an inventory preserved in the Bibliothèque du Roi, which, besides tapestries ornamented with figures, mentions heraldic tapestries (*tapisseries d'armoirie*), and *tappiz velus*, or hairy or shaggy tapestry. The fifteenth century affords many similar documents, though Jubinal does not give them so fully. He gives however very long extracts from a MS. in the Bibliothèque du Roi respecting some old tapestries, from which it is evident that the names *tapis Sarrazinois* and *tapis de Turquie*[*] were often applied to hangings fabricated in the West, they being probably made in imitation of Oriental work. In this epoch tapestry was often alluded to by poets, and to it is attributed the fabrication of most of the tapestries to which the term 'tapisseries historiées' has been applied.

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* Tapestry of Arras, representing the battles of Alexander the Great, formed part of the present sent by the king of France, in 1396, to the sultan Bajazet, to induce him to ransom some captives taken at the battle of Nicopolis. (Macpherson, *Annals of Commerce*, vol. i., p. 608.)

The sixteenth century, which was an age of general improvement in France, gave a new impulse to the production of tapestry. Francis I. founded the manufactures of Fontainebleau, in which threads of gold and silver were skilfully introduced into the work. It was, we are informed, with this new impulse that the practice was commenced of weaving tapestry in a single piece, instead of composing it, as before, of several smaller pieces joined together. This prince brought Primaticcio from Italy [Primaticcio, Francesco, vol. xix., p. 1], and, among other works of art, commissioned him to make designs for several tapestries, which were woven at Fontainebleau. Francis spared no pains in the encouragement of this department of the fine arts. He engaged Flemish workmen, whom he supplied with silk, wool, and other materials, and paid liberally for their labour; and documents exist to prove that he also patronized the tapestry-makers of Paris. Henry II., the son and successor of Francis, continued to encourage the manufactory at Fontainebleau, and established a manufacture of tapestry on the premises of the Hôpital de la Trinité, which attained its highest celebrity in the reign of Henry IV., and produced many fine tapestries. In 1594 Du Bourg, the most eminent artist connected with this establishment, made there the celebrated tapestries of St. Meri, which were in existence until a recent period; and these pleased Henry IV. so much, that he determined to re-establish the manufacture of tapestry at Paris, where it had been interrupted by the disorders of the preceding reigns. This he did in 1597, bringing Italian workers in gold and silk to assist in the work.

The narrative of M. Jubinal, from which most of the preceding facts are taken, does not extend later than the close of the sixteenth century; but, to continue the history of the tapestry manufacture in France without interruption, we may turn to the volume recently published by the Countess of Wilton. A few years after the events last mentioned, as appears from his 'Memoirs,' the Duc de Sully, Henry's minister, was actively engaged in promoting this branch of industry. In 1605 were laid the foundations of new edifices for the tapestry-weavers, in the horse-market at Paris; and at that time, or a little later, Flemish workmen were engaged to superintend the manufacture. The establishment languished, if it did not become quite extinct, after the death of Henry IV.; but when the royal palaces, especially the Louvre and the Tuileries, were receiving their rich decorations, in the reign of Louis XIV., his minister Colbert revived it, and from that time the celebrated royal tapestry-manufactory of the Gobelins dates its origin. This was established in premises which had been erected by celebrated dyers named Gobelin [Gobelin, vol. xi., p. 286], but which were purchased by Louis XIV. in or about the year 1666, and adapted to the tapestry-manufacture, under the name of Hôtel Royal des Gobelins. Foreign artists and workmen were engaged, laws were drawn up for the protection and government of the manufactory, and everything was done to render it, what it has ever since remained, the finest establishment of the kind in the world. 'The quantity of the finest and noblest works that have been produced by it,' observes the work above referred to, 'and the number of the best workmen bred up therein, are incredible; and the present flourishing condition of the arts and manufactures of France is, in great measure, owing thereto.' The production of tapestry at the Gobelins is said to have attained the highest perfection in the time of the minister Colbert and his successor M. de Louvois. Le Brun, when chief director of the establishment, made many designs for working after; and M. de Louvois caused tapestry to be made from some of the finest designs of Raphael, Julio Romano, and other Italian painters. A further account of this celebrated manufacture is given in the elegant volume which has just appeared under the title of 'The Hand-book of Needlework,' the authoress of which writes under her maiden name, Miss Lambert. She states that the manufacture declined greatly at the Revolution, but was revived under the government of Napoleon, and has ever since been carried on successfully, though by no means to the same extent as formerly. About 1802 ninety persons were employed in it, chiefly in preparing tapestry for the palace of St. Cloud. 'The pieces executed,' according to the work last named, 'are generally historical subjects, and it occasionally requires the labour of from two to six years to finish a single piece of tapestry.' 'The productions of this manufactory,' says the same authority, 'which is entirely supported by the government, are chiefly destined for the royal palaces, or for presents made by the king; but some few pieces, not designed as such, are allowed to be sold.' Wool is the only material now used, it being found to retain its colours better than any other; and in connection with the weaving establishment is one for dyeing wools, under the direction of able chemists, in which many colours are dyed for this purpose exclusively. From a passage in Evelyn's 'Diary' (Oct. 4, 1683), in which he speaks with admiration of some new French tapestry he had seen in the apartments of the duchess of Portsmouth, it appears that the productions of this manufactory were known in England at that time.

The preceding historical notices respecting tapestry refer almost exclusively to France, but we must retrace our steps to take a brief review of the use and manufacture of this kind of fabric in England. Respecting the Anglo-Saxon period, it is observed in the 'Pictorial History of England' (vol i., p. 323):—'The dwellings of the higher classes appear to have been completely and sometimes splendidly furnished: their walls were hung with silk richly embroidered with gold or colours. The needle-work for which the English ladies were so famous was herein displayed to great advantage. Ingulphus mentions some hangings ornamented with golden birds in needle-work, and a veil or curtain on which was represented in embroidery the destruction of Troy. In the Anglo-Saxon poem of Beowulf we read that, in 'the great wine-chamber'—

'There shone variegated with gold
The web on the walls.
Many wonders to the sight
Of each of the warriors
That would gaze on it became visible.'

'The Saxon term for a curtain or hanging was *waarift*; and, in the will of Wynflœda, we find the bequest of a long *heall wahrift* and a short one. The same lady also bequeaths three coverings for benches or settles (*setl-hrægl*).' The Bayeux Tapestry (vol. iv., p. 68) is perhaps the most antient piece of needlework in existence. It was probably owing to the expense of such hangings, when of large size, and the very long time required for their production, that the less comfortable device of painting the walls of chambers was extensively adopted in the early Norman period. Of this time the work before quoted observes (vol. i., p. 635):—'The hangings of needle-work and embroidery which adorned the walls of the Anglo-Saxon palaces, seem to have been partially superseded in the course of this period by the fashion of painting on the walls themselves, or the wainscot of the chamber, the same historical or fabulous subjects which had hitherto been displayed in threads of colours and gold.' Many instances might be enumerated of this kind of decoration, but it is sufficient to refer to the directions given by Henry III. early in his reign, for the painting of his wainscoted chamber in Winchester castle with the same pictures with which it had been previously adorned; a circumstance presumed by Walpole to indicate the very early existence of historical painting in England. The practice alluded to appears to have extended considerably during the reigns of Henry III. and his immediate successors; and, according to the same authority (vol. i., p. 864), the paintings were, in several instances, directed to be made in imitation of needle-work tapestries. Lady Wilton states that tapestry of needle-work, like the Bayeux tapestry of Matilda, which 'had been used solely for the decoration of altars, or the embellishment of other portions of sacred edifices, on occasions of festival or the performance of solemn rites, had been of much more general application amongst the luxurious inhabitants of the South, and was introduced into England as furniture hanging by Eleanor of Castile.' That tapestry was not originally introduced by that queen will be seen by the facts stated above; and we know not whether there is any further authority for the statement than the mention, by Matthew Paris, of her having used tapestry for covering floors, the word being apparently used in the sense of carpet. (*Pict. Hist. of England*, vol. i., p. 865, note.) Chaucer mentions a 'tapiser,' in company with a 'webbe' and a 'dyer,' among his Canterbury pilgrims; from which circumstance it may be presumed that the business was not a very uncommon one towards the close of the fourteenth century. In the fifteenth century the use of tapestry greatly extended in England; but then, and for long after, the principal supply appears to have been from the Continent. In the sixteenth century a kind of hanging was introduced which holds a place intermediate between painted walls and woven or embroidered tapestry. Shakspere alludes to these hangings under the name of 'painted cloths.'[*]

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[*] In describing, in a subsequent page, a remarkable Persian tapestry of the sixteenth century, embellished with emblematical devices, which is now in the possession of the Marquise de Lagoy, at Aix, Jubinal observes that the finest Persian tapestries are the produce of Khorassan, especially of the town of Yezd. These, he adds, are what we commonly call Turkish tapestries, not because they come from the Ottoman empire, but because, before the discovery of the passage round the Cape of Good Hope, Turkey formed the only way of communication with Persia. The establishment of the royal tapestry manufactories in France put an end to the importation of foreign tapestry; but the art of working it is stated to be continued successfully in the East, even to our own day.

The appearance of the rich tapestry common in the Elizabethan period is admirably described by Spenser, in his 'Faerie Queene,' book iii., canto ix., in the account of the tapestry seen by Britomart in the apartments of the house of Busirane, in the following lines:—

'For round about the walls yclothed were
With goodly arras of great majesty,
Woven with gold and silke so close and nere,
That the rich metall lurked privily,
As faining to be hid from envious eye;
Yet here, and there, and everywhere, unwares
It shewd itselfe, and shone unwillingly;
Like a discolourd snake, whose hidden snares
Through the greene gras his long bright-burnisht back declares.

The poet described what he was in the habit of seeing, and sufficient remains yet exist to attest the accuracy of his description; although in most cases the brilliancy of the metallic threads and the beauty of the colours are greatly impaired, and in some instances the gold and silver threads have been artfully withdrawn, their intrinsic value proving too strong a temptation for cupidity to resist.

The introduction of tapestry-weaving into England is usually attributed to a gentleman named Sheldon, late in the reign of Henry VIII. Lady Wilton mentions indeed an intimation by Walpole of its origin as early as the time of Edward III.; but if any attempt was made to introduce the art at that time, it does not appear to have produced any important result. According to her 'Art of Needlework,' Sheldon allowed an artist, named Robert Hicks, to use his manor-house at Burcheston, in Warwickshire, for the practice of the art; and mentioned him in his will, which was dated 1570, as 'the only auter and beginner of tapistry and arras within this realme.' At Burcheston were worked in tapestry, on a large scale, maps of Oxfordshire, Worcestershire, Warwickshire, and Gloucestershire, some fragments of which were, it is stated, in Walpole's collection at Strawberry Hill. Little more is known of this establishment. James I. endeavoured to revive the manufacture of tapestry by encouraging and assisting in the formation of an establishment at Mortlake, about 1619, under the management of Sir Francis Crane. James I. gave 2000*l*. towards the formation of this establishment, which appears to have been originally supplied with designs from abroad, but subsequently by an artist named Francis Cleyne, or Klein, a native of Rostock, in the duchy of Mecklenburg, who was engaged for the purpose. This undertaking was a favorite hobby both with James and his successor, who regarded Cleyne so favourably that he bestowed upon him, in 1625, an annuity of 100*l*. (Rymer's *Fœdera*, vol. xviii., p. 112), which he enjoyed until the civil war. In the same year Charles I. granted 2000*l*. a year for ten years to Sir Francis Crane, in lieu of an annual payment of 1000*l*. which he had previously covenanted to pay for that term, as the grant recites, 'towards the furtherance, upholding, and maintenance of the worke of tapestries, latelie brought into this our kingdome by the said Sir Francis Crane, and now by him and his workmen practised and put in use at Mortlake, in our countie of Surrey;' and of a further sum of 6000*l*. due to the establishment for three suits of gold tapestries. (*Fœdera*, vol. xviii., p. 60.) After the death of Sir Francis Crane, his brother, Sir Richard, sold the premises to the king, and during the civil war they were seized as royal property. After the Restoration, Charles II. endeavoured to revive the manufacture, and employed Verrio to make designs for it, but the attempt was unsuccessful. Lady Wilton however conceives that, although languishing, the work was not altogether extinct, 'for,' she observes, 'in Mr. Evelyn's very scarce tract entitled "Mundus Muliebris," printed in 1690, some of this manufacture is amongst the articles to be furnished by a gallant to his mistress.' During its period of prosperity, this manufacture produced the most superb hangings, after the designs of celebrated painters, with which the palaces of Windsor Castle, Hampton Court, Whitehall, St. James's, Nonsuch, Greenwich, &c., and many of the mansions of the nobility, were adorned. Five, at least, of the cartoons of Raphael, which appear to have been bought by Charles I. for that purpose, were worked in tapestry at Mortlake. These celebrated works were designed for the purpose of being copied in tapestry, and were originally worked in Flanders. [CARTOON, vol. vi., p. 330.] An act of parliament was passed in 1663 to encourage the linen and tapestry manufactures of England, and to restrain the great importation of foreign linen and tapestry.

The use of the word 'hangings,' as applied to tapestry, as well as to other kinds of lining for rooms, perhaps sufficiently indicates the manner in which such decorations were formerly put up. 'The tapestries,' observes the Countess of Wilton, 'whether wrought or woven, did not remain on the walls as do the hangings of modern days: it was the primitive office of grooms of the chamber to hang up the tapestry, which, in a royal progress, was sent forward with the purveyor and grooms of the chamber.' She relates a curious anecdote in illustration of this practice. Henry IV. of France, wishing to do honour to the pope's legate, the cardinal of Florence, when visiting St. Germain-en-Laye, sent orders to hang up the finest tapestry; but, by an awkward blunder, the suit selected for the cardinal's chamber was embellished with satirical emblems of the pope and the Roman court. The mistake was discovered by the Duc de Sully, on whose authority the anecdote is given, and another suit was substituted for that with the offensive devices. In a subsequent chapter, on 'The days of good Queen Bess,' after showing the universality of tapestry and similar decorations in the houses of the nobility and gentry of England, it is stated that tapestry was at that time suspended upon frames, which were probably, in many cases, at a considerable distance from the walls, as we frequently read of persons concealing themselves, like Falstaff (*Merry Wives of Windsor*, act iii., scene 3), 'behind the arras.'

The interest attached to antient tapestries as historical monuments, as well as in the character of works of art, is of no mean order. The most important work on this department of archæology is that of M. Jubinal, the author of the historical treatise quoted in the former part of this article, entitled 'Les Anciennes Tapisseries Historiées,' in which are given minute descriptions, illustrated by many large folio plates, of the most remarkable tapestries made from the eleventh to the sixteenth century, and preserved to the present time. Such monuments, as he observes in his preface, sometimes represent to us, with a charming and faithful *naïvete*, grave historical events, and sometimes scenes of gaiety. 'There they show us a siege or a tournament; here, a feast; a little farther, a chace; and always, whether chace, banquet, tournament, or siege, all is, as Montaigne would have said, pourtrayed to the life; they all retrace to us most literally the mode of life of our fathers, showing us their residences, their churches, their dresses, their arms, and even (thanks to their explanatory legends) their language at different epochs. Further than this, if we refer to the inventory of Charles V., made in 1379, we find that all the French literature of the fruitful ages preceding the era of that wise monarch had been by his orders translated into wool.' At a later period, although the beauty of tapestry was increased by improvements in the arts of weaving and dyeing, and by the adoption of superior designs, much of its peculiarly interesting character was lost. Jubinal, in the smaller work frequently quoted in the earlier part of this article, regrets the disappearance of the Gothic labels, which contained quaint descriptions of the subjects represented; of the peculiar architecture of the middle ages (*architecture à ogives*), and of the furniture and dresses of our forefathers; and he conceives that their place is but ill supplied by the imitation, 'clever in the great masters, but detestable in their disciples,' of Greek and Roman forms, of which he refers to 'celebrated and grievous examples in the compositions of Rubens reproduced by the manufactory of the Gobelins; in the tapestries of Beauvais, and in those of Aubusson.'

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[*] In Malone's edition (1821) many references to this kind of substitute for woven or embroidered tapestry, by various authors, are given. See notes on 'As you like it,' act iii., s. 2 (vol. vi., pp. 434-6), and 'Henry IV.,' Part 2, act ii., s. 1 (vol. xvii., p. 54). From the latter passage it would appear that the hangings alluded to were sometimes painted in water-colours.

In the primitive method of working tapestry with the needle, the wool was usually applied to a kind of canvas, and the effect produced was coarse and very defective; but some finer kinds of tapestry were embroidered upon a silken fabric. The process of weaving by the loom, after the manner known as the *haute lisse*, or high warp, was practised in the tapestries of Flanders (and, according to Jubinal, in those of England also), as early as the fourteenth and fifteenth centuries; the only essential difference between these and the productions of modern times being that previously noticed, the comparative size of the pieces woven in the loom. The weaving of tapestry, both by the 'haute lisse' and the 'basse lisse,' appears to be of Oriental invention; and the difference between the two methods may be briefly described. In the 'haute lisse' the loom, or rather, the frame with the warp-threads, is placed in a perpendicular position, and the weaver works standing; while in the 'basse lisse' the frame with the warp is laid horizontally, and the weaver works in a sitting position. In weaving with the 'basse lisse,' which, Miss Lambert observes, is now relinquished, the painting to be copied is laid beneath the threads of the warp, which are stretched in a manner resembling that of common weaving, the pattern being supported by a number of transverse threads stretched beneath it. The weaver, sitting before the loom, and leaning over the beam, carefully separates the threads of the warp with his fingers, so that he may see his pattern between them. He then takes in his other hand a kind of shuttle, called a *flûte*, charged with silk or wool of the colour required, and passes it between the threads, after separating them in the usual way by means of treddles worked by the feet. [WEAVING.] The thread of woof or shoot thus inserted is finally driven close up to the finished portion of the work by means of a reed or comb formed of box-wood or ivory, the teeth of which are inserted between the threads of the warp. In this process the face of the tapestry is downwards, so that the weaver cannot examine his work until the piece is completed and removed from the loom. The frame of the 'haute lisse' loom consists of two upright side-pieces, with large rollers placed horizontally between them. The threads of the warp, which usually consist of twisted wool, are wound round the upper roller, and the finished web is coiled round the lower one. The cartoon, or design to be copied, is placed perpendicularly behind the back or wrong side of the warp, and then the principal outlines of the pattern are drawn upon the front of the warp, the threads of which are sufficiently open to allow the artist to see the design between them. The cartoon is then removed so far back from the warp that the weaver may place himself between them with his back towards the former, so that he must turn round whenever he wishes to look at it. Attached to the upright side-pieces of the frame are contrivances for separating the threads of the warp, so as to allow the *flûte*, or broach, which carries the woof, to pass between them. Like the weaver with the 'basse lisse,' the operator works, as it were, blindfold; but by walking round to the front of the loom he may see the progress of his work, and may adjust any threads, which have not been forced into their right position by the reed or comb, with a large needle, called an *aiguille à presser*. The process of working with the 'haute lisse' is much slower than the other, and is indeed, says Jubinal, almost as slow as that of working with the needle. Lady Wilton, in describing the productions of the Hôtel Royal des Gobelins, observes that 'Not the least interesting part of the process was that performed by the *rentrayeurs*, or fine-drawers, who so unite the breadths of the tapestry into one picture, that no seam is discernible, but the whole appears like one design.' Now, however, the pieces are woven so wide that joining is very seldom resorted to, even for the largest pieces.

(Jubinal, *Recherches sur l'Usage et l'Origine des Tapisseries à Personnages, dites Historiées; The Art of Needlework*, edited by the Right Honourable the Countess of Wilton; *The Handbook of Needlework*, by Miss Lambert; &c.)

TAPHOZO'US. [CHEIROPTERA, vol. vii., p. 34.]

TAPIO'CA, a farinaceous substance, prepared in South America from two species of Janipha, or the bitter and sweet Cassada or Manioc plants, which two were long regarded as one species, and comprehended under the name of Jatropha Manihot, till Pohl distinguished them, calling the bitter *Manihot utilissima*, and the sweet *Manihot Aipi* (Pohl, *Pl. Brasil.*, ic. i. 32 t. 24). The chief distinction between them is that a 'tough ligneous fibre or cord runs through the heart of the sweet Cassava root, of which the latter is destitute.' Though the bitter contains a highly acrid and poisonous juice, from which the sweet is exempt, yet the bitter is cultivated almost to the entire exclusion of the other, which is probably owing to the greater facility with which it can be ground or rasped into flour, owing to the absence of the ligneous centre. The poisonous principle of the bitter manioc is thought to be of the nature of hydrocyanic acid. (Guibourt, *Hist. des Drogues*, tom. ii., p. 455. 3ième ed.) It is easily dissipated or decomposed by heat or fermentation: hence the flour becomes perfectly wholesome in the process of baking the cassava bread. [CASSAVA, vol. vi., p. 344.] The juice, after expression, may be inspissated by long boiling, or formed into a soup, with flesh and spices, called cassarepo. By means of molasses it can be fermented and converted into intoxicating drink.

The fecula, or flour, after the juice has been carefully expressed, having been washed, and dried in the air without heat, is termed *mouchaco* in Brazil, *moussache* in the Antilles, and *cypipa* in Cayenne. This constituted the Brazilian arrow-root of English commerce. When this fecula is prepared by drying on hot plates, it becomes granular, and is called *tapioca*. It occurs in irregular lumps or grains, and is partially soluble in cold water. The granules, diffused through water, and examined by the microscope, are of great uniformity of size, and smaller than those of arrow-root from the Marantas. Tapioca is very nutritious and easy of digestion, being free from all stimulating qualities. It is therefore very necessary to distinguish it from an artificial tapioca made with gum and potato starch, which is in larger granules, whiter, more easily broken, and more soluble in cold water than the genuine.

TAPIR, *Tapirus*, the name of a genus of pachydermatous quadrupeds.

Linnæus does not notice the Tapir in the 12th (his last) edition of the *Systema Naturæ*: but Gmelin quotes it as the Hippopotamus (terrestris) pedibus posticis trisulcis. (*Syst. Nat.* x. i., p. 74. n. 2.)

Gmelin introduces it under the title *Tapir*, between HIPPOPOTAMUS and SUS.

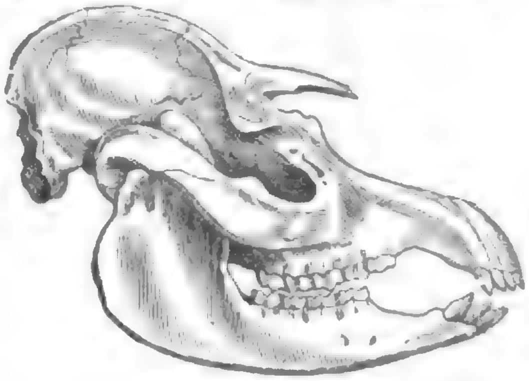
Cuvier arranges the genus as the last of his *Pachydermes Ordinaires*, making it immediately succeed the extinct *Palæotheria* and Lophiodons. The genus was well known to the older zoologists who wrote on the natural products of America, as we shall hereafter see.

ORGANIZATION.

Skeleton. When viewed in profile, the pyramidal elevation of the *skull* of the Tapir, calling to mind what is to be seen in the hog, strikes the observer forcibly. But the pyramid of the Tapir differs from that of the hog in having only three faces; and also in this, that its anterior line is formed by the meeting of the lateral faces, and it is only towards the front that it is dilated into a triangle, which is due to the frontal bones: these are early united and directed a little backwards. At the middle of the base of this triangle, to which the bones of the nose are articulated, is a point which penetrates between them; and from the two sides above the orbits descends a deep furrow produced by the structure of the upper border of the orbit, and which approaches towards the suborbital hole: it serves for the insertion of the muscles of the proboscis. The orbit descends lower than the mid-height of the head, is very wide, and has the postorbital apophyses but little marked.

That part of the cranium which is in the temporal fossa is convex. The occiput is a small demi-oval extremely concave plate, because the occipital crest projects considerably backwards in a parabolic shape. The occipital bone ascends on the cranium. The frontal bones descend largely in the temple, and are there articulated with the lachrymal, the palatine, the two sphenoids, and the temporal bone. The parietals are square, very large, occupying a great portion of the sagittal crest, and united also early between them. The nasal bones are no less striking than the form of the cranium. They are very short, articulated to the frontals by their base, and to those of the jaws by a descending apophysis; but they are free and projecting, forming a kind of triangular penthouse above the cavity of the nostrils. This structure, which reminds the observer of that of the elephant, indicates the presence of a moveable proboscis. The aperture of the osseous nostrils thus becomes extremely long, nearly horizontal, and bordered in great part by the maxillary bones, which advance well beyond the bones of the nose, to form the projecting part of the muzzle, they carry the intermaxillary bones which (a remarkable thing, observes Cuvier) were anchylosed together in the individual examined by him, although it was very young, and consequently formed but a single bone, and Cuvier remarked the same conformation in other crania. It was only in a nascent tapir, when no tooth had come forth, that he found the suture which separates the maxillaries from each other. These same intermaxillaries form a ceiling under the orbit. The lower border of the orbit and the half of the arch are due to the *os malæ*, or jugal bone; the rest to the temporal bone. The zygomatic arch is curved downwards at its anterior portion, and upwards at its posterior portion: it projects moderately outwards. The os unguis, or lachrymal bone, touches the malar bone, and advances a little on the cheek, and moderately in the orbit. There are two lachrymal bones in the very border of the orbit, separated by an apophysis, the upper of which is the largest. The suborbital hole is oval, rather large, and at a little distance in front of the suture, which unites the jugal and the lachrymal to the maxillary bone. The incisive hole is elliptical and very long, in great part, in the maxillary. The posterior nasal fossæ notch the palate towards the fifth molar. The suture which separates the palatine from the maxillary bone corresponds with the third. The palatine bones contribute much to the pterygoid *alæ*, and the sphenoid very little: these *alæ* are short and truncate, with a small hook which represents the internal pterygoid wing, and which remains for a considerable time a detached bone. The sphenoid bone does not reach the parietal in the temporal fossa, but remains separated from it by the squamose portion. The palatine bone there forms a long and narrow tract, which proceeds forward for the length of the upper border of the maxillary bone up to the suborbital canal. Behind the glenoid cavity of the temporal bone, which is very large, is a semicircular lamina, descending vertically and directing itself forwards and inwards: it interrupts the lateral and posterior motion of the lower jaw. Between this lamina and the mastoid apophysis is a rather narrow notch where the meatus auditorius internus is found. The mastoid apophysis descends as low as this lamina. It reaches the temporal bone by its anterior tubercle, and the occipital by its point. The hole analogous to the spheno-palatine is in the middle of the orbital tract of the palatine bone. The analogue of the pterygo-palatine bone is below it, on the suture of the palatine with the maxillary bone. The optic foramen is small, and placed on the suture of the frontal and of the anterior sphenoid bones. The spheno-orbital and round foramina are only separated from each other by a delicate lamina. There is a rather large vidian canal. The oval hole is confounded with the anterior and posterior apertures, so that a great portion of the petrous bone is separated from the sphenoid and basilary by a space. The tympanic bone does not appear to be ever anchylosed with the neighbouring bones, and falls easily, as in the hedgehog, the opossum, &c.

The lower jaw exhibits a striking width at its ascending ramus, and presents a rounded contour backwards at its posterior angle. Its coronoid apophysis elevates itself in the form of a pointed falx above the condyle, which is transverse and large. The two jaws are a little concave laterally at the vacant interval of the teeth, and are very much narrowed there; their edge is trenchant.



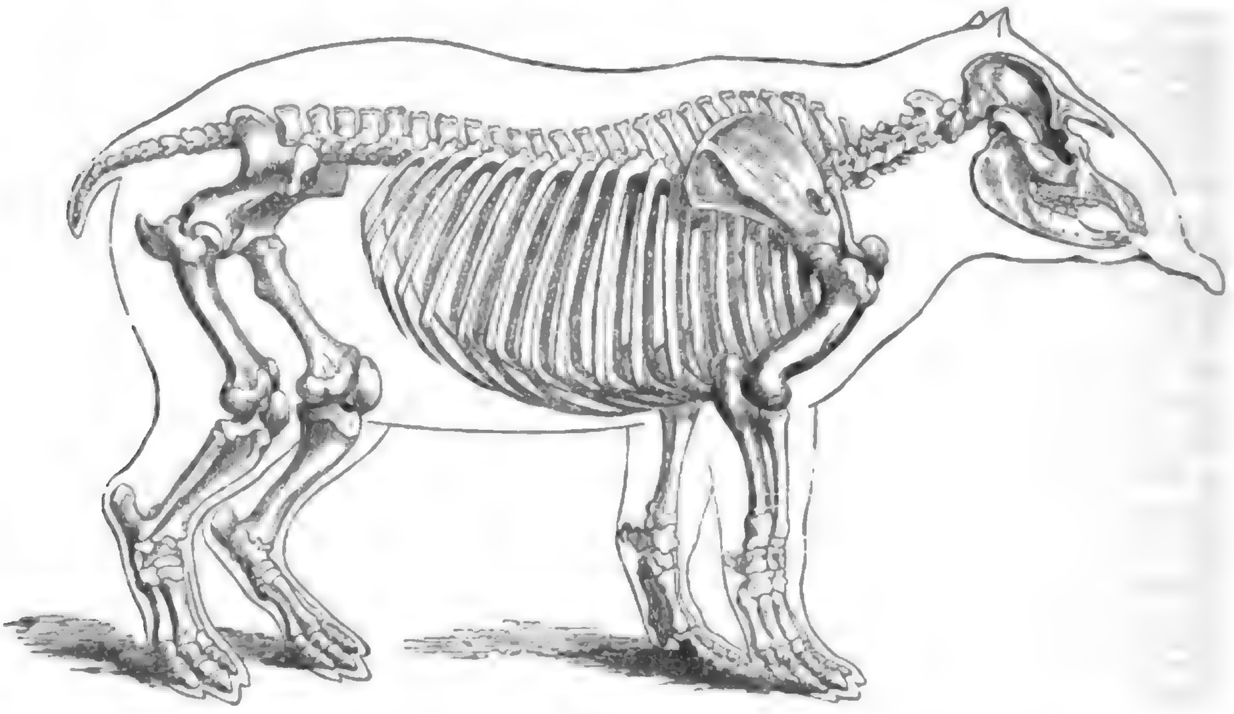
Skull of American Tapir.

Bones of the Neck and Trunk.—The lateral apophyses of the atlas are wide, but little extended outwards: the spinous process of the axis is an elevated crest; the transverse processes are small and irregular; the odontoid is large and obtuse; the transverse processes of the three succeeding vertebræ descend obliquely, are a little widened at the end and cut nearly square; their spinous processes are very small. The fifth cervical vertebra has a small apophysis on its transverse process, which, for the rest, resembles that of the preceding vertebræ, but is rather longer: its spinous process is also rather longer; still more is that of the seventh vertebra, the transverse process of which is very small—in short, a simple tubercle. The articular facets of the cervical vertebræ rise obliquely from within outwards, so that the articular facet of one vertebra is below that which responds to the preceding vertebra. The bodies of the vertebræ are convex forward and concave behind, an organization which is more or less repeated in the rest of the spine. The number of dorsal vertebræ amounts to twenty; the spinous apophysis of the second is the longest. They decrease and incline backwards to the eleventh, from which they become straight, square, and nearly equal. Their articular apophyses are so fitted that those of one vertebra are in advance and above those which correspond with it in the vertebra below. Cuvier found twenty pairs of ribs in one individual, nineteen in another, eight of which are true, all slender and rounded for the greatest part of their length. The breastbone is composed of five bones: its anterior portion is compressed, and projects in the form of a ploughshare. There are four lumbar vertebræ, the transverse apophyses of which are rather large. Those of the last, which are rather shorter and oblique, are articulated with the first sacral vertebra. These transverse apophyses have on their base the same elevated crests as the dorsals have for articulation with the ribs.

The *os sacrum* of the adult consists of seven vertebræ, the spinous apophyses of which are distinct and inclined backwards; the five last of these apophyses are short and terminate by a widened disk. The tail has seven vertebræ.

Bones of the Extremities.—The blade-bone has a strong semicircular notch towards the lower part of its anterior border; the rest of this border is round as well as the upper border: the posterior border makes an angle upwards and then descends a little concave. There is neither acromion nor coracoid process, if a hook-like process be excepted. The spine of the bone terminates at the lower third of it, its greatest projection is at its middle; the articular surface is oval and higher than it is long. This blade-bone, says Cuvier, emphatically, and not more emphatically than truly, cannot be confounded with that of any other animal.

The head of the humerus is powerful, behind the axis of the bone. Its large tuberosity is bilobated by a rounded notch; its bicipital canal is simple and not wide; the ridge is little marked; the condyles do not project much. The radial articular face is divided by a projecting rib into an entire pulley on the internal side, and the half of one on the external side; both the one and the other correspond to projections of the radius, so that this last has no rotation. It is even probable, observes Cuvier, that with age it is anchylosed to the ulna, which remains throughout its length on the external edge of the arm. The upper head of the radius is nearly rectangular; its body, rounded in front, is flattened behind. The body of the ulna is triangular. One of its crests follows the external crest of the radius.



Skeleton of American Tapir.

The carpus of the Tapir bears a near resemblance to that of the RHINOCEROS, especially in having, like it, a single small bone articulated with the wedge-shaped and unciform bones, in lieu of the trapezoid and thumb; but this bone is articulated with the metatarsal bone of the index, which is not the case in the rhinoceros. The other bones of the wrist are nearly of the same form, excepting that their width is less in proportion to their height, a condition which is true even with regard to the unciform bone, although it has to carry two complete metacarpals, whilst in the rhinoceros it only carries one and the vestige of another. The pisiform bone is also longer in proportion in the Tapir. The metacarpal of the middle finger is longest and straightest; those of the index and ring-finger are curved nearly symmetrically one with reference to the other, as in the rhinoceros. But the Tapir has also one small, short, and rather irregular metacarpal. The three first fingers are those which touch the earth, and their ungual phalanges resemble those of the rhinoceros; the little finger does not touch the ground. The first phalanges are longer than they are wide, but the contrary is the case with regard to the second.

The widened part of the ossa ilii is very broad transversely, and a little concave outwards. The external edge of this bone is larger than the internal one; the anterior border is largely concave, and the two spines are, as it were, truncated; its neck is narrow, with reference to its length; the oval holes are longer than they are wide, and the posterior extremity of the ischium terminates in a point very distant from its correspondent. The anterior passage of the pelvis is as long as it is wide, and nearly circular.

The femur has its great trochanter pointed, forming a projection backwards, and giving off a rib which descends along the external border. Besides the two ordinary trochanters, there is a third, which is flattened and recurved in front. In these points its resemblance to that of the horse is perceptible, but it differs much in having the two borders of the rotular pulley nearly equal. The fibula is curved outwards, which separates it a little from the tibia: this last has its upper head rather marked, but the tuberosity which terminates this end above is obtuse and curved but little. Its lower head is wider than it is long, is oblique, and its antero-posterior diameter on the internal side is wider, and this border more projecting than that of the fibular side.

The tarsus of the Tapir is still better modelled than its carpus after that of the rhinoceros, of which it seems to be only a repetition: only the os calcis is much more elongated and more compressed; but its facets are the same. The neck of the astragalus is longer and touches the cuboid bone by a narrower facet. There is no vestige of a hind toe, but the little finger is represented by an elongated bone, bent at the end, articulated to the scaphoid, to the small cuneiform and the external metatarsal bones. The posterior tubercle of the cuboid bone is less projecting and less hooked than in the rhinoceros. (*Ossemens Fossiles.*)

Cuvier, in his osteological comparison of the Indian Tapir with the American form, observes that a glance at the profile of their respective crania is sufficient to impress upon the observer their specific differences. The forehead of the Indian Tapir is, he observes, so convex, that it rises higher than the occiput: it elevates in its rise the nasal bones, which much prolongs the ascending part of the jaws and the descending portion of the frontal bones along the external aperture of the bony nostrils, thus giving much wider room for the comparatively large proboscis, and adding length to the furrows where the muscles are inserted. This organization, he observes, explains why the Indian Tapir has a more powerful and extensible trunk than that of America. There is even, he adds, in the Indian species, on the base of the nasal bones at their junction with the frontal bones, and on each side, a deep fossa which does not exist in the other species. This elevation of the forehead is accompanied by a depression of the occipital crest, which, far from forming a pyramid, as in the American species, rather descends backwards. The aperture of the bony nostrils, so enlarged by the prolongation of the maxillary bones, terminates below and forwards by more elevated intermaxillaries, which are for the rest anchylosed together in early youth as in the American Tapir.

The interval between the canine and the first molar is less in proportion in the Indian Tapir, whose dentition is otherwise the same with that of the American species.

The zygomatic apophysis of the Indian species is a little higher backward and less forward: its mastoid apophysis is more transversally turned.

The occipital surface of the skull offers a difference corresponding to that of the profile, inasmuch as it is less high, but it is also much wider in proportion; and from this width results another difference in the upper surface of the cranium, namely, that the sagittal crest, instead of remaining throughout its length linear and narrow, widens much backwards, and even remains rather wide at the point where it is most narrowed by the approximation of the two temporal fossæ. The triangle which these two fossæ leave in front upon the frontal bones is also wider and its surface more convex. The triangle formed by the true bones of the nose is wider at its base. For the rest, the composition of the cranium, the connexion of its bones, its sutures, its foramina, entirely resemble, as well as the teeth, those of the American species.

Cuvier then remarks that the rest of the skeleton of the two species does not offer such appreciable differences. The blade-bone of the Indian species is rather the wider; but the notch towards the lower part is smaller and rounder. The anterior hook of the great tuberosity of the humerus is more projecting; the unciform bone of the carpus is narrower; the last phalanges of the middle anterior toe are wider and more rounded, and the same may be said of the middle toe of the hind feet; the great trochanter of the femur is larger; the neck of the astragalus is shorter: but all these differences, Cuvier observes, are of so little importance, that, without those of the crania, they would hardly justify the conclusion of specific distinction. (*Ossemens Fossiles.*)

Mr. Yarrell, in the 4th vol. of the *Zoological Journal*, gives an account of the post-mortem appearances in an American Tapir brought to this country by Lieut. Maw, R.N., which survived its arrival in the gardens of the Zoological Society in the Regent's Park only a few hours.

When dead, the animal, which was said to be about twelve months old, measured from the nose to the root of the tail 48 inches, and its girth was 35 inches. The incisor teeth $\frac{6}{6}$ were very much used; the edges coming into close contact when the molars are in action. The canines $\frac{1-1}{1-1}$ were small in the upper jaw, and removed a short distance from the lateral incisor, for the admission of the larger canines of the lower jaw; the molars were $\frac{4-4}{3-3}$. Of those in the lower jaw, the first had three lobes, with five points; the second and third two lobes, with four points. Of the four upper molars, the first had two outer and one inner point; the other three had each two lobes with four points: all the parallel points or tubercles were connected transversely by a slight triangular ridge; and each of these triangular ridges, with their connected tubercles, shut into similarly shaped cavities in the teeth opposed to them, throughout the whole length of their continuous surfaces. The second, third, and fourth upper molars had each a small additional but less elevated point on the external anterior angle, increasing somewhat in size from the second tooth backwards. On cutting through the bones of the palate in order to the complete removal of the brain, Mr. Yarrell found the crown of another molar tooth on each side, posterior to, and somewhat within the line of range of, the last exposed molar. This tooth had a fifth tubercle of increased magnitude.

The cartilage of the septum narium was thick and strong, and the central ridge of the skull very much elevated. The ligamentum nuchæ was composed of three strong cord-like portions, two of which, passing in a parallel direction from the elongated spinous process of the first vertebra, were inserted together upon the extreme superior posterior angle of the central ridge of the cranium, supporting the whole length of the elevated crest and mane. The third portion of this strong ligament passed between the other two, and was inserted into the more elevated portion of the elongated spinous process of the dentata.

The anterior portion of the sternum was keel-like and rounded in shape, and projected forwards. There were twenty ribs on each side and four lumbar vertebræ. The tracheal cartilages were firm: the rings however were incomplete throughout. One large and one small lobe formed the right lung; one large and two small ones the left: they were inflamed. The pericardium, which was loaded with fat, was of unusual thickness; but the heart presented nothing remarkable: the coats of the arteries were particularly thick and firm.

The œsophagus was narrow: the stomach presented a single cavity, rather small, measuring, when moderately distended with air, 8 inches only from right to left, and 15½ inches in circumference: the parietes were thickened about the pylorus, but the internal surface was not examined, the organ having been preserved entire: it contained a loose mass of tow, hair, string, and shreds of cloth.

The spleen was narrow, thin, and 12 inches long.

The liver was divided into four lobes:—two, one large and one small, on the right side; and two, large and equal, on the left; the lower of these last was divided and notched on the edge. There was no gall-bladder.

The small intestines, uniform in size throughout their length, measured 21 feet, and were inflamed.

The cæcum was capacious compared with the stomach, measuring 14 inches in the line of its long axis, and 24 inches in girth at the largest part, and had two deep and several smaller circular indentations externally, and marked with one strong longitudinal band on each surface; tapering somewhat to a point at its closed extremity, but without any appendix vermiformis. The colon, at two feet from its commencement, doubled suddenly upon itself, and formed a fold 16 inches long, the inner surfaces of which were closely connected. The large intestines measured seven feet in length.

The sexual organs (the animal was a female) presented about the uterus, its cornua, and the ovaria, a degree of vascularity which rendered it probable that the period of life was approaching when breeding would have commenced.

Mr. Yarrell refers to Sir Everard Home's paper in *Phil. Trans.* (1821), in which Sir Everard points out the differences existing in the skulls of the Sumatran and American Tapirs, and has described a part of the viscera of the former. In the Sumatran Tapir the stomach is large, the intestinal canal very long, and the cæcum small; in the American Tapir the stomach is small, the intestines of moderate length, and the cæcum large.

Mr. Yarrell adds, that, of the species described,

The length of the Sumatran Tapir is eight feet; and the whole length of its intestinal canal is 89 feet 6 inches. Proportion as 11 to 1.

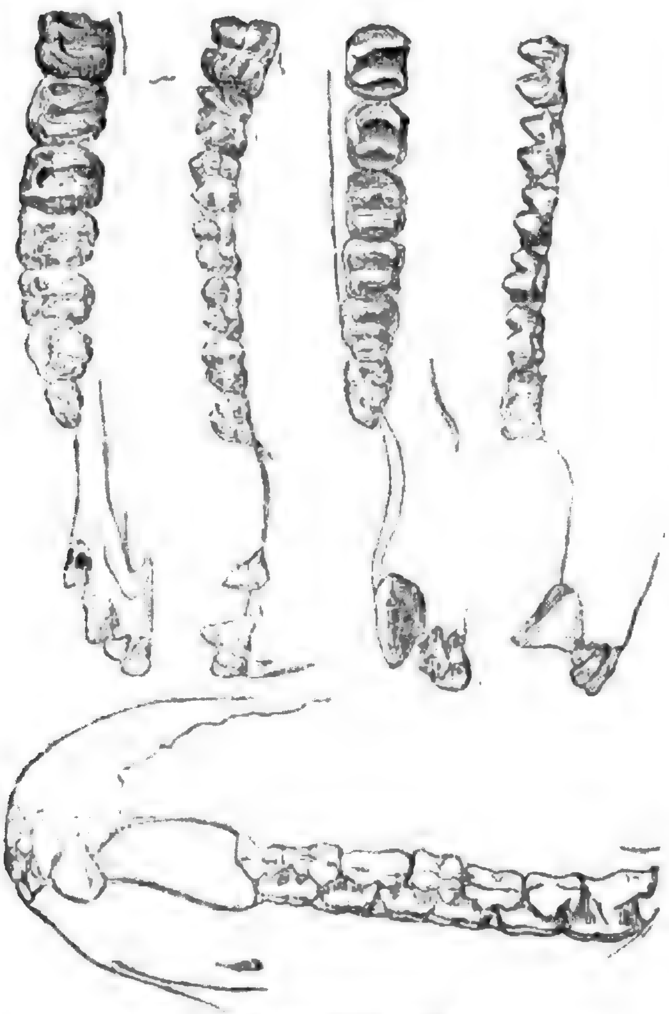
The length of the American Tapir is four feet; and the whole length of its intestinal canal 28 feet. Proportion, as 7 to 1.

In the *Physiological Series*, preserved in the Museum of the Royal College of Surgeons in London, No. 754, is the anus of an American Tapir, in which, as in the ordinary mammalia, the intestinal canal has a distinct external orifice, situated behind, and not, as in the osseous fishes, in front of the genito-urinary outlet. Professor Owen, the author of the Catalogue, remarks that this example of the mammiferous type of anus is preserved on account of the peculiar jagged appearance and abrupt termination of the common integument at the verge of the anus.

No. 1217 of the same series is a section of the kidney of a Tapir (*Tapir Americanus*), with the arteries injected, and the pelvis laid open to show the terminations of the tubuli uriniferi, as in the horse. No. 1286 is the suprarenal gland of an American Tapir laid open, showing the central dark-coloured substance very distinctly. No. 2778 exhibits part of the vagina, with the urethro-sexual canal, vulva, and clitoris of the American Tapir, in which the clitoris projects within the anterior margin of the vulva: it is a short pyramidal body with two small lateral lobes. The urethro-sexual canal is separated from the vagina by a broad transverse semilunar fold, beneath which is the wide aperture of the urethra. No. 2527 B, is the distal extremity of the penis of the Sumatran Tapir. The upper and lateral parts of the base of the glans present three rounded processes, beyond which the extremity of the glans is continued forwards, and terminates in a large truncate slightly convex surface, in the middle of which is situated the orifice of the urethra.

Generic Character.—Molars presenting on their crown, before they are worn, two transverse and rectilineal tubercles (collines). Nose terminated in a small moveable proboscis, but not terminated with an organ of touch like that of the elephan.; neck rather long; skin rather thick, and covered with hair, looking as if it had been close shorn; two inguinal mammæ. Anterior feet with four toes; posterior feet with three toes.

Dental formula:—incisors $\frac{6}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{7-7}{6-6}$ = 42.



Teeth of Sumatran Tapir.

Geographical Distribution.—Asia and America. M. Lesson observes that it was for a long time believed that this genus was peculiar to America; but that the rich and beautiful discoveries of MM. Diard and Duvaucel have proved that it is also proper to Asia: of which observation more will presently be said.

ASIATIC TAPIR.

Up to the year 1816 it appears to have been thought that the Tapir form was confined to America, and the species known in collections as the American Tapir seems to have been regarded as the only example of the genus. M. Lesson, who so sweepingly claims the discovery of the Asiatic species for French naturalists, is not the only zoologist of that country who puts forth such pretensions. Mr. Bennett has thus corrected those pretensions:—

'Some vague notices had reached Sir Stamford Raffles of the existence of a similar animal in Sumatra and the Malayan Peninsula; but to Major Farquhar belongs the credit of having first procured a specimen and submitted its description to the world at large. The history of this transaction affords too striking an illustration of the injustice of certain among the French zoologists to the merits of our countrymen to be passed over without observation. "The knowledge of this animal in France," says M. Desmarest, in his 'Mammalogie,' carefully shielding himself under an equivocal form of expression, "is due to M. Diard." But M. Lesson goes farther; and echoing, as usual, the dicta of his predecessor with a slight addition of his own, speaks of the Indian tapir as a species "discovered by M. Diard." Again, in the 'Dictionnaire des Sciences Naturelles,' M. Desmarest, forgetful of his former caution, heightens the farce still more by asserting that its "discovery in the forests of Sumatra and the Peninsula of Malacca is due to MM. Duvaucel and Diard." In none of these works is the least indication given that the animal in question had previously been even seen by an Englishman; much less is the fact suffered to transpire that long before M. Diard had "discovered" it, not in the forests of Sumatra or the Malayan Peninsula, but in the menagerie of the Governor-general of British India at Barrackpore, a full description, together with a figure of the animal and of its skull, had been laid before the Asiatic Society by Major Farquhar, for publication in their 'Researches.' This latter circumstance, it is true, was not mentioned by M. Frederick Cuvier when he figured the tapir of Malacca in his splendid work, from a drawing made by M. Diard in the Barrackpore menagerie, or by that gentleman himself in the published part of his accompanying letter; but there seems to have been no intention on their parts wilfully to mislead their readers. That M. Diard at least could not have been actuated by any such desire is fully proved by several passages in the note appended by him to Major Farquhar's original description, in which he speaks of the gallant officer as "the excellent naturalist who has enriched zoology with so important a discovery;" and attributes the "honour" to him "alone." Baron Cuvier too, in the recent edition of his 'Règne Animal,' silently rejects the unmerited distinction in favor of his stepson and friend; and candidly quotes, as the first describer, our, in this instance, more fortunate countryman.[*] After this, we trust that we shall hear no more of the "discovery" of the Indian tapir by MM. Diard and Duvaucel, who have too many real claims on the consideration of zoologists to require to be tricked out in the borrowed plumes with which it has hitherto been the fashion among our neighbours to invest them.' (*The Gardens and Menagerie of the Zoological Society delineated*, vol. i.)

Dr. Horsfield states that the first intelligence of the existence of this interesting animal in Sumatra was given to the government of Fort Marlborough at Bencoolen, in the year 1772, by Mr. Whalfeldt, who was employed in making a survey of the coast. In the month of April in that year, it is, according to Dr. Horsfield, noticed in the records, that Mr. Whalfeldt laid before the government his observations on the places southward of Cawoor, where he met with the tapir at the mouth of one of the rivers. He considered it to be the hippopotamus, and described it by that name; but the drawing which accompanied the report identifies it, says the Doctor, with the tapir. Dr. Horsfield adds that this mistake in the name may readily be explained, when it is recollected that in the tenth edition of the 'Systema Naturæ' of Linnæus the tapir is placed as a species of hippopotamus, while in the twelfth edition no mention is made of that animal.

'The learned author of the 'History of Sumatra,' William Marsden, Esq.,' continues Dr. Horsfield, 'was at that time secretary to the government at Bencoolen; and the public owes to his zeal in collecting every valuable information relating to that island the first notice of the existence of this animal, which is by the Malays in many places denominated *Kuda-ayer*, literally hippo-potamus. After the first discovery, in 1772, the tapir was not observed for a considerable period. From the same catalogue of Sir T. S. Raffles which has furnished the description, it appears that in the year 1805 a living specimen was sent to Sir George Leith, when lieutenant-governor of Penang. It was afterwards observed by Major Farquhar in the vicinity of Malacca. A drawing and description of it were communicated by him to the Asiatic Society in 1816, and a living subject was afterwards sent to the menagerie at Barrackpore from Bencoolen. At this place a drawing was made by M. Diard in the year 1818, which, accompanied by an extract from the description of Major Farquhar, was communicated to his friends in Paris, where, in March, 1819, M. Fred. Cuvier published it in his large lithographic work on the mammalia of the menagerie in Paris.'

'In the month of September, 1820, the first specimen of the Malayan tapir was received in England from Sir Thomas Stamford Raffles, with the general zoological collection of mammalia and birds, the descriptive catalogue of which, being contained in the 13th vol. of the 'Transactions of the Linnean Society,' has been already referred to. This specimen of tapir was accompanied by a complete skeleton, and the thoracic and abdominal viscera preserved in spirits of wine.' Dr. Horsfield then refers to the use made by Sir Everard Home of these materials in the paper above alluded to.

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[*] Calling him 'Farhharie' however.

A living specimen of this species was lately brought to this country, and publicly exhibited in the garden of the Zoological Society of London, where it died more than a year ago.

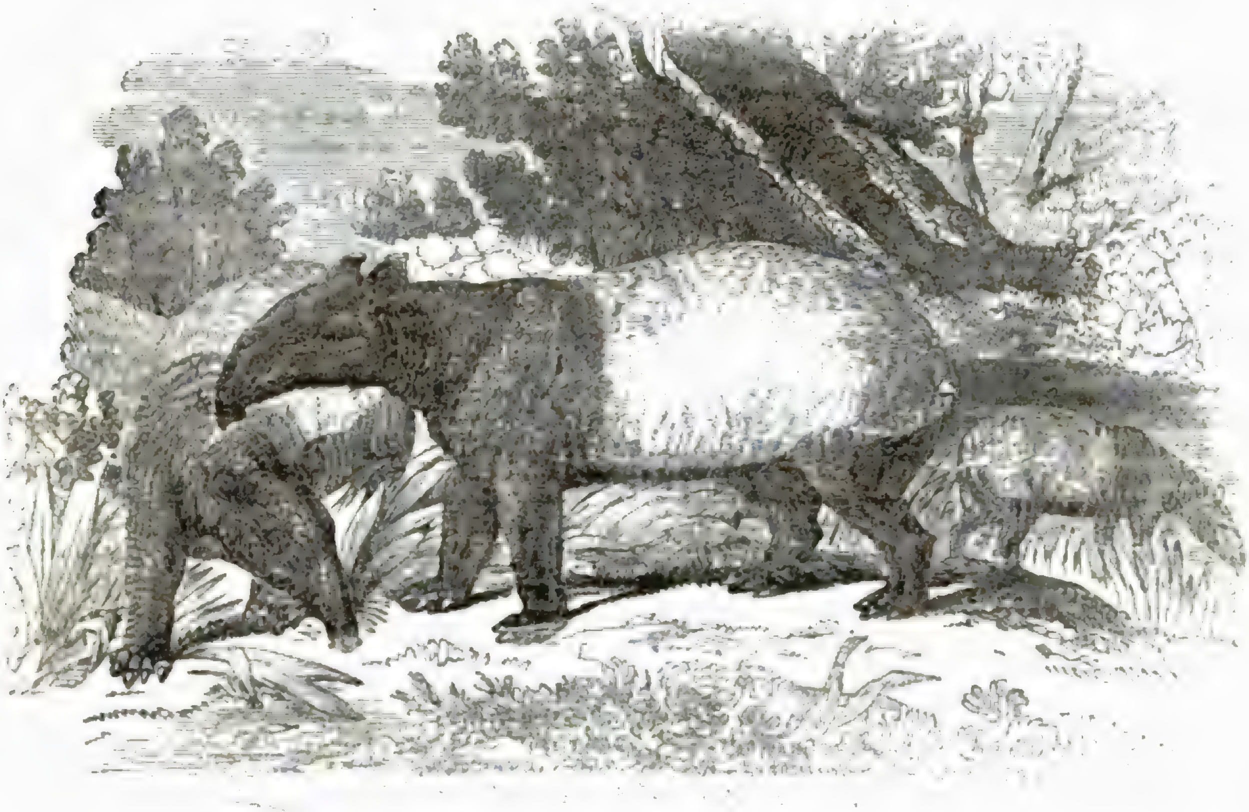
Description of *Tapirus Malayanus—Tapirus Indicus* of the French zoologists; *Le Maiba*, F. Cuv., *Mamm.*:—'The Malay Tapir resembles in form the American, and has a similar flexible proboscis, which is six or eight inches in length. Its general appearance is heavy and massive, somewhat resembling the hog. The eyes are small; the ears roundish, and bordered with white. The skin is thick and firm, thinly covered with short hair. There is no mane on the neck, as in the American species. The tail is very short, and almost destitute of hair. The legs are short and stout; the fore-feet furnished with four toes, the hind-feet with three. In the upper jaw there are seven molars on each side, one small canine inserted exactly on the suture of the incisor bone, and in front six incisors, the two outer of which are elongated into tusks. In the under jaw there are but six molars; the canines are large; and the number of the incisors, the outer of which are the smallest, is the same as in the upper jaw. The general colour is glossy black, with the exception of the back, rump, and sides of the belly, which are white, and separated by a defined line from the parts that are black.'

Such is the description of Sir Stamford Raffles, for the accuracy of which we can vouch, having compared it with the living animal in the garden of the Zoological Society. Major Farquhar describes a young Tapir of this species which he had alive in his house thus:—'It appears that until the age of four months it is black, and beautifully marked with spots and stripes of a fawn colour above and white below. After that period it began to change colour, the spots disappeared, and at the age of six months it had become of the usual colour of the adult.' (See post. American Tapirs.)

Marsden, as we have already seen, notices the animal as the Hippopotamus; *Koodo-ayer*. In Sumatra, according to Sir Stamford Raffles, it is known by different names in different parts of the country: thus by the people of Limun it is called *Saladang*; by those of the interior of Manna, *Gindol*; in the interior of Bencoolen, *Babi Alu*; and at Malacca, *Tennu*.

Habits.—The habits of this species in a state of nature are probably similar to those of the American Tapirs. In captivity, Major Farquhar describes it as of a mild and gentle disposition. 'It became as tame and familiar as a dog; fed indiscriminately on all kinds of vegetables, and was very fond of attending at table to receive bread, cakes, or the like.' Sir Stamford Raffles adds that the living specimen sent from Bencoolen to Bengal was young, and became very tractable. It was allowed to roam occasionally in the park at Barrackpore, and the man who had charge of it informed Sir Stamford that it frequently entered the ponds, and appeared to walk along the bottom under water, and not to make any attempt to swim. Sir Stamford also states that the flesh is eaten by the natives of Sumatra.

The individual exhibited in the Regent's Park was very mild and gentle.



Tapir Malayanus.

AMERICAN TAPIRS.

John de Laet (1633), speaking of the province of Vera-paz, says that among the living quadrupeds which are there found the greatest is that which the barbarians call *Beori*, and the Spaniards *Danta*, an animal not unlike a calf, but with shorter legs and articulated after the manner of an elephant's; the anterior feet have, he states, five toes or hoofs, the posterior only four. The head he describes as oblong, the forehead rather narrow, the eyes small in proportion to the bulk, and the proboscis as being a palm long and pendulous above the mouth. When the animal is angry, he states that it erects itself, and grinning shows its teeth, which are like those of hogs. The ears he describes as acute, the neck contracted, the tail short and with few hairs, the skin very thick, so that it may with difficulty be grasped by the hand or perforated by iron. It feeds, he says, on grass and sylvan herbage. The natives, he adds, eat its flesh, and relate that they are taught venesection by this animal, for when it finds itself overloaded with blood, by rubbing against rocks it opens the veins of the legs and lets blood. There can be no doubt that the animal here meant is one of the American Tapirs.

Marcgrave gives a very rude figure, not however to be mistaken for anything but a Tapir, under the name of *Tapiereté*, *Anta* of the Spaniards, describing it and its habits with considerable general accuracy; but Mr. Bennett observes that he speaks of the teeth as consisting of ten incisors and ten molars in each jaw, an error which Mr. Bennett remarks held its ground for nearly two centuries, and having passed successively through the writings of Ray, Brisson, Buffon, Gmelin, and Blumenbach, was first corrected by Geoffroy St. Hilaire.

Towards the close of last century the fabulous clouds that had gathered about the history of this animal began to clear away before the lights of observation. Buffon had noticed the only American Tapir then known, as the largest animal of the New World; but this can hardly be said of it when the Elk and the Wapiti are remembered. Geoffroy St. Hilaire and Baron Cuvier first accurately defined its zoological characters; and Sonnini and D'Azara gave a correct account of its habits. Buffon's figure, after a drawing by La Condamine, was the first at all approaching to accuracy. A living individual was afterwards brought to France, but died before its arrival at Paris, and furnished a still better design, published with further information, derived chiefly from Sonnini, and M. Bajon's memoir on the anatomy of the species, in the Supplement to Buffon, vol. vi.: but still some of the errors were retained; nor was the account of two other individuals living in the menagerie belonging to the Prince of Orange, by Allamand, complete.

Lieut. Maw, in his *Journal of a Passage from the Pacific to the Atlantic* (1829), speaks of the Tapir as common in the woods and rivers about Egas, there called *Anta*, and which is the same animal with the Sachywaka, Dante, or Gran Bestia of Peru, of which they had heard much both before and since embarking. Two kinds were described to them, one having the tips of its ears white, and which is the largest: when young it was stated to be striped and spotted like a deer, the spots disappearing as it grows older, till it becomes entirely of a dusky bay colour. Here we have a clear intimation of the knowledge of two species by those inhabiting the spot.

The form of the species best known has since been rendered familiar to Englishmen by the exhibition of living specimens in the gardens of the Zoological Society of London in the Regent's Park.

But this is not the only American Tapir; for M. Roulin, about thirteen years since, laid before the French Academy a description and figures of a new species inhabiting the mountainous parts of the same districts, the plains of which are frequented by the other; and his account is given in the *Annales des Sciences Naturelles:* from this it would appear that the American Tapir of the mountains is more nearly allied to the Asiatic species than the American Tapir of the plains.

We take as our example the species first known, *Tapir Americanus*, Gmel.

Description. General colour throughout deep brown approaching to black. Sides of the lower lip, band on the under and middle part of the chin, upper edges of the ears, and naked line at the junction of the hoofs pure white. Scanty hair of the body very short, closely adpressed to the surface; hardly distinguishable at a short distance. The skin beneath it is of great density, being, according to M. Roulin, not less than seven lines thick on the back, and eight or nine lines on the cheek, and so tough that Sonnini frequently shot at a female which was crossing the river with her young, without disturbing her or making her turn out of her course, though he saw the impression of a ball which he had fired on the animal's cheek. There is a thick rounded crest on the back of the neck, extending from the forehead as low as the level of the eyes to the shoulders, and bristled with a not thick mane of stiff blackish hairs. Mr. Bennett remarks that it is peculiar to the present species, but is not found, according to M. Roulin, in the female at Cayenne: although D'Azara states that the female is equally furnished with it in Paraguay. In the female brought by Lieut. Maw from Para, and formerly in the menagerie of the Zoological Society of London, it was very conspicuous. Head very long; muzzle prolonged and covered above with hair of the same colour as that of the body, but naked and flesh-coloured at its extremity (which is flattened) and underneath. Eyes very small, of a dull lead colour.

The colour of the individual dissected by Mr. Yarrell was rusty reddish-brown, with indications of lighter spots and horizontal lines on the ribs, flanks, and thighs. 'These fawn-coloured spots and stripes,' says Mr. Yarrell, 'are common to both species of Tapir' (the Sumatran and the American species then known are meant) 'while young; that of Sumatra not exhibiting till it is six months old any appearance of the well-defined black and white colour which afterwards distinguishes the adult animal.' (*Zool. Journ.*, vol. iv.)

Mr. Bennett, too, remarks that the young is of a much lighter brown than the adult, with numerous small white spots on the cheeks, a whitish muzzle, and six or eight complete narrow bands of white passing along each side of the body from the shoulders to the haunches. 'Regular rows,' says Mr. Bennett, in continuation, 'of small white spots, placed at equal distances from each other, alternate with these bands. The upper parts of the limbs are marked in a similar manner; their inner sides, as well as the under surface of the body, are white; and their extremities of the ground-colour of the whole body, with a few fainter spots scattered over them. Before the end of the first year of their age this livery becomes completely lost: it is partially visible in the young specimen in the Society's museum, but not at all in the living individuals at the Gardens (1830). Similar markings occur in the young of the Sumatran species, and also, we may observe, in that of the Hog in its native state. The adult female of the present species has generally a considerable number of whitish hairs intermingled with the brown, which gives her somewhat of a grizzled appearance.' (*Gardens and Menagerie of the Zoological Society delineated.*)

Locality. South America. 'Few animals of equal size,' says the author last quoted, 'have so extensive a range as the American Tapir. It is found in every part of South America to the east of the Andes, from the Straits of Magellan* to the Isthmus of Darien; but appears to be most common within the tropics. M. Roulin dwells upon it as a singular fact that although it occurs as far as 40° south of the equator, it ceases suddenly at about 8° north, in a situation where it is extremely abundant, and where no adequate cause has yet been assigned to bar its further progress, no large rivers nor lofty mountains intervening, nor any change in the character of the vegetation of the country being manifest. The left bank of the Atrato near its mouth, and the part of Darien inhabited by the independent Indians, may be considered as its northern limit. Its highest range, in the province of Maraquita at least, appears to be from 3000 to 3600 feet above the level of the sea, while the new species discovered by M. Roulin is only met with at a much greater elevation.'

Habits, Chace, &c. The inmost recesses of deep forests are the chosen haunts of this species, which is not gregarious, and flies from the proximity of man. It is for the most part nocturnal in its habits, sleeping or remaining quiet during the day, and at night seeking its food, which, in its natural state, consists of shoots of trees, buds, wild fruits, &c. If we are to believe D'Azara, and he was an accurate observer, it is very fond of the barréro, or nitrous earth of Paraguay. It is however a most indiscriminate swallower of everything filthy or clean, nutritious or otherwise, as the farrago found in the stomach of the individual dissected by Mr. Yarrell showed. Pieces of wood, clay, pebbles, and bones are not unfrequently taken out of the stomachs of those which are killed in the woods; and one kept by D'Azara gnawed a silver snuff-box to pieces and swallowed the contents.

It is a powerful animal, and everything in the underwood of the forest gives way to its rush. It is in the habit of making runs or roads through the brushwood, and these beaten tracks are usually selected by travellers in passing through the forests.

Quiet and peaceable in its demeanour, it is hunted for the sake of its tough hide and its flesh, which, though not liked by the European (for it is coarse and dry), is relished by the unsophisticated palate of the Indian.

The lasso is not often employed in its capture, not only from its haunts being generally unfavourable to that mode of hunting, but because its determined rush and strength will at a single effort snap the line which is strong enough to arrest the career of a bull. The hunters will sometimes lie in wait with their dogs near a Tapir's road as evening approaches, and so get between him and the water to which he usually directs his course for the purpose of bathing and wallowing at the commencement of his nocturnal career. He makes a good fight and inflicts severe wounds upon the dogs with his teeth, especially if he can reach the water, where he stands at bay, breast deep and defies the fiercest of them; for as they are compelled to swim to the attack, the Tapir bides his time, and seizing them by the backs of their necks as they successively come within his reach, shakes them off, not without biting a piece out.

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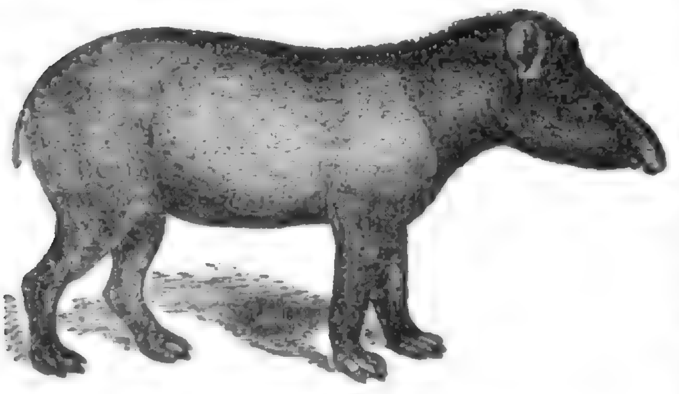
* Apparently not at present.

But it would seem that the most common method of catching them is by imitating their sharp but not very shrill whistle, and thus bringing them within shot of the Indian's poisoned arrow.

Lieut. Maw, who, as we have above seen, brought a young animal of this species to England, speaks of it as feeding upon herbs and the branches of trees, and going much into the water, walking along or rather perhaps across the bottoms of rivers. 'It possesses,' says Lieut. Maw, 'great strength, particularly in the fore part of the body; but is harmless, except when attacked. It is said to pass directly through the thickets without following any previous track.[*] We were told that when the Tapir is attacked by a Tiger' (*Felis Onça*) [LEOPARD, vol. xiii., p. 435], 'the Tiger generally springs upon the Tapir's back, when the latter rushes into the woods and endeavours to kill the assailant by dashing him against some large tree. Although strongly and apparently heavily made, the Tapir is said to be fleet.' (*Journal of a Passage*, &c.)

This species is mild in captivity and easily domesticated. Sonnini states that several tame Tapirs are permitted to go at liberty through the streets of Cayenne, and to wander into the woods, whence they return in the evening to the house where they are kept and fed. He adds that they are capable of attachment to their owner, and expresses his opinion that care and attention might convert its qualities of strength, docility, and patience to account as a beast of burthen.



American Tapir.

Fossil Tapirs.

Dr. Buckland, in his *Reliquiæ Diluvianæ*, notices the remains of Tapir in company with those of rhinoceros, elephant, horse, ox, deer, hyæna, bear, tiger, fox, wolf, mastodon, hog, and beaver, in the Val d'Arno, on the authority of Mr. Pentland; and in his interesting and instructive first plate illustrative of his *Bridgewater Treatise* figures a Tapir in little among the mammalia of the first period of the Tertiary series (Eocene of Lyell). In the Epplesheim sand (Miocene of Lyell), Professor Kaup found two species larger than those now living.

It should be borne in mind that the second or Miocene system of tertiary deposits contains a mixture of the extinct genera of lacustrine mammalia of the first or Eocene series, with the earliest forms of existing genera. M. Desnoyers first noticed this in the Faluns of Touraine, where the remains of *Palæotherium*, *Anthracotherium*, and *Lophiodon* were found mixed with the bones of the tapir, mastodon, rhinoceros, hippopotamus, and horse. These remains were fractured and rolled, and sometimes covered with flustra, and must, Dr. Buckland observes, have been derived from carcasses drifted into an æstuary or sea.

Von Meyer records the following species: *Tapir Avernensis*, Croiz. and Job., from the diluvium, Puy-de-Dôme, Cussac; *Tapir Mastodontoides*, Harlan, from Kentucky, with a justifiable query, whether it is a Tapir at all;[†] and *Tapir Priscus*, Kaup, from the Epplesheim sand. He also alludes to other remains noticed in the works of Fischer, Clift, and Eichwald. (Diluvium, Irawadi.)

Dr. Lund, in his 'View of the Fauna of Brazil,' states that he had in vain looked for either remains or foot-prints of the living Tapir; whence he concludes, that it does not take refuge in caves: but he says that he is in possession of fossil bones which evidently belong to the genus, though they are too imperfect to determine their relation to the recent animal.

TAPPING, or Paracentésis (in Surgery), is the operation usually employed for the removal of fluid from any of the serous cavities of the body in which it has collected in a dangerous quantity. It is accomplished by means of an instrument called a trocar, and a tube, or canula, in which it exactly fits. The trocar is of steel, cylindrical through the chief part of its length, and terminated by a three-sided pyramid which ends in a very sharp point. The canula being placed upon its shaft, the trocar is thrust into the cavity containing the fluid, and being then withdrawn through the canula, the latter is retained in the aperture till all the fluid is discharged. The diseases for which tapping is chiefly performed are ascites, hydrothorax, hydrocele, and, occasionally, hydrocephalus, and effusions of fluid in the pericardium.

TAPTY. [HINDUSTAN, p. 211.]

TAPUH. [SOOLOO ARCHIPELAGO.]

TAR, a well-known empyreumatic product.

The properties of tar are, that it is a viscid brown semi-fluid mass, which long preserves its softness. If it be mixed with water, it acquires a yellow colour and the taste of tar, with slightly acid properties; this solution is well known by the name of tar-water, and has been used in medicine. Tar is soluble in alcohol, in æther, and in the fixed and volatile oils.

If tar be distilled with water, there passes over a brown liquid which consists of much empyreumatic oil and some oil of turpentine; this product is called oil of tar; by redistillation with water it becomes colourless; the substance remaining in the still is pitch; so that, in fact, tar is a mixture of oil and pitch.

Within a few years, tar has been subjected to a minute examination by Reichenbach, who has obtained from it a variety of substances possessing very different properties; the most important of these is creasote. [CREASOTE.]

After what has been stated of the many different compound substances of which tar is constituted, no exact analysis could of course be stated; its chief constituent is carbon, combined with hydrogen and oxygen, and a small portion of azote.

TAR (French, *Goudron*; German, *Theer*; Italian, *Catrame*; Spanish, *Alquitran*; Polish, *Smola Gesta*; Russian, *Degot*, *Smola shitkaja*; Swedish, *Tjära*), is obtained from wood or coal by distillation in close vessels, or in piles from which the air is excluded. Pitch (French, *Poix*; German, *Pech*; Italian, *Pece*; Spanish, *Pez*; Russian, *Smola gustaja*) is commonly obtained by the inspissation of tar, or by boiling it until all the volatile matters are driven off. For the chemical properties of tar, see the preceding article.

Tar is extensively manufactured from the roots and branches of pines and firs in Norway, Sweden, Germany, Russia, North America, and other countries in which those trees abound; but that made in the north of Europe is considered far superior to what is produced in the United States. The process usually followed is described in Dr. E. D. Clarke's 'Travels in Scandinavia,' and is, he states, similar to that which, according to Theophrastus and Dioscorides, was practised by the antient Greeks. He observes indeed that 'there is not the smallest difference between a tar-work in the forests of Westro-Bothnia and those of antient Greece.' After describing the noble forests which cover the soil down even to the water's edge, about the inlets of the Gulf of Bothnia, Dr. Clarke says, 'From the most southern parts of Westro-Bothnia to the northern extremity of the Gulf, the inhabitants are occupied in the manufacture of tar, proofs of which are visible in the whole extent of the coast. . . . . The situation most favourable to the process is in a forest near to a marsh or bog; because the roots of the fir, from which tar is principally extracted, are always most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank or sloping hill), and the roots of the fir, together with logs and billets of the same, being neatly trussed in a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, to prevent the volatile parts from being dissipated, which, by means of a heavy wooden mallet, and a wooden stamper worked separately by two men, is beaten down and rendered as firm as possible above the wood. The stack of billets is then kindled, and a slow combustion of the fir takes place, without flame, as in making charcoal. During this combustion the tar exudes; and a cast-iron pan being at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as the barrels are filled, they are bunged and made ready for exportation.' 'From this description,' he adds, 'it will be evident that the mode of obtaining tar is by a kind of distillation *per descensum;* the turpentine, melted by the fire, mixing with the sap and juices of the fir, while the wood itself, becoming charred, is converted into charcoal.' The process of tar-making in Sweden, north of the Bothnian Gulf, has been more recently described in Laing's 'Tour in Sweden,' in which work it is stated that fir-trees which are stunted in growth, or from their situation unsuitable for the saw-mill, are prepared for this purpose by peeling off the bark to the height of one or two fathoms up the stem. This is done by degrees, so that the tree may not decay and dry up at once, but may remain for five or six years in a vegetative state,—alive, but not growing. The sap, thus checked in its circulation, makes the wood richer in tar, so that, when cut down, the tree is almost entirely converted into the substance from which tar is distilled. The roots, rotten stubs, and scorched trunks of trees felled in clearing land, are all applied to the purpose of producing tar. It is stated, in the last-mentioned work, that the state of the weather during the process of burning or distilling greatly affects the amount of produce. The labour required to convey the tar from the forests to the rivers is often very great; and not unfrequently the barrels are committed to the stream in order to pass rapids or falls.

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[*] But see above.

[†] Professor Owen believes this so-called Tapir to be the young of *Mastodon giganteus*.

In some parts of France and Switzerland tar is extracted in a kind of oven or kiln, built of stone or brick, in the form of an egg, with its smaller end downwards. These kilns are sometimes as much as ten feet deep and six feet in diameter; and they are provided with a gun-barrel or tube at the lower end to conduct the tar, as it is made, to vessels placed to receive it. The wood is cut into billets, and freed from its bark; and the kiln is filled with bundles of billets, chips being inserted to fill up the interstices. A layer of chips is also placed at the top of the kiln, which, when charged, is covered over with flat stones, so arranged as to form a kind of vaulted chimney. Fire is applied to the dry chips at the top, through an opening left in the centre, and, as soon as the pile is fairly lighted, the chimney is closed in with a large stone, and wet earth is heaped upon the top of the kiln until the escape of smoke is effectually prevented. It is however necessary occasionally to refresh the fire by the admission of a little air through holes in the sides of the kiln. The average product of tar is stated to be from ten to twelve per cent. of the weight of the charge; but the red wood and the knots furnish about one-fourth of their weight of tar. By this plan the wood is charred more equally, and the tar is of superior quality. A considerable quantity of lamp-black collects upon the stones which form the roof and chimney of the kiln, and this is removed after each operation. Probably a still better plan would be to distil the wood in close retorts, similar to those used in the manufacture of coal-gas; but any such apparatus is unsuitable for the wild forest districts in which tar is principally made.

The great importance of tar and pitch as naval stores enabled the Tar Company of Sweden, in 1703, to put England to considerable inconvenience, by refusing to supply those articles excepting at their own price, in such quantities as they might choose, and in Swedish shipping. This circumstance induced parliament to offer bounties for the importation of these and other naval stores from the British colonies in North America, a measure which produced highly beneficial results. It was computed at that period that the annual consumption of foreign tar and pitch in Great Britain and Ireland was about 1000 lasts, and that of other European countries about 5000 lasts, of which four-fifths was tar; and it was stated that besides Sweden, which afforded the chief supply, considerable quantities were made in Norway and in Russia. Probably this estimate was much too small; for Anderson states that in 1730 the quantity of tar annually shipped from Archangel in Russia was computed to be 40,000 lasts. The American war of independence, by interrupting the trade between England and North America, revived the former difficulty respecting the supply of tar, and led to the establishment of the manufacture of tar from pitcoal; an object which had been previously attempted. Becher, a foreign chemist, who lived about the time of Charles II., is supposed to have been the first to propose the making of coal-tar; and it was made for many years in the bishopric of Liege, and in other parts of Germany; the coal being distilled in a kind of still formed of cast-iron. No. 228 of the 'Philosophical Transactions' (vol. xix., p. 544), which was published in May, 1697, contains an 'Account of the making (of) pitch, tar, and oil out of a blackish stone in Shropshire, communicated by Mr. Martin Ele, the inventor of it.' The mineral used is described as a blackish porous rock, lying over the strata of coal, in Broseley, Bently, Pitchford, &c.; and the bituminous part was separated by breaking the rock to powder, and boiling it with water. About the year 1779, in consequence, as before stated, of the American war, some lamp-black manufacturers at Bristol turned their attention to the manufacture of tar from pit-coal; and in 1781, Lord Dundonald, a nobleman distinguished for his scientific pursuits, obtained a patent for improvements upon the process previously followed. Mr. Pitt, of Pendeford, near Wolverhampton, in a letter addressed to the Society of Arts, in 1790, on the subject of converting the smoke of steam-engine furnaces into tar, alludes to three establishments at Bradley, Tipton, and Dudley Wood, erected by Lord Dundonald and the gentlemen associated with him; and states that the business was then carried on with success. 'These tar-works,' says Mr. Pitt, 'are erected in the vicinity of large iron and coal works: the iron-masters furnish the tar-works with raw coal *gratis*, and receive in return the cokes produced by such coal; and the proprietors of the tar-works have the smoke only for their labour and interest of capital. (*Transactions of the Society of Arts*, vol. ix., p. 132.) The process adopted at these works is fully detailed by Mr. Pitt. The manufacture of coal-tar has not proved so important as was at one time anticipated, although for some purposes it is deemed superior to that made from wood. The author of the article 'Navy,' in the *Supplement to the Encyclopædia Britannica*, considers tar from sea-coal to be an important resource in case of England being compelled to revert to her own resources for naval stores; and observes that for painting or tarring wood-work of every kind, it is said to stand exposure to the weather better than the common tar. He also refers to the pitch-lake of Trinidad [TRINIDAD] as a source whence an almost inexhaustible supply of mineral pitch and tar might be obtained. Tar is produced in large quantities in the manufacture of coal-gas; but in some districts its value is considered so trifling that it is mixed with the fuel by which the retorts are heated. It is usually separated from the gas by condensation; but the introduction of a quantity of brushwood into the condenser, so as to form a mechanical interruption to the passage of the gas, is found greatly to assist the operation.

The import duty upon tar has been for some years past 12*s.* per last,[*] if from British possessions, and 15*s.* if from foreign countries; but under the new tariff of Sir Robert Peel (1842), it is respectively 6*d.* and 2*s.* 6*d.* per last. The quantity imported in the five years from 1835 to 1839, was 60,622 lasts, or about 12,124 lasts per annum; of which 58,106 lasts, or 11,621 lasts annually, were entered for home consumption. During this period the duty amounted to 44,023*l.*, or upon an average 8804*l.* per annum. Of the above quantity Russia furnished about 50,155 lasts; the United States, 6446 lasts; Sweden, 2297 lasts; Denmark, 1300 lasts; and Norway, 348 lasts; the remainder being made up of small quantities from Germany, Prussia, &c.

Pitch is extensively manufactured in Great Britain, yet the quantity imported in 1829 is stated, by M'Culloch, to have been about 10,752 cwt. The duty is 10*d.* per cwt., if from foreign countries, and 9*d.* if from British possessions; or, under the new tariff, 6*d.* and 1*d.* per cwt. respectively.

(Dr. E. D. Clarke's *Travels in Scandinavia*, sec. i., pp. 251, 252; Laing's *Tour in Sweden in* 1838, p. 176; Macpherson's *Annals of Commerce;* M'Culloch's *Dictionary of Commerce.*)

TARA. [SIBERIA.]

TARABLOUS. [SYRIA.]

TARAI. [HINDUSTAN, p. 217.]

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[*] A last is twelve barrels, and each barrel is, by the Custom-House regulations, to contain not more than thirty-one gallons and a half.

TARAKAÏ is the name of a large island which has long figured on our maps under the name of Saghalien or Saghalian, and has at different times been supposed to be called Tchoka, Karafto, and Sandan. This island extends from south of 46° to 54° 20′ N. lat., more than 600 miles in length, but the width is various. Towards the southern extremity, north of the Bay of Aniva, it is nearly 100 miles wide, but it soon contracts to about 25 miles, which is about its average width as far north as the Bay of Patience, where it suddenly expands to 120 miles, Cape Patience running far out into the Pacific. From this point (49° N. lat.) northward the island again grows narrower, but very gradually, so that at 51° N. lat. it is still nearly 80 miles wide. Farther north its average width does not exceed 50 miles. The area of the island probably exceeds 30,000 square miles, which is not much more than that of Scotland, if we include the islands.

Tarakaï extends along the eastern coast of Asia between 142° and 145° E. long., and is separated from the continent by a strait, which is called the Gulf of Tartary, because the country of the Mantchoos for a long time was known by the name of Tartary. This gulf or strait is 200 miles wide at its most southern extremity, but it grows narrower as we advance farther north, until near 51° 30′ N. lat. it is less than 40 miles wide. So far this sea has been navigated, but at that point a shoal extends across the gulf, on which there is only water for boats. That portion of the gulf which lies between 51° 30′ and 52° 30′ N. lat. is not known. Krusenstern thinks that this part of the island of Tarakaï is united to the continent of Asia by an isthmus, but La Perouse expressly states that dried fish is carried from the western shores of the island to the river Amur in boats, which could not be done if the isthmus of Krusenstern existed. It may appear strange that these two navigators have not been able to decide this point, as one sailed up from the south to 51° 30′, and the other from the north to nearly 53° N. lat., but they found the sea always covered with thick fogs, and hardly ever could see a few miles before them, and the water shoaled so suddenly and constantly that they did not think it advisable to proceed farther. If an isthmus exists, it must be near 52° 30′ N. lat., where a low sandy cape certainly stretches so far to the east as to approach very near the western shores of the island. North of this narrow and shallow part, the gulf presents a circular basin, about 50 miles wide, which receives the waters of the river Amur, and is therefore called by Krusenstern the Liman of the Amur. This basin is united with the sea of Okhotzk by a strait, which in the narrowest part is about ten miles wide. It does not appear that there is any current in this gulf, which is in favour of the opinion of Krusenstern. The southern extremity of Tarakaï is divided from the island of Yeso by the Strait of La Perouse, which, between Cape Crillon on Tarakaï and between Cape Soja on Yeso, is hardly thirty miles wide, and in which the tides run with great velocity. La Perouse, who visited the Gulf of Tartary in June, found that southern winds were blowing nearly uninterruptedly; but Broughton, who was there in September, experienced eastern and north-eastern winds.

Though the coast of the island is of great extent and much indented, it does not appear that there are many good harbours. Along the western shores only open roadsteads have been found. At the southern extremity of the island, between Cape Crillon and Cape Aniva, is a wide open bay, the Bay of Aniva, which is enclosed by two projecting tongues of land, and extends 50 miles from south to north. There is good anchorage at its most northern extremity. The projecting headland, which occurs near 49° N. lat., on the eastern side of Tarakaï, and terminates with Cape Patience, encloses the Bay of Patience, which is very extensive, but open and exposed to eastern and southern winds. At the most northern extremity of the island is the Northern Bay, between the cape of that name and Cape Mary. It is not very large, and offers in several places good anchorage and shelter.

The island is naturally divided into three tracts: the mountainous, which occupies the southern portion; the level, in the middle; and the hilly tract, which extends over the northern districts. The mountain-region is the largest, and comprehends more than one-half of the island, terminating on the north at Cape Délisle de la Croyère (near 51° N. lat.). A chain of mountains begins at Cape Crillon, and continues in an uninterrupted line northward to an elevated summit called Peak Bernizel, where it seems to be united to another and lower chain, which traverses the eastern peninsula, and incloses the Bay of Aniva on the east. Cape Aniva is formed by a high isolated hill, which is connected by a low isthmus with the chain of hills which lies farther north, and joins the principal range at Peak Bernizel. Farther north occur other summits, as Peak Lamanon, Peak Mongez, and Mount Tiara: the two last mentioned are north of 50° N. lat. None of these summits have been measured, but their elevation probably does not exceed 5000 feet above the sea-level. Along the western coast the mountains in some places come close up to the water's edge, but a narrow level tract generally separates them from the shore, and this tract is covered with high trees, while the delivities of the mountains are mostly bare, probably owing to the rapidity of their slope. Extensive flats occur at Aniva Bay and the Bay of Patience. The low country which skirts the shore on the eastern side of the mountains appears to be more extensive and less interrupted than that along the western shores. On the eastern side the shore in some places is level and low, and in others elevated. The country extending from 51° to 53° N. lat. is so low that the shores are not visible at the distance of five or six miles, and it is sandy and overgrown with bushes. The interior is in general level, partly sandy and partly swampy, and a great part of it is covered with short bushes or small trees. A number of low sand-hills are dispersed over the country, which are destitute of trees, and appear like islands in a sea of verdure. The hilly tract occupies the most northern part of the island, or that which extends from 53° N. lat. to Cape Elizabeth. The coast is in general high and steep, being generally composed of perpendicular white cliffs. There are only a few tracts in which the coast sinks down to the level of the sea; and here the villages are built. The interior consists of a succession of high hills covered with full-grown trees to the very summits; the valleys which intervene between them are partly wooded and partly covered with a fine close turf. This part of Tarakaï seems to possess a considerable degree of fertility.

Climate.—As European navigators have only occasionally visited this island, and have only stayed there a few days, or at the utmost a couple of weeks, our information respecting the climate is extremely deficient. We only know that even at the beginning of June the higher summits of the mountains have still some snow on them, which indicates that the country must be much colder than Great Britain, which is nearly at the same distance from the pole: otherwise the summer months seem to be temperate, but the continual fogs which enclose the island nearly all the year round are more dense than those that occur on the coasts of Nova Scotia.

Productions.—No kind of grain is cultivated, not even round the settlements of the Japanese, nor are orchards or kitchen-gardens mentioned. The inhabitants however derive profit from the spontaneous products of the soil: they dry the roots of a species of lily for winter food, and collect great quantities of garlic and angelica, which are found on the skirts of the woods. The forests consist of oak, maple, birch, and medlar, but chiefly of fir. Large tracts are covered with juniper-trees. Gooseberries, raspberries, and strawberries abound, and also wild celery and water-cresses. It does not appear that wild animals are numerous: only martens and bears are mentioned, and even these do not seem to be common. The sea supplies the inhabitants with the means of subsistence. Salmon is perhaps nowhere so abundant as in the Gulf of Tartary. The account of La Perouse in this respect seems hardly credible. Dried and smoked salmon, together with the skins of salmon, are prepared for the foreign market, and constitute the principal articles of export. Herrings, which are very abundant, are likewise cured and exported. Cod occurs, but it does not seem to be taken to such an amount as to form an article of export. Whales are numerous in the Strait of La Perouse and along the eastern coast, and train-oil in bladders is an article of export. In the same parts seals, fur-seals (*Phoca ursina*), sea-lions (*Phoca jubata*), and sea-otters (*Lutra marina*) are very frequent. No mines are worked.

The inhabitants are aborigines, among whom a few Japanese have settled on the Bay of Aniva, and a few Mantchoos on the Northern Bay. In the Japanese settlements are a few Japanese officers, but no Chinese authorities have been seen, nor is this island enumerated among the possessions of the Chinese. The aborigines call themselves *Aïnos* (*i.e.* men), and are at present known under that name as a nation. This nation extends northward to the peninsula of Kamtchatka, of which it occupies the most southern extremity near Cape Lopatka, and it inhabits the Kurile Islands, the Japanese island of Yeso, Tarakaï, and the coast of the continent of Asia from the mouth of the Amur river southward to the very boundary-line of Corea. They never cultivate the soil, nor apply themselves to hunting wild animals, and they keep no domestic animals except dogs, which they use in winter for drawing their sledges, like the inhabitants of Kamtchatka. La Perouse found them somewhat shorter in stature than Europeans, rarely exceeding five feet six inches, and some hardly five feet. Their countenances are benevolent and friendly; they have tolerably large eyes, thick lips, rather high cheek-bones, and a somewhat broad and compressed nose. Their cheeks and chins are covered with long, thick, black beards: there are many individuals whose body is covered with hair, as occasionally is the case in Europe. The only kind of manufacture among them is a kind of cloth made of the bark of willow-trees, which are very common in the island, and do not seem to differ from the European species. They use in this manufacture a machine. The other articles of cloth they obtain by barter from the Japanese and Mantchoos. They show also some skill in the erection of their huts and the building of their boats. Their huts are of wood, covered with the white bark of birch, and have a roof of wood thatched with dry straw. La Perouse compares them with the cottages of the peasants of France. Their boats are of large size and strongly built. Some of their costumes are evidently adopted from the Chinese, as the practice of letting their nails grow to a considerable length, and their mode of saluting by prostration. Like them, they sit on mats, and eat with little sticks. Their language does not resemble either that of the Japanese, Chinese, or Mantchoos. The Mantchoos visit the northern and western coast to barter dried and smoked salmon, and dried herrings, for some nankeens, tobacco, and utensils. The Japanese visit the southern and eastern districts, where they obtain train-oil, herrings and salmon, and a few furs, and give in return lacquered wooden eating and drinking vessels, tobacco and tobacco-pipes, kitchen utensils, rice, coarse cotton-cloth, and some minor articles.

(La Pérouse's *Voyage round the World;* Broughton's *Voyage of Discovery in the Northern Part of the Pacific;* Krusenstern, *Voyage round the World;* and Krusenstern's *Recueil de Mémoires explicatifs, &c.;* Langsdorf's *Voyages and Travels in various Parts of the World.*)

TARANTA'SIA, or TARANTAISE. [SAVOY.]

TARANTISMUS is the name given to a peculiar nervous affection which was long supposed to be the consequnce of the bite of the Tarantula Spider. It seems to have occurred frequently in the kingdom of Naples during the sixteenth century, and to have been nearly similar in its characters to the disease which was originally called St. Vitus's dance [CHOREA], and to that which has occasionally prevailed in parts of Scotland, and has been called the 'leaping ague.'

The patients, nearly all of whom were women, soon after being bitten (as it was supposed) used to fall into a profound stupor, from which nothing roused them but the sound of such music as pleased them, on hearing which they had an irresistible desire to dance. So long as the music continued, and was in tune and sufficiently lively, they would go on jumping and dancing till they fell exhausted; and, all the time, some used to shriek, some to laugh and sing, some to weep. When, after a short rest, they had recovered from their fatigue, they would again begin to dance with as much vigour as before, unless the music were played slowly or confusedly, when they would stop and grow anxious and melancholy, or even, if the music were not soon made agreeable to them, would fall into a dangerous state of stupor. The disease used to last about four days, and seemed to be cured by the profuse perspirations brought on by the active exercise; but it often returned at the same time in the following year, or even for a succession of years, and on every occasion required the same treament.

Since it has been found that the bite of the Tarantula can produce no such strange effects as these, many have suspected that the disease ascribed to it never really existed, but was feigned for the purpose of exciting pity or for the pleasure of dancing. There is good reason to believe that in most instances it was merely counterfeited: but there can be no doubt that such a disease had occurred and had given occasion to the practice of the fraud. Besides its similarity to diseases whose reality is generally admitted, such as the St. Vitus's dance and the leaping-ague, cases have occasionally been met with in recent times which closely resemble it, and in which there could be no just suspicion of fraud. Such a case is described by Mr. K. Wood, in the seventh volume of the 'Medico-Chirurgical Transactions;' another is recorded by Mr. Crichton, in the 31st volume of the 'Edinburgh Medical and Surgical Journal;' and in the 'Cyclopædia of Practical Medicine,' art. 'Chorea,' several cases of analogous affections are related. All these however occurred singly. That the Tarantismus and the St. Vitus's dance should have assumed the characters of epidemics may be ascribed to their propagating themselves, as all convulsive affections are apt to do among nervous and superstitious persons, by the propensity to imitation, the effects of which are still frequently seen in the production of hysteria, chorea, and other similar diseases.

TA'RANTO, a town of Apulia, in the kingdom of Naples, in the administrative province of Lecce, or Terra d'Otranto. It is an archbishop's see, and the head town of a district: it contains 18,000 inhabitants. It occupies only a small part of the site of the antient Tarentum, being confined to the island or peninsula at the entrance of the inner harbour or Mare piccolo, on which formerly stood the fortress or acropolis of Tarentum. There are few remains of the antient town. Modern Tarento is ill built: it is fortified and has a castle, several churches and convents. It carries on some trade by sea in small craft. It has also some manufactures of linen and of 'pinna marina,' the name of a kind of mussel or shell-fish, the silky filaments of which are woven into gloves and other articles. A part of the population is employed in fishing. Excellent oysters are found on the coast. The inner port is nearly filled up, but the outer or large port is accessible to vessels of good size, and is protected by two islands which are situated at the mouth. Taranto has the advantage of being the only safe harbour in that part of the eastern coast of Italy which extends from Messina to Cape Leucas. The large gulf which lies between the coast of Calabria and the Iapygian peninsula is called the gulf of Taranto. Much wool is grown in the neighbourhood of Taranto. Two lagoons, one of them of considerable extent, which lie south-east of the town, and which communicate with the sea, yield a great quantity of salt by evaporation. The district of Taranto contains above 87,000 inhabitants. [OTRANTO, TERRA DI.] (Neigebaur; Serristori; Afan di Rivera, *Considerazioni sulle due Sicilie;* Petroni, *Censimento dei Reali Dominj.*)

Antient Tarentum, the Taras (Τάρας) of the Greeks, was one of the principal, or rather the principal Greek city on the east coast of Italy. It is said to have been a town of the Messapians, to which were joined some Cretan colonists from the neighbouring town of Uria. About 694 B.C., according to the story, Phalantus, one of the Partheniæ, or illegitimate sons of the Spartan women born during the absence of their husbands in the first Messenian war, having left his country with a number of others of the same condition, arrived on the coast of Iapygia, took Tarentum, and expelled the original inhabitants. He organized the new colony, and remained at the head of it until he was expelled by an insurrection, and withdrew to Brundusium, where he died. (Justin, iii. 4.) A war between the Tarentines and the Iapygians ensued, in which the people of Rhegium assisted the Tarentines, but they were defeated by the Iapygians, who destroyed a great number of the Tarentines. (Diodorus, xi.) Tarentum however recovered from its losses, and it flourished by commerce, acquired a considerable extent of territory, and became the most powerful city of Magna Græcia. Heraclea was a colony of Tarentum. Herodotus (iii. 136) mentions Aristophilides as king of Tarentum in the time of Darius Hystaspes. The government however underwent several changes, and Strabo (vi. 193) speaks of Tarentum as being at one time a democracy. Archytas, a native of Tarentum, is said to have made a body of laws for the Tarentines. [ARCHYTAS.]

About 338 B.C. the Tarentines, being engaged in war with their neighbours the Lucanians, applied to Sparta for assistance. Archidamus, the son of Agesilaus, was sent to them, and he was killed in fighting on their side. Some years after, being hard pressed by the Lucanians and Bruttii, the Tarentines applied to Alexander, king of Epirus, and uncle to Alexander the Great. He came to Italy with troops, obtained considerable advantages, but was at last surprised and killed by the Bruttii, near Pandosia, B.C. 323. (Justin, xii. 2; Livy, viii. 24.). The Tarentines had by this time degenerated; like most of the Greeks on the Italian coast, they had become luxurious and effeminate. Ælian (*Var. Hist.*, xii. 30) speaks of their habit of drinking early in the morning, and their appearing intoxicated in the forum.

In the year 282 B.C. the Romans, after having conquered the Samnites, made war upon the Lucanians. The Tarentines, who saw with jealousy the encroachments of Rome, unexpectedly attacked a Roman fleet, commanded by the Proconsul L. Valerius, which was sailing near their coast, and killed a great many of the crew. The Roman senate sent commissioners to demand reparation for the outrage, but the Tarentines treated them with insult. Aroused however to a sense of their danger, they applied to Pyrrhus, king of Epirus, for assistance, and sent vessels to convey him over with his troops, B.C. 281. Pyrrhus soon found that the Tarentines were too effeminate to give him much support, and he was obliged to assume a dictatorial power in order to enforce something like order and obedience among them. Chiefly with his own troops, he carried on the war against Rome for several years, but was at last defeated by the consul M. Curius Dentatus, and obliged to re-embark for Epirus; leaving however a garrison in Tarentum, B.C. 275. [PYRRHUS.] The Tarentines having shortly after quarrelled with the Epirote garrison, applied to the Carthaginians for assistance to drive away the Epirotes. The Romans having had notice of this negotiation through Milo, the Epirote commander, sent the consul L. Papirius Cursor, who took Tarentum, and allowed the Epirote garrison to return home. It appears however from Livy (*Epitome*, xv. 1) that the Tarentines, though treated with severity, were placed in the condition of allies of Rome, which they continued to be till after the battle of Cannæ, when Hannibal, who occupied Campania and Apulia, began to carry on secret intelligence with some of the Tarentine chief citizens, who were dissatisfied with their forced Roman alliance.

In the year 212 B.C. the hostages of the Tarentines ran away from Rome, but being pursued and overtaken near Terracina, they were brought back, and after being beaten with rods were thrown down the Tarpeian rock. This cruel punishment irritated the people of Tarentum, an agreement was made with Hannibal, and his troops were admitted into the city by night. The Roman garrison stationed in the citadel was besieged by sea and by land. The example of Tarentum was followed by Metapontum and Thurium. The Roman garrison in the citadel of Tarentum defended it most gallantly, although they suffered greatly from want of provisions. An attempt which was made to introduce supplies by vessels from Sicily was defeated by the Tarentine squadron under Democrates, with the loss of several Roman ships. In 209 B.C. the consul Q. Fabius Maximus retook Tarentum by surprise, and through the treachery of the garrison left by Hannibal, which consisted of Bruttian auxiliaries. The Tarentines made only a slight defence. Nico, Democrates, and Philomenus, the leaders of the party which was hostile to Rome, fell during the assault. A great booty was made by the Romans, said to be nearly equal to that made at the taking of Syracuse. But the consul Fabius abstained from taking the statues of the gods, saying he would leave to the Tarentines their angry deities. (Livy, xxv. 7, 11; xxvi. 39; and xxvii. 15, 16.)

From that time Tarentum remained in subjection to Rome; and although it greatly declined in wealth and importance, it was still a considerable place in the time of Augustus. Horace calls it 'molle Tarentum' (*Satir.*, ii. 4), and 'imbelle Tarentum' (*Epist.*, i. 7). The Greek language and manners were retained by the inhabitants even after the fall of the Western Empire. Tarentum was one of the chief strongholds retained by the Byzantine emperors in Southern Italy. About A.D. 774, Romualdus, the Longobard duke of Beneventum, took Tarentum from the Byzantines. The Saracens landed at Tarentum about A.D. 830. The town was afterwards several times taken and sacked, and it was during this period that the old town on the mainland was abandoned, and the inhabitants retired to the island as being more fitted to their reduced numbers, and also better capable of defence. At the breaking up of the Longobard state of Beneventum, Tarentum was for a time a separate principality, like Capua and Salernum. In the eleventh century it was taken by the Normans with the rest of Apulia, and Robert Guiscard made his son Bohemund prince of Tarentum. Under the Suabian dynasty, Frederic II. gave the principality of Tarentum to his illegitimate son Manfred. Charles II. of Anjou gave it to his younger son Philip, whose descendants acted a considerable part in the civil wars of the kingdom of Naples under Joanna I. Tarentum came afterwards into the possession of the powerful family of the Orsini, upon whose extinction it reverted to the crown.

(Giannone; Giovani, *De Antiquitate et varia Tarentinorum Fortuna*; D'Aquino, *Deliciæ Tarentinæ Libri IV.*, Naples, 1771.)

TARARE. [RHÔNE.]

TARASCON, a town in France, in the department of Bouches du Rhône, 452 miles south-south-east of Paris, by Auxerre, Lyon, Valence, Le Pont St. Esprit, and Beaucaire; and 48 miles west-north-west of Aix, the capital of the department.

Tarascon is mentioned by Strabo, who writes the name *Ταράσκων*, and by Ptolemy, who writes it *Ταρουσκών*; but it appears to have been of little importance in antient times. Under the counts of Provence, to whom in the middle ages it was subject, it was of more consequence from its frontier position. It had a castle at least as early as A.D. 1251; of which the present castle occupies the site. This latter was built, according to Millin, by Louis II. of Anjou, count of Provence (A.D. 1384-1417); but according to other authorities Charles II. *le Boiteux* (A.D. 1285-1309) commenced the structure and Louis finished it. It is popularly called 'Château du Roi Réné' ('King Réné's Castle'), but it was undoubtedly erected before his accession.

The town is on the left bank of the Rhône, immediately opposite Beaucaire, on a rocky site sufficiently elevated above the bed of the river to secure it from inundation. The communication with Beaucaire was antiently by a stone bridge; a mass of stone-work, the remains of this bridge, lately existed, and probably still exists, in the middle of the river, between the two towns; the rest of the bridge had been swept away by the stream. In later times the communication was by two bridges of boats, extending one from each bank to this fragment of the old bridge. Within the last few years a suspension bridge of iron-bars has been constructed.

Tarascon is surrounded by an old ruined wall flanked with towers, and is entered by three gates. Some of the streets are straight and tolerably wide. The castle is a picturesque Gothic building of freestone in pretty good preservation: from the platform on the top of the castle there is an extensive view along the valley of the Rhône. Sainte Marthe (Martha) is the principal church in the town; in the crypt is a monument with a marble statue apparently sculptured early in the 16th century, and shown as the monument of Sainte Marthe. In the same church is the uncouth figure of a monster called the Tarasque, which, according to the legend, fed on human flesh and haunted the banks of the Rhône between Arles and Tarascon, and was overcome by Sainte Marthe. This figure is paraded through the city on Whit-Monday amidst the shouts of the idlers of the place, whose riotous behaviour frequently leads to serious accidents: it also makes part of the procession on the festival of Sainte Marthe. These customs, which had been disused after the Revolution, were renewed under the empire of Napoleon, if not before. There are a town-hall, a court-house, a commercial court (*Tribunal de Commerce*), two hospitals, a theatre, barracks, and abattoirs, or public slaughter-houses; these are most of them, if not all, modern buildings.

The population of the commune, in 1831, was 9225 for the town, or 10,967 for the whole commune. The neighbourhood of the town is very fertile, and a considerable trade is carried on in corn, wine, and oil; the townsmen are engaged in throwing silk and spinning cotton-yarn, and in manufacturing hussars' and grenadiers' caps, hats, brandy, vinegar, and starch; there are tan-yards and cooperages. There are three fairs in the year. The industry of the inhabitants and their lively temperament impart to the place an air of life and activity which contrasts remarkably with the ordinary dulness of Beaucaire.

Tarascon has a communal college or high school and a public library of 2000 vols.: it was the birth-place of Leon Ménard, the antiquary. The town was for a long time after the Revolution the seat of a subprefecture, or capital of an arrondissement; but about the time of the first restoration of the Bourbons, the subprefecture was removed to Arles.

(Vaysse de Villiers, *Itinéraire Descriptif de la France*; Millin, *Voyage dans les Départemens du Midi de la France*; *Dictionnaire Géographique Universel*.)

There is another town in France called Tarascon, in the department of Ariège, and on the river Ariège above Foix: it is from its position sometimes distinguished as Tarascon-sur-Ariège. D'Anville is disposed to identify it with the Tarusconienses of Pliny (*Hist. Nat.*, lib. iii., c. 5, 6), which others would fix at Tarascon on the Rhône. Tarascon-sur-Ariège is a small place, a mart of the ironstone dug in the adjacent Pyrenees. The population is probably about 1500.

TARA'XACUM. [Leontodon.]

TARAZO'NA, a considerable district of Aragon in Spain, bordering on the north and east on the province of Navarre; on the south on the province of Soria; and on the west on the Corregimiento de Borja. The capital, Tarazona, the antient Turiaso, is situated at the foot of a lofty mountain-range called the Moncayo, on the banks of the river Queiles, in 41° 55′ N. lat., 2° 4′ W. long. Tarazona is the see of a bishop, who is suffragan of Saragossa. The town is badly built, and the streets narrow and crooked. With the exception of the cathedral, a fine Gothic pile erected in the thirteenth century, there is no other building worth notice. Miñano (*Diccionario Geografico*, vol. viii., p. 392) estimates the population of Tarazona at 10,000 inhabitants, in 1827. The neighbourhood is well cultivated, and yields abundant crops of all sorts of grain. There is also a small town in La Mancha called Tarazona.

TARBES, a town in France, capital of the department of Hautes Pyrénées, or High Pyrenees: about 400 miles from Paris, in a direct line south-south-west; 453 miles by the shortest road through Orléans, Châteauroux, Limoges, Périgueux, Agen, and Auch: or 533 miles by Limoges, Cahors, Montauban, Toulouse, and Auch, which is the route given by Reichard in his *Itinéraire*. It is in 43° 13′ N. lat. and 0° 5′ E. long.

Tarbes is mentioned in the 'Notitia Provinciarum et Civitatum Galliae,' where it is called Turba: it was the chief town of the Bigerrones, Bigerri, or Begerri, a nation which has given name to the district of Bigorre. In the town or adjacent to it was a fortress, called, in the 'Notitia,' *Castrum Bigorra*, the site of which is now occupied by the cathedral. In the middle ages, Tarbes was the capital of the county of Bigorre; it suffered from the ravages of the Saracens and the Normans, and was held for a time by the English. There was some sharp fighting near the town, in the campaign of the Duke of Wellington, A.D. 1814.

Tarbes is situated in a fertile plain, nearly 1000 feet above the level of the sea, watered by the Adour (on the left bank of which the town stands) and by the Lechez, and bounded on the south by the Pyrenees. The town is walled; the streets are well laid out, broad, paved, and watered by little brooks or streams, which contribute both to coolness and cleanliness. There are two public places or squares, that of Maubourget, which is planted with trees, and that of Marcadieu, remarkable for its size; beside these two places, there is an agreeable promenade, called Le Prado, outside the walls. The houses in the town are generally of two or three stories, well built, of brick, some of marble, and roofed with slates. They have for the most part good gardens. The principal public buildings are the cathedral; the prefect's office, formerly the residence of the bishop, which from its elevated situation commands a pleasant prospect; and a handsome theatre of quite modern erection. The old castle of the counts of Bigorre is used as a prison. Tarbes has five faubourgs, or suburbs, on the five roads which lead from it in different directions: the suburbs are that of Rabastens on the east, on the right bank of the Adour, which separates it from the town; that of Vic on the north; that of Bagneres on the south; all on the roads leading respectively to those places; that of Sainte Anne on the west, on the road to Pau; and that of Sainte Catherine on the south-west, on the road to Lourdes and Argellez.

The population of the commune, in 1826, was 8712; in 1831, 9706; in 1836, 12,630. There are copper-mills and manufactories for copper utensils, paper-mills, and tanyards; the town is the general mart for the supply of the department; there is a considerable market every fortnight for agricultural produce of every kind and for cattle, much frequented by the Spaniards, who make large purchases of live stock. There is a marble-quarry near the town.

Tarbes has a subordinate court of justice and a commercial court, some fiscal and other government offices; a communal high school with a library, and school buildings of good architecture; a free school of drawing and architecture; an hospital; a society of agriculture; and a government stud, for which there are two large ranges of stables and a handsome riding-school, just outside the town.

The arrondissement of Tarbes has an area of 505 square miles, and comprehends 197 communes: the population, in 1831, was 104,022; in 1836, 110,542; and is divided into eleven cantons, or districts, each under a justice of the peace. The bishopric of Tarbes dates from the sixth century, and now comprehends the department: the bishop is a suffragan of the archbishop of Auch.

(Millin, *Voyage dans les Dép. du Midi de la France*; Malte Brun, *Géographie Universelle*; *Dictionnaire Géographique Universel*.)

TARDI'GRADA, Cuvier's name for the first family of the Edentata, comprising, of living genera, the Sloths only. [Ai; Unau.] The *Tardigrada* form the eighth order in Illiger's method, and comprise the Sloths and *Prochilus*; but the latter cannot be said to have any claim to such a collocation. [Bear, vol. iv., pp. 90, 91.]

TARDI'VOLA, Mr. Swainson's name for a genus of the subfamily Tanagrinæ, and thus characterized by him:—

Bill lengthened, conic, somewhat slender; the sides not gibbous; the commissure slightly or not at all sinuated. Wings very short; the first quill shorter than the four next, which are equal and longest. Tail lengthened, cuneated or graduated. Feet large. Tarsus and toes long. Outer toe rather shorter than the inner. Claws slender, slightly curved.

Example, *Tardivola sphenura*. [Tanagers.]

TARE. We hardly know whether *all* the words *tare*, *tret*, *cloff*, *suttle*, *gross*, *net*, are still used in commerce; they all hold their places in works of arithmetic. *Tare* is said to be the allowance for the weight of the box or bag in which goods are packed; *tret*, an allowance of 4lb. in 104lb. for waste; *cloff*, an allowance of 2lb. in 3 cwt., that the weight may hold good when sold by retail; the *gross* weight, that of the goods and package all together; the *suttle* weight, that which remains when tare only is allowed; the *net* weight, that which remains when all allowances are made. We shall merely state what we know of these words.

Tare (written *tara* in some of our older arithmetical works) is made from the Italian *tarare*, to abate. In that language *tara* is a technical term implying abatement of any kind, not for weight of package only. We believe *cloff* to have been the English word which originally stood for the allowance for package: in our older arithmeticians, tare and cloffe generally go together, and the latter seems to be for the package, the former for other abatements. *Cloff* or *clough* is defined in an old dictionary as that wherein any thing is put for carriage sake. Humphrey Baker (1562) speaks only of tare and cloffe; Masterson (1592), of tara, cloffe, and tret, but the first two terms are used together. We cannot find cloff used in the sense given to it by our modern books of arithmetic until about the end of the seventeenth century.

Tret seems to be from the Italian *tritare*, to crumble. Stevinus, in his Latin treatise on book-keeping, uses *intertrimentum* in the sense of deduction from the quantity charged for. *Gross* weight needs no explanation; the Italian form *netto* was formerly used for net weight. It being well known that these terms generally come to us from the Italian, we must suppose suttle to be from *sottile*, which is used in the sense of fine and valuable, and is applied to the finer part, as separated from the coarser. One of our old writers (Masterson, 'Arithmetike,' 1592) uses suttle weight in a manner which makes us imagine we see the origin of the *hundred* weight being a hundred *and twelve* pounds. Without any explanation, as if it were matter of notoriety, he contrasts *suttle* and *averdupois* weight, the former having 100 pounds to the hundredweight, the latter 112. In the rougher sort of goods, at the same period, the tare was (as appears by the tables they give) very often 12 pounds in 112: perhaps then the hundredweight of 112 pounds was only an allowance for the weight of the box, barrel, or other package.

TARES are a most important green crop in the improved systems of agriculture, especially on heavy soils, where they thrive best. When sown in autumn, with a small sprinkling of wheat or rye, they cover the ground in spring, and supply abundance of fodder in summer. A good crop of tares is fully equal in value, if not superior, to one of red clover: it comes off the ground in sufficient time to give the land a hasty summer tillage, which is so useful in destroying weeds, and to allow turnips to be sown in the same season. They smother annual weeds if the crop is plentiful, which should always be secured by an abundant manuring: thus they are a good substitute for a summer fallow in heavy soils, and amply repay the labour and manure bestowed upon them.

There are many species and varieties of tares; but that which is found the best adapted for agricultural purposes is the common tare (Vicia sativa), of which there are two principal varieties, very slightly differing in appearance, one of which is hardy, and will stand the severest winters: the other is more tender, and is therefore only sown in spring; but it has the advantage of vegetating more rapidly, so that spring tares sown in March will be fit to cut within a fortnight or three weeks after those which were sown in autumn. By sowing them at regular intervals from September to May, a succession of green tares in perfection, that is, in bloom, or when the pods are formed, may be cut for several months, from May to October. A prudent farmer arranges his crops so that he shall have artificial green food for his horses and cattle at least six months in the year, by having tares fit to cut between the first and second cut of clover. When there are more tares than is absolutely required for this purpose, and the weather permits, they make excellent hay; or, if the weather is not favourable, they are cut and given to sheep, which are folded on the portion already cut. It is an advantage to have portable racks for this purpose, that the fodder may not be trod under foot and wasted; or the tares may be placed between hurdles, tied two and two, which form extemporaneous racks. It is prudent to raise sufficient seed for another year; but a crop of seed-tares raised for sale is seldom profitable, as they greatly exhaust the soil: and the price varies so much in different seasons, that it becomes too much of a speculation for a farmer. The difficulty in distinguishing the seed of the winter tare from the spring variety is so great, that it should either be raised at home, or only purchased from neighbours, or from the most respectable seedsmen. It is a common practice with dealers to mix the seeds of the winter tares, after the time of sowing is past, with spring tares, which are in request at a later period. The inconvenience of this is, that they do not vegetate equally, and consequently the winter tare is not in bloom when the spring tare is fit for the scythe. Foreign tares, which are imported in large quantities, are often the growth of southern climates, and will not stand the winter; or they have been raised from seed sown in spring, so as to be really spring tares. The difference is probably more owing to habit than to any real botanical distinction between them. When spring tares are sown in autumn instead of winter tares, they may occasionally stand the frost, if not very severe; but, in general, they rot on the ground and never recover; whereas the real hardy winter tares, whose vegetation is slower, seem insensible to the severest frosts.

In the early part of summer green rye and tares, mixed, are sold at a great price in large towns, for horses which have worked hard and been highly fed in winter. They act as a gentle laxative, and cool the blood: near London, where every produce is forced with an abundance of manure, tares are often fit to cut early in May, and the land is immediately ploughed and planted with potatoes, or sown with mangel wurzel or ruta baga, which come off in September or October, in time for wheat-sowing. Thus two very profitable crops are raised during the time that the land, according to the old system, would have been fallow; and at the same time it is left as clean, by careful hoeing, as the best fallow would have made it.

There are a great many species of tares or vetches, for the terms are synonymous, many of which have been proposed to be introduced into general cultivation; but none seem, on the whole, to be so well adapted to our climate as the common tare: some have biennial and some perennial roots. The *Vicia biennis* has a strong stem and large leaves, and grows four or five feet high; but it is not so succulent as the common sort. It might, perhaps, by cultivation and early cutting, become a useful early fodder, and it may be worth while to make some experiments with it. There are several species of tares which grow wild in bushes and hedges; but they have never been cultivated in the fields, perhaps from the difficulty in collecting the seeds, which shed as soon as they are ripe. Of these, the *Vicia cracca* appears most deserving of attention. It bears its blue flower on stems or spikes longer than the leaves, which are downy. It is very common in France among wheat; and, although a decided weed there, it is not much dreaded by the peasants, as it improves the fodder greatly. It has the appearance of great luxuriance in its growth, where it meets with a proper support. If it were mixed with some plants with a strong stem, such as the Bokhara clover (Melitotus arborea altissima), which itself affords much fodder, it might probably be cultivated to great advantage.

In the south of France there is a white perennial vetch or tare, called *Vicia pisiformis*, which is cultivated for its white seeds, of which soups are made, as with the pea and lentil. It grows in very light soils; and, although indigenous to a southern climate, it is said not to be impatient of frost. It has been called by some the Canadian lentil, or the white tare.

We shall only notice one more of the wild tares, which is an annual; it is called the yellow tare (*Vicia lutea*). It grows in stony soils and among bushes, is very branching, and rises from one to two feet high. From some experiments made by the Agricultural Society of Versailles several years ago, it would appear that this tare might be cultivated with great advantage, and is even superior to the common sort, because it can be cut two or three times during the summer, and affords a very good pasture in winter, which does not stop its vegetation: it will even bloom in a mild winter. Although short, it is so thick upon the ground, that its first cut is as heavy as that of the common tare, which is seldom worth cutting a second time.

Tares should be sown on land which is well pulverised. If after wheat, the stubble should be ploughed in with a deep furrow after a powerful scarifier has gone over the land several times to loosen it: five or six cart-loads of good farm-yard dung should be ploughed in. The tares should be drilled or dibbled, and the surface well harrowed. The intervals should be hoed early in spring: this will accelerate the growth, and insure a complete covering of the ground. As soon as the tares show the flower, they may be cut daily till the pods are fully formed; after this, any which remain uncut should be made into hay or given to sheep; for if the seeds are allowed to swell, the ground will be much exhausted. Another piece should be ready to cut by this time, and thus there may be a succession of tares and broad clover from May to November. Tares may be sown as late as August, on a barley or rye stubble, for sheep-feed early in winter, or to be ploughed in to rot in the ground where beans or peas are intended to be sown early in spring: this is perhaps the cheapest mode of manuring the land, the only expense being the seed; for the tillage is necessary at all events. In light soils, tares and buckwheat sown together immediately after barley or rye harvest, will produce a considerable crop of vegetable matter, which may be ploughed in in November. In favourable seasons, wheat may be sown immediately after, without fearing the effect of two white crops following each other; for the tares and buckwheat intervening, by their shade, and the two ploughings of the ground, one when they are sown, and the second when they are ploughed in, will entirely destroy all weeds, and give to the soil that improvement which will enable it to bear as good a crop of wheat as it would have done had it been sown the year after on a clover ley. Clover, which could not be sown with the barley, from the foul state of the land, may be sown among the wheat in the next spring, when it is hoed for the second time. This is held out as a hint to show how an accidental interruption in a rotation may be remedied without any loss of crop or great deviation. As no rule is without exception, so no rotation can always be strictly adhered to; and those crops which admit of being sown at different times of the year are of the greatest use as substitutes for others which could not be conveniently sown without materially altering the succession of crops. In the common course of cultivation of heavy soils, where occasional fallows are necessary to clean the land, one-half of the land which requires fallowing may be sown with tares; and thus the clean unproductive summer fallow will only return at every second rotation. If the tares have been manured, or if they are fed off with sheep folded upon the land, the wheat or other crop which is sown after them will be as good as on a clean fallow, or after a good crop of clover. This alone would make tares a valuable crop; and they may be compared in their effect on heavy lands to turnips on lighter soils.

The seeds of the tare are occasionally ground into meal and made into bread. It is a very poor food; and when there is more seed than can be profitably disposed of, it may be given to pigs: but poultry, especially pigeons, are very fond of it. When given to horses, the seeds of tares are found very heating; and although they produce a fine glossy coat, they are not to be recommended for this purpose.

TARENTUM. [TARANTO.]

TARGUMS, or CHALDEE PARAPHRASES OF THE OLD TESTAMENT. During the Babylonish captivity, the language of the Jews was affected by the Chaldee dialect spoken at Babylon, to such an extent, that upon their return they could not understand the pure Hebrew of their sacred books; and therefore, when Ezra and the Levites read the law to the people, they found themselves obliged to add an explanation of it, undoubtedly in Chaldee. (*Nehem.*, viii. 8.) [HEBREW LANGUAGE; ARAMAEAN LANGUAGE.] In course of time such explanations were committed to writing, and from their being not simple versions, but explanatory paraphrases, they were called by the Chaldee word *Targum* (תרגום), which signifies 'an explanation.'

There are ten Targums extant:—1. *The Targum of Onkelos*, on the Pentateuch, is the most antient. Onkelos is supposed to have lived at Babylon. The Babylonish Talmud makes him a contemporary of Gamaliel, at the very beginning of the Christian æra. No critics place him lower than the second century. His language approaches nearer than that of the other Targums to the pure Chaldee of the books of Daniel and Ezra. He follows the Hebrew text so closely, that his work is less a paraphrase than a version, and he is free from the fables which prevailed among the later Jews.

2. *The Targum of Jonathan Ben Uzziel*, on the Prophets, is by many ascribed to an author contemporary with Onkelos, or even a little older, namely, Jonathan the son of Uzziel, a disciple of the elder Hillel. The mention of his name in the Talmuds proves him to have lived earlier than the fourth and fifth centuries. But Jahn points out certain internal marks, from which he concludes that this Targum was compiled, towards the end of the third century after Christ, from other paraphrases, some of which at least were considerably older. The Jews make Jonathan contemporary with the prophets Malachi, Zechariah, and Haggai, and relate marvellous stories respecting the composition of his Talmud.

This Targum is more paraphrastic than that of Onkelos; its dialect is not so pure; the version is not so accurate, and indeed varies in accuracy in different parts; but it is free from the fabulous stories of the later Talmuds. It comprises the Prophets, in the Jewish sense of the word, namely, the books of Joshua, Judges, Samuel, Kings, Isaiah, Jeremiah, Ezekiel, and the twelve minor Prophets.

3. *The Targum of the pseudo-Jonathan*, on the Pentateuch, is so called from its having been erroneously ascribed to Jonathan Ben Uzziel. In purity of dialect, in its general style, and in its mode of exposition, it is far inferior to the Targum of Jonathan. It abounds in silly fables, and displays great ignorance of Hebrew on the part of its author. From internal evidence, such as its mention of the Turks and Lombards, it is evident that it could not have been written earlier than the seventh, or perhaps the eighth, century.

4. *The Jerusalem Targum*, on the Pentateuch, of which however it omits large portions, and sometimes explains only single words, is evidently later than that of the pseudo-Jonathan, which it generally follows closely, occasionally departing from it for the worse. Its dialect is very impure, abounding in Greek, Latin, and Persian words.

The other Targums scarcely deserve a separate notice. An account of them, and lists of the editions and Latin versions of the Targums, will be found in the works quoted at the end of this article. Taken together, the Targums form a paraphrase of the whole of the Old Testament, except the books of Daniel, Ezra, and Nehemiah, which called the less for such an exposition, as they are to a great extent written in Chaldee.

(Prideaux's *Connection*, pt. ii., bk. viii.; the 'Introductions' of Horne and Jahn.)

TARI'FA, a small sea-port town situated in the narrowest part of the Strait of Gibraltar, on a point of land projecting into the sea; in 36° 3′ N. lat. and 5° 36′ W. long. The Arabs called it Jezirah Tarif (the Island of Tarif), because a Berber, named Tarif Ibn Malek Al-ma'feri, who was the lieutenant of Músa Ibn Nosseyr, landed on the little island facing the port with a small force, two years before the final conquest of Spain by the Arabs. [MOORS.] Tarifa is now a dependency of Cadiz, which has been made of late the capital of a province of the same name. In 1295 it was besieged by the Africans under Abú Yúsuf, but it was stoutly defended by Don Alonso Perez de Guzman 'el Bueno,' the progenitor of the dukes of Medina Sidonia, who would not surrender that fortress to them, notwithstanding they threatened to behead his only son, which they did before his eyes. In 1340 a great battle was fought near Tarifa, between Alphonso XI. of Castile and Abú-l-hasan, sultan of Fez and Marocco, when the former was victorious.

TARIFF, a table of duties to be paid on goods imported or exported. The principle of a tariff depends upon the commercial policy of the body by which it is framed, and the details are constantly fluctuating with the change of interests and the wants of the community, or in pursuance of commercial treaties with other states. The British tariff has undergone six important alterations within the last sixty years, namely in 1787, in 1809, 1819, 1825, 1833, and 1842. The act embodying the tariff of 1833 is the 3 & 4 Wm. IV., c. 56. Its character has been described in the Report of a Committee of the House of Commons in 1840, on the Import Duties, as presenting 'neither congruity nor unity of purpose: no general principles seem to have been applied. The tariff often aims at incompatible ends: the duties are sometimes meant to be both productive of revenue and for protective objects, which are frequently inconsistent with each other. Hence they sometimes operate to the complete exclusion of foreign produce, and in so far no revenue can of course be received; and sometimes, when the duty is inordinately high, the amount of revenue becomes in consequence trifling. An attempt is made to protect a great variety of particular interests at the expense of the revenue and of the commercial intercourse with other countries.' The schedules to the act 3 & 4 Wm. IV., c. 56, contain a list of 1150 articles, to each of which a specific duty is affixed. The unenumerated articles are admitted at an *ad valorem* duty of 5 and of 20 per cent, the rate having previously been 20 and 50 per cent. In 1838-9, seventeen articles produced 94½ per cent. of the total customs' duties, and the remainder only 5½ per cent., including twenty-nine, which produced 3$\frac{9}{10}$ per cent. The following table of the tariff of 1833, showing the duties received in 1838-9, is an analysis of one prepared by the inspector-general of imports for the parliamentary committee to which allusion has been made:—

	No. of Articles.	£
1. Articles producing on an average less than 24*l*. . . .	349	8,050
2. Ditto less than 240*l*. . .	132	31,629
3. Ditto less than 713*l*. . .	45	32,056
4. Ditto less than 2,290*l*. . .	107	244,933
5. Ditto less than 22,180*l*. .	63	1,397,324
6. Ditto less than 183,864*l*. .	10	1,838,630
7. Ditto less than 2,063,885 .	9	18,575,071
8. Articles on which no duty has been received . . .	147	Excess of drawback 5,398
	862	22,122,095

The new tariff, which is on the point of becoming law, contains very numerous alterations. Cattle and fresh meat are admitted, for the first time, on payment of duty; and the reduction of duty on salt-meat is considerable. Time will be required to show the result of the various changes which it contains. The heads of the tariff are comprised under nineteen heads, and the articles enumerated are as many as those in the tariff of 1833.

TARIK. [Roderic.]

TARLTON, RICHARD, a comic actor of great celebrity in the reign of Queen Elizabeth, was born in the hundred of Condover, in Shropshire. The date of his birth is not known. He died in 1588, and was buried (September 3) at St. Leonard's, Shoreditch, London.

Tarlton was especially distinguished for his performance of the clowns of the old English drama, in which he is spoken of as having been unrivalled, and seems besides to have been one of those clowns who spoke 'more than was set down for them:' he was famous for his extempore wit, which indeed must have been an important addition to the dull and vulgar speeches generally assigned to the clowns before Shakspere's time—he interlarded with his wit the lean and hungry prose. Dr. Cave, 'De Politica,' Oxford, 4to., 1588, says (we translate Cave's Latin), 'We English have our Tarlton, in whose voice and countenance dwells every kind of comic expression, and whose eccentric brain is filled with humorous and witty conceptions.'

Stow mentions that Tarlton was one of the twelve actors whom Queen Elizabeth, in 1583, constituted grooms of the chamber at Barn Elms: he seems indeed to have been one of her especial favourites; for Fuller says, that 'when Queen Elizabeth was serious (I dare not say sullen), and out of good humour, he could undumpish her at his pleasure. Her highest favourites would, in some cases, go to Tarlton before they would go to the queen, and he was their usher to prepare their advantageous access to her.'

One of Tarlton's last performances was in 'The Famous Victories of Henry V.;' this was in 1588, at the Bull in Bishopsgate Street, to which theatre he seems to have been generally attached. Of this play, which is a much earlier one than Shakspere's 'Henry V.,' a full account is given in the introductory notice to 'Henry VI., Parts I. and II.,' in Knight's 'Pictorial Shakspere.' It is one of the 'Six Old Plays,' printed by Nichols in 1779.

Tarlton is known to have written at least one play, 'The Seven Deadly Sins,' which, though never printed, and now lost, was much admired. Gabriel Hervey, in his 'Four Letters and certaine Sonnets especially touching Robert Greene and other Parties by him abused,' 4to., 1792, speaks of a work written by Thomas Nashe, 'right formally conveyed according to the stile and tenour of Tarlton's president, his famous playe of 'The Seven Deadly Sinnes,' which he designates as a 'most deadly but most lively playe.'

There is a portrait of Tarlton, in his clown's dress, with his pipe and tabor, in the Harl. MS. 3885; and a similar portrait of him (probably the one is a copy of the other) in the title-page of a pamphlet called 'Tarlton's Jests,' 4to., 1611. A copy of the former portrait is given in Knight's 'Shakspere,' at the end of 'Twelfth Night.' The peculiar flatness of his nose is said to have been occasioned by an injury which that feature received in parting some dogs and bears.

(Baker's *Biographia Dramatica*, by Reed and Jones.)

TARN, a river in France, belonging to the system of the Garonne. It rises near Mount Lozère, one of the Cévennes, in the department of Lozère, and flows first west to Sainte Enimie in the same department, 27 miles, and then south-west 27 miles to Milhau, in the department of Aveyron; from thence west-south-west 88 miles, by Alby and Gaillac, department of Tarn, to St. Sulpice; and from thence 48 miles north-west and west by Montauban (department of Tarn and Garonne) into the Garonne, below Moissac. The navigation is marked in Brué's map of France as commencing at Gaillac, and has a length of about 60 miles; other authorities make the navigation commence at Alby, and this statement agrees with the official accounts, which assign to the river a navigation of 90 miles. It has several tributaries, but none of them are navigable. [France; Garonne; Tarn (department): Tarn et Garonne.]

TARN, a department in the south of France, bounded on the north and north-east by that of Aveyron, on the south-east by that of Hérault, on the south by that of Aude, on the south-west and west by that of Haute Garonne, and on the north-west by that of Tarn and Garonne. The form approximates to that of a parallelogram, having its sides respectively facing the north-east, south-east, south-west, and north-west. The extreme length from north-west to south-east, from the neighbourhood of Penne on the Aveyron to the border of the department of Hérault, near St. Pons, is 65 miles; the extreme breadth, from the neighbourhood of Valence to that of Puy-Laurens, is 46 miles. The area is estimated at 2222 square miles, which is somewhat under the average area of the French departments, and rather greater than the conjoint areas of the two English counties Surrey and Sussex. The population, in 1826, was 327,655; in 1831, 335,844; and in 1836, 346,614, showing an increase in five years of 10,770 persons, or above 3 per cent., and giving 156 inhabitants to a square mile. In amount and density of population it is below the average of the French departments, and is very far below the county of Surrey alone in amount, and in density of population below both Surrey and Sussex. Alby, the capital, is on the Tarn, 339 miles in a straight line nearly due south of Paris, or 482 miles through Orléans, Châteauroux, Limoges, Cahors, Montauban, and Toulouse; a very circuitous route, but the only one laid down in Reichard's Road-book.

The department is very mountainous in the south-east part, where it comprehends a portion of the Cévennes. A range of hills branching off from this chain, and running nearly parallel to it, crosses the north-west part of the department, skirting the valley of the Tarn; and there are some other ranges of less elevation and importance. The peak of the Cévennes, which overlooks the town of Sorèze, in the south of the department, has an elevation of 1760 feet. The eastern side of the department, bounded by a line drawn southward or south by east from the junction of the Viaur and the Aveyron, is chiefly occupied by the granitic or other primary or by the earlier secondary formations: west of this boundary-line the tertiary formations prevail; only on the banks of the Cerou and the Aveyron in the northern part, and about Puy-Laurens in the southern part of the department, the secondary formations, which lie between the cretaceous group and the new red-sandstone group, crop out from beneath the tertiary rocks. The mineral productions are of no great importance. There was, in 1834, only one coal mine worked; it gave employment to 273 workmen within the mines and 42 others, making a total of 315: the quantity of coal produced was 19,933 tons, and the total value 13,152*l*., or 13*s*. 9*d*. per ton on the average. The quantity produced in 1835 was 18,420 tons. There were, in 1834, two iron-works with three forges for the manufacture of wrought-iron: the ore was converted directly into malleable iron, and charcoal was the only fuel employed. Lead and copper ore are said to be found, but no mines are now worked. There are marble-quarries, plaster-pits, and pits for porcelain and potters' clay.

The department belongs entirely to the basin of the Garonne. The Tarn, one of the principal feeders of that river, touches the border of the department just above the junction of the little river Rance, and flows along the border till that stream (which belongs altogether to the department of Aveyron) joins it; it then quits the border and flows westward to Alby and then south-west to the junction of the Agout, shortly after which it quits the department to enter that of Haute Garonne: the navigation commences at Gaillac, or, according to some authorities, at Alby. Just above Alby the Tarn has a fall, or rather a series of falls, over the steep face of a limestone rock, in which it has worn a number of channels, which so divide the stream, that when the water is low it may be crossed by leaping from one prominence to another: this fall is called Saut du Sabot or Saut du Tarn. The tributaries of the Tarn which belong to this department are the Aveyron, the Tescou, and the Agout. The Aveyron has only a small part of its course in this department, and another small part along the border; its affluent the Viaur has part of its course along the border; but the Cerou and the Verre, two other affluents of the Aveyron, belong to this department almost entirely. The Agout rises in the department of Hérault, but belongs almost entirely to this department, as do its affluents, the Viau (which receives the Vebre), the Gijou (which receives the Gijas and the Berlou), the Tauré (which receives the Larn and the Larnette), the Sor, the Bagas, and the Adou. None of the tributaries of the Tarn or their affluents are navigable, though some of them are of considerable length, the Aveyron being above 120 miles, the Viaur 60, the Agout 75, and the Adou 45; the others are smaller.

There are in the department five Routes Royales, or government roads, which had, January 1, 1837, an aggregate length of 207 miles, of which 116 miles were in good repair, 85 miles out of repair, and 6 miles unfinished. None of these roads are of the first class: the principal are those which lead from Alby south-west, by Gaillac, Lisle, and Rabastens, to Toulouse; south, by Réalmont and Castres, across the Cévennes into Languedoc; east by Villefranche to La Cavalerie, on the high road from Paris to Montpellier; and north-east by Carmeaux to Rodez, in the department of Aveyron. Roads branch from the Alby and Toulouse road at Gaillac, and lead, one west to Montauban and Bordeaux, one north by Cahusac and Cordes to Aurillac, in the department of Cantal. Another road leads from Castres by Lavaur to Toulouse. The departmental roads had at the same time an aggregate length of 485 miles, of which 296 were in repair and 189 out of repair. The vicinal roads had an estimated aggregate length of 7500 miles in round numbers.

The area of the department is equal to rather more than 1,400,000 acres; considerably more than one-half of this is under the plough. The soil, except in the mountainous parts, is generally fertile; but agriculture is in a very backward state; manures are neglected, and the system of rotation is very faulty. These deficiencies are chiefly observable in the arrondissements of Alby and Gaillac, which comprehend the beautiful valley of the Tarn; in the arrondissements of Castres and Lavaur, in the south of the department, improvements have been more readily adopted. The produce in grain, comprehending wheat, barley, oats, rye, maize, and buckwheat, is sufficient to supply the consumption of the department and to leave a little for exportation. Pulse, flax, hemp, woad, aniseed, coriander, and saffron are also raised; the growth of woad is of long establishment and considerable importance. The meadow and grass lands may be estimated at about 100,000 acres, and the heaths, commons, and other open pastures at 150,000 acres. The valleys and the slopes of the hills afford good pasturage, and the breeding of cattle is one of the principal sources of the wealth of the department. Sheep and pigs are numerous, and the veal is in high repute. The breed of horses is improving. The vineyards occupy nearly 80,000 acres; the cultivation of the vine is very skilfully and carefully managed. The red wines of Cunac, Caisaguet, St. Juéry, St. Amarans, and Gaillac are of the first class; those of Meilhart, La Roque, Florentin, La Grave, Tecon, and Rabastens are of the second class: Gaillac produces some white wines. The average produce of the vintage is estimated at above 430,000 hectolitres, valued at 5,500,000 francs. The orchards and gardens occupy about 6000 acres. The olive is not cultivated to any extent.

The woodlands occupy 200,000 acres; the oak, the beech, the ash, the maple, the chestnut, the walnut, the mulberry, and the wild cherry-tree are common.

Bees are numerous, but the breeding of the silkworm is not carried on to the extent of which it is capable. The wild boar, the roebuck, the wolf, the fox, the badger, the pole-cat, and the hedgehog are found; and small game is tolerably abundant.

The department is divided into four arrondissements, as follows:—

Name.	Position.	Area in Square Miles.	Population. 1831.	Population. 1836.	Communes.	Cantons.
Alby	N.E.	553	80,954	84,929	96	8
Castres	S. and E.	861	131,154	136,188	95	14
Gaillac	N.W.	496	71,323	72,001	79	8
Lavaur	S.W.	312	52,413	53,496	57	5
		2,222	335,844	346,614	327	35

In the arrondissement of Alby are—Alby, or Albi on the Tarn; population, in 1831, 9049 for the town, or 11,665 for the whole commune; in 1836, 11,801 for the commune [Alby]; Castelnau and Lescure, on the Tarn; Réalmont (pop. 2100 for the town, or 2660 for the whole commune) on the Adou, and Villefranche and Denat on a tributary of that river; Valence, Carmeaux, Monestiés, and Salles, on the Cerou, or its tributaries; Villeneuve, on the Verre; and Pampellonne, on the Viaur. Castelnau, distinguished as Castelnau-de-Bonnafoux, is built on a slope rising from the north bank of the Tarn, just below Alby, and is commanded by an old castle. Lescure was antiently fortified; it is a little above Alby. Réalmont has a Protestant church, and is a tolerably well-built town: there are some linen manufactories and a bleach-green; serge and cotton and worsted hose are also made: eight fairs are held in the town. Villefranche has nine considerable cattle-fairs. Valence is regularly laid out with straight streets, in a well-wooded district, from which a considerable quantity of timber is sent to Alby, Gaillac, and Bordeaux: the town has five large fairs, chiefly for cattle. Leather and glass are made at Carmeaux; and considerable trade is carried on at Monestiés in linen, thread, and cattle. Monestiés has thirteen fairs, Salles two, and Villeneuve (distinguished as Villeneuve-sur-Verre) five. Pampellone, or Pampelonne, is surrounded by the remains of its fortifications, and has two gates. There are two principal streets, and two large places or squares. Considerable business is done in horsecloths, which are manufactured; and there are six yearly fairs.

In the arrondissement of Castres are—Castres, on the Agout, population, in 1831, 12,032 for the town, or 16,418 for the whole commune; in 1836, 17,602 for the whole commune [Castres]; Brassac, Fort-de-Ferrières, Roquecourbe, Burlats, and Vielmeur, all on the Agout; Angles, Hautpoul, Mazamet (pop. 3896 for the town, or 7098 for the whole commune), and La Brugière, on the Tauré or its tributaries; La Caune (pop. 1650 for the town, or 3681 for the whole commune), on the Gigas; Vabres, on the Gijou; Mondragon, on the Adou; La Bessonié and Lautrec, between the Adou and the Agout; and Dourgne and Sorèze (pop. 1574 for the town, or 2817 for the whole commune), in the southern corner of the department. Brassac, distinguished as Brassac-de-Belfourtes, is the centre of a considerable manufacture of dimity and other cotton goods, carried on in the village of Brassac-Castelnau (which is included in the commune of the town), and other villages around. Fort de Ferrières takes its name from an antient fort, once used as a state prison, now as a manufactory of cotton goods. Roquecourbe, situated in a fertile district, has a Protestant church, and is the seat of a considerable manufacture of woollen stockings; it has four yearly fairs. Vielmeur, or Vielmur, has a manufacture of cotton yarn and of knitted stockings; it has five fairs. Angles has manufactures of woollen and cotton yarn, and woollen and cotton goods. Hautpoul has an antient castle, formerly the capital of the barony of Hautpoulois: it was stormed, A.D. 1212, by Simon de Montfort. Mazamet is a busy town; it has a number of manufactories for woollen goods of various sorts, some dye-houses, and several paper-mills; it has four fairs for cattle, wool, and manufactured goods. Flannels, blankets, and other woollens are manufactured at La Brugière, distinguished as La Brugière-Dulac; hosiery and dimity at La Caune; and calicoes, dimities, and other cotton goods, and flannel at Vabres, distinguished as Vabres-des-Sénégats. Vabres has a Protestant church: four fairs are held in the year. Mondragon, now of little importance, was formerly of considerable note: it has six yearly fairs: a number of pigs are sold here. Lautrec is on a small eminence, and has the ruins of an antient castle; it has ten yearly fairs. The neighbourhood produces good wine and melons. Lautrec was formerly a viscounty: it was held in the time of François I., by Odon de Foix, a general of considerable distinction in the Italian wars of that king. Dourgne has some manufactures of coarse woollens, three cattle-fairs, and in the environs some important quarries of white and gray marble. Sorèze had formerly a Benedictine abbey, where twelve young persons of noble family, but without fortune, received a gratuitous education: it has now a college or high school, one of the most important in the south of France. Cotton yarn, woollen and cotton hosiery, and leather are made: and there are two yearly fairs. Sorèze was fortified by the Huguenots in the religious wars of the sixteenth century, but the ramparts were destroyed in the reign of Louis XIV. At La Roquette, near Castres, are two remarkable natural curiosities: Le Rocher tremblant, a mass of stone, comprehending about 360 cubic feet, and resting on a very narrow base, so as to rock or vibrate sensibly when pushed, like the Logan or Logging Stone, in Cornwall; and the grotto which bears the name of St. Dominic, from having served as a retreat to that celebrated ecclesiastic.

In the arrondissement of Gaillac are—Gaillac (population in 1831, 5552 for the town, or 7725 for the whole commune; in 1836, 8199 for the commune), on the Tarn; Lisle (pop. 1726 for the town, or 5065 for the whole commune) and Rabastens (pop. 3417 for the town, or 6966 for the whole commune), on the same river; Penne, on the Aveyron; Cordes (pop. 2239 for the town, or 2602 for the commune), on the Cerou; Cestayrols, Cahuzac, Castelnau de Montmirail, and Puiceley, on or near the Verre; Salvaignac, near the Tescou; and Cadalen, between the Tarn and the Adou. Gaillac is on the right or north bank of the Tarn; it is an old town without any striking public building; there are an hospital and a small theatre. East of the town is a suburb, well laid out and pleasantly situated. There are brandy distilleries and cooperages, and one or two tan-yards, dye-houses, and yards for building boats and other river-craft. Trade is carried on in corn, wine, and vegetables: there are seven yearly fairs. Lisle (otherwise L'Ile d'Alby), on the right bank of the Tarn, is a small town, with a place or square regularly laid out and adorned with a fountain. Considerable trade is carried on in corn and wine, and there are seven yearly fairs for cattle, linen cloth, and wool. Rabastens, in a fertile plain on the right bank of the Tarn, is an ill laid out and ill-built town. There is a pleasant suburb, and adjacent to it an agreeable promenade. Some blankets are manufactured, and some trade carried on in corn, wine, and fruit: there are six yearly fairs. Rabastens has the ruins of an antient castle, which was taken by Simon de Montfort in the religious wars of the thirteenth century, and by the English in the wars of the fourteenth century. Cordes is on an elevated site on the left bank of the Cerou: it has a handsome place or square, and the ruins of an antient castle: linen and leather are manufactured; there is a considerable weekly market for corn and fruit, and there are six yearly fairs. Castelnau de Montmirail was antiently a place of strength: it is in a district fertile in corn and fruit. Coarse marble is quarried in the neighbourhood. Puiceley is on a height on the right bank of the Verre, not far from Castelnau de Montmirail; the chief business of the town is the manufacture of casks, joiners' and other wood work, and cheeses of great delicacy: there are four yearly fairs. Abundance of wood is obtained in the adjacent forest of Grésine. Salvaignac, or Salvagnac, is pleasantly situated on an eminence not far from the left bank of the Tescou: it has some iron forges, and considerable trade is carried on in cattle: there are six yearly fairs. Some trade in cattle is carried on at Cadalen.

In the arrondissement of Lavaur are—Lavaur or Laveur, near the Agout (population in 1831, 4422 for the town, or 7179 for the whole commune; in 1836, 7205 for the commune), Giroussens and St. Sulpice, on or near the same river; Puy-Laurens (population 1799 for the town, or 6160 for the whole commune), near the head of the Giron, an unimportant feeder of the Garonne; and Graulhet (population 2458 for the town, or 5097 for the whole commune) and Briatexte, on or near the Adou. Lavaur is on the left bank of the Agout, which is here crossed by a modern bridge of bold construction. The town was defended by walls and protected by a castle in the eleventh century. In the religious wars which signalised the early part of the thirteenth century, it was one of the strongholds of the Albigenses, from whom it was taken, A.D. 1211, by Simon de Montfort, who committed the most fearful cruelties. The place is divided into the old town and the new town, but is altogether ill built. The chief branch of industry is silk-throwing. The raw silks of Haut or Upper Languedoc are brought here; and when thrown are sent to Nîmes and Lyon. Some silk-stuffs for the upholsterers, and silk-stockings are made; and there are dye-houses and tan-yards: there are three yearly fairs. Lavaur has a high school, a small public library, an agricultural society, and a subordinate court of justice. Giroussens was formerly a place of strength, and the object of contest in the English wars of the fourteenth century. It stands on the right bank of the Agout: the townsmen manufacture brown pottery, but their ware is less in request than formerly. There is one yearly cattle-fair. Puy-Laurens is on a small eminence commanding the surrounding fertile plain. It was one of the strongholds of the Huguenots in the religious wars of the sixteenth century: but the fortifications were rased in the reign of Louis XIII. The town appears to have been after this still occupied by the Protestants, who had here an Academy of Sciences, which was suppressed after the revocation of the Edict of Nantes. Silk-throwing is carried on, and there is considerable trade with Spain in horses and mules: there are five well-attended yearly fairs. Graulhet, on the left bank of the Adou, has a considerable manufacture of hats and woollen stuffs, and a number of tan-yards. Considerable trade in horses is carried on, and there are five cattle-fairs. The district round the town is fertile: millstones are dug.

The population, when not otherwise described, is from the census of 1831.

That part of France which now constitutes this department was chiefly comprehended, in the earliest historical period, in the territory of the Ruteni. The southern portions were comprehended in the territory of the Umbranici, and the south-western in that of the Tolosates. That part of the territory of the Ruteni which was comprehended in the department is considered by D'Anville to have been occupied by the Ruteni Provinciales, distinguished by Cæsar by that epithet from the other Ruteni, as being within the limits of the Roman province at the time of his command in Gaul. The Umbranici and Tolosates were also within the province. The Ruteni were defeated by Fabius Maximus, B.C. 121, and it was probably at this time that part of them (the Ruteni Provinciales) became subject to Rome. The independent Ruteni took an active part in the general revolt of the Gauls under Vercingetorix, near the close of Cæsar's command, and were sent by Vercingetorix to ravage the lands of the Volcae Arecomici, who were Roman provincials. They were subdued by Cæsar. All these nations appear to have belonged to the great Celtic stock. Under the Romans the Ruteni (including the Ruteni Provinciales) appear to have been comprehended in the province of Aquitania Prima; the Umbranici and Tolosates, in Narbonensis Prima. The town of the Albienses (*Civitas Albiensium*) of the 'Notitia' was probably Alby: the Albigi of the anonymous Geographer of Ravenna was probably the same place. No other Roman town can be identified with any locality within the department. The river Tarn is noticed by Ausonius (*Mosellæ Descriptio*, 465) and Sidonius Apollinaris (*Carmen*, xxiv. 45) under the name of Tarnis: the former bestows on it the epithet 'aurifer,' 'the gold-bearing;' the second calls it 'citus,' the 'swift.'

In the middle ages, and down to the period of the Revolution, the larger portion of this department was known as the territory of L'Albigeois; the arrondissement of Lavaur, and the adjacent parts, formed the district of Le Bas (Lower) Lauraguais: both these were comprehended in Le Haut (Upper) Languedoc. Alby was the chief town of L'Albigeois; Lavaur of Bas Lauraguais.

Upon the downfal of the Roman Empire this part of France passed into the hands of the Visigoths, and subsequently of the Franks under Clovis. The district of L'Albigeois was part of the great duchy of Guienne in the time of the later kings of the Merovingian dynasty. It was subsequently held in succession by the counts of Toulouse, the viscounts of Béziers, and the counts of Carcassonne: and was, in the early part of the thirteenth century, the scene of the fearful cruelties perpetrated in the crusade against the Albigeois or Albigenses, a sect deriving their name from the district, and persecuted by the Romish church as heretical. [ALBIGENSES.] In the sequel of this crusade the district of L'Albigeois was annexed to the crown. The district of Lauraguais was successively held by the counts of Carcassonne and Barcelona; one of these latter, having become king of Aragon, ceded Le Lauraguais to the Viscount of Béziers, who again ceded it to St. Louis, king of France. It was alienated by Louis XI., who gave it to the counts of Auvergne, but was reunited to the crown by Henri IV.

TARN ET GARONNE, a department in the south of France, situated between 43° 47′ and 44° 23′ N. lat., and 0° 40′ and 2° 0′ E. long. It is bounded on the north by the department of Lot, on the north-east by that of Aveyron, on the east and south-east by that of Tarn, on the south by that of Haute Garonne, on the south-west by that of Gers, and on the north-west by that of Lot et Garonne. Its form is irregular; the greatest length is from north-east to south-west, from the border of the department of Aveyron near Parisot, to the bank of the little river Larax, near Lavit-de-Lomagne, 64 miles; the greatest breadth at right angles to the length, is from the border of the department of Lot et Garonne, near Montaigut, to the border of the department of Haute Garonne, near Grizalles, 44 miles. The area of the department is estimated at 1421 square miles, which is not so much as two-thirds of the average area of the French departments, and is rather less than the area of the English county of Sussex. The population, in 1826, was 241,586; in 1831, 242,509; and in 1836, 242,184, showing a very trifling increase (598 persons, less than 0·25 per cent.) in the ten years from 1826 to 1836; and in the latter half of the term a positive decrease. The number of inhabitants to a square mile, in 1836, was 170, which is rather above the average density of the population of France; but the department is inferior in amount of population to most other departments; and both in amount and density of population to the English county with which we have compared it. Montauban, the capital, is 335 miles in a direct line south by west of Paris, or 408 miles by the road through Paris, Orléans, Châteauroux, Limoges, and Cahors.

This department was not one of those formed at the first establishment of the departmental division of France by the National Assembly, A.D. 1790; but was created by a senatus-consultum under the reign of Napoleon, A.D. 1808. It was formed from the arrondissement of Montauban, taken from the department of Lot; the arrondissement of Castel Sarrasin, taken from the department of Haute Garonne; the cantons of Auvillard, Montaigut, and Valence, taken from the arrondissement of Agen, in the department of Lot et Garonne; the canton of Lavit-de-Lomagne, taken from the arrondissement of Lectoure, in the department of Gers; and the canton of St. Antonin, taken from the arrondissement of Villefranche, in the department of Aveyron. The department thus formed was divided into three new arrondissements, Montauban, Moissac, and Castel Sarrasin.

The department has no mountains and scarcely any hills; slight undulations alone vary its surface. The greater part is occupied by the tertiary formations of the basin of the Gironde: the part north-east of St. Antonin, on the Aveyron, and Puy-la-Roque, is occupied by the secondary formations which intervene between the chalk and the red marl or new red sandstone. Some of our authorities enumerate coal among the productions of the department; but this is hardly consistent with its geological character, nor were any coal-mines wrought in 1834 and 1835, of which the official returns are before us. Some iron is obtained; and there was, in 1834, one iron-work, with two furnaces for making pig-iron, and five forges for making wrought-iron. Charcoal was the fuel almost exclusively employed. Marble and good freestone are quarried in the north-east parts of the department; and limestone, marl, and potters'-clay are dug in several places.

The department belongs altogether to the basin of the Garonne. The Garonne itself enters it on the south side, a little below Grenade, and flows north-west by Verdun and Le-Mas-Garnier, to the junction of the Tarn: it then flows a few miles west by Auvillard; and turning again north-west, and passing Valence, quits the department. It has about 40 miles of its course (49 miles, according to the official account) in this department, navigable throughout. The Tarn enters the department on the south-east: it flows first north-west by Montauban to the neighbourhood of La Française; and then, in a winding channel, westward into the Garonne, which it joins on the right bank: its whole course in this department may be estimated at 36 miles (40 according to the official account), navigable throughout. These are the only navigable rivers. Of smaller streams, the Garonne receives on the left bank the Lambon, the Gimone, and the Serre, above the junction of the Tarn; and the Larax, or Rats, below the junction of that river. The Barguelone (formed by the junction of the Grande Barguelone and the Petite Barguelone) and the Saône (which receives the Seune) join the Garonne on the right bank, below the junction of the Tarn, and beyond the limits of the department, to which however a considerable part of their course belongs. The Aveyron, a considerable feeder of the Tarn, which it joins on the right bank, between Montauban and La Française, has the lower part of its course in this department or along the boundary. The Tarn receives also the Tescou (of which the Tescounet is a feeder) and the Lemboulas (of which the Latté is a feeder), both on the right bank. The Aveyron receives the Seye, the Bonnette, and the Lere, on the right bank; and the Verre and the Tause on the left bank.

The department had, 1 Jan., 1837, seven Routes Royales, or government roads, with an aggregate length of 158 miles, viz. 150 miles in good repair and 8 miles unfinished: the aggregate length of the departmental roads at the same time was 234 miles, viz. 156 miles in good repair and 78 miles unfinished: the bye-roads and lanes had an aggregate length of above 4200 miles. The principal road is that from Paris to Montauban and Toulouse: it enters the department on the north side, at the village of La Madeleine, and runs southward by Caussade and Réalville to Montauban; and from thence, still southward, by Grizalles, a little beyond which it quits the department, to Toulouse. A road from Montauban runs west-north-west, parallel to the course first of the Tarn, afterward of the Garonne, by La Française, Moissac, and Valence, to Bordeaux: another road runs south-west, by Montech and Beaumont-de-Lomagne, to Auch; and a third, east-south-east, to Gaillac and Alby, in the adjacent department of Tarn. A road which enters the department on the north-east runs by Caylus and Septfons, and, uniting with the road from Paris to Toulouse at Caussade, forms the communication between Rodez and Montauban. A road running from Moissac along the valley of the Garonne, by Castel Sarrasin, St. Porquier, Scatalen, and Fignan, to Grizalles, forms the shortest communication between Bordeaux and Toulouse.

The climate is generally mild, but subject to variations, which occasion frequent attacks of catarrh and rheumatism. The mean temperature in winter is from 36° to 39° of Fahrenheit, that of spring and autumn from 59° to 64°, and that of summer from 81° to 86°. Rains are frequent in spring: the summer heat increases gradually towards the end of July, when it is very great: autumn is the pleasantest season of the year: winter, though sometimes very cold, is generally dry. Snow rarely falls.

The area of the department may be estimated at about 910,000 acres in round numbers, of which about 575,000 acres, or above six-tenths, are under the plough. The soil is various; in some parts stiff and clayey, in others light and sandy; so sandy in some places as to be incapable of cultivation. The greater part however is very fertile: the plains and alluvial tracts which line the banks of the Garonne, the Tarn, and the Aveyron, are among the richest in France; but those along the banks of the Garonne are liable to be injured by the inundations of that river. The farms are generally separated by quick-hedges, and adorned with clumps of the wild quince-tree. The most important article of agricultural produce is wheat, which is of excellent quality. It is ground into flour, especially at Montauban; and large quantities are exported to America. Barley, oats, rye, maize, pulse, potatoes, vegetables of excellent quality, rape, flax, and hemp, are also cultivated to a considerable extent.

The meadows have an extent of about 43,000 or 44,000 acres, the heaths and open pastures of more than 41,000 acres. The number of horned cattle and sheep is not by any means so considerable as it might be: the breed of sheep has been however gradually improving, and the wool is of good quality. Horses, fitted for the light cavalry, are reared; and a considerable number of mules are bred for the Spanish market. The breeding of swine is on the increase. Poultry, especially ducks and geese, are numerous: they are salted in considerable quantity; and their livers, which sometimes weigh two pounds, are made into the pies for which this part of France, Toulouse especially, is so famous. The quills also form an important article of trade.

The vine is extensively cultivated on the slopes and more elevated plains, where the soil is commonly of a whitish colour, of mingled clay and fine sand, little adapted for the growth of corn, but suited to the vine, which succeeds admirably in the district between the Tarn and the Garonne. The vineyards have an extent of about 90,000 acres. A large part of their produce is made into brandy for exportation. The wine is of fair quality, but not first-rate; and in general of a deep colour, which it loses by age.

The orchards and gardens occupy about 4500 acres: the walnut and chestnut trees are of great size: the white mulberry is cultivated in order to rear the silk-worm, which is an object of attention, though not so extensively as it might be made. The woods occupy about 110,000 acres. Game and fresh-water fish are abundant: great quantities of the lamprey and the shad are taken in the Garonne in the spring.

The department is divided into three arrondissements, as follows:—

Name.	Situation.	Area in Sq. miles.	Population in 1831.	Population in 1836.	Cantons.	Communes.
Montauban	E.	619	107,853	106,799	11	62
Moissac	N.W.	341	62,489	62,735	6	49
Castel-Sarrasin . .	S.W.	461	72,167	72,650	7	80
		1421	242,509	242,184	24	191

In the arrondissement of Montauban are—Montauban, on the Tarn (population, in 1831, 18,255 for the town, or 25,400 for the whole commune: in 1836, 23,865 for the commune) [MONTAUBAN]; La Française (pop. 3686), near the Tarn; Varen, St. Antonin (pop. 2861 for the town, or 5482 for the whole commune), Montricoux, Bioullé, Négrepelisse, and Réalville (pop. 3030), on or near the Aveyron; Bruniquel, on the Verre; Parisot, on the Seye; Caylus (pop. 1518 for the town, or 5319 for the whole commune), on the Bonnette; Puy-la-Roque, Septfons, Caussade (pop. 2441 for the town, or 4479 for the whole commune), on or near the Lere or its affluents; Montpezat and Molières, on or near the Lemboulas; Mirabel, between the Lere and the Lemboulas; and Montclar, on the Tescounet. La Française has a manufacture of pottery from the fine clay which is dug in the neighbourhood. St. Antonin is on the right bank of the Aveyron, at the junction of the Bonnette. There are manufactures of serge and other woollen stuffs, and there are tan-yards and paper-mills: considerable trade is carried on in leather and dried plums. Montricoux has twelve yearly fairs: marble is quarried near the town. Négrepelisse was formerly inhabited chiefly by the Huguenots; and when Louis XIII. besieged Montauban (A.D. 1621), he put a garrison into this town; but the inhabitants rose upon the garrison, and put them to the sword, in consequence of which the town was taken and burnt by the royal army. Cotton goods are woven, and trade is carried on in corn, wine, and hemp: there are ten yearly fairs. At Réalville considerable trade is carried on in corn and flour: there are five yearly fairs. Bruniquel has an iron-work. Caylus has eleven yearly fairs, and a trade in corn. Caussade has some manufactures of linen and woollen; and the townsmen carry on trade in corn, flour, saffron, and truffles: there are eight yearly fairs.

In the arrondissement of Moissac are—Moissac, on the right bank of the Tarn (population, in 1831, 5950 for the town, or 10,165 for the whole commune; in 1836, 10,618 for the commune) [MOISSAC]; Auvillard or Auvillar (population 1963 for the town, or 2302 for the whole commune), on the Garonne; Valence (population 1994 for the town, or 2875 for the whole commune), between the Garonne and the Barguelone; Lauzerte (population 1753 for the town, or 3685 for the whole commune) and Miramont, on the Petite Barguelone; Monjoy or Montjoye and Castel-Sagrat, on or near the Saône; Le Bourg-du-Visa, on a small feeder of the Saône; Montaigut or Montaigu (population 2000 for the town, or 4172 for the whole commune) and Roquecor, on the Seune; and Dunes, near the western border of the department. At Auvillard or Auvillar (sometimes written Auvillards) are manufactures of earthenware and worsted hose: there are four yearly fairs. The neighbourhood is productive in wine. Valence (distinguished as Valence d'Agen) has four yearly fairs: the townsmen tan leather and prepare quills for writing. Lauzerte is in a picturesque situation on a rocky eminence, at the junction of the Lendou with the Petite Barguelone: it has eleven fairs, where much business is done in corn, wine, and cattle. Montaigu has some manufactures of woollen stuffs and leather, and five yearly fairs. Dunes has nineteen yearly fairs for cattle, corn, and linen cloth.

In the arrondissement of Castel-Sarrasin are—Castel-Sarrasin, near the right bank of the Garonne (population, in 1831, 3346 for the town, or 7092 for the whole commune; in 1836, 7408 for the commune); Verdun (population 1809 for the town, or 4234 for the whole commune), Le Mas-Garnier, and St. Nicolas-de-la-Grave, on the Garonne; St. Porquier, Scatalen, Montech, Fignan or Finhan (population 1600 for the town, or 1730 for the whole commune), and Grizalles or Grizolles (population 1724 for the town, or 2091 for the whole commune), between the Tarn and the Garonne; Bouillac, near the Lambon; Beaumont de Lomagne (population 3126 for the town, or 4130 for the whole commune), on the Gimone; and Lavit de Lomagne, near the Serre. Castel-Sarrasin suffered much in the religious wars, and the quantity of bones and of arms dug up in the neighbourhood bears testimony to the frequency or severity of the conflicts it has witnessed. The town is agreeably situated in a fertile plain about a mile from the Garonne, and is well built. The old walls and ditches have been destroyed, and replaced by agreeable promenades. The townsmen manufacture serge and other woollen stuffs, hats, and leather: there are three yearly fairs. There are one or two subordinate government offices. Verdun, distinguished from other places of the same name as Verdun-sur-Garonne, is on the left bank of the river: it has much declined from its former importance, but has still some woollen manufactures and three yearly fairs. St. Nicolas-de-la-Grave is known for the excellent melons grown in the surrounding district: there are four yearly fairs. St. Porquier is known for the extensive cultivation of tobacco and saffron in the neighbourhood: it has three yearly fairs. Grizalles or Grizolles is in a fertile plain, a short distance from the right bank of the Garonne: the townsmen manufacture a considerable quantity of cutlery, especially excellent scissars: there are three yearly fairs for cattle and horses. At Beaumont-de-Lomagne coarse cloth and other woollens, hats, and leather are manufactured, and trade is carried on in corn: there are seven fairs in the year.

The population, when not otherwise described, is that of the commune, and from the census of 1831.

This part of France, at the earliest historical period, was occupied by the Cadurci, a Celtic people, who were north of the Garumna (now the Garonne), the Tarnis (now the Tarn), and the river now known as the Tescou; by the Tolosates, also Celts, who inhabited the part south of these rivers; and by the Lactorates (of the Aquitanian stock), in whose territories that small portion of the department which lies south of the Garonne and west of the Larax or Rats was included. Perhaps some small portions of the north-western border may have belonged to the Nitiobriges, a Celtic people, and some portions of the eastern border to the Ruteni, who were also Celts: but these portions, if there were any, must have been very small. The Tasconi of Pliny, who appear to have left their name to the little rivers Tescou and Tescounet, on the banks of which they dwelt, were probably either a subdivision of the Tolosates, or a small tribe subject to them. In the Roman division of Gaul the Tolosates, with the Tasconi, were included in the province of Narbonensis Prima; the Cadurci and the Ruteni in that of Aquitania Prima; and the Nitiobriges and Lactorates in Novempopulana.

Only two places mentioned by Roman authorities are supposed to have been in this department. Cosa, mentioned in the Theodosian or Peutinger Table, was probably on the bank of the Aveyron, near Réalville; and the Fines of the same authority may be placed on the Tescou, near the junction of the Tescounet.

In the middle ages, the north-western parts, about Montaigut, Castel-Sagrat, and Valence, as far south as the Garonne, were included in L'Agenois; the northern and north-eastern parts, as far south as the Tarn, in the district of Le Bas Quercy, except just about Parisot and St. Antonin, which belonged to La Basse Marche in Rouergue; L'Agenois, Quercy, and Rouergue were all subdivisions of Guienne. South of the Garonne the whole was included in Gascogne or Gascony; the part west of the Larax being comprehended in Le Condomois, a district of Gascogne Proper; and the part eastward of the Larax in Lomagne and Rivière-Verdun, two districts in Bas (Lower) otherwise Noir (Black) Armagnac. The districts between the Garonne and the Tarn belonged to the district of Le Toulousain, or the county of Toulouse, properly so called, in Languedoc.

These territories, upon the overthrow of the Roman empire, passed into the hands of the Visigoths, from whom they were afterwards wrested by the Franks. The county of Toulouse was annexed to the crown in the reign of Philippe III. le Hardi; the county of Armagnac first by Louis XI. and finally by Henri IV., and Rouergue finally by François I. Le Quercy and L'Agenois were for a long time part of the English possessions in France. The English were finally driven out in the middle of the fifteenth century.

TARNOPOL is a circle in the eastern part of Austrian Galicia, bordering on the Russian government of Podolia. The area is about 1400 square miles, and the population 212,500, of whom about 13,000 are Jews. The surface of the country is an undulating plain broken only by a few hills. The forests are very extensive, and the soil in general extremely fertile: it produces corn, flax, hemp, tobacco, garden vegetables, and fruits. 'The fine meadows,' says Hassel, 'would enable the inhabitants to breed great numbers of cattle, but it is only the breeding of horses that is more considerable than in the rest of Galicia; they are of the true Polish race. In 1817 there were 36,273 horses, 9412 oxen, 26,339 cows, and 59,282 sheep.' According to the very detailed statistical tables for 1830 (published in 1834, which are the latest that we have seen), there were 41,223 horses, 11,156 oxen, 26,065 cows, and 81,283 sheep. There is no large river in the circle; the Podhorze forms the eastern boundary towards Russia, and the interior is watered by the Sered, the Tryna, the Guila, and other small streams.

TARNOPOL, the capital of the above circle, is a considerable town, with 10,500 inhabitants, of whom nearly half are Jews. It is situated on the river Sered, which there passes through a lake. There are in the town a Roman Catholic and a Greek church, three synagogues, a Jesuits' college, a gymnasium, and a philosophical seminary. In the year 1820, 50 of the Jesuits expelled from Russia were allowed to settle in a Dominican convent at Tarnopol. The sum of 300 florins a year was assigned to each, with a moderate sum for the establishment of the gymnasium, it being intended that they be solely employed in the education of youth in and out of the town. The inhabitants have a pretty considerable trade, but have not made much progress in manufactures. The principal establishments are tanneries. As in most Polish towns, the houses are of wood, and the streets unpaved, where filth of all kinds is suffered to accumulate.

(Hassel; Stein; Cannabich; *Mission from the Church of Scotland to the Jews*, 1842.)

TARNOW, a circle of Austrian Galicia, is bounded on the north by the Vistula, which separates it from Poland, on the east by Rzeszow, on the south by Jaslo, on the south-east by Sanok, and on the west by Bochnia. The area is 2000 square miles, and the population at present must be at least 240,000; since, according to the statistical tables for 1830, it was 238,453, of whom 14,608 were Jews. The country is an extensive plain, with here and there an inconsiderable eminence. The soil is on the whole not very fertile, in many parts sandy, and ill-cultivated. The rivers are, the Vistula on the north, the Dunajec on the west, and the Wisloka, which flows through the middle of the circle. Though the chief occupation of the inhabitants is agriculture, its operations are performed in a very slovenly manner, and the breeding of cattle is by no means in proportion to the extent of the country: the forests however are very profitable, and there is no other circle in Galicia where the people make so many wooden wares of various kinds, pipe-staves, &c. There are no manufactories, properly speaking, except in the chief town and its neighbourhood, but the country-people manufacture a great quantity of linen.

TARNOW, the capital of the circle, is pleasantly situated on an eminence near the river Biala, over which there is a handsome wooden bridge of one arch of 180 feet span, which is entirely covered over. The population of the town, without the suburb, is 2250, of whom 1650 are Jews; with the suburb the population is 4800. The houses are for the most part well built of brick, two stories high. This town is the see of a Roman Catholic bishop, and the seat of the tribunal of the circle. It has a cathedral, a Franciscan convent, a synagogue, a gymnasium, a Jewish infirmary, a military hospital, erected in 1835, and several schools. The inhabitants manufacture linen, damask, wooden-ware, and cabinet-work. They have many tanneries, and carry on a brisk trade. The cathedral contains the monuments of the princes Janusz von Ostrog, and of the counts of Tarnow-Tarnoswsky: two of them are from 60 to 70 feet high, and reach to the roof of the church. These two monuments are very highly spoken of as works of art.

TARPEIAN ROCK. [ROME.]

TARPORLEY. [CHESHIRE.]

TARQUI'NII (Ταρκυνία, or Ταρκουίναι), an antient town of Etruria, on the southern bank of the river Marta, which empties itself into the sea a few miles below. According to Strabo (v. 2, p. 355, ed. Tauchnitz), the town was founded by Tarcon, one of the companions of Tyrrhenus (Stephanus Byzant., *s. v.* Ταρκυνία; Virgil, *Æn.*, viii. 505; Silius Italicus, viii. 473); and, according to others, it was a colony of Thessalians and Spinambrians. In the reign of Ancus Marcius, Demaratus of Corinth is said to have come with a band of his countrymen to Etruria, and to have been favourably received by the Tarquinienses; and the story describes him as the father of L. Tarquinius Priscus. [TARQUINIUS.] Whatever may be thought of this tradition, it seems clear that Etruria and Tarquinii in particular experienced at an early period considerable influence from Greece. Tarquinii appears to have become in a short time a great and powerful city, as is clear from the wars which it carried on with Rome, and from the important remains which have recently been discovered; and there is little doubt that it formed one of the twelve republics of Etruria, consisting of the city and an extensive territory around it. After the expulsion of Tarquinius Superbus from Rome, in B.C. 509, the Tarquinienses were the most forward in his cause, and unsuccessfully endeavoured to restore him by force of arms. (Liv., ii. 6, &c.) About the year B.C. 397, the Tarquinienses again made war upon the Romans, and ravaged their territory, but they were defeated by A. Postumius and L. Julius. This however did not deter them from renewing their hostilities against Rome, and from making inroads upon her territory. It was on such an occasion, in the year B.C. 358, that a war broke out between the two states, which lasted for several years. The Romans in their first campaign, under the consul C. Fabius, were unsuccessful, and the Tarquinienses made 307 Roman soldiers prisoners, all of whom were sacrificed to the gods. Rome for some time carried on the war on the defensive, while her enemies acquired new allies, and invaded the Roman territory as far as the Salinæ, at the mouth of the Tiber. At last however, in 356 B.C., they were defeated by the dictator Marcius Rutilus, and the year after they were compelled by C. Sulpicius to lay down their arms. The Romans now took cruel revenge for the outrage which had been committed upon their prisoners. The common Tarquinienses who fell into the hands of the Romans were all massacred, but 358 nobles were sent to Rome, where they were beaten to death in the forum. (Liv., vii. 12-19.) Shortly after the Tarquinienses sued for a truce, which was granted for forty years. Tarquinii, like the rest of the Etruscan towns, was henceforth neutral in the wars of Rome with other nations, and remained in almost perfect independence of Rome. Shortly after the expiration of the truce the Tarquinienses obtained a peace of the same duration. At a later period Tarquinii became a Roman Municipium (Cicero, *pro Caecin.*, 4).

The site of the antient Tarquinii is clearly discernible in the ruins still extant on the hill of Tarchino, near the modern town of Corneto. The place has in modern times acquired a peculiar interest through the numerous works of art which have been discovered in the tombs and catacombs. The first of these were opened in 1699, and what was found in them was described by Buonarotti. New discoveries have frequently been made there since that time; the most important are the paintings with which the walls of the catacombs are decorated; but besides these, thermæ and temples with inscriptions, mosaics and vases, and other works of art, are found there. Respecting these discoveries, see Wilcox and Morton, *Account of some subterraneous Apartments with Etruscan Inscriptions and Paintings, &c.*, in the *Philosophical Transactions for* 1763, vol. vii., 127; Von Stackelberg, *Aelteste Denkmäler der Malerei, oder Wandgemälde aus den Hypogäen von Tarquinii*, 1827, with numerous plates.

TARQUI'NIUS. According to early Roman history the family of the Tarquinii gave two kings and one consul to Rome. Its origin was traced to the town of Tarquinii in Etruria, and thence to Greece. Modern investigations however have shown that the Tarquinii did not come from Etruria, but must originally have belonged to Latium, and that from the earliest times there existed at Rome a gens Tarquinia. (Niebuhr, *Hist. of Rome*, i., p. 373, &c.) We subjoin a list of those members of the house of the Tarquins who play a prominent part in the early history of Rome.

Lucius Tarquinius Priscus. The old story concerning his birth and his arrival in Rome ran thus:—During the tyranny of Cypselus at Corinth, Demaratus, a wealthy merchant who belonged to the noble family of the Bacchiads, was obliged by the tyrant to quit his native city. He sailed to Etruria, which he had often visited before on his mercantile voyages, and took up his residence at Tarquinii. Here he married a woman of noble rank, who bore him two sons, Lucumo and Aruns. (Dionys., iii. 46; Liv., i. 34; Polyb., vi. 2.) As an aspiring foreigner could never hope to satisfy his ambition in Etruria, Lucumo, after the death of his father and brother, resolved to emigrate with his wife Tanaquil and a numerous band of friends to Rome, where several strangers had already obtained the highest honours. He was confirmed in his expectations by a miraculous occurrence which happened just when he was approaching the city, and by the interpretation of it by his wife, who was well skilled in augury. At Rome Lucumo was favourably received by King Ancus Marcius, and lands were assigned to him. To omit nothing on his part which might characterize him as a complete Roman, he adopted the name of Lucius Tarquinius, to which subsequently the name Priscus was added to distinguish him from other members of his house. His wealth and prudence induced King Ancus to allow Tarquin to take part in all the affairs of state, and in his will he made him the guardian of his children, who were yet under age. [Ancus Marcius.] Tarquin himself aspired to become king of Rome. Accordingly, on the death of Ancus, he sent the young princes out hunting, and during their absence he held the comitia for electing a successor to Ancus, and succeeded in persuading the people to elect him, to the exclusion of the sons of Ancus, 616 B.C.

This is the common story of the descent of the fifth king of Rome, of the manner in which he came to Rome, and was raised to the throne. How much there may be historical in the tradition cannot be ascertained. Thus much however appears certain, that the arrival of Demaratus in Etruria cannot have been contemporaneous with the tyranny of Cypselus, and that, as stated above, Tarquinius was not a foreigner, but belonged to a Latin gens Tarquinia. (Niebuhr, *Hist. of Rome*, i., p. 373, &c.)

L. Tarquinius Priscus distinguished himself during his reign no less in war than in the peaceful administration of the state. His first war was against the Latins, from whom he took great spoil. With equal success he carried on war with the Sabines, whom he defeated in two great battles, and from whom he took the town of Collatia with its territory. After this he again made war on the Latins, and after he had subdued them and made himself master of many of their towns, he concluded a peace with them. During the intervals between these wars he introduced various improvements into the constitution of the state, which are mentioned in the articles Rome, p. 104, and Senatus, and which were intended to organize the body of the plebeians, and perhaps to place them on an equality with the patricians. But he could only partially carry his schemes into effect, as he was thwarted by the augur Attus Navius, who probably acted at the instigation of the patricians. After his first Latin war, Tarquin built the Circus Maximus for the exhibition of the public spectacles, and is said to have been the founder of the Roman or great games (Ludi Magni or Romani). He also assigned the ground round the forum to private individuals, that they might there build porticoes and places for transacting business; and lastly he is said to have formed the plan of enclosing the city by a stone wall, which he was prevented from accomplishing by the outbreak of the Sabine war. After the second war against the Latins, he recurred to his plan, and is said to have made actual preparations for building the wall; but the completion of it was reserved for his successor Servius Tullius. The greatest work at Rome, which owes its origin to Tarquin, and which has survived all the vicissitudes of the city, are the gigantic sewers (cloacae) in the lower districts of Rome. [Cloaca.]

The sons of Ancus Marcius, who had been deprived of the throne by their guardian Tarquin, never forgot the injury, and when they discovered that it was his and Tanaquil's intention to secure the succession to Servius Tullius, they formed the design of murdering Tarquin. [Servius Tullius.] For this purpose they hired two sturdy shepherds, who went to the king's palace, and there conducted themselves as if they were engaged in a violent quarrel. At last the king himself appeared to settle their dispute, but while he was listening to one of them, the other split the king's head with an axe. Thus died L. Tarquinius Priscus, after a reign of thirty-eight years, in B.C. 578. The queen kept his death secret until the succession was secured to Servius Tullius. The assassins were seized, and the sons of Ancus fled to Suessa Pometia. (Livy, i. 34-42; Dionysius, iii. 46-73.) Tarquinius Priscus left two sons, Lucius and Aruns Tarquinius.

During the reign of this king Rome appears as a powerful state in comparison with what it is said to have been before him. According to the historians this greatness was not the result of his reign, but is supposed to have existed before it, and to have enabled him to do what he did, so that this increase of the power and dominion of Rome must have taken place previous to his reign, although we do not know how it was effected. Some traditions mentioned (Tacitus, *Annal.*, iv. 65) that under Tarquinius Priscus an Etruscan of the name of Caeles Vibenna came with a colony to Rome and settled on the Caelian hill, which derived its name from him.

Lucius Tarquinius Superbus, the seventh and last king of Rome, was the son of Tarquinius Priscus, and brother of Aruns. Tullia, a daughter of Servius Tullius, was married to the gentle Aruns, and her sister to L. Tarquinius. In concert with Lucius, Tullia murdered her own husband Aruns and her sister, and then married L. Tarquinius. Lucius placed himself at the head of a conspiracy, and murdered his own father-in-law, the aged Servius Tullius. Tarquinius, who received the surname of the Haughty or the Tyrant (Superbus), succeeded his father-in-law as king of Rome, 584 B.C., without either being elected by the people or confirmed by the senate.

There is no doubt that the hatred of the very name of king which prevailed at Rome during the republic, has greatly contributed to exaggerate the cruelty and tyranny of the last king, and thus to corrupt his history. But notwithstanding all this, it is clear that Tarquin by his talents, both as a general and a statesman, quickly raised Rome to a degree of power which it had never possessed before. The first act attributed to him after his accession is the death of all the senators who had supported the reforms of Servius Tullius, and in order to render his own person safe, he formed an armed body-guard which always accompanied him. He in fact undid all that Servius had done: he took on himself the administration of justice, put persons to death or sent them into exile according to his own pleasure, and kept the whole internal and external administration in his own hands, without either consulting the people or the senate. In order that the senate might sink into insignificance, he never filled up the vacancies which so frequently occurred through his executions, banishments, or through the natural death of senators. To secure himself still more, he formed a close connection with the Latins, to one of whom, Octavius Mamilius of Tusculum, he gave his own daughter in marriage. The influence which he thus gained among the Latins was most visible in their assemblies on the Alban Mount by the temple of Jupiter Latiaris, in which Rome also had a vote. Tarquinius, by cunning and fraud, or, according to others, by force of arms, subdued the towns of Latium and placed Rome at the head of the league (Livy, i. 50, &c.; Dionysius, iv. 45, &c.; Cicero, *De Re Publ.*, ii. 24), which was now also joined by the Hernicans and the Volscian towns of Ecetra and Antium. The wealthy town of Suessa Pometia was besieged and taken, perhaps because it had refused to join the league. The Latin town of Gabii experienced a similar fate. Sextus, the king's youngest son, went thither under the pretext of being a deserter, and contrived to put himself at the head of the Gabian army. After having put to death or sent into exile the most distinguished citizens of Gabii by the advice of his father, he treacherously surrendered the town to him. The whole account of the war with Gabii bears the character of a fable, and resembles in many respects other fabulous stories of early Grecian history. The treaty which was formed with Gabii after its surrender, was engraved on a wooden shield, and preserved in the temple of Jupiter Fidius to the time of Dionysius of Halicarnassus. Tarquin founded in the conquered territory of the Volscians the two colonies of Signia and Circeii, by which he extended and strengthened the power of Rome.

Tarquin is said to have been fond of splendour and magnificence. He built the capitol, with the threefold temple of Jupiter, Juno, and Minerva, and adorned it with brazen statues of the gods and of the early kings. (Livy, i. 53; Dionysius, iv. 59; Pliny, *Hist. Nat.*, xxxiii. 4; xxxiv. 13.) Here he also deposited the oracular books which he had purchased from a Sibyl. [SIBYL.] After the establishment of the colonies of Signia and Circeii, a fearful omen was seen, which seemed to bode ruin to his family; and in order to ascertain its import he sent his two sons, Sextus and Aruns, accompanied by his nephew, L. Junius Brutus, to Delphi. To the question as to which of the three ambassadors was to reign at Rome, the Pythia answered: he who should first kiss his mother. Brutus, who had always assumed the appearance of an idiot, understood the oracle, and on landing in Italy, fell down and kissed the earth, the mother of all. Tarquin's coffers were now exhausted by the great works that he had undertaken, and he was tempted to make himself master of Ardea, a wealthy town of the Rutuli. As however he did not succeed in his first attack, he laid siege to the town. While this was going on, a dispute arose between the sons of Tarquin and their cousin, C. Tarquinius Collatinus, respecting the virtue of their wives. This led to the violation of the chaste Lucretia, the wife of Collatinus, who lived at Collatia, by Sextus, the king's eldest son. As the highest pride of a Roman woman at this time was her virtue, Lucretia sent for her husband, father, and Brutus, and killed herself in their presence, after having cursed the family of the king, and implored her friends to avenge the injury which she had suffered. Brutus immediately marched with an armed force from Collatia to Rome, and roused the people to avenge the indignity and throw off the yoke of their tyrant. The citizens were easily persuaded; they deprived the king, who was yet in the camp of Ardea, of his imperium, and banished him with his wife and children from Rome, 510 B.C. After these occurrences Tarquin hastened to Rome, but finding the gates of the city shut upon him, and learning that he was declared an exile, he retired to Caere, whither he was followed by his son Aruns. His other son Sextus sought a refuge at Gabii, but the citizens, remembering his former treachery, put him to death. The simple fact of the banishment of King Tarquin, which was commemorated at Rome every year by a festival called 'The King's Flight' (Regifugium or Fugalia), is beyond all doubt historical; but what is described as its immediate cause, and its accompanying circumstances, may be poetical inventions.

Tarquin however did not give up the hope of recovering what he had lost. He first sent ambassadors to Rome to demand the surrender of his moveable property. During their stay in the city the ambassadors formed a conspiracy, in which young patricians chiefly are said to have joined them. The conspirators were discovered and put to death, and the moveable property of the royal family was given up to the people, in order to render reconciliation impossible. The king is said to have found favour and protection with the inhabitants of Caere and Tarquinii, and with the Veientines, and to have led the united forces of these people against the Romans, who however defeated their enemies near the forest of Arsia. Brutus fell in this battle in single combat with Aruns. Tarquin now sought and found assistance at Clusium, which was then governed by the mighty Lar Porsenna. [PORSENNA.] During the war of this chieftain with Rome Tarquin is entirely lost sight of in the narrative of the historians; but after its conclusion we find him supported by the Latins, and waging a fresh war against Rome under the Latin dictator Octavius Mamilius of Tusculum. The battle near lake Regillus (496 B.C.), in which the king lost his only surviving son, decided the whole contest. The account of the detail of this battle is as fabulous as any part of the early history of Rome, and formed, as Niebuhr supposes, the concluding part of the 'Lay of the Tarquins.' The aged king, now deprived of all his hopes, retired to Cumae, which was then governed by the tyrant Aristodemus, where he died the year following, 495 B.C. (Livy, ii. 19, &c.; Dionysius, vi. 2, &c.; Niebuhr, *Hist. of Rome*, i., p. 555, &c.)

LUCIUS TARQUINIUS COLLATINUS, the son of Egerius, and the husband of Lucretia. After the banishment of the king he was elected consul together with L. Junius Brutus. But the people beginning to suspect that he might perhaps be tempted to follow the example of his kinsman, and endanger the freedom of the young republic, he was compelled to abdicate, and to submit to the sentence of exile, which was now pronounced upon the whole family of the Tarquinii. (Livy, i. 57, 60; ii. 2.)

TARRAGO'NA, a province of Spain, bordering on the north on Catalonia, on the south on Valencia, and on the west on Aragon. The capital, Tarragona, is situated on the coast of the Mediterranean, on the declivity of a mountain rising to 760 feet above the level of the sea, and near the mouth of the river Francolí, 41° 7′ N. lat. and 1° 17′ E. long. Tarragona, the Roman Tarraco, is one of the most antient cities of Spain; as it is supposed to have been founded by the Phœnicians. During the second Punic War it became a Roman colony (Plin., *Hist. Nat.*, iii. 3), and, subsequently under Augustus, the capital of Hispania Citerior, or Tarraconensis, which comprised Catalonia, Aragon, Navarre, Biscay, the Asturias, Galicia, a portion of Leon, and the Balearic Islands. Tarraco was also the chief city of one of the seven conventus, or divisions of the province for purposes of administration, and chiefly for justice. In A.D. 467 it was taken by Euric, king of the Goths, and levelled with the earth. The Arabs reduced it in 710, like most cities on that coast, and it remained in their hands until Raymond IV., count of Barcelona, took it from them, about the close of the eleventh century. The city being found in a very ruinous and dilapidated state, Don Bernardo, archbishop of Toledo, undertook to rebuild it on condition that the pope would absolve him of an oath he had taken, and not fulfilled, of repairing to the Holy Land. The absolution having been granted, the archbishop of Toledo destined the greatest portion of the revenues of his see to the rebuilding of Tarragona. During the War of Succession, the English took possession of the city, which they intended to keep and began to fortify. Some of the outworks and redoubts thrown up by them are still visible. In 1810 the French, under Marshal Suchet, laid siege to it, and took it by storm on the 29th of June, 1811, after a siege of several months. The conduct of the French commander on this occasion is greatly to blame; he not only justified, but even encouraged, the perpetration of all kinds of atrocities, on the ground that he wished by one dreadful example to terrify the people and prevent all further resistance. An attempt to retake the city, made in June, 1813, by the allied forces under General Sir John Murray, failed completely; for at the approach of Suchet, who was advancing from Valencia, that officer raised the siege and re-embarked his troops with such precipitation that he left all his artillery and stores behind.

Tarragona is tolerably well built, and the Roman remains render it interesting. Besides the circus, which is now almost entirely built upon, it has a very fine amphitheatre, in a good state of preservation, and a large Roman building, probably a temple, which the inhabitants call 'the palace of Augustus.' The remains of a splendid aqueduct, which once supplied Tarragona with water, which was brought from a distance of 16 miles, afford likewise a proof of the importance of the city under the Romans. About three miles east of the city there is a very fine mausoleum, which the vulgar call 'El Sepulcro de los Scipiones' (the tomb of the Scipios), from a belief that Cnæus and Publius Scipio are buried under it. Of the Moorish domination there remain no other traces than a large building close to the sea, which is believed to have been their arsenal. The cathedral is by far the most interesting building in the city, and is well deserving of attention for its vast dimensions and the elegance and purity of its Gothic architecture. It was erected in the year 1117, but has since been greatly added to. The chapel of Santa Thecla, which is entirely built of rich marbles and jaspers, is one of the richest and most tastefully decorated in the church. The great altarpiece too is much admired for its exquisite carvings, executed by a native artist in 1426. Tarragona is the see of an archbishop, who once disputed with that of Toledo the primacy of Spain. During the Moorish domination, several provincial and general councils were held there. At the first, which took place in 816, it was ordained that the Sabbath should commence on Saturday night. The immediate neighbourhood of Tarragona is well cultivated, and yields corn, wine, oil, and hemp, in great abundance. The principal manufactures are cloth, coarse cotton-goods, hats, and cutlery, which are exported to all parts of Spain, and to the island of Cuba.

TARSHISH (תַּרְשִׁישׁ) is a place mentioned in the Old Testament, particularly in connection with the commerce of the Hebrews and Phœnicians. In *Gen.*, x. 4, the name occurs among the sons of Javan, who are supposed to have peopled the southern parts of Europe. (Compare *Ps.* lxxii. 10; *Isaiah*, lxvi. 19.) In other passages it is mentioned as sending to Tyre silver, iron, tin, and lead (*Ezekiel*, xxvii. 12; *Jerem.*, x. 9); and from *Isaiah*, xxiii. 10, some have inferred that it was subject to the Phœnicians. The prophet Jonah, attempting to avoid his mission to Nineveh, fled from Joppa in a ship bound to Tarshish. (*Jonah*, i. 3; iv. 2.) In several passages of the Bible 'ships of Tarshish' are spoken of, especially in connection with Tyre; and it is pretty generally agreed that that phrase only describes a species of large ship, such as those used in the trade with Tarshish, just as we speak of 'Indiamen.'

From a comparison of the above passages, the majority of critics have concluded that Tarshish must be sought for in the western part of the Mediterranean, or even outside the Straits; and it has been generally identified with the Phœnician emporium of Tartessus in Spain, a place which would undoubtedly furnish the products said to have been brought from Tarshish. The Phœnician name 'Tarshish' would easily become the Greek Ταρτησσός; in fact the Aramæan pronunciation of 'Tarshish' would be 'Tarthesh.' We have abundant proofs that the Phœnicians had established an extensive commercial intercourse with Spain at a very early period.

But there is a considerable difficulty about the position of this Tartessus. The antient geographers place it, some at the mouth of the river Baetis (Guadalquivir), the most antient name of which river they state to have been also Tartessus; while others identify it with the city of Calpe, or Carteia, near Mount Calpe, the rock of Gibraltar. (Herod., iv. 152; Strabo, p. 140, 148-151; Mela, iii. 6; Plin., iii. 1; Pausan., vi. 19; Steph. Byzant., *v.* Ταρτησσός.)

The best way to explain and reconcile these statements with each other, and with the biblical accounts respecting Tarshish, seems to be by taking the latter as the name not of a single place, but of the whole country in the neighbourhood of Gibraltar. In this district there may have been more than one city bearing a name like Tartessus. The name survives in various forms in the names of the rock Calpe, of the neighbouring city Calpe, Carpe, or Carteia (for it is written in all these ways), and of the people Carpetani. This statement will be more clearly understood after a reference to the articles on the letters C, P, and T. In confirmation of this view, Strabo states that the country in the neighbourhood of Calpe was called Tartessis.

Respecting the difficulty arising from the conjoint mention of Tarshish and Ophir in the book of *Chronicles*, see Ophir.

TA'RSIUS, Storr's name for a genus of Quadrumana.

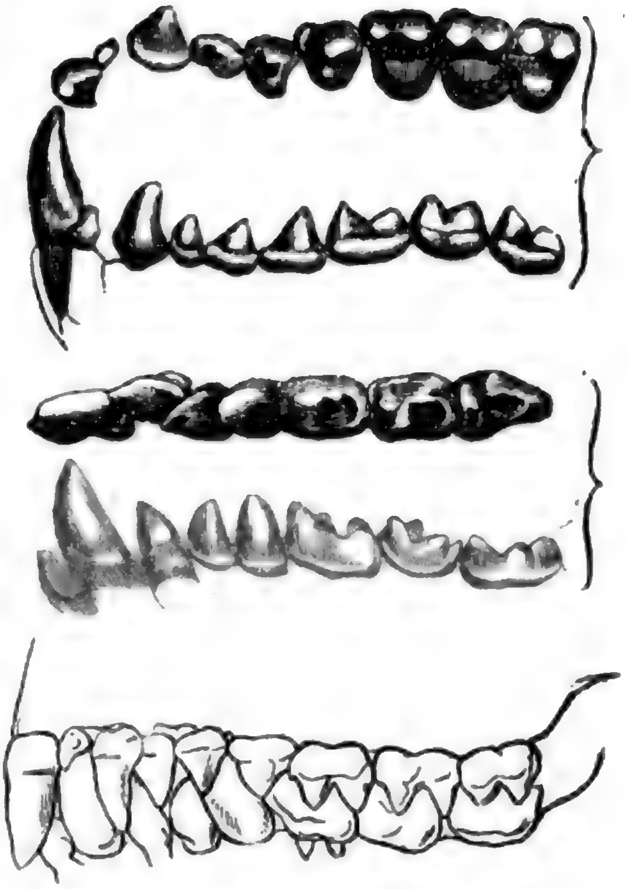
Generic Character.—Head rounded; muzzle short; eyes very large; posterior limbs very much elongated, with the tarsus thrice as long as the metatarsus. Tail long.

Dental formula:—incisors $\frac{4}{2}$; canines $\frac{1-1}{1-1}$; molars $\frac{6-6}{6-6}$ = 34.

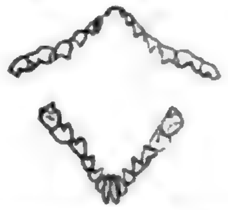
Example, *Tarsius Bancanus.*

Description.—Dr. Horsfield remarks, that although the Tarsius from Banca agrees in the essential points with the other species of this singular genus which have hitherto been discovered, it has no intermediate front teeth, and the exterior tooth on each side is, compared with the other species, very minute. Counting (with Desmarest) one canine tooth on each side, above and beneath, it has, says Dr. Horsfield, only five grinders in each jaw.

'The head,' continues Dr. Horsfield, 'in proportion to the size of the body, is large; the arch of the forehead rises high, and the occiput is regularly spheroidal. The proximity of disposition and excessive size of the eyes is equally characteristic in this as in other species. The rostrum, or extremity of the face, is short and obtuse; the nose is slightly rounded, almost flat above; and the nostrils, as usual in this genus, are pierced laterally. The ears, which from their erect position and their projection beyond the cranium give a peculiar distinctive character and appearance to the other species, in our animal are disposed horizontally, and instead of rising up towards the crown of the head, incline backwards and extend but little from its sides; the lobes, as usual, are very thin, membranous, semitransparent, thinly beset with delicate hairs; several tufts of longer hairs arise from the base, where the interior membranaceous lobules are discovered, but in our specimen too much contracted to admit of a detailed description. The neck is very short, and the anterior extremities have the same proportion to the body as in the other species. The hands are externally covered with a very soft down; internally they are naked, and provided with several rather prominent protuberances, which, according to the opinion of Mr. Fischer, are calculated to assist the animal in climbing. The fingers are deeply divided and very delicate; those of the hands have the same proportion, one to the other, as they have in man; on the feet they are more lengthened and slender; the third finger is longer than the middle finger, and the thumb is proportionally short. In all the third phalanx is somewhat thickened, and surrounded by a projecting orbicular border, which, in the thumb particularly, constitutes a delicate ball, supporting the nail. The nails of all the fingers of the hand, as well as of the thumb and the third and fourth finger of the feet, are triangular, and represent a delicate compressed scale: on the index and middle finger of the feet they are erect, sharp, compressed, slightly curved, and not inaptly compared by Mr. Fischer to the thorns of a rose-bush, constituting one of the essential characters of this genus. The body is handsomely formed, and, as in the other species, somewhat contracted towards the pelvis; the lower extremities also have in general a similar character, but the tarsus has less of the extravagant length which is common to the other *Tarsii.*

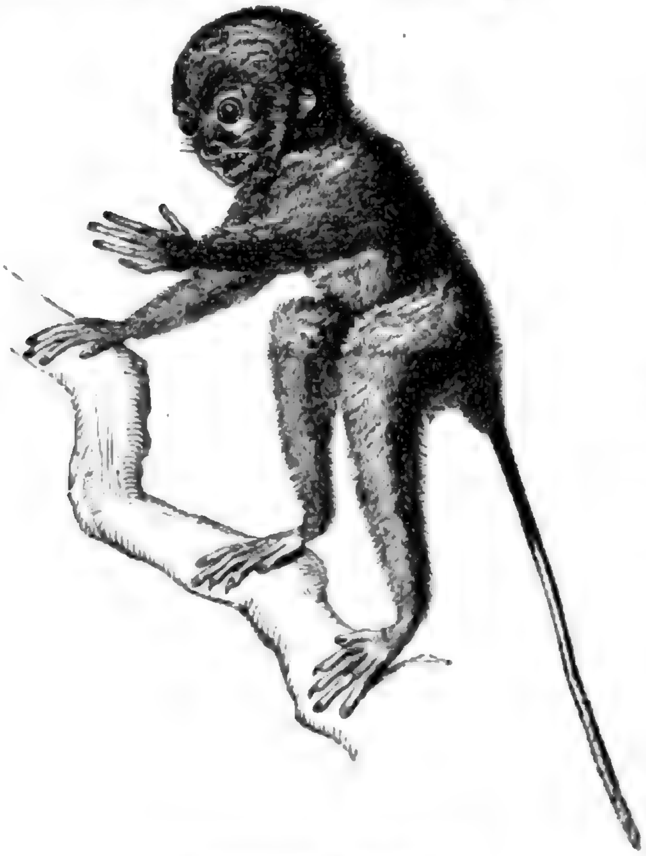


Teeth of Tarsius, much larger than the nat. size. (F. Cuv.)



Front view of the teeth of Tarsius Bancanus. (Horsf., The tail has nearly the length of the body and head taken together; it is somewhat thicker at the base, nearly naked two-thirds of its length, but covered towards the extremity with a soft down, which forms, near the tip, a very obscure tuft. The fur is remarkably soft to the touch; it is composed of a thick and very delicate wool, which envelopes the body, head, and extremities, forming a coat of an unequal surface, from which irregular straggling hairs project; at the root of the tail, and at the bands of both extremities, it terminates abruptly in the form of a ring. The general colour is brown, inclining to grey; on the breast, abdomen, and interior of the extremities it is grey, inclining to whitish: a rufous tint is sparingly dispersed over the upper parts, which shows itself most on the head and extremities: the naked parts of the tail near the root are considerably darker than the extremity.' (*Zoological Researches in Java.*)

Locality.—Dr. Horsfield obtained this animal in Banca, near Jeboos, one of the mining districts, where, he says, it inhabits the extensive forests in the vicinity.



Tarsius Bancanus. (Horsf.)

M. F. Cuvier remarks that the dentition of the *Tarsier* approximates the animal more to the *Galeopitheci*, and even to the bats, than to the *Quadrumana*. The bones of this genus are well represented in the excellent *Ostéographie* of M. de Blainville.

TARSUS, now TERSOOS, a town on the Cydnus, situated in Itshili, a division of Caraman, and formerly one of the chief towns of Cilicia. It is about twelve miles distant from the sea, and is in 37° N. lat. and 34° 50′ E. long. The traditions about its origin are various. It has been supposed to be the Tarshish of Scripture, but neither Bochart nor Vincent (*Commerce of the Ancients*) countenances this conjecture. Stephanus Byzantinus (*v.* Ταρσός) says it was founded by Sardanapalus (see the inscription on the tomb of that monarch, Strabo, 672, ed. Casaub.). Ammianus, l. xiv., c. 28, and Solinus, *Polyhist.*, c. xli., assert that Perseus was the founder (Lucan, iii. 225), and the name Tarsus has been derived from the fable that his horse Pegasus lost a hoof (Ταρσός) there. (Dionys. Perieget., 868, et seq., and for other fanciful derivations see Stephanus Byz.) Strabo relates that it was a settlement made by those who accompanied Triptolemus from Argos in his quest of Io (p. 750, ed. Casaub.). The first historical notice of Tarsus after this is in Xenophon, *Anab.*, i. 2), who describes Tarsus as a great and flourishing city when it was taken and plundered by the younger Cyrus, who afterwards concluded a treaty with Syennesis, king of Cilicia, who had his palace there.

We learn from Curtius (iii. 4), that Alexander the Great arrived at Tarsus just in time to save it from being burnt by the Persians. In later times the inhabitants joined the party of Julius Cæsar, in honour of whom they took the name Juliopolis; they were in consequence severely punished by Cassius, and rewarded afterwards by Antony, who made Tarsus a free city. (Dion, 47, 342, 344, fol., Hamb., 1750.) Tarsus enjoyed the favour of Augustus, whose tutor Athenodorus, a Stoic, was a native of this place, and persuaded the emperor to release his countrymen from all taxation. (Lucian, *Macrob.*, 21, Lehmann, 1839.) Athenodorus, returning to his native place in his old age, expelled a troublesome faction, at the head of which was Boethus, an unprincipled demagogue, and remodelled the constitution. (See Strabo, p. 674, who gives some curious details.) He was succeeded in his government by Nestor, an Academician.

Tarsus continued to flourish under the emperors, under whom it assumed the several titles—Hadriana, Commodiana, Antoninopolis, Macriniana, Alexandriana, Alexandrinopolis, and finally, in the time of Valerian, Hadriana, Severiana, Antoniniana. (Eckhel, *Doct. Vet.*, III., 'Tarsus.') The Tarsians, according to Strabo, excelled in quickness of repartee and every kind of ready wit; and their schools of philosophy were not less celebrated than those of Athens and Alexandria. The chief among the Stoics were the two Athenodori; among the Academicians, Nestor. Athenæus (v., 215, ed. Casaub.) speaks of Lysias, an Epicurean, who was tyrant of Tarsus at some time. The coins of this city inform us of its relations with Cilicia and the adjacent provinces. The inscriptions ΚΟΙΝΟΣ ΚΙΛΙΚΙΑΣ, on a decastyle temple; ΚΟΙΝΟΣ ΤΩΝ ΤΡΙΩΝ ΕΠΑΡΧΙΩΝ, referring to the games common to the three provinces of Isauria, Caria, and Lycaonia, are to be found in Mionnet, *Recueil des Médailles*, iii. That it was a metropolis appears from an inscription on a coin, ΜΗΤΡΟΠΟΛΕΩΣ ΤΥΧΗ, and from the testimony of Strabo; and Appian's statement that it was a free city is confirmed by the title ΕΛΕΥΘΕΡΑ. St. Paul was a native of this place. (*Acts*, xvi. 37; and xxii. 25-28.) Other interesting types and inscriptions occur on the coins of Tarsus. On those of Septimius Severus there is ΣΕΒΗΡΕΙΑ ΟΛΥΜΠΙΑ ΕΠΙΝΕΙΚΙΑ, recording his victory over Pescennius Niger in Cilicia. Jupiter Nicephorus, Apollo, Hercules engaged in several of his labours, Perseus with the harpa, are frequent types, and confirm the testimony of Dion Chrysostom (*Orat.*, 33, 20), who mentions these among the chief deities of the place.

The figure of Triptolemus, the reputed founder, also occurs; and the name ΒΟΗΘΟΥ, referring perhaps to the demagogue of that name. The imperial series extends as low as Gallienus, and contains some silver coins, a proof of the great wealth and importance of Tarsus. In the Synecdemus of Hierocles, Tarsus is placed in the Provincia Ciliciæ Prima, and styled Metropolis; Constantine Porphyrogennetus (lib. ii., *Them.* 13) places it in the Theme of Seleuceia, and adds, that it was an important outpost for the Arabs. It had been seized by them during the early times of their empire, and had been strongly fortified by Harun al Rashid, whose son and successor Al Mamun, was buried there, A.D. 833. It was recovered by Nicephorus Phocas, the successor of Constantine Porphyrogennetus, after a great resistance. (Leo Diacon., iv. 3, &c.) Ebn Haukal, an Oriental geographer, who wrote in the tenth century, thus describes it:—'Tarsous is a considerable town, with a double wall of stone. The inhabitants are valiant men, horsemen, and fond of warlike achievements. It is a strong and pleasant place. From it to the borders of Roum are many hills and mountains of difficult ascent. They say that in Tarsous there are above a thousand horsemen; and in all the chief cities of Islam, such as Seistan and Kirman, and Pars, and Khuzistan, and Irak, and Hejaz, and Egypt, there are inns, or public places, appointed for the people of this town.' (Ouseley's Translation, p. 46.)

Tarsus was afterwards retaken by the Arabs, but it was wrested from them by the Crusaders, under the command of Tancred, the nephew of Boemond, who resigned his conquest to Baldwin, afterwards count of Edessa. (Guibert de Nogent, *Histoire de la Première Croisade*, iii. 108; Guizot, *Mém. relat. à l'Hist. de France*, ix.) William of Tyre describes it at this time as a metropolis of Cilicia, with suffragan towns, and a population of Greeks and Armenians, much oppressed by the Arabs. Albert d'Aix says that it was populous, and well fortified. In the twelfth century Benjamin of Tudela speaks of it as the limit of the Greek empire (i. 58, Asher's translat.); and in the thirteenth, during the caliphate of Mostazem, the Arabs attempted to recover Tarsus, but failed. (Abulpharagius, p. 160, ed. Pococke, Oxon., 1673.) It was finally taken by Mohammed II., in 1458. (Von Hammer's *Geschichte des Osmanischen Reiches*, ii. 35.)

Very few remains of the antient city of Tarsus exist: at the north-west end of the antient town is part of an old gateway, and near it a very large mound, apparently artificial, with a flat top, from which is an extensive view of the adjacent plain: on an eminence to the south-west are the ruins of a spacious circular edifice, probably the gymnasium. Lucas, who visited it in 1704, only noticed one inscription, which he gives (i. 271-2, Amster., 1714). For the probable situation of the tomb of Julian, see Rennel, *Western Asia*, 88, &c. On a rock three or four leagues from Tarsus is a fortress, called the Castle of Giants. Kazalu, the port of Tarsus, is now about twelve miles distant, and is closed up by a sand-bar. (Beaufort's *Survey of Caramania*, 276.) The population of Tarsus is about 6000, chiefly Greeks and Armenian Christians, governed by a Moosellim: its site is unhealthy. For further information, see Michaud and Poujoulat's *Correspondence d'Orient*, vii., 146.

TARTA'GLIA, NICHOLAS, a learned Italian mathematician, who was born at Brescia about the beginning of the sixteenth century. When he was six years of age his father, who followed the humble occupation of a messenger, or carrier, died, leaving him in indigent circumstances, and without education. Even his family name is unknown, and that which he bore (designating one who stammers) was given him in derision by his young companions in consequence of an impediment in his speech arising from a wound which he received on his lips from a soldier, when the French army under Gaston de Foix relieved Brescia in 1512.

No account has been transmitted of the means by which Tartaglia obtained a knowledge of the rudiments of science, and it is probable that he owed but little to a preceptor. His own exertions, aided only by a mind endowed with the power of readily comprehending the processes of mathematical investigation, enabled him at length to attain the highest rank among the geometers of his time. Having passed several years as a teacher at Verona and Vicenza, he was appointed professor of mathematics at Brescia, and in 1534 he removed to Venice, where he held the like post till his death, which took place in 1557.

Tartaglia wrote on military engineering and on natural philosophy, but it is on his talents as an algebraist that his fame principally rests. In that age it was the custom for mathematicians to send difficult propositions to each other for solution, as trials of skill; and in the work entitled 'Quesiti ed Inventioni Diverse,' which Tartaglia published in 1546, there are contained some interesting accounts of the circumstances connected with the algebraic questions which he had received and answered. Among these are his investigations relating to equations of the third degree; and the solutions of two cases, in which both the second and third powers of the unknown quantity are involved, are shown to have been discovered in 1530, on the occasion of a question proposed by a person who kept a school at Brescia: Tartaglia states also that, in the year 1535, he found out the solutions of two equations, in which the first and third powers of the unknown quantity enter without the second, while preparing himself for a public contest with Antonia Maria Fiore, who then resided at Venice, and who had challenged him to a competition, in which each was to solve as many as he could of thirty questions to be proposed by the other. It is added that Tartaglia, in two hours, answered all those of his opponent without receiving one solution from the latter in return.

In 1539, Cardan, who had been informed of the discoveries of Tartaglia, applied to the latter for the solution of certain questions which he proposed, in the hope of obtaining from him a knowledge of the processes which he employed in obtaining the roots of equations of the kind just mentioned. The application was made at first through a bookseller, and afterwards by letter; but Tartaglia, who, by the possession of his secret, enjoyed great advantages over the other mathematicians of the time in resolving the questions which were proposed to him, declined making any communication by which his method might become publicly known. Though disappointed in these attempts, Cardan soon afterwards succeeded, by a promise of introducing him to an Italian nobleman, who had the reputation of being a great patron of learned men, in inducing Tartaglia to make a visit to himself at Milan: the latter, while there, yielded to the entreaties of his host, and having exacted a promise of inviolable secrecy, gave him a key to the rule which he had discovered. Cardan immediately found himself embarrassed with what is called the irreducible case, in which the expression $\frac{1}{4}Q^2-\frac{1}{27}P^3$ [IRREDUCIBLE CASE], entering into the value of the unknown quantity under the sign of the square root, is negative, and he applied to Tartaglia on the subject: the latter however declined giving a direct answer to his inquiry, being himself unable to conquer the difficulty; in fact the solution of the equation in this case is even now usually obtained by the aid of trigonometrical functions.

In the work of Tartaglia above mentioned there is an account given of a dialogue which took place in 1541 between himself and a Mr. Richard Wentworth, who then resided at Venice, and to whom it appears that Tartaglia had given lessons in mathematics. On being pressed by that gentleman to give him the rules for the solution of equations containing the second and third powers of the unknown quantity, the Italian mathematician declined doing so, on the plea that he was about to compose a work on arithmetic and algebra, in which the rules, he said, were to appear.

In 1545 Cardan published his work entitled 'Ars Magna,' and, in direct violation of his solemn promise, gave in it the rule for the solution of the cubic equation containing the first and third powers of the unknown quantity. He does not assert that he is the discoverer of the rule, but observes that it was first found out about 30 years previously by Scipio Ferreus, of Bologna; and adds that it had since that time been independently discovered by Tartaglia. The publication of this work produced, as might be expected, the most animated remonstrances from the man who thus felt himself seriously injured and aggrieved: Tartaglia however revenged himself in no other way than by sending challenges to Cardan and his disciple Lewis Ferrari, to hold with him a disputation on mathematical subjects, by which the public might be judges of their several merits. The discussion actually took place in 1549, in the church of Santa Maria, in Milan, between Tartaglia and Ferrari; but during the sitting, on the former pointing out an error which had been committed by Cardan in the solution of a problem, the people, who appear to have taken the side of their townsman, excited a tumult, and the assembly broke up without coming to a decision. Tartaglia has received no more justice from posterity than he experienced from his cotemporaries, and the formula for the value of the unknown quantity in such equations is still designated Cardan's rule. It must be admitted however that Cardan was the first who published its demonstration.

The works of Tartaglia, all of which were published at Venice, are—'Nuova Scienza; cioè Invenzione nuovamente trovata, utile per ciascuno speculativo Matematico Bombardiero,' &c., 1537: this is a treatise on the theory and practice of gunnery, and it was translated into English in 1588. 'Euclide, diligentemente rassettato,' &c., 1543: this is said to be the first Italian translation of Euclid. 'Archimedes Opera emendata,' &c., 1543. 'Quesiti ed Invenzioni Diverse,' 1550: this is the work above mentioned, and it is dedicated to Henry VIII. of England: it contains the answers to questions which had been proposed to Tartaglia concerning mechanics and hydrostatics; and to one of the books there is a supplement concerning the art of fortifying places. 'La Travagliata Invenzione, ossia, Regola per sollevare ogni affondata Nave,' &c., 1551; 'Ragionamenti sopra la Travagliata Invenzione,' 1551; 'General Trattato de' Numeri e Misure,' 1556-1560; 'Trattato di Aritmetica,' 1556; 'Descrizione dell' Artifiziosa Macchina fatta per cavare il Galeone,' 1560; 'Archimedis de Insidentibus Aquæ Libri duo,' 1565; 'Jordani Opusculum de Ponderositate,' 1565. A collection of his principal works was published in 1606.

TARTAN. [WEAVING.]

TARTAR. [POTASSIUM.]

TARTARIC ACID. This acid was first obtained in a separate state by Scheele; it exists in several vegetable products, but principally in bi-tartrate of potash, which is usually called *cream of tartar*, a salt which is deposited from wine.

The tartaric acid of this salt is obtained first by converting the excess of it, one half of it, into tartrate of lime by the addition of chalk, and the other half into the same salt by means of chloride of calcium; the resulting tartrate of lime is decomposed by sulphuric acid, by which sulphate of lime is precipitated, and the solution of tartaric acid thus obtained by single elective affinity and decomposition is evaporated, and crystals of the acid are deposited on cooling.

The properties of tartaric acid are, that it is colourless, inodorous, and very sour to the taste; it occurs in crystals of a considerable size, the primary form of which is an oblique rhombic prism: it suffers no change by exposure to the air; water at 60° dissolves about one fifth of its weight, and at 212° twice its weight; the solution acts strongly on vegetable blue colours, turning them red, and it becomes mouldy and decomposes when long kept; alcohol dissolves it, but more sparingly than water. The crystals, when heated a little above the boiling-point of water, melt into a liquid, which boils at 250°, leaving on cooling a semi-transparent mass, which is rather deliquescent; if it be more strongly heated in a retort, tartaric acid is decomposed, and converted into pyrotartaric acid, accompanied with some other products. When very strongly heated in the air, a coaly mass is procured, which is eventually dissipated. Sulphuric acid acts upon and decomposes tartaric acid, with the production of acetic acid; by means of nitric acid it also suffers decomposition, and a portion of its carbon, by acquiring oxygen from the decomposed nitric acid, is converted into oxalic acid.

Solution of tartaric acid acts with facility upon those metals which decompose water, as iron and zinc; it combines readily with alkalis, earths, and metallic oxides; and these salts are called *tartrates*. For an account of the more important of these we refer to the respective bases. Tartaric acid has a remarkable disposition to form double salts, one of the most distinct and remarkable of which is the tartrate of potash and soda, which has long been employed in medicine under the name of Rochelle Salts.

Tartaric acid free from water, in which state it may be obtained by exposure to a heat of 302° in an oil-bath for some time, consists of

Two equivalents of hydrogen	2	or	3·
Four equivalents of carbon .	24	„	36·4
Five equivalents of oxygen .	40	„	60·6
Equivalent . .	66		100·

It is insoluble in cold water.

In the crystallized state it consists of—

One equivalent of anhydrous acid	66	or	88
One equivalent of water .	9	„	12
Equivalent . . .	75		100

By the action of heat, so as partially to decompose it, tartaric acid is converted into tartrelic acid and tartralic acid, which are not of sufficient importance to require description.

Tartaric acid is largely employed as a discharge in calico-printing, and for making what are called sodaic powders, which are extemporaneous imitations of soda-water.

TARTARIC ACID is entirely confined to the vegetable kingdom, and is found free or uncombined in tamarinds, in the unripe grape, and in pepper; and in combination in tamarinds, ripe grapes, gooseberries, mulberries, squill, dandelion, chenopodium vulvaria, in various species of pines, and as tartrate of lime in the fruit of the Rhus typhina. For medical purposes it should be remarkably pure, when it is without odour, but makes a powerful acid impression on the organs of taste. In small doses, properly diluted, it acts as a refrigerant, and is of much value in fevers, particularly mucous, and in biliary remittents. It excites the appetite of persons in whom the stomach is in a healthy condition; and those who, by long indulgence in stimulating food and drinks, experience loss of appetite, painful digestion, constipation, with a yellow and altered countenance, and diminished muscular power, find in tartaric acid a remedy of singular power. For this state of system a few crystals should be dissolved in two small tumblers, nd drank in the morning fasting, an hour intervening between the tumblers. A few grains are sufficient for each tumbler, as when made too strong it excites irritation, followed by purging. Occasionally it disturbs the nervous system in a distressing way, so that patients refuse to continue its use. This plan has in many instances reclaimed individuals addicted to habitual intoxication, to which they have recourse to relieve a painful feeling of sinking and craving of the stomach, which is effectually removed by the acid draught. This is also useful after an attack of *delirium tremens*.

Tartaric acid enters the circulation, and diffuses itself through the whole body, and may be recognised in the urine, generally in combination, often with lime. Tartaric acid is much used to decompose alkaline carbonates, and form effervescing draughts, the employment of which requires caution. [ANTACIDS.]

TARTARS, or, more correctly, TATARS (Khazars and Kiptshak). The name Tatars once designated a great number of different nations in Middle Asia and Eastern Europe, which, according to general opinion, were of one common origin. Careful research however into their history, language, and ethnographical relations, has shown that the name of Tatars never designated any particular race, although it was at first restricted to certain tribes, among which there was no difference of race. It has however gradually become a collective name, under which are comprehended different nations of Mongol, Turkish, and even Finnish origin. The numerous errors and the inextricable confusion in the earlier historians who have written on this subject can only be cleared up by going back to the historical origin of the name of Tatars.

As early as the beginning of the ninth century, the Chinese knew a people called Táta, who lived to the east and south-east of the lake of Baikal, towards the upper part of the river Amur. They were also called Tatcöl, the Chinese pronunciation of Tatar, and they are probably identical with the Taidjod of the Mongol historian Sánang-Setsen. In the middle of the tenth century the Tatars were divided into three tribes, the White, the Wild, and the Black or Water Tatars, the last of which lived about the sources of the Amur, and were subject to the White, until Insugay (Yessugay), the father of Genghis Khan, a prince of the Water Tatars, subdued the White Tatars, in the middle of the twelfth century. He then united the Wild and all the other tribes of his race; and his son Genghis Khan gave to these warlike nations, the general name of which seems to have been Bede, the name of Köke-Mongols, that is, the Blue Bold, or the Celestial Mongols. A particular circumstance made the change of their name agreeable to his subjects. The word Tatar signifies in the Mongol language 'a tributary people,' and, in consequence, could not be agreeable to nations which had not only ceased to be tributary, but boasted of the noble title of Mongols. (Sanang Setsen, *History of the Eastern Mongols*, ed. J. J. Schmidt, p. 71, and notes 21 and 22; Pallas, *Sammlung Historischer Nachrichten über die Mongolischen Völkerschaften*, vol. ii., p. 429; Schmidt, *Forschungen im Gebiete der Völker Mittel Asiens*, p. 59.)

When Genghis Khan sent his son Tushi Khan to conquer the west, all the Turkish nations which were scattered over Middle Asia, from the sources of the Amur to the Caspian, were subjugated, and thus became Tatars, that is, tributary subjects of the Mongol empire. Eastern Europe, inhabited by other Turks and numerous nations of the Finnish race, shared their fate; the tributary inhabitants were obliged to fight under a Mongol chief; and the names of Mongols and Tatars were not only confounded, but the latter soon gained the ascendency, because it designated the great majority of Mongol subjects. In 1223, when the Mongols made their first invasion of Russia, they were generally called Tatars; and when Batu, the grandson of Genghis Khan, after having laid waste Russia and Poland, appeared on the frontier of Germany, the emperor Frederic II. summoned the princes to rise against the Tatars. The battle of Wahlstatt, or Liegnitz, was fought on the 9th of April, 1241, in which the Mongols, although they defeated a feeble army of Poles and Germans, were so struck with the heroic resistance of the Teutonic knights, that they did not advance any farther. This battle was for some time generally called the Tatar Battle: seven Silesian nobles who survived that day had and have still Tatar-caps in their armorial bearings; and another German knight, whose descendants are still living, had his name changed in commemoration of the day; but his new name was not Mongol, but Tader. A further proof of the great numerical preponderance of the tributary nations over the true Mongols is, that an army of 660,000 men, with which Batu occupied Russia and the Ural country, contained only 160,000 Mongols; while 500,000 belonged to the subdued Turkish, Finnish, and Slavonic nations. (Hammer, *Geschichte der Goldnen Horde in Kiptshak*, p. 114, 115, 141; Karamsin, iii., p. 275.)

These well-known facts, which might easily be augmented, are sufficient to prove that the name of Tatars was first known in Europe in its etymological signification; that it got a political signification, and was applied to nations which were not of Mongol origin; and that it had lost all precise ethnographical signification even before it reached the West. Tatars became a general name for any nomadic and barbarous hordes which invaded Europe from Western Asia, and thus it appears why in Sweden the gipsies were once known under the name of Tattars, and why in the duchy of Holstein they are still called either by the name of Zikhainers or by that of Tatars. (Benzelius, *Epitome Commentariorum Moysis Armeni*, Stockholm, 1723, 4to., p. 89.)

The incorrect orthography Tartars occurs as early as the appearance of the Mongols in Europe, and was probably introduced by superstitious monks and writers, who, struck with the seeming analogy between Tatar and Tartarus, believed them to have come from the infernal regions. This at least is more probable than the opinion that the name Tartars was introduced by Saint Louis, who, in a letter to his queen Blanche, about the approaching danger of the Tatars, speaks of them in the following terms:—'This divine consolation will always exalt our souls, that in the present danger of the *Tartars* either we shall push them back into the Tartarus whence they are come, or they will bring us all into heaven.' (Klaproth, *Asia Polyglotta*, p. 202.) These words rather prove that in King Louis's time the name and its origin were known.

If the empire of Genghis Khan had lasted longer, the name of Mongols would certainly have prevailed over that of the tributary nations, in the same way as that of the Franks supplanted the names of the Gauls, the Romans, the Goths, and the Burgundians. But the name of Mongols disappeared in Europe, and was no longer heard of except in the remote deserts of eastern Asia. The old name of Tatars however lasted as a designation of the different inhabitants of the empire of Kiptshak, which was founded by the descendants of Genghis Khan on the frontiers of Asia and Europe. There the princes only and part of the nobles were Mongols, and they were sometimes called so by those foreigners who were able to perceive the ethnographical differences among the inhabitants of Kiptshak (Treaties between Venice and the Golden Horde, cited below), but the remaining population was composed of Turkish and Finnish tribes, of which the former were the more numerous. The Russians, who were under the dominion of the Mongols for above two centuries, knew the Finnish tribes by the name of Tshudes, and their application of the name of Tatars exclusively to the Turks of Kiptshak gave rise to the present signification of the name. The other nations of Europe were less able to make such distinctions. Thus, for instance, Olearius, the secretary to the duke of Holstein's embassy to Persia, says, in his 'Travels,' that Moruma (Murom on the Oka) was 'the first town of Tartary on the way from Moscow, and that at Wasiligrod, at the entrance of the Sura into the Wolga, began the country of those Tatars who are called Tsheremisses.' But Murom is situated just at the entrance of the country of the Mordwins, one of the oldest Finnish tribes known to history, and the Tsheremisses are likewise of Finnish origin. Nevertheless Olearius calls them Tatars. He observes however that their language had a particular character, and resembled neither the Turkish nor the Tatar language, an observation which proves that Tatar has here two meanings: it first designates the inhabitants of the conquered territory of Kiptshak (Tartary), and then in a narrower sense the Turkish inhabitants of that country.

At present the name of Tatar is still given to the Turkish inhabitants of southern and eastern Russia, and as their origin is well known, there is no more reason for dropping the name for that of Turks, than there is for refusing the French their name, and calling them Gauls. It is nevertheless an important fact that the Tatars call themselves Turks, and feel highly offended by being called Tatars, a name which in their idiom signifies 'robbers. This fact refutes the hypothesis of Klaproth, who believes that the subjects of the Mongol empire adopted the name of Tatars as a title of honour, on account of its being the antient name of the chief tribe of the ruling nation. Klaproth's opinion becomes also entirely untenable if put in connexion with a fact stated by Sherefeddin and Arabshah, who tell us that Timur, who, as a descendant of Genghis Khan, undoubtedly belonged to the Mongol race, in a letter to Báyazid, calls himself a Turk, upbraiding this sultan of the Osmanlis with being a vulgar Turkoman. Can we believe that the subdued nations should have distinguished themselves by an ignoble name of their masters, while these, at the same time, made a boast of that of their Turkish subjects! It must be repeated that the tributary nations were called Tatars by the Mongols and by foreigners, and disliked the name on account of its meaning; and that the ethnographical signification of it was supplanted by the general and glorious name of Mongols. [TURKS.]

This account of the origin and the gradual diffusion of the name Tatar is more or less different from those given by Klaproth, Abel Rémusat, and Schmidt, but it is founded entirely on facts the knowledge of which we owe to these authors, and especially to Julius von Klaproth. Besides the above-cited works, the reader may consult Schmidt, in Hammer, *Fundgruben des Orients*, vol. vi., heft 3; Klaproth, *Beleuchtung und Widerlegung der Forschungen des Herrn Schmidt*; Abel Rémusat, *Recherches sur les Langues Tartares*; Abulghasi Bayadurkhan, *Histoire Généalogique des Tartars*, Leyden, 1726, 8vo.; Ahmedis Arabsiadae, *Vita et Res gestae Timuri*, ed. Manger, ii., cap. 19; Sherefeddin Ali, *Hist. de Timour Bey*, trad. par Pétis de la Croix, l. v., c. 14.)

The above-mentioned Turkish nations were known in history long before they were called Tatars. Part of them founded the empire of Khazaria, between the Dniepr and the Yaïk.

The *Khazars*, the Ghysser or Ghazar of Moses of Khorene, inhabited in the time of this Armenian author, in the fifth century A.D., the country north of the Caspian Sea; and in the sixth century they penetrated into the countries north of the Kuban and the Black Sea, where they founded a powerful empire. Among the Byzantine historians, Theophanes is the first who mentions them. As early as A.D. 625 they allied themselves with the emperor Heraclius, and in conjunction with him attacked Anushirwan, the king of Persia, and from that time were in continual political intercourse with the Byzantine emperors, who were always anxious to maintain peaceful relations with this people. Contemporary historians state that the Khazars consisted of two principal races: one of them was little, ugly, with black hair, and probably of Finnish origin; the other was tall and handsome, and spoke a Turkish dialect: many other races however were mixed up with them, so that Leo Diaconus justly calls them a 'colluvies gentium.'

(Ouseley, *Oriental Geography of Ebn Haukal*, pp. 185-190; Frähn, *Veteres Memoriæ Chazarorum ex Ibn Foszlano, &c.*; *Mémoires de l'Académie de St. Pétersbourg*, vol. viii.; Theophanes, iii. 28; vi. 9.)

Their kings were called Chagan, or more correctly Khaghan, which was the name of the old Mongol kings a thousand years before the appearance of the Khazars. In the time of the emperor Constantinus Porphyrogenitus the Khazarian empire extended in the south to the Black Sea, and contained the northern part of the Crimea, which preserved the name of Khazaria until the thirteenth century, and the island of Taman, then inhabited by Goths; on the Caucasian isthmus it was separated from the Alans by the present river of Manytsh. The western coast of the Caspian Sea belonged to it as far as Derbent in the present country of Daghestan, where they were contiguous to the Arabs. The eastern boundaries of it were probably the river of Yaïk or Ural. On the north it extended even beyond Kasan, and on the west it was bounded by the Dniepr. In the eighth century the Khazars made the Russians of Kiew for some time tributary, as well as the Sewerians, the Radiwitshes, the Viatitshes, and other Slavonic nations. Constantinus Porphyrogenitus recommends his son to maintain an alliance with the mighty Khazars, but he severely blames his predecessor Leo, who had assumed the imperial dignity against the will of the patriarch, and who had crowned his disobedience against the ecclesiastical authority by marrying the daughter of the Khaghan. 'For,' adds this historian, 'the Khazars, far from being orthodox Christians, are no Christians at all, but impious heathens; and Leo was punished for his crime by a carbuncle in his face, of which he died young, after severe sufferings.'* Christianity indeed, although some feeble traces of it appear in Khazaria as early as 740, was not adopted by the majority of the Khazars. On the contrary, their kings were Jews, and many Jews had founded great families in that country.

However strange this circumstance may appear, it is an undoubted fact. According to Frähn, one of the best writers on the Khazars, the religion of Moses was propagated among this people by the Jews, who were expelled from the Byzantine empire at the end of the eighth century. The princes, states Ibn Haukal, were obliged to be Jews, but the nine ministers of the Khaghan might be Jews, Christians, Mohammedans, or heathens, a fact from which we must conclude that there was great toleration in Khazaria. In the subsequent centuries we meet with some Christian princes, such as Georges Tzuda, in 1016, but the Khaghan Cosro (Khosrew), who reigned about 1140, was a Jew who had been converted to the religion of Moses by the rabbi Isaak Sangarus, as is stated by the rabbi Jehudah, in his work cited below, which is dedicated to that king.

(Ibn Haukal; Massudi, in Silvestre de Sacy, *Chrest. Arabe;* Herbelot, *Bibliothèque Orientale*, sub voce 'Khozar;' Frähn; Lehrberg, *Untersuchungen zur älteren Geschichte Russlands;* Karamsin and Bulgarin, *Hist. of Russia;* Müller, *Der Ugrische Volksstamm;* Joh. Buxtorfius, fil., *Liber Cosri*, Basileae, 1660, 4to. This last book was originally written in Arabic, by Jehudah Levita, and was translated into Hebrew by Jehudah Abn Tybbon, both Spanish rabbis.)

The Khazars were very different from those barbarous Mongol tribes which afterwards invaded Europe. Although many of them led a nomadic life, they were generally settled in villages and towns, which they embellished with magnificent buildings erected by Arabian and Byzantine architects, and the ruins of which still attest their former splendour. Ignorant historians have asserted that neither navigation nor commerce flourished among them, but there are numerous facts which prove the contrary. In the first place, the number of Jews and the toleration that existed in Khazaria may be considered as certain indications of the flourishing state of its commerce. The Khazars were renowned for their fine carpets, which were principally manufactured in their capital, Itel, the present Astrakhan, which was also called Bilándsher and Nihíje, Semend, with the surname of Seraï Banu, or 'the palace of the lady,' now Tarku, Old Kasan, and Sarkel, a fortress on the Don, were also commercial towns. Honey, skins, leather, furs, fish, salt, copper of the Ural, were the goods they exchanged in the southern countries for silk, wines, spices, jewellery, which they carried to the inhabitants of the north. Gold and silver vessels, which were fabricated in India in antient times, have been found in our own days at Perm on the Kama, in the north-eastern corner of Russia. The Wolga with its tributary rivers and the Dwina were the commercial roads by which they communicated with the kingdom of Perm, the Biarmia of the old Scandinavian and Anglo-Saxon writers, and with the Norwegians, who, after having doubled North Cape, anchored in the mouth of the Dwina. This route ceased to be used when the Tatars of Kiptshak stopped all intercourse across eastern Russia, and was not re-opened before the end of the sixteenth century, when Jenkinson, an Englishman, discovered it again. Another road followed the Dniepr as far as Orkha, and, reaching the Duna in the west and the Wolkhow in the north, brought them into communication with the Baltic, and with Julin, the famous city of the Wendes. The Arabs took a considerable part in this commerce, and their presence in these northern regions is attested not only by their geographers, such as Ibn Foszlan, Massudi, Shemseddin, and Yakut, but also by numerous Kufic coins which have been found in Scandinavia, and in the vast country between the Baltic and the Black and the Caspian seas. In short, in the period from the seventh to the eleventh century, the Khazars and the Arabs followed certain commercial routes in Russia, the natural advantages of which were so obvious, that the emperor Constantinus Porphyrogenitus, overlooking entirely the tract between the upper part of the Dniepr and the sources of the Lovat, believed that the Russians of Nemogarda, the present Novgorod on the Wolkhow, sailed with their ships directly to Kiew on the Dniepr. (*De Adm. Imp.*, cap. 9.) The present canal system of Russia, which is generally regarded as the realization of an idea of Peter the Great and field-marshal Münnich, is founded on that system of commercial intercourse which had been carried into effect by the Khazars a thousand years before.

The power of the Khazars in Europe was broken by the Russians in 1016, who made their Khaghan Georges Tzula a prisoner; but in Asia it continued for two centuries longer, until it gradually sank under the repeated attacks of the Pechenegues, the Uzes, the Bulgars, the Kumanes, the Yasses, and their very name had disappeared, when, in the beginning of the thirteenth century, eastern Europe was overwhelmed by the greatest of all conquerors, Genghis Khan. (Constantinus Porphyrogenitus, *De Administrando Imperio;* Nestor; Frähn; Lehrberg; *Nova Acta Acad. Petropolitanae*, vol. iii., p. 46; *Mémoires de l'Académie de St. Pétersbourg*, vol. i., p. 527; vol. ii., p. 297; vol. iii., p. 73; vol. viii., p. 577; Hüllmann, *Geschichte des Byzantinischen Handels;* Moderach, *Déscription Economique du Gouvernement de Perm;* *Description of Perm*, in Hermann, *Statistische Annalen;* *History of the Commerce of Russia*, in Storch, *Gemälde des Russischen Reiches*, vol. iv.; Krestinin, *Geschichte der Stadt Archangel;* Lelewel, *Numismatique*, sect. 'Poland;' Hanway, *Historical Account of the British Trade over the Caspian Sea;* Hakluyt, *Navigation*, with regard to Jenkinson and Chancellor.)

Tatars of the Golden Horde, or of Kiptshak.—While Genghis Khan was carrying his arms into India and China, Batu, his grandson, invaded the west as far as the frontiers of Germany, conquered the easternmost part of Europe, which was inhabited by Slavonic, Turkish, and Finnish nations, and compelled the princes of Russia to become his vassals. One of Genghis Khan's last acts (1227) was to bestow upon Batu the dignity of a Khan or viceroy of the western conquests, which formed one of the four, and afterwards five, uluses, or under-kingdoms, into which the Mongol empire was divided. The new viceroy chose for his vast dominions the name of Kaptshak, more correctly Kiptshak, or 'the hollow tree,' which was the name of a warlike Turkish people who lived in the flat country between the Wolga and the Don, the name of which was Deshti Kiptshak, or 'the steppe of the hollow tree.' The narrower signification of this name, which still belongs to a district near the mouth of the Terek, must therefore not be confounded with its larger meaning as that of an empire the frontiers of which varied according to the military success of its inhabitants. A second name of Batu's kingdom was that of the Golden Horde, or rather, of the Golden Camp, *ordu*, the camp, having been confounded with *orda*, the horde. In his golden tent, which was at Great Seraï on the Akhtuba, a branch of the lower part of the Wolga, Batu received the Russian princes who were his vassals; Saython, king of Armenia; and Plano Carpini and Ruysbroek (Rubriquis), the ambassadors of Saint Louis, king of France, who, while fighting against the Mohammedans in Egypt as enemies of Christ, courted the friendship of heathen Tatars as useful in his schemes against Germany. Batu founded the town of Great Seraï, his capital; Seraï, called afterwards Baghji-Seraï, in the Crimea; and New Kasan at a short distance from Old Kasan. He died in 1255.

After the short reign of Sertak and Ulaghji, the eldest and the youngest sons of Batu, the throne was occupied by their paternal uncle Berke, who seized the government in spite of the right of the second and the third sons of his late brother. Berke was the first khan of Kiptshak who was converted to the Mohammedan religion, and he showed himself so zealous that he ordered all persons to be put to death who refused to follow the Korán. This happened before 1258, and thus the Islám took root on the banks of the Wolga and in the snowy deserts of Siberia. In 1260 Berke sent Noghaï, his greatest captain, against Hulaku, the Mongol governor of Persia, who aimed at independence, but was defeated on the 19th of January, 1263, in a bloody battle on the banks of the Terek, and had a considerable part of his army drowned in retreating across the frozen river. It was in the same year that Marco Polo came to the Golden Camp, where he stayed for a whole year. Berke, who is generally represented as a prince of great merit, and whose influence in Asia Minor was sensibly felt by the Byzantine emperors, died in 1266, and was succeeded by Mengku Timur, a grandson of Batu. This prince ceded to the Genoese Kaffa in the Crimea, a town which was then one of the great markets where the Tatars used to sell the immense number of prisoners that they made in Russia and Poland, as slaves to the southern nations, and especially to the Sultans of Egypt, who there recruited the body of the Mamluks. He sent commissioners into all the subject Russian towns, who sold as slaves all who did not pay the heavy poll-tax imposed upon them by the Tatars. This proceeding caused such great mischief to the commerce of Old Novgorod, that the Germans of Lübeck and other Hanseatic towns, in order to save their stores, sent ambassadors with rich presents to Mengku Timur, who reached the Golden Camp in 1269. Mengku Timur Khan died about 1283. His successors, Tuday Mengku and Talabugha, ravaged Hungary and Poland, threatened Germany, and kept up diplomatic relations with France. (Abel Rémusat, *Mémoires de l'Acad. des Inscript. et B. L.*, vol. vii.)

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* Constantinus confounds two of his predecessors. The emperor Flavius Constantinus, a great heretic, married Irene, the daughter of the Khaghan, and died in 775; their son Flavius Leo, surnamed Chazarus, on account of his maternal origin, was a still greater heretic, and died in 780, of carbuncles in his face in his thirtieth year. (Bandurius, *Com.* in cap. 13, *De Admin. Imp.;* Du Cange, *Hist. Byzant. P. I. Familiae ac Stemmata*, p. 124-126.)

The following khan was Toktay, whose reign is important in many respects. Under him, paper money, an old invention, afterwards imitated in Persia, was introduced into Kiptshak under the name of Jaw, many years before any such thing was known in Europe. (J. von Klaproth, *Origin of Paper Money*; Von Hammer, p. 222.) Toktay owed his elevation to the throne to Noghaï, above mentioned, a powerful under-khan of the southern Turks of Kiptshak, who belonged to the house of Genghis Khan, and who was married to Euphrosyna, a natural daughter of the emperor Michael Palaeologus. The power and the influence of Noghaï were so great, that he would perhaps have made himself master of Kiptshak, if jealousy had not arisen among his sons and led to a civil war, in which Toktay took an active part. After a struggle of seven years, Noghaï was defeated, and died of a wound in 1295, but he left his name to his tribes, who from that time to the present day have been, and are still known under the name of Tatars Noghaïs, or Nogay Tartars. Toktay Khan, who died in the year 1313, abandoned the Islâm and adored idols and the stars, but he never showed himself intolerant to other believers. He was married to a natural daughter of his ally the emperor Andronicus, who followed the policy of some other Byzantine emperors, who gave their legitimate princesses to Christian princes, while they abandoned their natural daughters to Turks and Tatars, who did not set much value on the difference between legitimate and illegitimate children.

Usbeg, the successor of Toktay, a boy thirteen years of age, found the Russian princes disobedient: they delayed to take the oath of vassalage until the young khan peremptorily ordered the first of them, Michael, grand-duke of Moscow, to appear in the Golden Camp. Michael immediately went, justified himself, and was dismissed without punishment, but Usbeg seized him some years later, and, after having punished him for some months, ordered him to be put to death. This happened (in 1319) precisely a year after the pope had written a letter to Usbeg, in which he thanked him for the kind protection that he had granted to his Christian subjects. (Mosheim, *Hist. Tatar. Eccles., Append.*, p. 130.) In 1327, the Tatarian garrison of Twer having been surprised and cut to pieces by the Russian inhabitants, who were excited to this act of national vengeance by their prince Alexander Wassiliewicz, Usbeg Khan invaded the country, slaughtered the inhabitants, expelled Alexander, and ordered John Jaroslawicz, prince of Riäsan, to be executed. Alexander also and his two sons were beheaded in 1339, and their death was preceded or followed by the execution of six princes more, among whom was Juri Danilowicz, grand-duke of Moscow. Many common people shared their fate, and for forty years after this bloody revenge, peace was never again disturbed in Russia by any rebellion against the authority of the Tatars. By a treaty of the 7th August, 1333, the first which was made between the Tatars and European states, Usbeg granted considerable commercial advantages to the Venetians of Azof or Tana. (The treaty is contained in Hammer, *Geschichte des Osmanischen Reiches*, vol. iii., p. 665.) Usbeg's court was brilliant. Although as a Mohammedan he had several wives, he was far from keeping them in that close confinement to which the women of the Oriental nations have always been subjected. Sitting on a silver throne under a golden canopy, and surrounded by his royal children and the nobles of his court, the gallant khan rose when one of his women entered the room, and stepping forwards, took the hand of the unveiled lady and led her to a seat by his side. (Hammer.) One of his daughters was married to Kusun, sultan of Egypt, a native of Kiptshak. Usbeg died in 1340, and his descendants became khans of some Turkish tribes to the east of the Caspian Sea, which are still known by the name of Usbecks.

One of Usbeg's successors, Berdibeg (1359), murdered his old father, strangled his twelve brothers, and assumed the title of 'king of the just, the sublime support of the world and of religion.' He himself was murdered three years later, and with his death the house of Batu became extinct. The reign of all the following khans was short and bloody. Civil wars shook the empire, and Kiptshak was divided for some time into several khanats, the most powerful of which were those of Kasan, of Astrakhan, of the Crimea, and of the Yaïk, each of which claimed the supremacy. At last Mamay was successful in reuniting them for a short time. He made an alliance with Jaghello, the grand-duke of Lithuania, for the purpose of subjugating the different Russian princes, who had become less dependent on Kiptshak in proportion as its strength was undermined by war and rebellion. Dmitri, the grand-duke of Moscow, had just assembled his troops, when, on the 8th of September, 1380, he was attacked in the plain of Kúlikow, by 700,000 (?) Tatars and Lithuanians. (Karamsin. v., p. 31; and all the other Russian historians.) The Tatars were defeated with dreadful slaughter; 200,000 (?) of them were left on the field, and Mamay fled to Kaffa in the Crimea, where he was treacherously murdered. For the first time during a hundred and forty years, a hope of national independence consoled the Russians.

Toktamish Khan, the son of Urus Kkan, who was the founder of the dynasty of the White Horde, avenged the defeat of Kúlikow. In 1382 he took Moscow by storm, burnt the town, and ravaged Russia. He renewed the treaties with the Venetians and the Genoese, and Kiptshak was in a fair way to recover from all its calamities, when Timur, or Tamerlane, the conqueror of Asia, appeared on the banks of the Yaïk. Toktamish was twice defeated by Timur, and in a third battle on the banks of the Kama, north of the mouth of the Bielaya, which happened on the 18th of June, 1391, his whole army was slaughtered. The khan of Kiptshak, however, did not despair: he appeared in the field with a new army, and advanced to meet Timur. The encounter took place near the mouth of the Terek, on the 15th of April, 1395; but notwithstanding their heroic resistance, the Tatars were again defeated, and Timur's host overwhelmed Russia. Seraï and Astrakhan were destroyed, Moscow was threatened, and saved by the interposition of the Holy Virgin, who appeared on the walls (26th of August, 1395), and Toktamish fled to Witold, grand-duke of Lithuania. Meanwhile Timur had left Kiptshak, and his beys, unable to maintain themselves in the hostile country, were driven out in 1399 by some enterprising Tatar chiefs. One of them, Kostlogh Timur, became khan of Kasan, and the others maintained themselves in the Crimea, on the Yaïk, and at Great Seraï, the khan of which assumed the name of khan of the Golden Horde, without having much authority over the others. Encouraged by the divisions among their masters, the Russian princes paid their tribute very irregularly, and ceased to appear in the Golden Camp and to take the oath of vassalage. In 1450 Haji Ghiray was almost independent in the Crimea. From 1462 there were constant wars between the khan of Kasan and Ivan Wassiliewicz, grand-duke of Moscow, who at last conquered the whole khanat, and took the capital, Kasan, in the autumn of 1468. During this time, Casimir, king of Poland, defeated the Southern Tatars, and when the Great Khan of Seraï was bold enough to send ambassadors to Ivan to claim the tribute which was due, the grand-duke refused it haughtily, cut off the noses of the ambassadors, and sent them back in this state to the Golden Camp. He then allied himself with Mengli, khan of the Crimea, and attacked the great khan, who was defeated, in 1480, at the Oka, and near Azof on the Don. This was the last war between Russia and the Golden Horde. Russia, free from the yoke of foreigners, was master of Kasan; Mengli became an independent khan in the Crimea, and Yaghmurji in Astrakhan. The khanat of Astrakhan was conquered by the Russians in 1544. The khanat of the Crimea, although it became a vassal state of Turkey, existed for three centuries, when it was conquered by Potemkin, under Catherine the Great. Thus the powerful kingdom of Kiptshak, the creation of Genghis Khan, became a province of Russia.

In this long struggle with the Tatars, the Russians were taught to bear chains, and to forge them for other nations. From 1240 to 1440, two hundred and fifty Russian princes went to the Golden Camp and humbly knelt before the majesty of a Tatar king; twelve of them were beheaded. One hundred and thirty noble families of Russia and many of the common people are descended from the Tatars. Many words in the Russian language, several legal customs, various social usages, and articles of dress, several names of weights, measures, and coins, ceremonies at the emperor's court, the knout itself, are of Tatar origin. The influence of the Tatars upon the Russians has never been better characterized than by that bon-mot of Napoleon: 'Scrub a Russian, and you will find a Tatar.' [Astrakhan; Casan; Crimea; Turkey; Turks.]

(Hammer, *Geschichte der Goldenen Horde in Kiptshak;* Mohammed Riza, *Asseb u's Seyiâr* (the Seven Planets); *Histoire des Khans de la Crimée*, traduite du Turk par Mirza-Kasem-Bey, 1832, in 4to.; Abulghazi; D'Obsson Krestinin, *Geschichte der Kasanischen Zare*, Petersburg, 1791; Fischer, *Sibirische Geschichte*, Petersburg, 1768; Deguignes, *Histoire des Huns.*)

TA'RTARUS (Τάρταρος) was, according to the notions of the Greeks and Romans, a part of the lower world, and was inaccessible to the light of the sun and to the winds. Homer describes it as being as far below Hades as heaven is above the earth, and as being provided with brazen gates at its entrance. (*Iliad*, viii. 13, &c., 481.) He further regards it chiefly as the place in which the gods were punished. Hesiod entertains on the whole the same idea, but he adds that Tartarus is surrounded by a brazen wall and triple night; the roots of the earth and the sea hang down into it. It is the prison of the Titans. (Hesiod, *Theog.*, 720, &c.) In later times Tartarus designated that part of the lower world in which the shades of the wicked were punished (Plato, *De Re Publ.*, p. 616; Virgil, *Æn.*, vi. 543), and the ideas then formed of it were more awful than in earlier times. According to Virgil's description, which we may take as an example of the later ideas, the road into the lower world was divided at a certain point into two roads, the left of which led into Tartarus, which was surrounded by a triple wall and the fiery river Phlegethon, and was closed with an adamantine gate. At its outer side Tisiphone kept watch, and at the inner side the fifty-headed hydra. Rhadamanthys was the judge in Tartarus, and at his command the Furies scourged the shades of the wicked. Tartarus was twice as far below the earth as heaven above it.

Tartarus was also the name of a small river in Gallia Transpadana, which is now called Tartaro. It was connected with the Padus and Athesis by the Fossae Philistinae.

TARTARY, or more correctly **TATARY**. This name was in former times given by the European nations to the country of Kaptshak or Kiptshak [Tartars], or the three Khanats of Astrakhan, Kasan, and the Crimea [Astrakhan; Casan; Crimea], the last of which had the special name of Little Tatary. [Turkey.] Great Tatary, on the contrary, designated the vast country between the Caspian Sea on the west, the desert of Gobi on the east, Siberia on the north, and Persia, Afghanistan, and Tibet on the south. The greater part of it has now the more convenient name of Turkistan. [Turkistan.] The name of Tatary has entirely disappeared from geography, but it occurs frequently in the history of those regions.

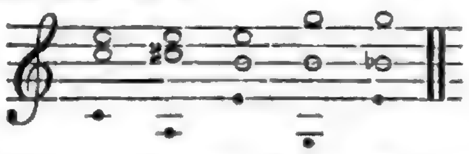
(Ritter, *Asien.*)

TARTESSUS. [Tarshish.]

TARTI'NI, GIUSEPPE, a name celebrated in the annals of music, was born at Pisano, on the coast of Istria, in 1692, and educated at the university of Padua, for the profession of jurisprudence; but his love of music triumphed over his graver pursuit, and after some struggles, and several adventures of rather a romantic kind,—among which the fighting of many duels, the marrying a cardinal's niece against her uncle's and his father's consent, and his consequent flight to a monastery, where, to avoid the effects of his eminency's resentment, he remained during two years secreted, may be thus slightly mentioned,—he became a professed violinist, and the founder of a school which in after-times boasted of a Nardini, a Pugnani, a Viotti, and a Baillot among its disciples.

Tartini was also a composer, and his productions are much extolled by a very competent judge, M. Baillot, an eminent French violinist and good critic: but he is more generally known by his writings on the art, among which his *Trattato di Musica seconda la vera Scienza dell' Armonia* (1754), a strictly scientific work, is still read, and was freely and ably translated and explained in 1771, by Edward Stillingfleet, under the title of 'Principles and Powers of Harmony,' who cleared it of many of the obscurities which D'Alembert justly complained of, and by his additions and illustrations rendered it entertaining as well as instructive. This Treatise is partly founded on the author's theory of a *Third Sound*, a subject which has so long engaged the attention of all writers on acoustics, and on which most of Tartini's work is built, that we here give an explanation of it nearly in the words of the above-named translator, or, rather, commentator.

'Two sounds being given on musical instruments that admit of the tones being held out and strengthened at pleasure, as violins, oboes, horns, &c., a third sound will be heard. On the violin let the intervals CE, C♯E, BE, BG, B♭G, be sounded with a strong bow, and the third sounds, represented by the black notes in the subjoined example, will be heard:—



'A similar result will occur if the same intervals be sounded by two players on the violin, distant from each other about 29 or 30 feet; always using a strong bow, and holding out the notes. The auditor will hear the third sound much better if stationed exactly between the two instruments. Two oboes will produce the same effect placed at a much greater distance.'

'This discovery of the *Grave Harmonics*, as these third sounds are called, was made so nearly at the same time by Tartini and Romieu, that both seem to have an undoubted claim to be considered as discoverers. M. Romieu was a member of the Royal Society of Sciences of Montpellier. The memoir which he read before the society is entitled "A New Discovery of Grave Harmonic Sounds, which are very sensibly produced from the union of Wind Instruments."'

Tartini died at Padua in 1770. To the *Dictionnaire des Musiciens* we are indebted for what relates to his early life: which work also furnished M. Prony with materials for an interesting memoir in the *Biographie Universelle.* In the *Encyclopédie* is an *éloge* by M. Ginguené on the compositions of Tartini, in which they are most indiscreetly compared with those of Corelli.

TARTRATES. [Tartaric Acid.]

TARUDANT. [Marocco.]

TASHKEND. [Turkistan.]

TASMAN, ABEL JANSSEN, one of the greatest navigators of the seventeenth century, whose fame has not equalled his merits, owing to his countrymen, the Dutch, having neglected to make known the important services which he rendered to geography. In the service of the Dutch East India Company he gave such proof of his enterprise and ability as to induce Anthony Van Diemen, the most distinguished governor-general who had presided over the affairs of that company, to commission him, in 1642, to proceed on a voyage, the object of which was to ascertain the extent of the Australian continent, on the western coast of which discoveries had been made by previous Dutch navigators.

On the 14th August, 1642, Tasman sailed from Batavia in command of two vessels, the Heemskirk and the Zeehaan, directing his course first towards the Isle of France, where he put in for provisions and water. From the Isle of France he set sail on the 3rd October, and proceeded south to about 41° S. lat., afterwards to the south-east, to about 50° S. lat., and then due east. Having passed 127° E. long., he sailed to the north and east, and on the 24th November discovered, at 10 miles distance, a land to which he gave the name of Van Diemen. He did not remain here long, nor did he meet with any of the natives, but he continued on his voyage, sailing to the south-east, and doubled what he conceived to be the southern extremity of the Australian continent, or New Holland, but what in fact was the southern extremity of the island of Tasmania, or Van Diemen's Land. He made an unsuccessful attempt to anchor in a bay, to which he gave the name of the Bay of Tempests—Storm Bay—on the south-eastern coast of Van Diemen's Land; and then ran to the north, where he found secure anchorage in another bay, to which he gave the name of Frederik Hendrik Bay, 42° 52′ S. lat., 147° 57′ E. long. On the shore he erected a standard, to which he attached the colours of the Dutch East India Company, and on the 5th set sail again. Unfavourable winds prevented his surveying, as he had intended, the north coast, and he therefore bore to the east, proposing to visit the Solomon's Islands, of which some account had been given by previous navigators. But on the 13th, being in about 42° 10′ S. lat. and 170° E. long., he found himself in view of a high and mountainous country, which he named Staaten Land—land of estates—now known as New Zealand. Tasman supposed this land to be part of the continent of Australia. He sailed along the coast towards the north-east, and on the 17th anchored at the entrance of what he concluded to be a great bay. The natives from the shore approached in their canoes, but still remained at a distance, and refused to come on board either of Tasman's vessels, although every amicable demonstration was exhibited by the crews. Gathering confidence however, they afterwards came in large numbers, and a quarrel ensuing between them and the Dutch, three sailors were murdered. The bay in which this happened received the name of Mordenaars' Bay, or Murderers' Bay (40° 40′ S. lat., 173° E. long.). Tasman did not revenge the death of his men, but, availing himself of a favourable wind, set sail. Being followed however by two and twenty canoes with natives armed, he fired among them, killed one or two natives, and drove the rest on shore. He did not make any progress owing to the variableness of the weather, and was obliged to anchor again in a bay to the east of Massacre or Murderers' Bay, which yet preserves his name—Tasman's Bay (about 41° S. lat., 173° 30′ E. long.). When enabled to resume the voyage, he continued his course along the coast, bearing northwards, until, on the 4th January, 1643, he found himself in a situation in which the violence of the current bearing to the west, and the swelling of the waves, which bore to the north-west, led him to conclude that the sea in that part afforded a free passage. To the west he perceived a group of small islands which he named the Three Kings (in about 34° 3′ S. lat., 172° 5′ E. long.). Those islands were inhabited, but the violence of the waves prevented all intercourse with the natives. Tasman now resolved to sail to the east, and afterwards to the north as far as 17° S. lat., and then to the west towards the isles of Cocos (15° 50′ S. lat., 174° 10′ W. long.), and of Hoorn (14° S. lat., 178° 20′ W. long.), with a view of obtaining some fresh provisions at one of these islands. On the 6th January he saw an island to the south at three miles distance, but no name is given to it. On the 8th, being, as he represents, in 32° S. lat. and 174° E. long., the force of the waves which rolled from the south-east suggested to him that he ought not to look for land in that direction; he therefore changed his course to the north, and on the 19th discovered an island which he called Pyllstaart (22° 22′ S. lat., 176° W. long.). On the following day he saw two other islands, and on the 21st approached the more northern, which he named Amsterdam, the native name being Tonga Taboo (21° 30′ S. lat., 175° 20′ W. long.); the other Middelburg, the native name being Eoa, the Ea-oo-wee of Cook (21° 24′ S. lat., 175° W. long.). The islanders brought various fruits in their canoes, and Tasman has described them as uniting courage with mildness. While here he discovered some other isles, before one of which he anchored, naming it Rotterdam, the native name being Ana Moka or Annamooka, 20° 15′ S. lat., 174° 31′ W. long. Captain Cook, when he visited these islands about a hundred and fifty years afterwards, found the tradition of Tasman's visit preserved among the natives.

On the 1st of February Tasman discovered the islands of Prince William, but his provisions being nearly exhausted, he could not stay to visit them. For several days subsequently the sky was so cloudy as to prevent his ascertaining the situation of his vessel, and when fine weather partially returned, he judged it best to sail towards 5° S. lat., and then to bear towards New Guinea, apprehending the return of unfavourable weather, in which he might be cast upon an unknown coast. By the 22nd of March he was in 5° 2′ S. lat., and having the advantage of clear weather and the east trade-winds, he soon came in sight of a cluster of islands which had been visited by two navigators, Schouten and Le Maire, and by them named Ontong Java. On the 29th he sailed past the Green Islands (4° 53′ S. lat., 154° 50′ E. long.), and on the 30th the Isle of St. John (3° 50′ S. lat., 153° 50′ E. long.). This island, he says, appeared to be well cultivated, to abound in flesh, fowl, fish, and fruit, and to have a numerous population. Schouten having before sustained some injury from the natives, Tasman did not attempt to land. On the 1st of April he was in sight of what he supposed to be New Guinea, but in fact of New Britain, and shortly after he doubled the cape to which Spanish navigators had before given the name of Cabo Santa Maria—Cape St. George of Dampier (5° S. lat., 152° 15′ E. long.). The crew were suddenly awoke on the night of the 12th by what resembled the shock of an earthquake: the situation of the vessel at the time, as Tasman states, being 3° 45′ S. lat. They sounded, supposing that the ship had struck, but could find no bottom. Several shocks, each less violent, succeeded. On the 20th they were near to Brandande Yland, or Burning Island, which had been mentioned before by Schouten: on the 27th they were in sight of another island, which he calls Jama, a little to the east of Moa (8° 21′ S. lat., 127° 45′ E. long.), where they obtained cocoa-nuts and other fruits. Tasman has described the inhabitants as absolutely black, and speaking a copious language, in which the frequent repetition of the letter *r* is noticed. He anchored on the following day at the Isle of Moa, where he was detained for eight days by unfavourable weather. The Dutch carried on an interchange of knives for cocoa-nuts and Indian figs with the natives. On the 12th of May he coasted the island to which Schouten had before given his name (50′ S. lat., 136° 20′ E. long.), and which is described as fertile and populous: the natives gave proof of their commerce with different Spanish vessels by the production of various articles which they had received in barter. Having now fulfilled his instructions, Tasman directed his course back to Batavia, where he arrived on the 15th June. A map of his discoveries was sent to the Stadt House at Amsterdam.

The success of this voyage induced Van Diemen to commit to Tasman the command of a second expedition, the objects of which are set forth in the instructions given by the governor-general on the occasion. These instructions are printed in the introduction to Flinders' Voyages. After quitting Point Turc, or False Cape, situated in 8° S. lat., on the south coast of New Guinea, he was to continue eastward along the coast to 9° S. lat., carefully crossing the cove at that place, looking about the high islands or Speults River with the yachts for a harbour, despatching the tender De Braak for two or three days into the cove, in order to discover whether within the great inlet there might not be found an entrance to the South Sea.[*] From this place he was to coast along the west coast of New Guinea (Carpentaria) to the farthest discoveries in 17° S. lat., following the coast farther, as it might run westward or southward. It was feared that he would meet in those parts with the south-east trade-winds; from which it would be difficult to keep the coast on board, if he stretched to the south-east; but notwithstanding he was by all means to endeavour to proceed, that it might be ascertained whether the land was divided from the great known South Continent or not. These instructions were signed in 1644, 29th January, by the governor-general, and two vessels—the Zeehaan and the Braak—were placed at Tasman's disposal. But of the results of this second voyage absolutely nothing is known with certainty; nothing was ever published. 'It seems to have been the general opinion,' says Flinders, 'that Tasman sailed round the Gulf of Carpentaria, and then westward along Arnhem, and the northern coast of Van Diemen's Land; and the form of those coasts in Thévénot's charts of 1663, and in those of most succeeding geographers, even up to the end of the eighteenth century, is supposed to have resulted from this voyage. This opinion is strengthened by finding the names of Tasman, and of the governor-general, and of two of the council, who signed his instructions, applied to places at the head of the gulf; as is also that of Maria, the daughter of the governor, to whom Tasman is said to have been attached. In the notes also of Burgomaster Witsen, concerning the inhabitants of New Guinea and Hollandia Nova, as extracted by Mr. Dalrymple (*Collection of Voyages*), Tasman is mentioned as among those from whom his information was drawn.' Of the private life of Tasman nothing is known, neither when nor where he was born or died.

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[*] The great inlet or cove where the passage was to be sought, is the north-west part of Torres Straits. It is evident that a suspicion was entertained in 1644 of such a strait; but that the Dutch were ignorant of its having been passed. The 'high islands' are those which lie in 10° S. lat. on the west side of the straits. Speults river appears to be the opening between the Prince of Wales Island and Cape York; through which Cook afterwards passed, and named Endeavour Strait. (Flinders' *Voyage*, 'Introduction.')

An account of Tasman's first voyage is given in the *Collection de Thévénot*, partie iv.; in Harris's *Navigantium atque Itinerantium Bibliotheca*, 1744, fol.; at the end of the *Voyages de Correa*, tome ii., Paris; in *Terra Australis Cognita, or Voyages to the Terra Australis during the Sixteenth, Seventeenth, and Eighteenth Centuries*, by Callander, Edin., 1766. From these sources, and from the *Biographie Universelle*, tome 45, the substance of this article has been collected. Tasman is not even named in Chalmers, nor in many other universal biographies in the English language.

TASMA'NIA, more generally known by the name of Van Diemen's Land, is an island and British colony situated in the southern hemisphere, south of Australia. It lies between 40° 45′ and 43° 45′ S. lat., and between 144° 45′ and 148° 30′ E. long. It is separated from Australia by Bass's Strait, which washes its northern shore. On the west of the island is the Indian Ocean, and on the east the Pacific. On the south it is washed by that portion of the ocean which connects the two first-named oceans, and extends southward to the shores of the newly-discovered antarctic continent. [SOUTH POLAR COUNTRIES.] From Cape Grim, its north-western extremity, it extends south-south-east to South Cape, a distance of about 230 miles, and this is its greatest length. Its greatest width occurs near 41° 20′ S. lat., between Ordnance Point on the west and St. Helen's Point on the east, which are about 190 miles distant from one another. According to a rough estimate, the surface is 24,000 square miles, or about 4000 square miles less than the extent of Ireland.

Coast-line and Islands.—The western coast, beginning on the north at Cape Grim, and extending to South-West Cape, is about 240 miles long. It is less accessible than the other shores of the island, as in general it runs in a continuous line, being only broken by large inlets at two places. The shores are steep, exposed to the prevailing south-western winds, to a strong swell and surf, and without anchorage and shelter. This coast is therefore rarely visited by vessels, and no settlements have been established on it, except at Macquarrie Harbour and Port Davey, where a few convicts are kept to cut wood. The northern parts of this coast, and as far south as Macquarrie Harbour, are in general low, but south of Macquarrie Harbour they are high. South of Cape Grim, which consists of steep rocks of moderate elevation, the coast is formed by low black rocks, which towards West Point sink down to the level of the sea, and in this part there are a few shallow creeks. From West Point, which is formed by a short, low, and sandy projection, to the mouth of the river Arthur, the beach is low and sandy, and behind it extends a swampy level tract, covered with tea-trees to the distance of three or four miles, where the country rises into low hills. At a few places the low beach is interrupted by rocky cliffs. This low coast continues to Ordnance Point, near which is Jacob's Harbour, which is accessible to boats. At Ordnance Point the coast rises to a moderate elevation, but it is frequently interrupted by low and sandy tracts. The shores are overgrown with low bushes. A bay of moderate extent occurs between the mouth of the river Pedder and Sandy Cape, but it is shallow and useless. That part of the coast which extends from Sandy Cape to Macquarrie Harbour is almost unknown, except that it chiefly consists of sandy low shores, without a beach, at the back of which there are hills, some of which attain a considerable elevation. Macquarrie Harbour is a fine sheet of water, extending nearly 25 miles south-south-east, and terminating with two fine basins, Birch's Inlet and Kelly's Basin. It is on an average five miles wide, and affords good anchorage and complete shelter; but near its entrance is a bar, which has only nine feet of water. The harbour is surrounded by wooded hills. Cape Sorell, forming the western side of the entrance of Macquarrie Harbour, is a steep and rocky promontory, and farther south the coast-line is high and rocky, and here and there a few rocks project into the sea, but the small bays thus formed do not afford shelter against the swell of the sea, and not even a safe landing-place. At the back of the beach there are steep and lofty hills. Cape Hibbs is formed by a mountain-mass projecting three or four miles into the sea. South of it the coast rises still higher, and between that cape and Rocky Point two hills, which project about two miles from the shores, constitute a harbour, in which small vessels may anchor, but it is open to the west. The high shores continue to Port Davey and to South-West Cape. Port Davey is the best harbour on this coast. At the entrance it is about four miles wide, and it continues at that width about 6 miles inland, when it divides into two branches. That branch which runs northward is called Cockburn, and is about two miles wide and six long: the southern, which runs eastward, does not much exceed a mile in width, but extends more than 10 miles inland, turning at its eastern extremity to the south. These two branches have good anchorage, and afford safe shelter, being surrounded by high hills; but the wide bay, of which they are branches, is open to the westerly winds and the swell of the sea: the anchorage however is good.

The southern coast, between South-West Cape and Whale Head, is about 50 miles long, and runs in a serpentine line, forming several bays, of which a few have good anchorage, as Cox Bight, east of South-West Cape, and the nameless wide bay which lies west of South Cape, and at whose innermost recess is a harbour about five miles long and a mile wide, which has a good entrance, and affords anchorage and shelter, but it has not been regularly surveyed. This harbour is separated from the wide bay by a tongue of land of moderate elevation, on which the sea breaks with a heavy surf. The shores of this coast are in general rocky and high, and constitute the lower declivity of the mountain-masses which extend over this part of the country. Several small islands opposite this coast break the swell of the sea, and as most of them are elevated, they serve as beacons.

The south-eastern coast extends from Whale Head, the most south-eastern promontory of Tasmania, to Cape Frederik Hendrik, about 60 miles in a straight line, but, measured along the shores, it is probably double that extent. It contains a greater number of safe anchorages than probably any other country of the same extent on the globe. There is hardly a mile along this coast-line which does not offer a safe refuge to vessels. This great advantage is owing partly to the size and form of the island of Bruni, which extends along the coast, and partly to two far-projecting promontories, called Ralph's Peninsula and Tasman's Peninsula. The island of Bruni extends about 30 miles nearly due south and north, but it varies greatly in width; as the isthmus of St. Aignan is only a few hundred paces across, whilst the mountain tract south of it is more than eight miles wide. It consists of three isolated tracts of high hills, connected by isthmuses: the most southern of these tracts has the form of a hook, and is connected with the central mountain-tract by a low isthmus about a mile wide and two miles long, which separates Taylor's Bay from Bad Bay. The central mountain-tract, constituting the main body of the island, is about 15 miles long from south to north, and more than eight miles wide in the broadest part. It is connected with the northern mountain-tract by the isthmus of

St. Aignan, which is five miles long, and only a few hundred paces wide. It is low and sandy, and separates Isthmus Bay on the west from Adventure Bay on the east. The northern mountain-tract is about 12 miles long, and so much indented on the western shore that its average width does not exceed three miles, though in some places it is five miles across. The mountains of this island do not appear to exceed 1200 feet in elevation: they are covered with wood, and supply numerous streams. Along the western side of the island are five harbours, which, from south to north, are called Great Cove or Taylor's Bay, Little Cove, Isthmus Bay, Great Bay, and Burnes Bay. They all have excellent anchorage and shelter, except Taylor's Bay, which is rather too large, and exposed to the gusts of wind which come down from the mountains on the mainland. On the eastern side of Bruni Island are three bays, Bad Bay, Adventure Bay, and Trumpeter Bay. Bad Bay is useless, being open to the southern winds, and subject to a very heavy swell, which causes such a tremendous surf at the foot of the rocks which surround the basin, that landing is almost impossible. Adventure Bay is open to the east, but is so far protected by Tasman's Peninsula, that the inconveniences of this harbour during easterly winds are reduced to a difficult landing. Before the foundation of the colony it was frequently visited by whalers. Trumpeter Bay is of moderate extent.

The strait which divides Bruni Island from the mainland of Tasmania is called D'Entrecasteaux Channel, or Storm Bay Passage, and extends 45 miles in a straight line from Whale Head to Pilot Strait, or the narrow arm that divides the northern extremity of Bruni Island from Tasmania. Its southern entrance between Whale Head and Bruni Head is wide and open to the south and west; but on the western shores there are two excellent harbours, Recherche Bay and Mussel Bay. North of Mussel Bay the channel begins, which is 30 miles long, and varies in width from one to eight miles. In all its extent it has excellent anchorage and sufficient depth; even opposite Isthmus Bay, where it is shallowest, it is 40 feet deep. Being mostly surrounded by hills, which shelter it on all sides, it is, properly speaking, an immense harbour, the only inconveniences of which are that it is subject to gusts of wind, and that the bottom consists of an earth somewhat too tenacious. On the western shores of the channel, besides several smaller harbours or coves, there are three, or rather four, large and excellent ports: Esperance Bay or Adamson's Harbour; Huon Bay, or the extensive æstuary of the river of that name, which extends nearly 20 miles inland, and has sufficient depth of water for large vessels; Port Cygnet, or Swan Port, situated near the mouth of the Huon æstuary; and North-West Bay, which constitutes the most northern extremity of D'Entrecasteaux Channel, and resembles the harbour of Portsmouth. North-West Bay is two miles wide at its entrance, and extends nearly six miles inland. The low and level country surrounding this excellent basin is the most southern district of Tasmania in which cultivation has made any progress. The strait leading from it to the wide æstuary of the river Derwent is only one mile wide, and is called Pilot Strait.

East of Bruni Island, and between it and Tasman's Peninsula is Storm Bay, extending about fifteen miles from south to north, and as much from west to east. Though it has good anchorage-ground, and is almost entirely free from danger, it cannot be considered as a harbour, being open towards the south, though protected on the three other sides by high hills. Storm Bay however leads to two extensive arms of the sea, which open to the north of it, and are respectively called the æstuary of the Derwent and Frederick Henry Bay. These two arms of the sea are separated by Ralph's Peninsula, which extends about 20 miles from north to south; and this distance may be considered as the length of the two arms of the sea, the æstuary of the Derwent advancing a few miles farther inland. At the entrance of the æstuary is a small rocky island, Ironpot, on which a lighthouse has been erected. Within the æstuary is Ralph's Bay, on the east. This bay is formed by a low sandy spit of land which projects from the west side of Ralph's Peninsula, and surrounds the bay on the south and west; and by another spit of land which projects to the south. The entrance of Ralph's Bay is a short channel, nearly two miles wide, which leads to a basin eight miles long and three wide, with excellent anchorage, and sheltered on all sides. Ralph's Peninsula consists of two mountainous tracts united by a low isthmus. This isthmus is only half a mile wide, and is the place where Ralph's Bay approaches nearest to Frederick Henry Bay. This last-mentioned bay, which has also the name of North Bay (Bai du Nord) is united to Storm Bay by a channel situated between Ralph's Peninsula and Tasman's Peninsula, which is five miles long and five miles wide. The bay itself consists of three basins, North Bay, Pitt Water, and Norfolk Bay. North Bay, which occupies the centre, is a basin about eight miles long from south to north, and six from west to east. It has good anchorage, with sufficient depth of water, and is generally well sheltered. Along its northern shores there is a low and sandy tongue of land, with an opening at its eastern extremity, which leads to Pitt Water, an arm of the sea extending from east-south-east to west-north-west about eight miles, with an average width of two miles, which branches out into numerous small coves and inlets affording safe anchorage for small vessels, but the entrance has only sufficient depth for them. Norfolk Bay lies to the east of North Bay, with which it is connected by a channel about three miles wide. This bay is surrounded on three sides by Tasman's Peninsula, and constitutes one of the finest harbours on the island: it has excellent anchorage, with a convenient depth of water, and is sheltered by high hills. It is eight miles long, and the width varies from three to five miles. It is free from all danger, and branches out into numerous coves.

Tasman's Peninsula extends about 25 miles from south to north: it consists of two larger peninsulas, of which the southern is properly called Tasman's, and the northern Forestier's Peninsula. Tasman's Peninsula surrounds Norfolk Bay on the south and west: it extends west and east about 15 miles, with an average width of eight miles. The surface of this tract is covered with mountains, which rise with a steep ascent from the water's edge, and are mostly composed of basalt columns, especially between Maingon Bay and Fortesque Bay. On the west side of the peninsula, on the east shores of Storm Bay, is Wedge Bay, which has tolerably good anchorage. Maingon Bay, on the south coast of the peninsula, is quite open, but on the north it leads into a safe harbour, Port Arthur, which runs more than six miles inland, and is more than a mile wide. The high rocky isthmus which divides its northern extremity from Norfolk Bay is only three miles wide. On the eastern shores of Tasman's Peninsula is Fortesque Bay, which is large, and has excellent anchorage, but it is open to the east. Pirates Bay, farther north, is still more open: it is separated from Norfolk Bay by an isthmus called Eagle Hawk Neck, which is only 600 feet wide and 700 feet long, and which connects Tasman's Peninsula with Forestier's Peninsula. It is low and sandy. Forestier's Peninsula extends 10 miles from south to north, with an average width of seven miles: it is a roundish mass of high rocky mountains, scantily covered with low trees, and it has a sterile soil. The high rocky masses along its eastern shores run in a continuous line. On the north side of the peninsula is Frederik Hendrik Harbour, in which Tasman anchored in 1642: it has good depth, but is open, and along the southern side it is lined with shoals and rocks. The isthmus which joins Forestier's Peninsula to the mainland of Tasmania is called East Bay Neck, and the northern portion of Norfolk Bay is also known by the name of East Bay: it is about two miles long, and half a mile wide in the narrowest part: it is low and sandy. The bay which extends between this neck and the most northern portion of Forestier's Peninsula, and is called Blackman's Bay, is spacious and well sheltered, but beset with shoals and rocks, especially along the southern shores and its entrance, so as to admit only small vessels.

The eastern coast of Tasmania extends from the northern extremity of Forestier's Peninsula to Cape Portland on Bass's Strait, more than 150 miles in a straight line. The southern part, or that south of 42° S. lat., resembles in some degree the south-eastern coast: it contains many places of refuge for vessels, though in general they are much less numerous than on the south-east coast, and not quite so safe and commodious. The wide bay on the north of Forestier's Peninsula, from which a channel leads to Blackman's Bay, has a flat sandy shore, no which the sea breaks with a heavy surf, so as to render it inaccessible, but towards the north are several small coves for boats. Cape Bernier is formed by a high conical hill: between it and

Prosser's Bay the coast is high and rocky, except at Sandspit, where it is low, and forms a shallow cove. Prosser's Bay is of good size, being three miles wide at its entrance, and extending in two arms five miles inland. There are several shoals in it, but it has good anchorage, especially in the northern arm. Between Prosser's Bay and Cape Bailly the coast is high, rocky, and well wooded. At Cape Bailly begins Oyster Bay, the largest of the bays of Tasmania: it is 18 miles long from south to north, and 15 miles wide at the entrance, but it narrows gradually towards the north, being at its northern recess 10 miles across. It contains good anchoring-ground, and is tolerably safe, for though it is open towards the south, the island of Maria and several smaller islands in that direction break the swell of the sea. The surrounding country is hilly and well wooded. Near Cape Bailly is Little Swan Port, a moderately extensive basin with a shallow entrance. It admits only boats. The western shores of Oyster Bay are high and steep, and may be approached with safety. On the northern side of the bay is a tongue of land less than a mile wide. It consists of low sand-hills, and terminates on the east at a narrow and shallow channel, which leads northward to an arm of the sea, which winds through a low country for more than 10 miles. This arm of the sea is shallow, and called Moulting Lagoon. The eastern side of Oyster Bay is formed by Vanderlin's Peninsula and Schouten's Island. Vanderlin's Peninsula is nearly 12 miles long, and consists of two masses of rocky mountains, united by a low sandy neck, about one mile and a half long and one mile and a half wide, on which is a small fresh-water lake. To the west of this neck is Refuge Bay, and to the east Thouin Bay. The first is a safe harbour, but the second is open and rather shallow. Another low and sandy neck about three miles long and a mile wide connects Vanderlin's Peninsula with the main body of Tasmania. The mountains of the southern mass of Vanderlin's Peninsula are the highest in the peninsula. Schouten's Island is separated from that peninsula by Geographe Strait, which is nearly three miles long and about one mile and a half wide on an average: there is good anchorage in the strait. Schouten's Island has nearly the form of a square, and extends about four miles in every direction. On its southern side, in Faure Bay, there is anchoring-ground. The island consists of a mass of rock, descending on the east with a steep declivity to the water's edge, but on the west with a gentle well-wooded slope.

South of Oyster Bay is the island of Maria, which is about 12 miles long, and consists of two large masses of rocks connected by a neck of land. The northern mass extends 7 miles from east to west, and consists of elevated mountains, the highest part of which, called the Bishop and Clerk, is about 3500 feet above the sea-level. The declivity of the mountains towards the east is very steep and terminates on the beach; but the slope is gentle towards the west, where it leaves a broad level tract along the sea, which is sandy and scantily wooded. The low sandy neck south of it is only 300 paces across, and about two miles long. On the west of it is Oyster Bay, which is well sheltered and has good anchorage, but is shallow near the land; and on the east of the neck is Reidle Bay, which is deeper, but has a rocky bottom, and is exposed to the easterly and southerly winds. The southern peninsula of Maria Island is one mass of rocks, rather well wooded, which descends towards the east in precipices and towards the west with a gentle slope. The strait which divides Maria Island from the mainland is about five miles wide on an average, and is nearly equal to D'Entrecasteaux Channel in the advantages which it affords to navigation, having good anchorage-ground, and being generally well protected against the winds and swell of the sea. North of Maria Island, towards the entrance of Oyster Bay, is a small island, White Rock, to which seals resort in great numbers.

The remainder of the eastern coast, beginning at Cape Tourville on the south, is as difficult of access as the western coast of Tasmania. In an extent of more than 100 miles not one harbour occurs which can be entered by vessels of moderate size, and even small craft find only three or four places where they can anchor with safety. The coast between Cape Tourville and Eddystone Point is elevated and rocky, and always beaten by a heavy surf. South of Cape Lodi the hills are barren and generally destitute of trees. Farther north however they are still more elevated, but tolerably well wooded. Between Eddystone Point and Cape Portland the shores consist of a low tract of considerable width: the soil is sandy and of indifferent fertility. The woods which cover it consist of short, crooked trees. This part of the coast is beset with shoals, and cannot be approached with safety.

The northern coast of Tasmania extends from Cape Portland on the east to Cape Grim on the west, and is about 160 miles long in a straight line, but following the coast it measures more than 220 miles. North of this coast is Bass's Strait, at the eastern entrance of which is the group of the Furneaux Islands, which consist of two larger islands, four of moderate size, and many smaller islands. The larger, Great Island, extends 40 miles nearly due south and north, and is on an average nine miles long, so that its surface may be estimated at 360 square miles, or somewhat more than that of the Scotch island of Islay. The interior of the island is mountainous, and the mountains advance on the west side close to the sea, but leave a tract of low ground along the eastern shore, which is sandy and in some parts swampy. South of Great Island is Cape Barren Island, which extends from east to west about 20 miles, with an average width of about five miles. It consists of several isolated masses of rocks connected by low grounds. These islands, as well as the smaller islands, are generally mountainous and rather high; they contain many low tracts of considerable extent, but the soil is sandy, swampy, and in general of indifferent quality. Trees are not abundant, and only of stunted growth. The surface is chiefly covered with thick bushes, coarse wire-grass, and a kind of Chenopodium, the ashes of which may be used in the manufacture of soap. Fresh water is scarce. These islands are always surrounded by great numbers of seals, and are resorted to by many vessels from Sydney and other places. The strait which divides Furneaux Islands from Tasmania is called Banks's Strait. It is 10 miles wide, and contains no hidden dangers, but as the current sets through it with great rapidity from east to west, it is not much used: the vessels that sail to and from Sidney generally pass through Kent Strait, or the middle strait of the three which constitute the eastern entrance of Bass's Strait. This strait is 24 miles wide between Great Island and Kent Group, and in general free from dangers. The western current which runs through it is moderate.

The coast from Cape Portland on the east to Port Dalrymple at the mouth of the river Tamar is low and sandy, with the exception of some sandy hills at and between East and West Double Sandy Points, and the high cape of Stony Head, which consists of elevated rocky masses overgrown with grass. The shores are either entirely barren or covered with short bushes. In a few places there are swamps, and in others some flat and low rocks of small extent. The bays have in general sufficient depth of water and good anchorage-ground, but being wide and open, they do not afford security against winds and the swell of the sea. The largest is Ringarooma Bay, west of Cape Portland.

Port Dalrymple is the best harbour on the northern shores, though it cannot be compared with the harbours on the south-eastern coast. Before its entrance on the west is the dangerous reef called Hebes Reef, and even in the sea-reach, which is two miles wide and six long, there are some shoals. The navigation is tedious and difficult, but the Tamar is deep enough for large vessels as far as Launceston, 30 miles from Port Dalrymple in a straight line. West of Port Dalrymple the coast is high, being formed by elevated and wooded hills, the highest of which are called the Asbestos Hills. To the west of these hills is Port Sorell, which is rather spacious and has good anchorage, but is difficult of access. Between Port Sorell and Port Frederick the shores are low, and about half a mile from the sea is a narrow lagoon, which occupies more than half of the space between the two harbours. Port Frederick, or the æstuary of the river Mersey, resembles Port Sorell. From this harbour to Penguin Point, west of the mouth of Leven river, the coast is generally rocky and high, but intersected by the mouths of several rivers, which however do not admit even boats, except the Leven, which may be ascended by boats to the distance of six miles from the sea. From Penguin Point to Circular Head the coast presents an alternation of high and low shores. The low shores are sandy or swampy, and generally covered with thick bushes, and the high shores present in many places columns of basalt, the tops of which are covered with a layer of good soil, and overgrown with trees. There is no harbour for ships on the coast, except at the mouth of Emu river, where small vessels find good anchorage in Emu Bay. Boats may enter Parish's Harbour, not far from Emu Bay to the west, and Pebbly Bay, west of Rocky Cape, a rather elevated rocky mass projecting into the sea.

Circular Head is a tongue of land projecting into the sea to the distance of about seven miles from the mainland. Its northern portion is an undulating table-land resting on basalt columns, whose surface is covered with bushes and small trees, and affords good pasture-ground. The highest part of it is 450 feet above the sea-level. This table-land is about five miles long from north to south, and somewhat more than two miles across in the widest part. It is united to the mainland by a low sandy isthmus nearly three miles long and about one mile wide. On each side of the isthmus is a tongue of land, which advances four or five miles into the sea, and forms two harbours, called East and West Bay, which have sufficient depth for small vessels. The advantages afforded by these two harbours, and the pasture-ground on Circular Head, have induced the Van Diemen's Land Company to fix their chief establishment here. The coast from Circular Head to Cape Grim is low and sandy. In some places there are swamps overgrown with tea-trees. It is lined by numerous shoals, and though there are several coves at the embouchures of the rivers, none of them has sufficient depth of water for a boat.

North of this coast-line are the Hunter Islands, a group consisting of three larger and several smaller islands. Robbin Island, the nearest to the mainland, is divided from it by a narrow strait, Robbin Channel, which is full of shoals, but has good anchoring-ground near the eastern entrance. The island is about 7 miles long from east to west, and 5 miles wide on an average. The eastern portion, embracing about two-thirds of the whole, is low, and has a sandy soil, covered with bushes and small trees: it has also pasture-ground. The western district is a rocky ridge, covered with heath. Three-Hummock Island is about the same size, but it is hilly, and chiefly covered with bushes, low trees, or grass. On its eastern side is a cove, with indifferent anchorage. West of Three-Hummock Island is Barren Island, which is the largest of the group, being 15 miles long, and on an average 4 miles wide. It is likewise rocky in its whole extent, but less elevated than Three-Hummock Island: in fertility it seems to resemble it very much. On the western shores are numerous reefs, which render the access to the island difficult and almost impossible. Towards the southern end of that coast however there is a cove, which is accessible to boats. The strait between Barren Island and Three-Hummock is called Peron Channel: it is well protected by the surrounding islands, and has good anchorage at several places, so that it may be considered the best harbour at the western entrance of Bass Strait. The basin, surrounded by the three large islands of this group, is called Boulanger Bay. It is well protected, but very dangerous, being full of shoals and small low islands, especially towards the north-western district of Tasmania.

Surface and Soil.—As the first European settlement on Tasmania was established only forty years ago, it can be no matter of surprise that the country is imperfectly explored. Nearly one-half of the island is almost unknown, namely, nearly two-thirds of that portion which is south of 42°, and one-third of that which is north of that parallel.

The *Unexplored Mountain-Region*, south of 42°, occupies the southern and western districts of the island, and reaches north-east to the banks of the river Derwent. This river, from its source in Lake St. Clair to its mouth, separates the well-known part of the island from that which is entirely unknown except the coasts and the districts in the immediate vicinity of the river. These districts are occupied by an apparently continuous mountain-range, which extends along the river at a short distance from its banks, and in some places sends off branches which advance close to the river. This range is sometimes called the Western Mountains by the settlers, but has not yet obtained any other name. It begins on the æstuary of the Derwent, opposite the entrance of Ralph's Bay, with Mount Nelson, which is considered to be about 1000 feet above the sea. Hence it extends north-west to Mount Wellington, which is a few miles west of Hobart Town, and rises, according to Darwin, 3100 feet above the sea. Farther on, the range, which occupies a width of perhaps 20 miles, does not seem to contain many summits which rise much above the general level of the range, which level probably is never less than 2000 feet above the sea. The summits, which have been noticed, are—Mount Field (near 42° 40′), which is estimated at 3000 feet; and Wyld's Craig, or Peak of Teneriffe, about 4500 feet above the sea. The latter is covered with snow for nine months. It is stated that in several places plains of considerable extent occur on the top of the range; but as the whole of it is covered with an impenetrable forest, it has hitherto been impossible to ascertain this fact. The mountains which surround Lake St. Clair, the source of the river Derwent, appear to be connected with this range, and to constitute its northern extremity. At the southern extremity of the range is a large peninsula, formed by D'Entrecasteaux Channel and the æstuary of the river Huon, the whole of which is covered with high hills, clothed with dense forests to their summits, and broken only in a few places by valleys, which exhibit a great degree of fertility, but in which no settlements have yet been made.

The remainder of this region is only known so far as it has been observed from the sea and a few places from the coast. The most striking feature of this district is a mountain-range which rises a few miles from the southern coast, and appears to extend, without interruption, from the eastern part of Port Davey, called Bathurst Harbour, to the vicinity of Port Refuge, at the entrance of D'Entrecasteaux Channel. Its lower parts are covered with thick forests, but the higher are without wood. Some parts of them appear white, which has suggested the opinion that they are always covered with snow; but this fact is questioned. The higher parts however are considered to rise to an elevation of 5000 feet above the sea-level. North of this range there are two elevated mountain-masses, a few miles south of 43° S. lat., which are called Harz Mountain and Arthur's Range. The latter is visible from Mount Wellington, though more than 50 miles distant. At the back of these masses, north of 43° S. lat., open plains are stated to extend from the banks of the river Huon to the mountains which line the western shores. A few open plains of moderate extent are also found near the banks of the Huon, where the river runs eastward; but farther down the whole country is covered with impenetrable forests. From this river to 42° S. lat. the country is entirely unknown. Several summits have been seen from considerable distances. The most elevated appears to be Frenchman's Cap, east of Macquarrie Harbour, which is covered with snow nearly the whole year: its base is said to be surrounded by woodless, open, and grassy plains of considerable extent. The forests, which cover this region almost without interruption, consist chiefly of different kinds of Eucalyptus, especially Eucalyptus globulus, and different kinds of pines, among which Tasmania and many tree-like ferns are frequently met with.

The *Valley of the Lower Derwent* extends from Mount Nelson upwards to the confluence of the Derwent with the Ouse (near 42° 35′ S. lat.), and is rather more than 50 miles long, measured along the bends of the river. The Derwent runs close to the range of high mountains which extend along its western banks; and the space between the banks of the river and the base of the steep rocky masses hardly ever exceeds a mile in width, and is frequently not half so much. The soil of this narrow and comparatively level tract is of great fertility, and a large part of it is under cultivation. On the east of the river the valley extends to the distance of about five miles, where it meets the higher hills that enclose the valleys which lie farther east and north. The surface of this part of the valley is level near the banks of the river, and subject to inundations; but at a short distance from them the ground rises in gentle undulations, on which some low and isolated hills are met with. The soil of this tract appears to be generally of first-rate quality: it produces rich crops of wheat, and is well adapted to orchards. Cultivation is rapidly spreading over this tract.

A *Hilly Region* extends east of the Lower Valley of the Derwent. It extends eastward to the shores of the Pacific, and northward nearly to 42° 35′ S. lat. The surface of this tract is a continuous succession of hill and dale. The tra veller no sooner arrives at the bottom of one hill than he has to ascend another, often three or four times in the space of a mile. In some places the land swells into greater heights, which have several miles of ascent. Except the valleys, which constitute the bottoms of the numerous rivers which traverse this region from north to south, and which are generally of moderate width, the level tracts, either marshes or plains, are comparatively few. The most elevated part of this region appears to be a ridge of high ground which begins on the north at Table Mountain, a summit standing near the south-eastern extremity of Lake Sorell, whose elevation is estimated at 3800 feet. The ridge branching off from it towards the south is of moderate elevation, but considerable width, occupying the greater part of the tract between the rivers Clyde and Jordan. It terminates about five miles from the banks of the Derwent in Mount Dromedary, the summit of which is 1800 feet above the sea-level. In general the hills sink lower as we proceed south, and the surface of Ralph's Peninsula, and of the country enclosing Pitt's Water and North Bay, is only undulating. Cultivation in this region is almost exclusively limited to the bottoms of the rivers, where there is a strong soil, which produces plentiful crops of wheat and other grain. The declivity of the hills is sometimes too steep for cultivation, and they are generally covered with thick woods. But even where the declivities are gentle, which is most frequently the case, the soil is too dry. These declivities, and also the upper parts of the hills, where small levels frequently occur, are overgrown with open forests without underwood, under the shade of which there is grass nearly all the year round. These hills afford excellent pasture for sheep and cattle. This description applies to the whole region, except that portion which is north of Norfolk Bay, and which appears not to have been explored. That part of it which lies along the Pacific consists only of rocky masses, frequently destitute of woods and bushes, and in other places overgrown with crooked and stunted trees.

The *Elevated Plains* are north of the Hilly Region, and extend from 42° 35′ to about 41° 50′. They are separated from the Pacific by a higher tract, called Eastern Tier. This tract begins on the south near 42° 35′, where it is about 10 miles wide, and extends northward to the valley of the South Esk, to which it descends with a steep declivity. It increases in width as it proceeds farther north, and on the banks of the South Esk it is more than 30 miles from east to west. This region also is entirely unknown, and is a blank on our maps. We can find no information respecting its character and capabilities. The heights which extend along the sea are very scantily wooded, and do not present a promising aspect. The plains themselves are divided into the southern and northern plains by a somewhat hilly and wooded tract, which crosses them in a diagonal direction from south-east to north-west, beginning on the Eastern Tier with the Blue Hills, south-east of Oatlands, and passing east of that township to Table Mount, and the other heights surrounding Lake Sorell, and hence to the range of mountains called the Western Tier or Western Mountains, from the southern extremity of which it is divided by the upper valley of Lake River. Farther west the Western Tier constitutes the northern boundary of the southern plains. These southern plains are distinguished by many large lakes. The most western of these lakes is that of St. Clair, the source of the Derwent river. It is about ten miles long and three miles wide on an average, and differs from the lakes farther east in having more of the shape of an alpine lake and being surrounded by mountains. The country east of the lake St. Clair is not included in the plains, being very mountainous, and containing several high summits between the Derwent on the west and the Nive river on the east. Even to the east of the last-mentioned river that part of the country which lies near the Derwent is extremely uneven and hilly, but farther north the southern plains begin with the tract that surrounds Lake Echo. This lake is of a round form, but only three miles in diameter. The shape of this, like all those farther east, shows that they are not enclosed by mountains, but spread out in plains. North of Lake Echo is Great Lake, the source of the Shannon, one of the largest tributaries of the Derwent. It is said that this lake is 20 miles long, 10 wide, and, owing to its numerous branches, 75 miles in circuit; but our maps give it hardly half these dimensions. East of Great Lake are the three Arthur lakes, the largest of which has a circuit of between 20 and 30 miles. Lake Sorell, which is farther to the south-east, is of a very irregular form, and hardly inferior in extent to Great Lake. Smaller lakes are numerous, especially along the wooded tract which separates the southern from the northern plains. There are fewer lakes in the northern plains, and they are all small, with the exception of the Western Lagoon, a cluster of lakes situated at the eastern termination of the Western Tier, the largest of which may be five miles long and half a mile wide. The woody tract separating the plains has a hilly surface, and is about eight miles wide where it is crossed by the great road from Hobart Town to Launceston. In the plains there are some short ridges of low hills, which rise above the common level with very long slopes, and are covered with open forests. At other places there are single hills, mostly of a conical form, hence called sugar-loaves: they are most frequent in the district which approaches the Eastern Tier. In other respects the surface of the plains is either a dead level or slightly undulating. In their natural state they are generally destitute of trees, but in a few spots, especially where the surface is undulating, trees occur in small clumps. The climate is much colder than in the low tracts near the coast, as the snow sometimes covers the ground for several weeks, and thus the soil imbibes sufficient moisture to maintain a vigorous growth of grass nearly all the year round. The pastures thus produced constitute the agricultural wealth of this region, as the soil is seldom rich enough for the growth of grain. The pastures are much better adapted for sheep than for cattle, and the chief part of the wool exported from Tasmania is brought to the seaports from this region. Among these plains that called Salt-Pan Plain requires notice. It lies near the watershed of the Derwent and Tamar, between the sources of the Macquarrie river, which runs to the Tamar, and those of the Jordan, which falls into the Derwent. In this plain are three ponds, or, rather, hollow depressions, which are filled with water during the rainy season, but dry up when the rains are over, and the soil is then so strongly impregnated with salt that a considerable quantity is collected every season for domestic purposes.

The region hitherto described is watered by many streams, most of which join the Derwent. This river originates, as already observed, in Lake St. Clair. It runs about 60 miles measured in a straight line, until it meets the tide-water, and its general course is south-east. Issuing from the lake, it traverses for several miles a plain, and then enters a narrow valley bounded by mountains, in which it is joined from the north by the Nive, and from the south by the Florentine river, the course of which two tributaries is hardly known. It leaves the mountains above its junction with the Dee, where it forms two cataracts, a mile from one another, of which the uppermost is 30 feet high. It then flows along the foot of the western mountains with a rapid current, and is not navigated, chiefly owing to the numerous rocks along its banks, but also partly because its volume of water is subject to great changes. The last rapids occur at New Norfolk, up to which place the tide-water comes. During the summer months the water of the river is brackish, and unfit for drinking at New Norfolk; but when it is swollen by rains, it is fresh to the distance of two or three miles below the town. The river is here a quarter of a mile wide, and begins to be navigable for ships. A few miles lower down the river widens to three-quarters of a mile, which width is gradually increased to two miles. Below Hobart Town it varies between two and four miles, and is deep enough for large vessels, and free from shoals, which are rather numerous above that town. The tide ascends 30 miles from Storm Bay. None of the tributaries which enter the Derwent from the south, after it has emerged from the mountains, are above the size of a mountain-torrent; but it receives several rivers from the north which flow from 20 to 30 miles, as the Dee, the Ouse, the Clyde, and the Jordan. Some of them form cataracts and rapids, and none of them are navigable.

The river Huon, which drains the greater part of the mountain-region west of the Derwent, has a course of about 80 miles; but this river lies without the settled portion of the colony, and its course has only been explored within a few years. No account of it exists. It forms a wide aestuary, like the Derwent, which opens in D'Entrecasteaux Bay. Coal River drains the undulating country east of the Derwent, and falls into Pitt's Water: its course is about 20 miles.

We pass to the description of the northern part of Tasmania (north of 41° 50′). The watershed of the eastern districts of this country lies close to the Pacific, as the remotest sources of the South Esk are only from four to five miles from its shores. The Upper Valley of the South Esk lies between two large mountain-masses, but the Lower Valley constitutes a part of the Basin of Lincoln. The Upper Valley extends from the sources of the river westward to the vicinity of Ben Lomond Rivulet, where an offset of the Ben Lomond comes close to the river, whilst from the south the most north-western branch of the Eastern Tier also approaches very near, so that there is a natural pass by which the Upper Valley of the South Esk is entered. This valley extends about 35 miles from the gorge, following the St. Paul's River, but nearly 50 miles along the Break-o'-Day River. The mountains which extend along the shores of the Pacific, and connect the northern part of the Eastern Tier with the range of the Ben Lomond, have not been explored. When seen from the sea they constitute a high range, overtopped by several summits, among which is Tasman's Peak and Mount Champagny, south-west of Cape St. Helen's: the last mentioned, a conical summit, rises about 3000 feet above the sea. It has not yet been ascertained where and how this maritime range is connected with Ben Lomond. Ben Lomond appears to be the highest ground in this part of Tasmania, and is estimated to rise 4200 feet, or about 1200 feet higher than the mountain in Scotland whose name has been transferred to it. The mountain-mass, of which it forms the most elevated portion, extends to a considerable distance to the south-west, where, as already observed, it comes close to the banks of the South Esk, near the place where it is joined by Ben Lomond Rivulet, and it is probable that it advances still farther to the north-east, in which direction this region has not been explored. It is however certain that the maritime range and that of Ben Lomond join at an acute angle, leaving between them a depression of a basin-like shape, which may be called the Basin of Fingal, from a township of that name situated near the place where the South Esk and the Break-o'-Day River join. The existence of this basin has only been ascertained within the last ten years, and our information respecting it is scanty; but as the settlements begin to be numerous, and as it has been divided into hundreds, we may presume that the soil of this tract is good. The Basin of Fingal extends from north to south about 15 miles, and about as much from east to west. Its southern districts are drained by the Break-o'-Day River, which rises in the maritime range, and, running eastward, meets below Fingal the South Esk, which originates in the Ben Lomond range, and waters the northern districts of the basin. A few miles below the confluence of these two branches, the South Esk, having a south-west course, enters a wide valley, about 10 miles long, and afterwards reaches a plain, where it is met by the St. Paul's River. The valley, through which the last-mentioned branch of the South Esk descends from its source in the maritime range, is for a considerable part of its course so wide, that it has obtained the name of St. Paul's Plains, which are described as an undulating country, in some parts overgrown with open forests, and in others without trees, but well watered, and producing rich pasture. Between the Valley of St. Paul's River and the Basin of Fingal is a mountain-mass, which is connected on the east with the maritime range, and whose western extremity is marked by a dome-like summit, to which the name of St. Paul's Dome has been given. It is considered to rise 2800 feet above the sea-level. After the confluence of the two principal branches, the South Esk turns westward, and flows along the base of the Eastern Tier, so that between the river and the mountain south of it there is only a narrow strip, with an undulating or hilly surface, which however has a good soil. North of the river the valley extends to the base of the Ben Lomond range, a distance of five or six miles: the intervening ground resembles in general the St. Paul's Plains, being better adapted for pasture than for agriculture, and partly covered with thin forests. Thus the valley continues to the gorge above the mouth of Ben Lomond Rivulet.

North of the Upper Valley of the South Esk extends the *North-Eastern Mountain Region*, the whole of which is probably occupied by mountains; but the interior of it has not been explored, and only the outskirts of it are known. The country along the Bay of Fires, between Cape St. Helen's and Eddystone Point, is of considerable elevation, but partly well wooded and partly covered with a fine growth of grass. This tract is supposed to be fit for pastoral settlements. North of Eddystone Point the mountains are several miles from the shore: they have only been seen from a distance, and appear to constitute one continuous mass, broken in a few places by ravines, by which small rivers issue from them. There are no striking summits, except Mount Cameron, between Eddystone Point and Ringarooma Bay, but its elevation is not known. The mountains are generally wooded. The flat country between these mountains and the sea, from Eddystone Point to the mouth of the Tamar, is watered by numerous small streams, but the soil is generally dry and sandy, in some places overgrown with bushes or short, crooked trees, and in others covered with swamps, in which only tea-bushes are found. There are a few tracts which have a better soil, and might be cultivated, as on the banks of Piper's River. The best portion of this region is the valley of the North Esk, which opens to the west, and stretches eastward into the mountains on the north of the Ben Lomond range. This valley however is narrow, and contains very few tracts adapted for agricultural purposes, and the number of settlements is small, though the proximity of the town of Launceston affords a ready sale for their produce. A ridge of sterile but wooded hills runs along the southern side of the river, and continues to the banks of the South Esk, where that river, about a mile above Launceston, runs in a narrow valley for a mile, and at the point where it leaves that valley forms a cataract about 40 feet high.

The gorge through which the South Esk flows above Launceston separates the valley of the Tamar, which lies north of it, from the Basin of Lincoln, which extends south of it. The Tamar is only a deep inlet of the sea, which begins at the town of Launceston, and where the two Esks fall into it. Its length to Port Dalrymple in a straight line is about 30 miles, but measured along its numerous bends it is 43 miles. The tides come up to Launceston, at which place the inlet is only 60 yards wide, yet vessels of 150 tons may ascend to the town. The width of the navigable channel is 20 yards, nor does it widen for two miles below the town, and it is very narrow 10 or 12 miles farther, though the inlet itself widens to three-quarters of a mile. Ten or twelve miles below Launceston the inlet alternately expands to a breadth of three miles, and contracts to a mile, so as to appear like several small lakes connected by short channels. In this part are several shoals and sand-banks, and they only disappear about 15 miles from the sea. It is a great obstacle to the navigation of the river that the wind always blows either directly up or down it, so that a vessel is often obliged to depend upon the tide, and it sometimes happens that a passage from Port Dalrymple to Launceston occupies two or three weeks. The valley of the Tamar, measured between the summits on the two sides of the river, is about eight miles wide, but two or three of them are occupied by the declivities, though these declivities are rather steep. Thus the cultivable ground, if the extent of the inlet itself is subtracted, varies between three and six miles. Near the town of Launceston, and to a distance of about 11 miles north of it, the country on both sides of the river possesses a considerable degree of fertility, and is well settled; but farther down the eastern banks have a dry sandy or stony soil of very inferior quality, which is still uninhabited. On the left bank of the river the soil is much better, and there the settlements are numerous, though not so numerous as near Launceston.

The *Basin of Lincoln*, so called from the hundred of Lincoln, which occupies the centre of it, is the most fertile portion of Tasmania. It includes on the east the lower valley of the South Esk, extending to the western base of Ben Lomond, and on the west reaches the eastern base of the Western Tier. It is separated from the Northern Elevated Plains by the hilly and woody tract called Epping Forest. On the north it is bounded by the ridge of hills south of Launceston, and the mountains which line the northern banks of the Mæander as far as the mouth of Quamby's Brook. It extends from south-east to north-west about 25 miles, and as much from north-east to south-west. This gives an area of 600 square miles. This basin is watered by several large rivers which unite, and ultimately fall into the South Esk before it enters the abovementioned gorge. These rivers are, from east to west—Elizabeth River, Macquarrie River, Lake River, Pennyroyal River, and Mæander or Western River. The surface and the soil of the Basin are not uniform. East of the South Esk the higher country chiefly consists of plains, either destitute of wood or thinly wooded, and well adapted for sheep: the wide bottom of the rivers yields rich crops. The country between the South Esk and Lake River consists of wide valleys along the courses of the rivers, and narrow ridges of hills between them, which however in some places attain a considerable elevation above their bases. These hills are generally wooded, and though the soil on their declivities is good, they are at present only used as pasture-ground: the wide level tracts along the watercourses have a very fertile soil, most of which is under cultivation. The most level portion of the basin is that which is west of Lake River, for in this district the uplands do not rise much above the bottom of the valleys, extend with an undulating surface, and are seldom interrupted by high hills. Like the bottoms, they were formerly clothed with trees, except on the very margins of the rivers, but nearly the whole of the region has been cleared and converted into fields. The soil of the bottoms is very rich, but they are subject to inundations, which however are of short duration. From the Basin of Lincoln all the corn is brought to Launceston, which is exported from that place, and which is the principal support of the population in the country round Sydney, whenever Australia experiences a dearth.

To the west of this basin is the *Western Tier*, or Western Mountains, which extend from the banks of the Lake River a few miles below the place where that river issues from the Arthur Lakes, in a west-north-west direction to the sources of the river Mersey, a distance of about 50 miles. The range lies between the southern plains and the Basin of Lincoln, but we have very little information respecting this region. A few summits have been noticed, as the Quamby Bluff, near the north-western extremity of the Basin of Lincoln, which is stated to be 3500 feet high, and the Extreme Western Bluff, at the west end of the region. It appears that the upper part of the range constitutes a tolerable level, on which only a few peaks attain 500 feet, and which is covered with small lakes, grass, and an alpine vegetation. Some low rocky ridges which run across it are covered with crooked eucalyptus and bushes. The width of this elevated tract does not exceed a few miles, but its elevation must be considerable, which may be inferred from the circumstance that even in January, which corresponds to our July, a heavy fall of snow was experienced, which covered the ground some inches deep. The whole vegetation, especially the frequent occurrence of lichens and mosses, proves its great elevation, which probably is not much less than 4000 feet above the sea-level.

At its northern extremity the Western Tier is of considerable width, extending from Quamby's Bluff to Extreme Western Bluff, a distance of about 25 miles. At its northern declivity extends a depression or valley, from east to west, which may be called the *Valley of the Mæander*, as that river drains the greater part of it. Though a cart-road has been made through it, we are not acquainted with its extent from south to north, but we are informed that it extends westward to the vicinity of the Mersey where this river turns westward, being here divided from the valley of the last-mentioned river by a narrow offset of the Western Tier. This tract consists of level plains, which are generally without trees, but in several places there are small clumps of them, and they are occasionally intersected by narrow belts of forest, extending from the mountains to the banks of the rivers. Numerous rivers water this country, the soil of which is stated to be of good quality, and equally adapted to cultivation and the rearing of cattle.

Proceeding westward from the banks of the Mersey, two high and steep mountain-ridges must be passed before that region is reached which is called the *Surrey Hills*, and which constitutes one of the most remarkable features of Tasmania. It occupies the country for about 20 miles on each side of 146° E. long. and an equal extent on both sides of 41° 30′ S. lat., but properly speaking, its extent towards the south is not known, and it is even probable that it reaches the foot of the Eldon range, a chain of mountains which has been seen from a distance, and which probably is about 41° 55′ S. lat. This region gives origin to a great number of rivers, which run off in all directions. With the exception of a few rivulets originating near the coast, all the rivers which fall into the sea west of 146° 25 E. long. and north of 42° S. lat. rise in the Surrey Hills: they must therefore constitute the highest ground in this part of Tasmania. It is remarkable that the highest part of the region lies on its outer edges, for the region is surrounded on the east, and still more on the north and west, by hills which rise considerably above the general level, have extremely steep declivities, and narrow level tracts on their tops, but are otherwise covered with dense forests frequently matted together by underwood. Among the single summits are the St. Valentine's Peak, near the northern edge, which is 3000 feet above the sea, and the Black Bluff Mount, which is said to be 300 feet higher. The interior of the region is very different. Its surface is formed by a succession of low hills, which rise with so gentle a slope that it may be considered a plain, and it is intersected by small brooks, the sides of which are adorned with narrow belts of beautiful shrubs and trees. Whenever a hill rises to a higher elevation, its declivity consists of level and regular terraces, as if laid out by art, and the summit is crowned with stately peppermint-trees. There are many open plains of several square miles in extent without a tree. In general there are not more than ten trees to an acre. The hills are covered with a vigorous growth of grass. The soil is a dark vegetable mould upon a rich brown loam. The substratum appears to be gravel, which renders these hills perfectly dry, and fit for sheep-walks, for which purpose they now are used by the settlements which have been formed on them by the Van Diemen's Land Company. This country extends north of St. Valentine's Peak on both sides of the Emu river, where it appears even more park-like than farther south, being handsomely clumped with trees. This tract is called the Hampshire Hills. The elevation of the Surrey Hills above the sea-level renders the climate much colder than on the coast. Snow covers the ground for several weeks, which however must be considered as an advantage in a country where the soil inclines to dryness. It has also the benefit of abundant rains during autumn (March and April).

Between the valley of the Mæander and the Surrey Hills on the south, and Bass's Strait on the north, is the hilly region of Devonshire. The mountains which extend from the gorge of the South Esk to the west of the Tamar north-north-west, and terminate on the sea with Point Flinders, appear to constitute a continuous range of moderate elevation. They are partly wooded and partly destitute of trees, and in some places covered with a very scanty vegetation of shrubs or grass. Farther west this region is very little known, except that the spaces between the rivers are filled up with mountains and high hills, and that these heights come close to the shores of the sea. Few, if any, settlements have been formed on it. This region extends westward to the banks of the Emu River.

West of the Emu River begins the *Great Plain* of Tasmania: it occupies the north-western portion of the island, extending along the northern coast from the Emu to Cape Grim, and along the western coast to the Arthur River. The narrowest portion of this plain appears to be between the Emu and Detention Rivers, where its width does not exceed 12 miles, and it terminates on the south at the Hampshire Hills. Farther west a continuous range of high hills, called the Campbell Range, forms its boundary, and terminates near the source of the Detention River with Dip Hill, a mountain of moderate elevation. The surface of this portion of the plain is strongly undulating, and in many parts even hilly. Near the shores it is overgrown with dense forests, which are made nearly impenetrable by the underwood, bushes, and ferns. But about three miles or somewhat more from the sea the forests are interrupted by a succession of small plains covered with grass and destitute of trees. They have a light dry soil, are well watered by springs and streams, and surrounded by excellent timber. The grass is coarse but plentiful: there are also some tracts fit for cultivation. West of Detention River the plain grows wider. From Dip Hill, at the source of the river, Hellyer distinguished the high grounds at Cape Grim and West Point, though they are of very moderate elevation. The plain, west of Detention River, exceed 15 miles in width. This large tract however is very ill adapted for colonization. The surface is generally level, and the water not being carried off, the country has been converted into an immense swamp. A portion of the swamp is overgrown by low tea-trees, and the remainder is covered with forests of eucalyptus and underwood. The higher grounds, which generally occur nearer the shores, have a sandy soil covered with heath or stunted trees. The only tract which seems to be applicable to useful purposes is along the sea from Cape Grim to the River Arthur: its width near the cape is several miles, but farther south it grows much narrower: the surface is hilly and partly stony. The soil has generally a tendency to sand, but it is thickly covered with kangaroo grass, and makes good pasture-ground for sheep, and in some places for cattle. Trees occur only at considerable distances from each other. It is probable that the plain continues south of Arthur River, but that it is of less extent there, as low hills have been seen at a short distance from the sea, which are dry and only covered with bushes, but behind them the hills rise much higher. These parts have never been visited.

The Arthur, whose mouth is near 41° 10′ S. lat., is a river of considerable size, and brings down a large volume of water. There is a bar across its mouth, on which the sea breaks with a heavy surf. Its middle course is not known, but it is supposed that the chief supply of its waters is derived from the Surrey Hills, and that two large rivers, which rise there, and are respectively called Hellyer River and Arthur River, unite in the country between the Surrey Hills and the western coast; and that by their confluence the Arthur is formed.

The other known rivers of the northern part of Tasmania are unimportant, with the exception of the Emu, which is navigable for boats for a few miles. With respect to the South Esk, which probably has a course of 100 miles, two of its principal branches, the Macquarrie and the Lake River, rise on the southern elevated plains, and the upper branches of these rivers interlock with rivers which flow southward to the Derwent. As other branches of the South Esk rise near the eastern coast, and others far to the west, it is probable that the area of the country which is drained by it and the North Esk does not fall short of 4000 square miles. The Tamar certainly receives the drainage of a much larger extent of country than any other river of Tasmania.

Climate.—As no meteorological observations have been published on the climate of Tasmania, we only know its peculiarities by comparisons which have been made between it and that of England and Sydney. There is a considerable difference between the climate of Hobart Town on the southern, and of Launceston on the northern coast. The climate of Hobart Town seems to be greatly influenced by the range of mountains west of the town and the vicinity of the open ocean. The vague statement of Breton, that the mean temperature in summer is 70°, and in winter between 40° and 48°, is apparently not derived from observations, and is not much to be relied on. The climate of Hobart Town is extremely changeable. Heat, cold, rain, and sunshine succeed each other with a rapidity which is rarely observed in any other part of the globe. The winter is not more constant than the summer: the same alternations, with the addition of hail and snow, follow each other in quick succession; but the snow never remains on the ground beyond a few hours, whilst at Launceston it falls in greater quantity, and covers the ground for many days together. This statement does not agree with another, according to which the average number of days on which rain actually falls does not exceed fifty or sixty in the year, and that, except on these days, the sky is clear, the sun brilliant, and the atmosphere dry, pure, and elastic. Hot winds sometimes occur, which occasionally raise the thermometer to 108°. They blow from north and north-west, and rarely last a long time; but during their prevalence vegetation is greatly injured. However warm the middle of the day may be, it is invariably attended by a morning and evening so cool as completely to brace the body, and to counteract any enervating effects of the climate. Thunder-storms are less frequent than in Australia, but violent gusts of wind sometimes occur, which cause great destruction in the forests, and the coasts are visited by much boisterous weather. Along the western coast strong south-westerly winds prevail nearly all the year round, and render this tract almost inaccessible on account of the want of harbours. During some seasons of the year westerly gales continue for many weeks in Bass's Strait, so that vessels sailing from Sydney to the Atlantic find that they save time and labour by going round the island. The climate is very healthy: no epidemic or contagious diseases have been observed, and acute diseases are generally mild and of short duration, and yield more easily to the usual remedies than in any other country.

Productions.—The mineral wealth of the island is not known. The existence of gold and silver rests on statements which cannot be relied on; but that of copper is certain, and this metal is rather abundant in some of the hills on the north coast. Iron-ore is abundant, but not yet turned to account. Some ore which was subjected to a trial yielded 80 per cent. of metal. There are also indications of lead, zinc, and manganese; and those of coal have been found all across the island. Roofing-slate of good quality abounds in many parts: on the Arthur such extensive layers were discovered by Hellyer, that in his opinion the whole globe might be supplied with them. Salt is obtained from the salt lakes of Salt-Pan Plain, and is also got from sea-water on Bruni Island, but not in sufficient quantity to supply the consumption. Salt is imported from England. Excellent sandstone for building is found in all parts of the island, and marble is met with at various places. Basalt rocks are frequent along the coast and in many places in the interior.

No tropical grains or plants are cultivated, but all grains cultivated in England succeed well. Wheat is of excellent quality, weighing generally from 62 to 64 pounds the bushel: considerable quantities are exported. Barley and oats will only thrive in a good soil. Vegetables of all kinds are most plentiful, even those of Southern Europe, the production of which requires in England much care and expense. The apple-orchards are of great extent, and the making of cider is attended to. Peaches, apricots, and nectarines grow very abundantly. Damsons, plums, cherries, pears, and quinces are also grown; but the fruit is of inferior quality, for want of care. Grapes are of good quality, but no good wine has yet been made. Raspberries, gooseberries, and currents are abundant and of good quality: strawberries are also good. All these fruits have been introduced by the settlers.

The domestic animals of Europe have been transplanted to Tasmania, and thrive very well. Sheep are most numerous. Wool and live stock are exported to a great extent. Black cattle are also numerous, and many head are annually exported; and also some horses. Fowls are extremely numerous, but geese and ducks are not much kept.

The spermaceti-whale is very abundant in Bass's Strait, and many of them are annually taken, but more by the inhabitants of Australia than by those of Tasmania. Black whales abound in all the seas round the island, and a very lucrative fishery is carried on along the southern coast. Whalebone and train-oil are important articles of export. A small quantity of spermaceti-oil is also exported. Seals are found on most of the smaller islands, and especially on the eastern coast: their skins constitute an article of export. Some of the animals of the forests are common to Australia and Tasmania. The native tiger (Hyæna opossum) and the native devil (Dasyurus ursinus) are peculiar to Tasmania, and perhaps also the wild cat. These are the only carnivorous animals in Tasmania, with the exception of some species of weasel. There are three or four species of kangaroos, two kinds of opossum, the bandicoot, the native porcupine or echidna, the wombat, the opossum-mouse, and the ornithorhynchus paradoxus. All the wild animals of Tasmania, with the exception of the native devil, are very easily tamed and domesticated. The birds are numerous: these are emus, black and white cockatoos, parrots, two kinds of magpies, the laughing jackass, hawks, eagles, the carrion crow, pelican, black swan, ducks, teal, widgeons, quails, snipes, and bronze-winged pigeons: the last-named are considered the most beautiful birds in the island. There are likewise several varieties of snakes, two or three of which are venomous; also centipedes, scorpions, and large ants. Fish are said to be more numerous than on the coast of Australia, but they have not been further noticed. The river-fish are small.

None of the forest-trees or shrubs yield an edible fruit. They are all evergreens, and have that sombre olive hue which prevails in Australia, without a single lively tint, except that of the native cherry, to break this monotony. The most numerous are the eucalyptus, which attains an immense size. From one of its species a manna is obtained, which tastes like some kind of sugar-plum: it forms concretions on the leaves and smaller branches; but is found in such trifling quantities, that it would never repay the trouble of collecting it. The most useful tree is the stringy bark, which is used for building and fencing; and the blue gum, of which most of the boats in the colony are built. The smaller trees are used for masts for small vessels. The peppermint, so called from the taste of the leaves, is a large tree, but of very little use. The Huon pine is the most beautiful wood in the island: it is very superior both in colour and substance to the Norway deal, but is scarce and difficult to be had. The Adventure pine, so called from the bay of that name, is a species of pine adapted for house-work and furniture; but it is not common. The black and silver wattle (mimosa) are used in house-work and furniture, but they are of diminutive size. The bark of the black wattle is exported to England in large quantities. The tea-tree is a shrub which grows in wet situations: an infusion of its leaves makes a pleasant beverage, and, with a little sugar, forms an excellent substitute for tea.

(Flinders's *Voyage to Terra Australis;* Rossel's *Voyage d'Entrecasteaux*, &c.; Evans's *Geographical, Historical, and Topographical Description of Van Diemen's Land;* Widowson's *Present State of Agriculture, &c., in Van Diemen's Land;* Bischoff's *Sketch of the History of Van Diemen's Land, &c.;* and Breton's *Excursions in New South Wales, &c.*)

History.—In 1803 Lieutenant Bowen, commissioned by the government of New South Wales, landed on the east bank of the Derwent, and formally took possession of Van Diemen's Land as a place of settlement. In the following year Colonel Collins, the first lieutenant-governor, arrived, and established the seat of government on the west bank of the Derwent: he gave to the spot the name of Hobart Town, in compliment to Lord Hobart, then secretary of state for the colonies. Colonel Patterson arrived in the same year in the Tamar, and formed an establishment on its west bank. Colonel Davey succeeded to the government in 1813, and under his administration the ports of the colony were first opened to commerce, only transport vessels from New South Wales having previously been admitted. Colonel Sorell was appointed lieutenant-governor in 1817, and in 1819 the immigration of free settlers from England commenced, the colony having been previously exclusively formed of criminals sent from New South Wales for crimes repeated there, and of the civil and military officers charged with their superintendence. Till the year 1824 the government was subject to that of New South Wales, and the chief civil and criminal questions arising in Van Diemen's Land were decided in Sydney. The only courts in the island were those of police magistrates, who had cognizance of petty crimes, and a court for the settlement of questions of value not exceeding 50*l*., in which a military officer presided. Great inconvenience and mischief resulted from this state of things. Civil cases were mostly settled by compromise; and in criminal cases, the most dangerous offenders were allowed to escape.

The most important steps in the progress of the colony were made between the years 1824 and 1836, during the administration of Colonel Arthur:—

In 1824, the population was 12,643; in 1835 it was 40,283

„	Number of vessels which arrived .	33;	„	234
„	Sailed outwards .	35;	„	225
„	Acres in crop	34,033;	„	87,283
„	Pounds of wool exported .	130,000;	„	1,942,800
„	Number of manufactories .	22;	„	133
„	Banks . .	1;	„	6
„	Revenue .	£16,866;	„	£106,639
„	Expenditure .	£32,126;	„	£103,029
„	Value of Imports	£62,000;	„	£583,646
„	Exports	£14,500;	„	£320,679

(*Statistical Returns of Van Diemen's Land, compiled by the Colonial Secretary, Hobart Town, dated 10th Oct.*, 1836.)

Roads were formed and bridges constructed in different parts of the island; wholesome laws were introduced; the tone of public opinion was improved, and the fruits of enterprise and industry were secured by an improved police system.

That which chiefly contributed to the progress of the settlement was extraordinary encouragements held out to emigrants. Grants of land were made to them proportioned in extent to the capital which the colonist was prepared to invest in stock and in agricultural improvements. The labour of convicts was not only liberally provided, but the colonist was rewarded for employing it by allowances of rations for himself and the convicts in his employ for some time after his arrival; and at a later period, when this remuneration, or, to speak more correctly, this additional bonus, was withdrawn altogether, labour was obtained on the easy conditions of the settler providing clothes, food, and lodging to the convicts assigned to him. There were other advantages likewise incident to the penal purposes for which the colony was founded, which assisted its progress. The character and condition of the majority of the population required that a civil and military force should be established on the island, which, being maintained by the British government, introduced so much capital annually. From the magnitude of their crimes or their dangerous character, it was not deemed safe to remove from under the immediate coercion of government a large number, amounting latterly to some thousands, of the convicts, and their punishment was made to consist of hard labour at works of public utility, such as the making and repairing of roads and bridges. While the expense of maintaining these convicts was defrayed by the British government, the settlers contracted to supply the various articles which made up that expense. They were thus in a twofold manner benefited: they had labourers employed for their advantage at the cost of a third party, and they were enabled to derive a profit from the payment of that labour. With such circumstances in its favour, with a healthy climate, and a soil of average capabilities, it was impossible that Tasmania should not advance. Its progress has accordingly been steady, scarcely subject to any of those variations to which young colonies are exposed;—to none indeed but such as may be strictly referred to that gambling spirit of speculation which the occasional great profits of an imperfectly established market are apt to engender.

In 1831 the system of colonization by free grants of land was abolished, and since then land has been sold by auction, first at the upset price of five shillings per acre; subsequently at twelve shillings; and latterly at twenty, at which it remains. The system of assignment of convict labour is at present only partially in force, and it is intended to discontinue it. The colony has probably advanced to that state in which the advantages (advantages not without some drawbacks even in the best case) of compulsory labour have ceased, and in which the minute care, the good will, the steady subordination of the servant are requisite to the success of industrial operations.

Trade and Commerce.—The staple article of production in Tasmania is wool, the amount of which exported in the year ending December, 1838, exceeded 2,490,990 lbs. (*Parliamentary Report on Wool and Woollen Manufactures*, April 29, 1839.) The value of this wool in the English market has, according to the Statistical Report of the secretary to the government of Van Diemen's Land, quoted above, ranged from 1*s*. 6*d*. to 2*s*. 6*d*. per lb. A considerable trade has during the last five years been carried on with the new colonies of Australia, South Australia, and Port Phillip, in sheep, the prices of which have varied in that time so much as from seven shillings to sixty shillings per head.

Owing to the smallness of the demand for grain, and the great outlay required in the clearing of land, agricultural operations have been slow in Tasmania. This has likewise been accounted for by the circumstance that few practical farmers emigrated to the colony. 'The earlier settlers were chiefly artizans of intemperate habits, unacquainted with husbandry, and disinclined to attain a knowledge of it. Still (says the writer from whose account we quote, himself for ten years a colonist of Van Diemen's Land) they obtained and located themselves on grants of land; turned up the soil, and threw grain into it; and it being grateful, repaid their rude essays with bountiful harvests. This was sufficient. When one piece of land was exhausted, another was broken up, and so on in constant succession. Fresh settlers continued to arrive, and obtained land too; and as these were not agriculturists either, they had to copy their predecessors. Such was the progress of agriculture in Van Diemen's Land; and such is its condition at the present period (1838). The diversity of the climate in the different districts is still overlooked; the seasons are scarcely ascertained, and the proper times for sowing remain doubtful, and are adopted irregularly.' (*The Condition and Capabilities of Van Diemen's Land*, by John Dixon, 1839.) Van Diemen's Land however produces not only a sufficient supply of grain for domestic consumption, but has contributed for several years to supply the deficiency in New South Wales; and in the opinion of local writers there is a probability of its being the granary of the southern hemisphere. Oxen are generally used, instead of horses, in ploughing, and the implements of husbandry are those in use in England.

Oil constitutes the second great article of export from Tasmania. Whales of the black species were at one time taken in great abundance in the bays on the coast of the island; but we find that Mr. Dixon confirms the apprehensions expressed by an earlier writer on the colony (*Observations on New South Wales and Van Diemen's Land*, by John Henderson, Calcutta, 1832) of their being driven away by an injudicious prosecution of the fishery at all seasons of the year. . Sperm oil, as well as that of the black whale, is exported. The returns derived from this source are still considerable.

Among the miscellaneous exports are bark, kangaroo skins, whale-bone, and potatoes (to Sydney); but the aggregate of the returns from these articles is trifling.

There are about eight banking establishments, with branches in the chief towns. They are all joint-stock, the shareholders being responsible to the full extent of their property. They circulate notes of one pound and upwards. Bank interest at a recent date was ten per cent., and at the period at which this article is written it cannot be affirmed with confidence whether it is lowered. There are also several companies for the insurance of life and property.

Divisions of the Island.—Originally Tasmania was divided into two counties, but it has since been subdivided into police districts, and more recently into thirty-six counties. We are not aware however that any map embracing the county divisions has been published, and in the following details we adhere to the divisions into districts. The district of Hobart Town is bounded on the east by the river Derwent, and on the south and west by the river Huon, on the north by New Norfolk and Richmond districts. It comprises an area of about 400 square miles, or 250,000 acres, of which not more than about 4000 are yet in cultivation. Richmond is bounded on the south and east by the sea, on the north by Oatlands, and on the west by New Norfolk: its towns are Richmond, Sorell, and Brighton; besides which it includes several large agricultural establishments: it contains about 1050 square miles, or 672,000 acres, of which about 22,000 are estimated to be under cultivation. New Norfolk is bounded on three sides by Hobart, Clyde, and Richmond districts, and on the west and southwest by unlocated lands. The towns are New Norfolk and Hamilton, and it comprises about 1500 square miles, or 96,000 acres, a great portion of which is barren and rocky: about 6000 acres are in cultivation. Clyde is bounded on the west by unlocated lands, and on the other three sides by Norfolk Plains, Campbell Town, and Oatlands districts: its only town is Bothwell. This district comprises 1700 square miles, or 1,088,000 acres, about 5000 of which are in cultivation. Oatlands, bounded on the south by Richmond, east by Oyster Bay, west by the Clyde district, and north by Campbell Town, contains 900 square miles, or about 576,000 acres. Oatlands and Jericho are its towns. Upwards of 4000 acres are in cultivation. Campbell Town, bounded on the south by Oatlands, east by unlocated lands extending to the sea, west by the Clyde and Norfolk Plains, and north by Launceston district, comprises about 1260 square miles, or 850,000 acres. Its towns are Campbell Town and Ross. The land is rich and fertile, having 8000 or 9000 acres in cultivation. Norfolk Plains are bounded on the south by the Clyde, east by Campbell Town and Launceston districts, and by the territories of the Van Diemen's Land Company, and north by Bass's Straits. This district comprises 2250 square miles, or rather more than 1,500,000 acres. Longford and Westbury are the townships. About 8000 acres of land are supposed to be in cultivation. Launceston district is bounded on the south by Campbell Town, on the west by Norfolk Plains districts, and on the north and east by the ocean. Besides the town of Launceston it has Perth and George Town. The district covers 3800 square miles, or about 2,352,000 acres; not more than 10,000 or 11,000 of which are in cultivation. Oyster Bay is bounded on the south by Richmond, west and north by Oatlands and Campbell Town districts, and east by the ocean. It contains about 900 square miles, or 576,000 acres, of which between 2000 and 3000 are estimated to be in cultivation. (Martin's *Van Diemen's Land*; *Hobart Town Annual*.)

The other divisions of the island are—the Van Diemen's Land Company's territories, comprising nearly half a million of acres on the north-west corner of the island, bounded on two sides by the sea, on the others by crown lands not yet located, and by the settled districts of the Norfolk Plains; and Tasman's Peninsula. Of the purposes to which Tasman's Peninsula is applied, an account is given in the article TRANSPORTATION.

Towns.—Of the towns mentioned in the preceding outline of the territorial divisions of Tasmania, only two or three are worthy of notice, the others being little more than villages or sites laid out for towns on which a few straggling houses are built. 'Hobart Town is built upon an undulating surface, receding from a cove on the left of the Derwent. Seen from the water, it seems to run up before you on a variety of ascents, and to spread itself abroad upon the hills in the distance. Mount Wellington, a great mountain, which during nine months in the year is capped with snow, and which rises four thousand feet above the level of the sea, stands at the back, in darkness and sublimity, and overlooks the surrounding scenery. The town is laid out with judgment. There are about twenty streets, all wide, and dividing or intersecting one another at right angles. A narrow and shallow rivulet, which takes its rise from Mount Wellington, flows through the town, and affords the inhabitants their only supply of fresh water. All the streets are macadamized, and none are flagged. . . The houses bear no common aspect. Some are of brick, others of stone; but all, instead of being slated, are roofed with shingles. As every proprietor has been guided by his own taste in the structure of his house, few are built alike or upon the same plan; and as he was not restrained by the government to a settled line, they are often planted in a zigzag position. The town covers a great deal of ground, but little of it after all is built upon. A tree is seen sometimes standing in the midst of houses, and a house often in the midst of trees. Dwellings have been erected long before the streets were made, and the town being upon a very irregular surface, some of the buildings in consequence now occupy very awkward situations. On one side of a street they are often elevated much above the level; while, on the other they are sunk considerably beneath it. Shops are scattered all over Hobart Town; but the business thoroughfare is confined to two streets. Some of the shops are showy and respectable, even tasteful and elegant; displaying an appearance equal to that of many in London. The householder is as particular in decorating the interior of his house as he would be were he in England, and hence his furniture is not inferior to that of those of his own rank in the mother country.' (Dixon's *Account*.) In 1839 there were upwards of fifteen hundred houses in Hobart Town. Among the public buildings may be named three handsome Episcopalian churches, and one Presbyterian, one superior edifice belonging to the Wesleyans, besides several of inferior description, the property of the same body, two Independent chapels, and a Roman Catholic church, by this time probably completed. The Government House is an irregular structure, made up of continual additions to an originally small building, and is shortly to give place to another house intended for the residence of the lieutenant-governor, of which the foundation has been laid. There are custom-houses, a handsome theatre, a court-house, and police-office, and an exchange has been set on foot. There are many benevolent and religious institutions and societies established, and two or three of a literary character. Seven papers are published, most of which are weekly, besides an official gazette and two gratuitous advertising sheets. The population of Hobart Town, including the convicts and military as well as the free inhabitants, in the town and its immediate precincts, is not less than ten thousand. The following returns exhibit the amount of the Hobart Town imports and exports, with the places from which received, and to which sent, for the year ending December, 1837:—

Imports.

Great Britain	£230,950
New South Wales	95,865
Mauritius	8,147
Calcutta	4,397
Canton	1,541
Manilla	380
Singapore	1,876
Cape of Good Hope	3,620
United States	490
Hamburg	860
	£348,126

Exports.

Great Britain	£166,585
New South Wales	53,980
Swan River	95
South Australia	11,414
New Zealand	1,699
Mauritius	858
Calcutta	590
Canton	15
Valparaiso	60
	£235,296

In a comparison of these returns it is pointed out by the editor of the 'Van Diemen's Land Annual,' from which publication they are taken, that the apparent balance exhibited against Hobart Town is diminished when it is considered that a great portion of this balance consists of property imported by individuals who have settled in the colony. We have not been able to procure authentic returns of a later date than those quoted; but it may be concluded that the value both of the exports and imports of Hobart Town has greatly increased since.

Launceston, the second town of the colony, is situated at the confluence of the North and South Esk, which there form the Tamar, flowing about forty-five miles, when it disembogues into the ocean at Bass's Straits. It is 124 miles from the capital of the colony. Launceston is situated in a marshy spot, and is neither in beauty nor in the promise of health to be compared to Hobart Town. The enterprise of its inhabitants, aided by the vicinity of the richest settlements in the island, is however great, and it is not improbable that this town will outstrip its southern competitor in commerce. The imports in the year 1837 were 191,843*l.* in value; the exports being 264,599*l.*, upwards of twenty-nine thousand pounds above those of Hobart Town; and in subsequent years it is believed that the difference is much greater in amount. Launceston contains many churches, the property of different religious denominations, and the private and public buildings are not destitute of architectural beauty.

The highway between the northern and southern capitals of Tasmania is for the most part well laid out; there are inns along this road at short distances from one another, the accommodation in which is not far from equalling the same on the roads of England. Passing from the highway into what were not long since unpeopled woods, the fashionable vehicle as well as the rustic waggon of the settler is to be seen driven along cross roads which are everywhere in process of formation; and here and there, only partially obscured from a distance by the thick and sombre Australian foliage, are to be seen mansions almost baronial, superseding the rude shelter of the aborigine, and the hut, almost as rude, in which the colonist first lodged.

Population.—In 1838 a census of the free inhabitants of Van Diemen's Land was made with a reference to the religious denominations to which they belonged, which exhibited the following summary:—

Church of England	16,094
Church of Scotland	2,551
Church of Rome	2,288
Wesleyans	1,289
Baptists	175
Independents	635
Quakers	80
Jews	132
	23,244

The accuracy of this return, in so far as it referred to the relative numbers belonging to different religious denominations, was generally questioned; but the aggregate representation of the amount of population, we believe, was admitted. No great increase by immigration has taken place since, and the new colony of Port Phillip has attracted many from Tasmania. The return of the number of male and female convicts for the same year gives:—

Male convicts	16,129
Female convicts	2,139

An account of the convict system of Van Diemen's Land is reserved for the article TRANSPORTATION; but the following returns are introduced here, as they bear upon the general social condition of the island:—

Return showing the Disposal of the Convicts in 1838.

Sentence of transportation expired	793
Free and conditional pardons	365
Transported to New South Wales	23
Transported to Port Arthur	1,306
Absconded in 1837	225
Died	167
Executed	4
Confined in gaols	69
Sick in hospitals	82
Invalid establishments	126
Employed in chain gangs	537
Employed in public works	2,583
Artificers on loan to settlers	262
Assigned to settlers	6,023
'Tickets of leave,' or conditionally free	3,960
Constables and field police	395
Missing	39
	16,959*

Female Convicts.

Sentence of transportation expired	163
Conditional pardons	52
Died	16
Sent to New South Wales	1
Total number remaining	2,086
	2,318*

State of Crime.—If Van Diemen's Land has greatly benefited in an economical sense by being a settlement for convicts, it has undoubtedly suffered from this cause in a moral sense. A paragraph will not suffice to give an accurate idea of the general moral condition of the population. Referring therefore to the *Transportation Report* of 1838, and to a volume entitled 'Australiana,' by Captain Maconochie, R.N., K.H. (Parker, Strand, 1839), we shall introduce here only a few details and accompanying explanations taken from the last of these authorities. 'Notwithstanding the strictness and vigilance of the police of this colony, notwithstanding the length of time during which the prisoners have for the most part been subjected to its minute supervision, notwithstanding the decided tendency of the age to moral improvement, and notwithstanding the great influx of free settlers into the colony within the last ten years and the high personal respectability of most of them, the proportion of crime and disorder to the entire population is not only very great, but appears in many particulars even to be on the increase.' From No. 33 of the *Statistical Papers* drawn up by the colonial secretary, it appears that convictions for drunkenness were, in 1824, as 3[illegible] to 100 of the whole population, and in 1832 as 9[illegible]. Convictions under penal statutes of free persons in 1824 were as 5[illegible] to 100, and in 1832 as 7[illegible]; and general misdemeanors by convicts in 1824 were as 11[illegible] to 100, and in 1832 as 43[illegible]. After 1832 the returns are differently made, and the several heads of offence are multiplied; yet, with few exceptions, the same general fact is evident. Thus drunkenness among the convicts in 1833-34-35 was as 4[illegible], 4[illegible], 4[illegible] respectively to 100. The tendency, as is well known, in English society, unless in peculiar circumstances, has been rather steadily, during the last ten or twelve years, towards sobriety. Felonies disposed of summarily were in like manner, in 1833-34-35, as 2[illegible], 4[illegible], 3[illegible] to 100; among free people, as 7[illegible], 5[illegible], 3[illegible] to 100; and what are called various offences, not included under previous heads, as 1[illegible], 3[illegible], 4[illegible] to 100. Captain Maconochie quotes returns of the convictions before the supreme court and quarter-sessions, on which he remarks: 1st, that the ratios throughout to the whole population are enormous, convictions in England being scarcely 1 to 1000 inhabitants, and in Scotland only 1 to 1300, those for Van Diemen's Land being, in 1835, 1 to 105[illegible]; 2nd, the extreme vigilance of Van Diemen's Land police tends to prevent the commission of great crimes, while the latitude given to its summary jurisdiction makes it unnecessary to bring medium offences under the cognizance of the higher courts; 3rd, the pecuniary prosperity of Van Diemen's Land is advancing, which shows that dissipation, not distress, leads there to crime. Comparing the state of petty crime in the colony to that in London, it is found that in Van Diemen's Land, for drunkenness alone, the convictions among the free population are about 14 per cent.; whereas in London, for every description of petty offence, they are little more than 5 per cent.; and Captain Maconochie remarks that the returns in Van Diemen's Land refer to a mixed populatiòn of agriculturists as well as town residents, which makes the comparison still more disadvantageous. As general characteristics, he mentions dissension, bitterness of feeling, improvidence, and a reliance upon authority, instead of moral influence, in the relations of master and servant. He remarks also that there is a low standard of moral principle, a characteristic which, though not so obvious, is radically more detrimental than great occasional vices, and one which it is more difficult to correct. But as he frequently points out in his interesting work, and as there is a necessity of remarking here, in strictness a social character can scarcely be predicated yet in reference to the population of Van Diemen's Land; the colony is not old enough to have moulded the character of its inhabitants; and, amid much that is painful in the aspect of society, there is also much of an opposite character—individual benevolence and public spirit.

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* We have not introduced the returns of convicts arriving from England, which explain the difference between these totals and those previously quoted.

Government.—Van Diemen's Land is administered by a lieutenant-governor, who is assisted by two councils. The lieutenant-governor has the initiative of all laws. The councils are called the Executive and the Legislative. The former is composed of official members, and the latter of official and non-official: all are appointed by the crown, and removable at the governor's pleasure, with the sanction of the crown. If two-thirds of the legislative council are opposed to any act proposed, it cannot pass: the reasons of dissent are entered. Practically however this provision is of no value, for half of the council are salaried officers of the local government. Laws passed by the council must, within seven days, be enrolled in the Supreme Court; and fourteen days from such enrolment, unless the judges declare them to be repugnant to British law or the charter, or letters patent of the colony, they come into operation. In case of objection being made, the governor and council re-consider the act. The laws of England, so far as they can be applied, are recognised, and embodied in local enactments.

The judicature consists of a supreme court, having two judges, of courts of quarter-sessions, and courts of requests, which last are sometimes called courts of conscience, and have jurisdiction in matters to the extent of ten pounds. Criminal offences are tried in the Supreme Court by seven military officers as a jury; civil cases, by a judge and two assessors, magistrates of the colony appointed by the governor, and who are open to challenge by the parties, the challenge being determined by the judge: if the assessors do not agree, the judge has a casting vote. The Supreme Court may, on the application of either party in an action, summon a jury to try it. This court declares insolvencies and distributes effects: it likewise possesses equitable and ecclesiastical jurisdiction. The total estimated expenses of the judicial establishment for the year 1839 was 15,266*l*. 7*s*. 6*d*.

In all the most populous districts of the island there are police magistrates, who sit daily for the trial of petty offences: their decisions are subject to the approval of the governor, who is advised by the chief police magistrate. A large constabulary force is maintained, composed chiefly of convicts. The total police estimates of Van Diemen's Land for 1839 exceeded 26,000*l*.

The ecclesiastical provision is of the most liberal character. Three religious denominations, the Episcopalian, Presbyterian, and Roman Catholic, receive allowances from the state. They are equally provided for in proportion to the respective number of their bodies, and the clergy of each have the same political status. In the towns the subscription of two hundred adults (three children or persons under a specified age being considered equal to one adult) to a paper, intimating their connection with one of the denominations named, desiring to have a church erected for the use of such denomination, and the contribution of at least 300*l*. towards its erection, are the conditions on which the government erects such church and provides for the maintenance of worship in it. In the rural districts the fulfilment of these conditions by eighty adults, residing within a radius of ten miles, is required. The sum expended by the government on the erection of a church is equal to that raised by private contribution. The stipend allowed to the clergy in the towns is 250*l*. annually, and to those in the rural districts 200*l*. A glebe and ten acres of land are also allowed, and in certain cases a further sum of money for the feed of a horse. The Wesleyans have an annual grant of 400*l*. voted in their favour by the legislative council.

The Church Act has stimulated the erection of churches in the colony, so that there is now no deficiency, comparatively speaking, except in the districts in which there is a very limited population. The estimated expenses of the ecclesiastical establishment for the year 1839 amounted to 7055*l*. 14*s*. 11*d*.; but the Church Act had not, at the period at which that estimate was made, exerted so much influence as it has since done, and at present it is certain that the ecclesiastical outlay is considerably above the sum stated. Numerous places of worship have been erected throughout the settled districts of the island by Protestant denominations, not embraced in the government scheme of support. The government assists in the maintenance of Sabbath schools in connection with the different churches.

Liberal provision is made for juvenile education, on the principles chiefly of the British and Foreign School Society; and, besides a collegiate institution, founded and maintained by the government, one has been projected by the colonists, for which subscriptions have been raised. The site of the first is at New Norfolk; the second is to be established at Campbell Town. These institutions are to be in the first instance superior grammar-schools; and gradually, as professors can be obtained, and there is a demand for the higher branches of learning, they are to receive the character of colleges.

In the estimates of the expenditure of Van Diemen's Land for the year 1839, a sum of 4000*l*. is put down for schools; and an additional sum of 2751*l*. for the 'Orphan Schools,' in which the offspring of convicts are educated and maintained. The expense of the collegiate institution is not included in the sum of 4000*l*.: its foundation had not been laid at the date of that estimate.

The revenue of the colony is derived from duties on spirits—10*s*. per gallon on brandy; 7*s*. 6*d*. on hollands or geneva, West India Rum, or British gin; 1*s*. 6*d*. per pound on tobacco: from licences — 25*l*. per annum for licence to sell spirits; 3*l*. 3*s*. for auctioneer's, and 4*l*. 4*s*. for marriage licences: from the fees of public offices, fines, &c. It has increased progressively for many years. In 1826 it amounted to 34,655*l*. 0*s*. 1¼*d*.; in 1830 it was 62,018*l*. 7*s*. 8¼*d*.; in 1835 it was 91,320*l*. 19*s*. 9¼*d*. (*Statistical Report* of the Colonial Secretary.) With the addition of the revenue derived from the sale of land in these years, it amounted to 65,178*l*. 17*s*. 0¼*d*. in 1830; to 106,640*l*. 8*s*. 2*d*. in 1835; in 1840, the revenue, it was estimated, would amount to 200,000*l*. Part of this revenue is appropriated to the immigration of labourers, and the rest to the civil, judicial, ecclesiastical, and miscellaneous expenses of the colony, which are not borne by the British government. The expenditure of the year 1837 amounted to 136,856*l*. 1*s*. 6*d*.; for 1838 the estimated total was 124,143*l*. 14*s*. 4*d*.; for 1839, 111,770*l*. (*Abstract*, dated July 5th, 1838, Colonial Secretary's Office, Hobart Town.)

Natives.—The aborigines of Van Diemen's Land so closely resemble in physical character those of Australia, as to leave no doubt of their origin being the same. [AUSTRALIA.] M. Péron says that the Tasmanian has a large head, especially remarkable for the great length of the line from the chin to the sinciput, and that the head of the New Hollander is less bulky, and is compressed in the back part, while that of the Tasmanian is elongated in the same direction. The great difference consists in the hair, which is straight or curled in the New Hollander, and woolly in the Tasmanian. (*Papers on New South Wales*, by Baron Field, Esq.) In language and customs the resemblance is equally apparent. Tasman, in the brief account of his voyage, published in 'Harris's Collection of Voyages' (vol. i., p. 325), mentions his observing on the shores of Van Diemen's Land trees which had 'a kind of steps cut in the bark, in order to climb up to the birds' nests: these steps, he says, were the distance of five feet from each other, so that we must conclude, that either these people are of a prodigious size, or that they have some way of climbing trees that we are not used to.' The difficulty here suggested by Tasman has been since resolved: 'The natives of Australia climb trees by cutting notches in the bark, by means of a small stone hatchet, and with each hand alternately. By long acquired habit a native can support himself with his toes on very small notches, not only in climbing, but while he cuts other notches for his further ascent with one hand, the other arm embracing the tree.' (Major Mitchell's *Travels in Australia*, vol. ii., p. 338.) In this singular custom the natives of Van Diemen's Land and of Eastern Australia agree. The corroboreé dance [SWAN RIVER] is common to both, and the offensive weapons of both people are precisely the same. Major Mitchell expresses a decided opinion that the natives of both countries are derived from a common stock (*Travels*, vol. ii., p. 341), in which other travellers have concurred. The natives of Tasmania, according to the accounts of early colonists, and of Cook and D'Entrecasteaux, appear to have been more intelligent and friendly than those of New Holland when first approached. M. Labillardière, the historian and naturalist of the expedition of Admiral D'Entrecasteaux, speaks of their music, their knowledge of plants, and their general acuteness, in terms by no means contemptuous; while he highly praises the humane and confiding disposition which they evinced towards their French visitors. Dr. Ross, the Editor of the 'Van Diemen's Land Annual,' to whom we are indebted for the best records of the early history of the colony, after many years' opportunities of intercourse with the aborigines, thus refers to them: 'During all the intercourse I have had with this interesting people, I not only found no want of sense or judgment among them, but, on the contrary, much to admire in them as thinking men, as endued not only with much ingenuity and penetration, but with the tenderest sympathies of the heart, and all the nobler passions that elevate man in the scale of being.'

Original harmlessness of character has not however preserved the Tasmanians from the usual consequences of European contact—expatriation or extinction. The history of the events which have nearly extinguished this race is briefly as follows:—Van Diemen's Land was colonized in the first instance by the most abandoned criminals. These men had no wives; no regular system of discipline was adopted in reference to them, but they were dispersed in small bodies over the territory, while others, escaping from control, pursued a predatory life. The wives of the natives were seduced by criminals, which excited the animosity of the men, and during several years indiscriminate warfare subsisted between the aboriginal and the colonizing population. At length, in 1830, the local government systematically interfered, and the free and convict inhabitants of the colony were enrolled for the purpose of killing or capturing the aborigines. Very limited success attended this mode of proceeding after it had been in operation for a considerable period, when Mr. Robinson, an individual of remarkable courage and self-possession volunteered, with the assistance of some friendly natives, to bring the rest to terms of pacification. By fair promises to the natives he accomplished a victory which could not be obtained by an expenditure of upwards of 36,000*l*. (*Van Diemen's Land Annual for* 1838) differently directed, and the natives put themselves in the power of the government. This triumph, obtained by moral influence, and which might have been made subservient to the good of both races consistently with the aborigines remaining on their native soil, was converted to their ruin. They were transported to an unfavourable spot (Flinders' Island, in Bass's Straits), where a miserable remnant of about eighty individuals were all that survived in 1836 of a population of three or four thousands, the estimated aboriginal population of Van Diemen's Land when colonization began there. (*Van Diemen's Land Annual for* 1838, pp. 127-8.) The courage which faced the aborigines unarmed in a time of warfare, was no evidence that the individual who dared to do this possessed the qualities essential for the successful treatment of an uncivilized race with a view to its improvement. However that courage was rewarded by the appointment of Mr. Robinson to the office of 'civilizing' the Tasmanians at Flinders' Island. It would be tedious to detail the features of the 'civilizing' system pursued there: it is sufficient to mention that every habit and amusement peculiar to the aborigines has been discouraged; the cumbrous and uncongenial forms and incidents of advanced civilization have been enforced in every-day life; the native language has been as much as possible suppressed; native names have been made to yield to those of the Cæsars, the Hannibals, and the Scipios; a disposition to indulge in the pleasures of the chace has been recorded as a delinquency; and the verbal repetition of the Commandments and the Catechism is alleged as the evidence of religious progress, and a confutation of all disbelief as to the capacity of uncivilized races to appreciate the doctrines of Christianity. (*Report of the Commandant of Flinders' Island; Parliamentary Papers*, 1839.)

An intelligent witness of the experiment carried on at Flinders' Island has thus reported upon it: 'The commandant has an establishment of thirty-two convicts to wait on the aborigines, and supply the deficiencies of their own labour, and is rewarded by a great deal of reading, writing, singing, rehearsal of the catechism, tailoring, submission, attachment, decorum, tranquillity, everything, in a word, which gratifies superficial examination; and he persuades himself that he is eminently successful with them: but they have no free agency, and are mere children at school, and they cannot escape from their prison, they cannot subsist at a distance from it, they must not break its rules, it must be a place of excessive *ennui* to them: as moral agents they are lower now than when savages; and they die the faster, I fear, for much of this kindness. The commandant imputes the mortality among them to the situation and climate, and wishes to transport them to the south coast of New Holland; but in six months I am persuaded they would be, on this plan, happy savages in the bush.' (*MS. Letter.*)

TASSIE, JAMES, was born of humble parentage, in or about the year 1735, in the neighbourhood of Glasgow, and was brought up as a country stone-mason. Going to Glasgow on a fair-day to enjoy himself with his companions, he visited the collection of paintings exhibited by the brothers Foulis, who were then endeavouring to establish an academy for the fine arts in that city. [FOULIS, vol. x., p. 383.] Feeling a strong desire to become a painter, Tassie removed to Glasgow, and studied drawing in Foulis's academy, but continued to practise his business. Though poor, he was frugal, industrious, and persevering; and, hoping at least to become a statuary, if not a painter, he, in 1763, went to Dublin, where he was employed for some time as a sculptor and modeller. There he became acquainted with Dr. Quin, who was making experiments in the beautiful art of imitating engraved gems by means of coloured glass, or pastes, and who engaged him as his confidential assistant. Having succeeded in effecting great improvements in the art by their joint labours, Tassie was encouraged by his patron to remove to London, and to follow it as a profession. He accordingly reached London in 1766; and although, owing to his diffidence and modesty, he had to struggle with many difficulties, he gradually emerged from obscurity, obtained a comfortable competence, and established such a reputation, that the principal cabinets of Europe were thrown open to him. Among his earliest patrons in the metropolis were the Society of Arts, who, in 1767, awarded him the sum of ten guineas for imitations of antient onyx. In 1775 Tassie, who then resided in Compton Street, Soho, published a catalogue of the antient and modern gems in his collection, of which he sold pastes or sulphur impressions at very moderate prices. The collection then amounted to more than three thousand articles; but it was subsequently much extended, and in 1791 appeared a new catalogue, containing fifteen thousand eight hundred articles, and forming two quarto volumes. This work, which is not confined to a dry description of the gems, but contains much useful information on that department of antient art, was compiled by Mr. R. E. Raspe, who prefixed to the catalogue an introduction on the utility of such a collection of works of art, and on the history of engraving upon hard stones, and the imitation of gems by artificial pastes. The work contains also a frontispiece and fifty-seven plates of gems, etched by David Allan. From Raspe's introduction it appears that the demand for Tassie's pastes was encouraged, in the first instance, by the jewellers, who introduced them into fashion by setting them in rings, seals, bracelets, and other trinkets. He was very careful of his reputation, and would not issue imperfect impressions; but the celebrity of his casts induced other and less skilful modellers to sell their works under his name. About 1787 or 1788 Tassie received an order from the empress of Russia for a complete set of his gems, which he executed in the most satisfactory manner, in a beautiful white enamel composition, so hard as to strike fire with steel, and of such a texture as to take a fine polish, and to show every touch of the artist with the greatest accuracy. Wherever it was possible to do so, he coloured these in exact imitation of the originals; and in other cases such colours were used as might display the work to advantage. Tassie's business was continued by his nephew, William, on his premises in Leicester-square; and he added to the collection a series of casts of coins, from the museum of the late Dr. William Hunter, of which he made a set by order of the emperor Alexander, to add to the gems executed for the empress by his uncle, who died in 1799. Besides the branch of art for which he is principally celebrated, Tassie displayed considerable talent in modelling small portraits in wax, from which he frequently made pastes. He was much respected in private life for his piety, simplicity, modesty, and benevolence.

(Raspe's *Catalogue of Tassie's Gems, &c.*; Dr. Gleig's *Supplement to the third edition of the Encyclopædia Britannica*, 1801.)

TASSISUDAN. [BOOTAN.]

TASSO, BERNARDO, born at Bergamo in 1493, lost his father when a boy, and was brought up under the care of his uncle Luigi Tasso, bishop of Recanati, who was living at Bergamo. The bishop being murdered by robbers in 1520, Tasso left his native town, and lived for several years at Padua and Venice, and other towns of North Italy, where he displayed his talent for poetical composition. In 1525 he engaged himself as secretary to Guido Rangone, who was general of the Papal troops in North Italy. In 1529 he went to the court of Ferrara, where he remained a short time. A volume of Italian verses which he published at Venice in 1531 made him known to Ferrante Sanseverino, prince of Salerno, one of the principal Neapolitan barons, who kept a princely court after the feudal fashion of the times. The prince invited him to come to Naples, granted him a handsome allowance, with the liberty of withdrawing himself from time to time from his court to apply to his poetical studies in rural retirement. Tasso accompanied the prince of Salerno in the expedition which Charles V. undertook against Tunis, in 1534. He was afterwards sent to Spain, in 1537, on a political mission, and on his return he spent some time at Venice, where he became acquainted with the celebrated Tullia d'Aragona, the illegitimate daughter of a cardinal of the royal house of Aragon, who was herself a poetess, and led a very free life. Bernardo Tasso wrote verses in her praise. Having at last disentangled himself from this connection, he returned to Naples, where he soon after married a young lady of Sorrento called Porzia de Rossi, by whom he had a son, Torquato. In 1547 an insurrection broke out at Naples against the Spanish viceroy Don Pedro de Toledo, who, in concert with Pope Paul III., wished to establish the Inquisition in Naples after the fashion of Spain. The people elected a sort of council composed of nobles and citizens, under the name of 'Union for the service of God, the emperor, and the city,' to administer temporarily the affairs of the country. This body chose the prince of Sanseverino and the prince of Sangro as its deputies to proceed to Germany and lay their grievances before Charles V. Bernardo Tasso, against the opinion of others, advised the prince to accept this mission. Sanseverino found the emperor highly incensed against the Neapolitans, and fearing for himself, he went to France and entered the service of Henry II., for which he was declared a rebel by Charles V., and his property was confiscated. Bernardo Tasso followed his patron to France, where, after a time, he found himself in great pecuniary distress. He then returned to Italy, and went to the court of Guidobaldo, duke of Urbino, from whence he passed to that of the duke Gonzaga of Mantua, who made him governor of Ostiglia, in which place he died in 1569.

Bernardo Tasso wrote a romantic poem in ottava rima, entitled 'Amadigi,' the subject of which is taken from a Spanish romance. [AMADIS DE GAULA.] The plot or plots of Tasso's poem are deficient in interest, but the style is good, and the poet excels in his descriptions and comparisons, but he indulges at times in licentious strains. After writing his poem, he detached one of the episodes and swelled it into a separate poem, entitled 'Floridante,' which was published after his death by his son. He also wrote five books of 'rime,' eclogues, hymns, odes, sonnets and other lyrics, some of which are admired for their imagery and smoothness of versification. He introduced in the Italian language that species of poetry which is called 'pescatoria' and 'marinaresca,' being descriptive of the habits and occupations of fishermen and mariners. His letters have been published in three volumes.

(Corniani, *Secoli della Letteratura Italiana*; Tiraboschi, *Storia della Letteratura Italiana*; Panizzi, *Introductory Essay on the Romantic Narrative Poetry of the Italians*, prefixed to his edition of 'Bojardo.')

TASSO, TORQUATO, son of Bernardo, was born at Sorrento, in 1544. At the age of ten he was sent for by his father, then an exile, and after some time spent with him in several towns of north Italy, he went to the university of Padua to study law, for which however he had little inclination. At the age of eighteen he composed his first poem, 'Rinaldo,' in twelve cantos. The subject is romantic, and is taken from the old chivalric legends concerning Charlemagne and his wars with the Moors. Bernardo was at first angry with his son for neglecting his more serious studies, but at last he relented, and gave his consent to the publication of the poem, which Torquato dedicated to the Cardinal Luigi d'Este, brother of Alfonso II., duke of Ferrara. In 1566 the cardinal took him into his service as a gentleman attendant, and introduced him to his brother the duke, and to his two unmarried sisters Lucrezia and Eleonora. He was well received by all, and admitted into their familiar society. Tasso was young and amorous; he had been for some time passionately in love with Laura Peperara, a lady of Mantua, to whom he addressed many sonnets and other verses after the manner of Petrarch, styling her his Laura. This lady, with whom he had probably become acquainted during a visit which he paid to his father at Mantua in 1564, came some years after to Ferrara as a lady of honour of the duchess, and was married to Count Turchi of Ferrara. But in the mean time Tasso appears to have been struck with the personal attractions and mental accomplishments of the princess Eleonora, the duke's sister, and already in 1566 there is a sonnet by him, beginning 'Nel tuo petto real da voci sparte,' which is evidently addressed to a princess of a sovereign house. From that time he continued to write amatory verses evidently addressed to the same person, whom he styles his 'donna,' or mistress. In some of them he mentions the name of Eleonora, but as there were several ladies of that name at different times at the court of Ferrara, this has given rise to various surmises about the person meant. At last Tasso avowed in several ways his love for the princess, though, from the then existing usages of society, it was impossible that he could ever have obtained her hand. Most of the sonnets and other lyrics, which are evidently intended for this object of his second love, are conceived in a respectful and somewhat melancholy strain, as if the writer felt the hopelessness of his passion. The disparity of rank was in those times an insurmountable obstacle to any legitimate result of such an attachment, and the house of Este was one of the proudest in Italy. Like Petrarch, Tasso seems to have obtained friendship only in return for his love. But there are some of Tasso's compositions written between 1567 and 1570, in which he assumes the tone of a favoured lover. Such are the two sonnets 'Donna di me doppia vittoria aveste' and 'Prima colla beltà voi mi vinceste,' the dialogue between love and a lover, beginning 'Tu ch' i più chiusi affetti,' and the madrigal which begins 'Soavissimo bacio.' From the context, although no name is mentioned, they all evidently allude to the same object as the other amatory verses addressed to his 'donna.' There are also some autograph lines of Tasso discovered by Mai among the Falconieri MSS., and published by Betti at Rome (*Giornale Arcadico*, October, 1827), in which Eleonora is mentioned by name:

> 'Quando sarà che d'Eleonora mia
> Possa godermi in libertade amore?
> Ah, pietoso il destin tanto mi dia!
> Addio cetra, addio lauri, addio rossore.'

It would appear that these verses, having been abstracted from Tasso's papers by some enemy, and shown to Duke Alfonso, first roused his suspicions.

Professor Rosini, in his able essay upon the 'Love of Tasso and the Causes of his Imprisonment,' Pisa, 1832, proves, in opposition to the assertion of Serassi and others, that Eleonora d'Este was the object of the above compositions, as well as of all the others addressed to his 'donna.' It is the four compositions last alluded to that constitute the real guilt of Tasso: they boast in prurient language of favours received, which, according to the best circumstantial evidence, were never granted, and which, if even granted, ought not to have been mentioned. And Tasso himself must have felt this, for when he set out for France at the beginning of 1571, to accompany Cardinal Luigi d'Este on a mission to Charles IX., he left his MSS. in charge of his friend Rondinelli, with directions to publish them in case he should die abroad, 'except those which he had written to oblige some friend, and which must be buried with him.'

This was a subterfuge to conceal the object of the above-mentioned compositions, and to make them appear as if written at the request of others, which in itself would have been no very creditable employment for a man of genius. However, before the end of the year 1571, Tasso took his leave of the cardinal in France. It would appear that while in that country, where he was introduced at the court of king Charles IX., and became acquainted with the French poet Ronsard, Tasso applied himself to study the points of controversy then debated between the Roman Catholic and the Reformed churches, and that his investigations of those delicate matters displeased the cardinal, who spoke to him strongly on the subject. But Tasso had other and secret reasons for wishing to return to Italy. Having returned to Ferrara, he entered the service of Duke Alfonso himself, by whom he was most graciously treated. 'The duke extolled his poetical talent; he often listened to the recital of his verses (Tasso was then engaged about his 'Gerusalemme,' which he intended to dedicate to the duke); he admitted him to his own table, and to his own familiar society; and he refused him no favour that he chose to ask.' (Serassi, *Vita del Tasso*; Rosini, *Saggio sugli Amori di Tasso*.) Such was the conduct of Duke Alfonso towards the poet, until he discovered, years after, his guilty compositions. Whilst Tasso was thus a favoured guest, rather than a dependant of Duke Alfonso, he wrote his pastoral drama, the 'Aminta,' in which he portrays with exquisite skill the pangs and the delirium of love deemed hopeless for a long season, but in the end requited. The drama was performed at the court of duke Alfonso, and its fame soon spread about Italy. Lucrezia, Eleonora's sister, who had married Francesco Maria, duke of Urbino, wishing to hear the 'Aminta,' invited Tasso to her court, where he remained several months. This was in 1573. While Tasso was absent from Ferrara, envy was busy at work against him to lower his credit with Duke Alfonso. At the same time Guarino, the poet, who was also at the court of Ferrara, strove to ingratiate himself with the princess Eleonora, and this excited the jealousy of Tasso. It appears that Tasso had been in the habit of writing to the princess, and sending her some of his poetical compositions; but now he wrote none for several months. At last he wrote her a letter, dated September, 1573, which was first published by his biographer Serassi, in which, after apologizing for his long silence, he sends her a sonnet, 'which,' he says, 'is not like those fine ones which I suppose your grace is now wont to hear very often,' alluding to those of his rival Guarino. And he goes on to say, that his sonnet is poor both in the conception and the style, as the author is poor of luck. This last expression cannot be understood as referring to his circumstances, for he was still in favour with both the courts of Ferrara and Urbino, and was receiving at the time presents from the duchess Lucrezia of Urbino. But still he sends to the princess Eleonora the sonnet, 'hoping that, whether good or bad, it will produce the effect that he wishes.' This sonnet, which begins 'Sdegno, debil guerrier, campion audace,' is that of a desponding lover who asks for mercy. Tasso concludes his letter with the usual subterfuge, that 'the sonnet is not written on his own accouut, but at the request of a poor lover, who having been for a time angry with his mistress, is now no longer able to stand out, and surrenders himself and asks for mercy.' This and other passages of his amorous verses, referred to by Professor Rosini in the above-quoted essay, prove that the princess Eleonora had been long aware of Tasso's passion, and felt flattered by it, but probably looked upon it as a poetical feeling, for which she gave him her friendship. He himself acknowledges this in several places; and yet this same man had already written, in the recess of his study, the guilty compositions which have been mentioned above.

Towards the end of 1573 Tasso returned to Ferrara, where he applied himself to finish his great epic poem 'La Gerusalemme.' The touching episode of Olindo and Sofronia, in the second canto, was meant to portray his own situation with regard to the princess Eleonora; and in a sonnet which he wrote to that lady he evidently speaks of the character of Sofronia as meant to represent herself.

Parts of the 'Gerusalemme' began to circulate about in MS., and the author was assailed by numerous pedantic critics. He thought that the duke and his sister Eleonora did not take up his defence with sufficient zeal; and this slight sank deep into the poet's heart. Towards the end of 1576 a false friend, who was in the secret of his love for the princess, disclosed some particulars of it to others. Tasso having heard of this, and meeting him in the court of the ducal palace, required him to deny what he had said, and upon the other's refusal, gave him a blow in the face. This led to a duel; the treacherous friend came escorted by his relatives, who also drew their swords against the poet, but Tasso, who was a good swordsman, succeeded in parrying their blows, and came away in triumph. Nothing particular happened after this until June of the following year, 1577, when Tasso, on the evening of the 17th of June, being in the apartments of the duchess of Urbino, in Duke Alfonso's palace at Ferrara, fell into a violent passion at some impertinence real or supposed of a domestic, and forgot himself so far as to throw a knife after him. He was immediately arrested by order of duke Alfonso, and confined to a room which looked on the court of the palace. It appears that between these two incidents his own servants had been tampered with in order to give up his concealed papers. Tasso got information of this, and looked out for a trusty servant from Urbino, and wrote on the subject to Guido Baldo, marquis del Monte, and his letter is quoted by his biographer Serassi. He had also felt for some time scruples about matters of faith: he mentions in his discourse to Scipione Gonzaga, that he had doubts concerning many points of religion; he had even applied to the inquisitor of Bologna, who had granted him absolution; but still he thought himself under the censures of the church. All these things added to the anguish of his mind. From the place of his imprisonment Tasso wrote a submissive letter to the duke, begging his pardon, and the duke appearing to forgive him, released him after a few days, and took him with him to his country-seat of Bel Riguardo about the end of June. What happened there between the duke and Tasso is not ascertained, but from some expressions of the poet it appears that he was there closely and sternly examined by the duke, who had probably by this time in his possession Tasso's papers, 'in order to get from him an acknowledgment of what, if avowed, would incense him against him.' (Tasso's Sonnet, beginning 'Alma grande d'Alcide,' addressed to the deceased duke Hercules, father of Alfonso.) On the 11th of July the duke sent Tasso back to Ferrara under an escort, and shut him up in the convent of St. Francis, his secretary having written to the monks that he was mad, and must be treated as a madman.

Tasso's love adventures, his real or pretended madness, and the causes of his long imprisonment, made much noise about Italy at the time; and they have been so much discussed and commented upon since, that they have acquired an historical importance, especially as they serve to illustrate the manners of the times. Duke Alfonso has been much abused, and, we think, without discrimination, for his treatment of the poet. There is a mystery about the whole story resembling that which hangs over Ovid's banishment. Professor Rosini has collected with the greatest patience and care the discordant opinions, as well as the evidence resulting from Tasso's own writings, published and unpublished, and from those of his contemporaries; and the conclusion which he arrives at by the help of sound criticism is, that the Duke, having in his hands the loose compositions of Tasso already mentioned, which joined to his other compositions addressed to the same person, and his other strange sayings and doings, furnished full evidence that his sister Eleonora was the person alluded to in them, was naturally enough incensed against the poet, and thought that the only reparation that he could make to her injured honour was to make it be supposed that Tasso was mad. This gives the clue to his subsequent treatment of the poet. He must also have been confident that his sister was guiltless, otherwise, as Rosini observes, he would have taken a different sort of vengeance, according to the manners of the age. From the convent of St. Francis, Tasso wrote to the duke, saying, 'that the clemency of his highness had forgiven him his faults, and that thenceforth if he spoke to any one, he should acknowledge to all that which he clearly knew, that he was under a sanitary treatment.' He adds, that he had resolved, when the treatment was over, to turn monk; and in a postscript he says, that he earnestly wishes that the Duke may know all the truth, that he may not think him more mad than he is. In a long letter which he afterwards wrote to the Duke of Urbino, he says, that 'in order to please Duke Alfonso, he thought it no disgrace to imitate the example of Brutus and Solon.' Both those personages, according to Livy and Plutarch, feigned madness. Receiving no answer from either Duke Alfonso or the Duke of Urbino, Tasso, about the 20th of July, ran away from the convent, quitted Ferrara, and made his way alone and mostly on foot to Naples, and thence to Sorrento, where his sister was married. Having by kind treatment recovered his health and his spirits, he went to Rome, where he applied through some agent of the Duke to be allowed to return to Ferrara. Duke Alfonso wrote in reply, that he was willing to receive Tasso again into his service, if he would allow himself to be treated by the physicians; but that if he continued his subterfuges, and to talk as he had done before, he would immediately turn him out of his territories, and never allow him to return. Tasso, upon this, returned to Ferrara in the spring of 1578, with the Cavaliere Gualengo. He was civilly but coldly received by the Duke, who gave him to understand that he ought now to try to compose himself and to lead a quiet life, and to avoid all excitement. He attempted to get an interview with the Princess Eleonora and the Duchess of Urbino, but was prevented. Tasso, tired of this manner of life, having lost the favour which he used to enjoy at court, ran away again from Ferrara in the summer of 1578, wandered to Mantua, Padua, and Venice, and then went to Urbino, where he wrote to the duke of Urbino, who appears to have been then on bad terms with his own wife and with the court of Ferrara, entreating him to make the truth known, and to contradict the reports maliciously 'circulated of his madness,' saying that he had submitted to it in obedience to Duke Alfonso's wishes, but that he could not consent any longer to lead an animal life, far from literature and from the Muses. He wrote in similar terms to his friend Scipione Gonzaga at Rome, to his own sister at Sorrento, and to the Arciprete Lamberti, to whom he sent a sonnet, beginning 'Falso è il romor che suona.' In October, 1578, he left Urbino, and went to Piedmont under an assumed name; but he was soon known, and his fame as a poet secured him a flattering reception from Charles Emmanuel, Prince of Piedmont, who offered to take him into his service upon the same terms as the Duke of Ferrara. But poor Tasso had still his eyes and his heart fixed upon Ferrara, and in spite of the advice of his friends at Turin, and, among others, of the Marquis Filippo d'Este, Alfonso's relative, he determined to go to Ferrara. He was encouraged to do so by letters from the Cardinal Albano, who it appears had been commissioned by the duke to induce him to return, promising him a kind reception. He arrived at Ferrara on the 21st February, 1579, on the eve of the arrival of Margarita Gonzaga, the new bride of Duke Alfonso. The court was busy about the preparations to receive the duchess. The duke refused to see Tasso, the princesses also denied themselves, his old apartments in the palace were closed to him, and the courtiers and court attendants treated him with rudeness and contempt. Tasso now became furious, and he uttered impertinent words against the duke and the whole house of Este, which being reported to Alfonso, he gave orders to arrest him and confine him in the hospital of St. Anna as a declared madman.

Tasso remained a prisoner in the hospital full seven years, till July, 1586. From some obscure passages of his own letters he appears to have been treated very harshly at first by the attendants of the hospital. He wrote to the duke, and to the princesses, but in vain. At last he grew more calm, and was treated with greater leniency. The wretched hole which is shown at Ferrara as having been his prison is no longer believed by competent judges to be the identical place of his confinement. (Valéry, *Voyages Littèraires en Italie*, book vii., ch. 14.) Political party-feeling in our age has contributed to exaggerate the hardships of Tasso's confinement, as religious party-feeling has exaggerated the sufferings of Galileo in a similar condition. There was hardship no doubt in both instances, and the hardship in Tasso's case was aggravated by the state of his own sore and unsettled mind. When Cardinal Scipione Gonzaga visited Tasso at St. Anna, in the spring of 1580, he was lodged in a large and commodious apartment, where he could write and correct his compositions. In November of the same year he was visited by Montaigne, who speaks of him as a man whose reason was overcome by the vivacity of his imagination. In July, 1581, the Lady Marfisa d'Este obtained leave of Alfonso to take Tasso with her for a few days to her country-house, where he had a philosophical discussion with her and her two ladies of honour, Tarquinia Molza, a learned woman, and Ginevra Marzia, upon the nature of love. From the recollection of this conversation, Tasso afterwards composed his dialogue, which he entitled 'La Molza, ovvero dell' Amore.' In September, 1582, Tasso received at St. Anna the visit of Aldo the younger, who brought him copies of some of the finest editions which had come out of his press, and they spent two days together in speaking of their respective studies. Tasso in the meantime was busy writing, or correcting his various poetical compositions which were printed at Venice, but very inaccurately, to his great annoyance. He wrote in his confinement several philosophical discourses or treatises, such as 'Il Gonzaga, ossia del Piacere Onesto,' 'Il Padre di Famiglia,' the discourse 'Della Virtù Eroica e della Carità,' the dialogue 'Della Nobiltà,' and others. In his discourse to Gonzaga he says that it was wished that he should become insane, and that the cause, or at least one of the causes, of this persecution was some lascivious verses of his.

In 1583 Tasso grew seriously ill, he complained of his head, of his digestion, of singing in his ears, and other symptoms of a like nature. He consulted his friend Mercuriale, a physician of Padua, but Tasso was not a very docile patient; he wished for none but pleasant medicaments, and he would not submit to a total abstinence from wine. One of his vagaries was that he had a familiar spirit who appeared to him to comfort him. In 1584 he was allowed to be out at large during the Carnival season, and he wrote a curious dialogue on that circumstance entitled 'Il Gianluca, o della Maschere.' He enjoyed the society of Tarquinia Molza, of Count Girolamo Pepoli, and other noblemen and ladies of the court of Ferrara. He wrote about that time the dialogues 'Il Beltramo, ovvero della Cortesia;' 'Il Malpiglio, ovvero della Corte;' 'Il Ghirlinsone, ovvero dell' Epitaffio;' 'La Cavalletta, ovvero della Poesia Toscana;' and 'Il Rangone, ovvero della Pace,' which last, addressed to Bianca Capello, grand-duchess of Tuscany, is dated from his apartments of St. Anna, 'Dalle sue stanze in St. Anna.' He was now tolerably composed and reconciled, and could hardly be called a prisoner. In one of his autograph letters, written to the Marquis Buoncompagni, in April, 1585, and which is in the library of Ferrara, there is a passage copied by Valéry, in which he says that 'the duke does not keep me in prison, but in the hospital of St. Anna, where priests and monks can visit me at their pleasure, and no one prevents them from doing me good.' In several of his unpublished letters he gives directions about some articles for his wardrobe or his table, and shows a refined taste in both. But in that same year, 1585, a fresh source of vexations opened upon him. His great epic poem, 'La Gerusalemme Liberata,' had been published complete at Parma in 1581, and afterwards at Mantua in 1584. A host of critics fell upon it, and by their strictures strove to obscure all the merits of the poem. At the head of them stood Salviati, of the Crusca Academy. Tasso's language, his poetical style, his imagery, the plot of his poem, his episodes, everything was made a subject of censure. Tasso, already weakened by mental and bodily suffering, felt these attacks bitterly. He however took up his pen and wrote in a measured and dignified tone a defence of his poem. He was at the same time writing letters to all his friends to obtain his final liberty from the duke. He wrote to the city of Bergamo, to the duke of Mantua, to the grand-duke of Tuscany, to the pope, to the emperor, who all employed their good offices on his behalf with Duke Alfonso, who hesitated a long time before he consented to his release. At last Vincenzo Gonzaga, son of the duke of Mantua, obtained, in July, 1586, permission for Tasso to accompany him to Mantua. His reception at that court was like a triumph. In order to make some return for the kindness which he experienced from the house of Gonzaga, he completed his tragedy of 'Torrismondo,' which he dedicated to his liberator Vincenzo, on his accession to the ducal throne of Mantua in 1587. The subject of the 'Torrismondo' is a supposed Scandinavian legend. Some of the descriptions have been admired. After some time spent at Mantua and in his paternal town of Bergamo, Tasso, depressed by a settled melancholy, took leave of Duke Vincenzo, and repaired to Rome in the latter part of 1587, and thence to Naples in the following year. The poet appeared delighted with the beauties of his native country. At Naples he began a lawsuit to recover his paternal property, which had been seized when his father Bernardo became an exile. The Neapolitan courts of law have been at all times proverbially known for their dilatoriness, and justice was wretchedly administered under the Spanish viceregal administration. Tasso made little progress in his suit. But he found a sincere friend in the Marquis Gio. Batista Manso, who took him in the autumn to his estate of Bisaccio, where they spent the time in sporting, listening to the rustic improvvisatori, and conversing in the evening upon various topics, especially about Tasso's pretended familiar. It was at the request of Manso's mother that Tasso undertook his 'Sette Giornate del Mondo Creato,' which is a poetical paraphrase of the narrative of the creation of the world in the first two chapters of Genesis. In 1589, Tasso, always restless, repaired to Rome; but finding himself in great pecuniary distress, he accepted an invitation of the grand-duke Ferdinand de' Medici to go to Florence in the spring of 1590, where he was received with great honour by the court and other persons of distinction, as if to make amends for the annoyance given to him by Salviati and his compeers.

Towards the end of the same year however he went to Rome, and in 1591 he returned to Naples, and then applied himself to re-write his epic poem, under the title of 'Gerusalemme Conquistata,' in order to satisfy the critics. However the first version of his poem is in the hands of all, whilst few ever read his 'Gerusalemme Conquistata.' Tasso intended to end his days at Naples; but in 1592, Cardinal Aldobrandini having been made pope by the name of Clement VIII., his nephew, Cinzio Aldobrandini, afterwards cardinal, who was well acquainted with Tasso, invited him in the most pressing manner to Rome, where he came about middle of that year. He was stopped several days at Mola di Gaeta, the road being blocked up by the bands of the famous robber chief Marco Sciarra, who was scouring the country with perfect impunity. Sciarra, who was a man of birth and education, having heard that Tasso was detained at Mola, sent him a message to entreat him to proceed on his journey, assuring him of perfect safety from his men, and offering him an escort, which however Tasso declined; upon which Sciarra withdrew his men from the mountains of Itri, so as to leave the passage open for Tasso. Having arrived safely at Rome, he completed his 'Gerusalemme Conquistata,' which he dedicated to Cardinal Cinzio Aldobrandini. In the summer of 1594 he returned to Naples, and lodged first in the Benedictine monastery of San Severino, and afterwards went to a country-seat of his friend Manso. Meantime Cardinal Cinzio, out of affection and gratitude towards Tasso, prevailed on Pope Clement to grant the poet the honour of being solemnly crowned with the laurel-crown in the Capitol, as Petrarch and others had been. This being agreed upon, Cardinal Cinzio hastened to announce the news to Tasso, urging him to repair to Rome as soon as possible. Tasso did not seem at all elated: he observed to Manso that he thought it more glorious to deserve honours than to receive them. He however assented, and took an affectionate leave of his kind friend Manso, with a foreboding that it would be the last. He spent the Christmas festivities at the monastery of Monte Casino, and arrived at Rome in the beginning of 1595. He was met outside of the gates by many gentlemen and attendants of the Papal court, by whom he was led in a kind of triumph to the Vatican palace, where he was introduced to the pope, who told him that he had 'awarded him the laurel-crown, in order that it might be as much honoured by him, as in former times it had served to honour others.' Tasso was lodged in the Papal palace, and treated with the greatest regard. While the day of the coronation was anxiously expected, Cardinal Cinzio fell ill; and Lent coming on, the pageant was postponed, and then Tasso himself fell seriously ill. He felt from the first a conviction that this illness would be his last; and wishing to compose himself in retirement for his last moments, he expressed a wish to be taken to the monastery of St. Onofrio, on Mount Janiculum. Having been carried thither in one of Cardinal Cinzio's carriages, he said to the prior and his monks who came to receive him at the gate, 'I am come to die amongst you.' He was led into a comfortable apartment, where he devoted his remaining days entirely to religious practices, and seemed totally weaned from worldly feelings and cares. When the pope's physician announced to him his approaching death, he embraced him, thanking him for the happy tidings. To Cardinal Cinzio, who came to take leave of him, he expressed his gratitude for all his kindness; and as the cardinal and those present could not refrain from tears, he said to them, 'You think that you are leaving me, but I shall go before you.' He expired on the 25th of April, 1595, after fifteen days' illness, being fifty-one years of age. He was buried, according to his desire, in the church of St. Onofrio, with a plain slab over his tomb, upon which the monks engraved the simple inscription, 'Torquati Tassi ossa hic jacent.'

The lasting fame of Tasso as a great poet rests upon his 'Gerusalemme Liberata,' or 'Il Goffredo,' as it is sometimes called, one of the few great epic poems of which the world can boast. The action is complete: it relates the events of the great crusade, and ends with the ostensible object of that expedition, the deliverance of Jerusalem from the hands of the Moslems. The beauties, as well as the faults of the composition, have been the theme of many disquisitions. Among foreign critics, Blair, Voltaire, D'Alembert, La Harpe, and Châteaubriand have been loud in its praise. The poem has a peculiarity that distinguishes it from most other epics: it is essentially a Christian poem; and breathes throughout the feelings, the faith, and the hopes of a Christian. Tasso, as he says in his invocation,

> 'O Musa, tu che di caduchi allori
> Non circondi la fronte in Elicona,
> Ma su nel Cielo intra i beati cori
> Hai di stelle immortali aurea Corona.'—(c. i., st. 2.)

had drawn his inspiration from a sacred source, and has thus afforded a refutation to those who pretend that the Christian religion is not so favourable to poetical imagery as the splendid fictions of mythology. A melancholy tinge pervades the poem; but it is a melancholy lighted up by cheering and constant hope. With the single exception of the episode of the gardens of Armida, the language of the 'Gerusalemme' is eminently chaste, and the morality of its sentiments is pure and elevated, which renders it fit for the perusal of youth. Among its beauties of detail we will only instance the episode of Olindo and Sofronia, in the 2nd canto; the council of the dæmons in the 4th; the flight of Erminia, and her meeting with the old shepherd on the banks of the Jordan, in the 7th; the introduction of the Turk Solyman into the besieged city, in the 10th; the death of Clorinda, in the 12th; and the last fight of Argante with Tancred, in the 19th canto.

The other poems of Tasso have been mentioned in the course of this article. His lyrical compositions are very numerous, and many of them exquisite both in language and sentiment. Besides those which are upon amorous subjects, some refer to contemporary events, or are in praise of contemporary princes; others are upon religious subjects; and others refer to his own misfortunes. The whole of Tasso's poetical works have been published in one large 8vo. vol. of nearly 1000 pages, in double columns, at Venice, 1833. Prefixed to it is the biography of the author, by his friend the Marquis Manso.

Tasso's prose works consist of dialogues and dissertations, some of which have been already noticed; of a treatise upon epic poetry, dedicated to Cardinal Pietro Aldobrandini; discourses upon the poetical art, dedicated to Scipione Gonzaga; and of numerous letters, some of which have remained unpublished till lately, 'Lettere Inedite,' Pisa, 1827. Professor Rosini has edited a new edition of all the works of Tasso, begun at Pisa in 1820.

Tasso's 'Gerusalemme Liberata' has been translated into most European languages. There are English translations by Fairfax, Hoole, Broadhead, Hunt, and Wiffen. It has also been paraphrased into several Italian dialects, Milanese, Neapolitan, Calabrian, &c. The Life of Tasso has been written by Manso, Serassi, and others, and has been commented upon by Tiraboschi, Muratori, Zeno, Maffei, and other Italian philologists.

TASSO'NI, ALESSA'NDRO, born of a noble family at Modena, in 1565, was educated first in his native town, and afterwards at Bologna and Ferrara, where he studied the law. In 1597 he went to Rome, when he entered the service of Cardinal Ascanio Colonna, whom he accompanied to Spain in the year 1600. In 1603 the cardinal, having been made viceroy of Aragon, sent Tassoni to Rome to take charge of the administration of his property in Italy. During his stay in Spain Tassoni had opportunities of observing the internal state of that kingdom, which, after alarming all Europe in the preceding century by its ambition and the extent of its conquests, was now fast sinking into decay under the weak reign of Philip III. At Rome he wrote his 'Considerazioni sopra il Petrarca,' published in 1609, in which he commented very severely upon numerous faults, real or supposed, which he pointed out in the writings of that generally admired poet. Endowed with an inquisitive but somewhat captious mind, Tassoni aimed in his writings at opposing received opinions, and he employed sarcasm and ridicule for the purpose. Aromatari of Assisi took up the defence of Petrarch in his 'Risposte' to Tassoni's considerations, and this led to a controversy in the usual bitter style of Italian literary polemics. In 1612 Tassoni published his 'Pensieri Diversi' in ten books, being a collection of remarks on various subjects of science and literature which he had been in the habit for years of entering in his memorandum-book. Among other subjects he attacked the Physics of Aristotle, although he does not seem to have had himself very correct notions of physical phenomena. This work led to another controversy between Tassoni and several of his contemporaries. Meantime the Cardinal Colonna had died, and Tassoni, being now without employment, applied to Charles Emmanuel I., duke of Savoy, who promised him the post of secretary to his son, the cardinal of Savoy. But partly through court intrigues, and partly on account of Tassoni's known aversion to the court of Spain, with which the Duke of Saxony wished to be on good terms, he was kept waiting for years before he could take possession of his office at the court of the cardinal, who was then residing at Rome. Certain compositions entitled 'Filippiche,' in which the court of Spain was severely handled, as well as another pamphlet entitled 'Esequie della Monarchia di Spagna,' which appeared during that period, were generally attributed to Tassoni. Tiraboschi thinks that the first two of the 'Filippiche' are Tassoni's, but that the other five are by another pen. Copies of this work are very scarce. In 1623 Tassoni left the cardinal of Savoy in disgust, and retired to a country-house in the suburb of Transtevere, where he employed himself in study and rural occupations. About this time he had his portrait taken with the rind of a fig in his hand and the following distich written underneath:—

> 'Dextera cur ficum quæris mea gestet inanem?
> Longi operis merces hæc fuit: aula dedit.'

In 1626 Cardinal Ludovisi, nephew of Pope Gregory XV., took Tassoni into his service, and gave him apartments in his own palace, with a handsome stipend. After the cardinal's death, in 1632, Tassoni repaired to Modena, when he was made councillor to his sovereign Duke Francis I. of Este, for the remainder of his life. He died at Modena in 1635.

Besides the works already mentioned, Tassoni made an abridgment in Italian of the 'Annals' of Baronius, and some 'Annotazioni,' or corrections and additions to the Italian vocabulary of La Crusca. But the work for which he is best known is his mock-heroic poem, 'La Secchia Rapita,' or the 'Rape of a Bucket.' He is considered as having first introduced this kind of composition in the Italian language, as he had finished, though not published in print, his poem years before his contemporary Bracciolini published, in 1618, his 'Scherno degli Dei,' in which he turns into ridicule the gods of the antient mythology. Tassoni's poem was published in a printed form in 1622, but MS. copies had been in circulation long before. The subject is taken from the annals of his country under the year 1249, when a war having broken out between the two neighbouring cities of Modena and Bologna, the Modenese carried off in triumph a wooden bucket from within one of the gates of Bologna, which bucket is still seen suspended by a chain in the cathedral of Modena. The 'Secchia Rapita' has been generally admired by Italian as well as foreign critics. Voltaire speaks of it disparagingly, although he has borrowed from it (Valéry, *Voyages Littéraires*), but Perrault and other French critics have done Tassoni full justice. The humour of the poem is peculiarly Italian, and the admixture of the serious and heroic with the burlesque is happily combined. Some of the descriptive passages are exquisitely soft and true to nature, such as the song in canto viii. which begins: 'Dormiva Endimion tra l'erbe e i fiori,' and the beautiful episode in canto x. of the voyage of Venus from the mouth of the Arno to Naples for the purpose of engaging Manfred, son of Frederic II., to assist the Guibelines of North Italy. The 'Secchia Rapita' has gone through numerous editions: that of Barotti, Modena, 1744, is most splendid. Gironi has collected various judgments and comments upon this poem in his biography of Tassoni. Muratori has also written the Life of Tassoni.

(Tiraboschi, *Storia della Letteratura Italiana*; Corniani, *Secoli della Letteratura Italiana*; Zeno, *Note al Fontanini*.)

TASTE. The organs of this special sense are certain parts within the cavity of the mouth, obviously so disposed as to take early cognizance of matters about to be swallowed, and to act as sentinels for the remainder of the alimentary canal, at the entrance of which they are situated. Their special endowment, aided by an exquisite development of common sensibility, enables them to give timely notice of any acrid, caustic, or nauseous quality, of any undue temperature, of any inconvenient hardness, irregularity, size, or sharpness in the material submitted to them, and thus to protect the stomach against the intrusion of many hurtful agents. These organs moreover establish for our appetites a scale of liking and disliking: they superadd a discriminative pleasure to the enforced assuaging of hunger: they modify that merely quantitative ingestion, which is an absolute and daily need of the organism, with a qualitative choice, and so give a motive to those variations in diet which experience proves to be beneficial or necessary.

Common language (as in the word 'palatable') seems to attribute the sense exclusively to a part, which is by no means the only or chief seat of it. In order to give a more correct notion of its extent, we shall first briefly sketch the arrangement of the membrane which lines the cavity of the mouth. It is a continuation (a tubular folding in, as it were, through the aperture of the lips) of the general integument, the skin; and although somewhat changed in its grosser characters, it yet preserves, under the name of mucous membrane, a close resemblance to the parent tissue. It lines the inside of the cheeks, invests the alveoli, or gums, giving to these parts their polished smoothness of surface, is reflected from the lower alveolar arches to the tongue, from the upper alveolar arches to the palate, and from both these organs prolonged backward into the throat. In its palatine portion, the membrane covers the horizontal processes of the upper jaw, which divide the cavity of the mouth from that of the nose, and, while spread on this solid frame-work, is said to belong to the hard palate; and it likewise extends backward, beyond the limits of this bony partition, to form a pendulous flap, called the soft palate; which, with the nipple-like uvula, that hangs from its extreme edge, may readily be seen when the mouth is opened. In extending to the tongue, the membrane is so arranged as to leave the tip and sides of that organ prominent and free; and is remarkably developed into a vast number of minute eminences called *papillæ*, which cover the borders and surface of the tongue, are largely supplied with nerves and blood-vessels, and variously concerned in the functions of the part. [Tongue; Palate.]

Very careful experiments on the sense of taste have been made by MM. Guyot and Admyrauld (*Mémoire sur le Siège du Goût chez l'Homme*, Paris, 1830), from which the following results are obtained:—A small portion of the soft palate, just above the base of the uvula, the remotest part of the back of the tongue, where it corresponds to the isthmus of the palate, and the entire circumference of the tongue, are so endowed; while the internal surface of the cheeks, the hard palate, the gum, the remaining parts of the soft palate and of the tongue are entirely destitute. Thus, those parts of the tongue with which, in sipping or in masticating, the food would have contact (its borders, and, most eminently, its tip), are gustative; and the property is shared, though in a less degree, by the lingual and palatine surfaces of the isthmus through which the food enters the sphere of involuntary actions.

The nerve, specially endowed with the sense of taste, is a branch of the third part of the fifth cerebral nerve, called, from its function, gustatory; but it seems possible to some physiologists that the glosso-pharyngeal nerve shares this property. The gustatory nerve is distributed to the papillary surface of the tongue, especially along its borders and tip: the lingual part of the glosso-pharyngeal nerve is restricted in its distribution to the posterior part of the tongue, where it supplies the mucous surface exclusively.

For the sensation of taste, moisture must be present; all are familiar with a temporary impairment of the sense, under the influence of unusual dryness of the surface of its organs; the parched tongue of fever is notoriously indifferent to all savours. Matters are only capable of being tasted when they exist in a fluid form: an insoluble body is insipid; a solid body provokes an immediate flow of saliva, and its sapid qualities are perceived in proportion only as it dissolves: certain gases are alleged to excite sensations of taste; but it is only by such as are soluble in the saliva (sulphurous acid, for instance), and only in proportion as they are dissolved that these impressions are produced.

'"The sensation of taste undoubtedly admits of an immense variety of modifications which no language can express. If a man were to examine five hundred different wines, he would hardly find two of them that had precisely the same taste: the same thing holds in cheese, and in many other things. Yet of five hundred different tastes in cheese or wine, we can hardly describe twenty, so as to give a distinct notion of them to one who had not tasted them."' The vague, or not-to-be-described, nature of gustatory impressions, as here expressed by Dr. Reid, receives some additional obscurity from the circumstance that taste and smell are often simultaneously affected in a manner which renders it difficult to abstract either. Various substances, after exciting the sense of touch on the fauces, and that of taste on the tongue, are capable of producing a third impression, which is popularly referred to the palate, but is really felt upon the sentient membrane of the nostrils: the fume of certain kinds of food ascends into the cavities of the nose, and produces this third and distinct sensation: in administering medicine to children, it is well known that the greater part of what is disagreeable in its flavour may be avoided by closing the nostrils when the draught is swallowed; and by repeating this experiment upon various articles of food, it is easy to ascertain how much of their flavour depends upon one sense, and how much is appreciated by the other.' Mr. Mayo, from whom this paragraph is quoted, goes on to classify the impressions produced by substances taken into the fauces:—

1. Where sensations of *touch* alone are produced, as by rock-crystal, sapphire, or ice.
2. Where, in addition to being felt upon the tongue, the substance excites *sensation in the nostrils*, as for instance tin and other odorous metals.
3. Where, besides being felt upon the tongue, it produces sensations of *taste*, as, for instance, sugar and salt.
4. Where the substance is felt on the tongue and tasted by it, and in addition excites a sense of flavour in the nostrils, as, for instance, bread, manna, and other substances. (*Outlines of Physiology*, p. 314.)

Flavour, then (in distinction from *taste*), can in correctness be attributed only to bodies possessed of some aroma or volatility; and, by alternately smelling and tasting such, and by contrasting their impression with that produced by a simply sapid substance (mustard and salt can illustrate the two cases), it will be noticed that flavour is but an odour, which, from its affecting a comparatively unpractised part of the olfactory apparatus, is at first imperfectly and obscurely recognised.

Such are the chief relations of the sense of taste in man, and in the animals which most nearly resemble him in structure. As the sense is a provision for the security of the digestive organs, we may on sound physiological grounds anticipate its existence, under a more or less modified form, in every animal possessing a digestive cavity. No special organ for its exercise (with very doubtful exceptions) can be traced in the invertebrata; nor can we presume to infer in them the presence of taste, otherwise than as an obscure sense determining their choice or rejection of food: to this extent it undoubtedly exists in them, even to the bottom of the scale—to the infusory animalcules, in which Ehrenberg has witnessed its exercise. Among the invertebrata, mollusks possess the most highly developed alimentary organs, and it seems probable that in them the guiding sense of those organs has a corresponding development.

Through the subregnum of vertebrata it acquires an advancing maturement: in the lower classes, fishes and reptiles, the organs are present, but seem rather to belong to the movements of prehension and of deglutition, than to the sense of taste: in birds too the organs are little developed, and the sense seemingly imperfect: through the class of mammalia it is gradually augmented in acuteness; but although in certain orders of them, or in particular individuals, the sense appears sharp and the appetite fastidious, it is probably in man alone that the organs and their function are completely matured.

TASTE, according to the definition of Sir Joshua Reynolds, 'is that act of the mind by which we like or dislike, whatever be the subject.' (*Discourses before the Royal Society*; Discourse vii.)

Taste is frequently spoken of as a gift, as something independent of rules, a kind of instinct, bestowed more liberally in degree upon some men than upon others. It has been treated by some writers as the result of caprice or fashion, as having no uniform or permanent principles for the ground of its decisions. Others have resolved it into different complex elements, whose joint development is determined by certain principles of beauty or sublimity in things external.

Lord Bacon has been quoted as apparently sanctioning the idea of taste being a kind of gift or instinct. 'A man cannot tell,' he says, 'whether Apelles or Albert Durer were more the trifler; whereof one would make a personage of geometrical proportions; the other by taking the best parts out of divers faces to make one excellent. The painter must do it by a kind of felicity, and not by rule. Sir Joshua Reynolds has overthrown this position in one sentence: 'Every object which pleases must give us pleasure upon some certain principles.' These principles are unquestionably so intelligible that they may be embodied in the form of words, and may be drawn out into rules. Burke, towards the end of his essay on Taste (introductory to the Sublime and Beautiful), has likewise adverted to this position, which will come under notice again in the course of this article.

The hypothesis which refers our emotion of taste to the influence of fashion, or temporary and varying causes, has been maintained in the *Inquiry into the Principles of Taste*, by Mr. Payne Knight. According to Mr. Knight, there is scarcely any subject upon which men differ more than concerning the objects of their pleasures and amusements; and this difference subsists not only among individuals, but among ages and nations; almost every generation accusing that which preceded it of bad taste in building, furniture, and dress; and almost every nation having its own peculiar modes and ideas of excellence in these matters, to which it pertinaciously adheres, until one particular people has acquired such an ascendency in power and reputation as to set what is called the fashion, when this fashion is indiscriminately adopted upon the blind principle of imitation, and without any consideration of the differences of climate, constitution, or habits of life, and every one who presumes to deviate from it is thought an odd mortal, a humorist void of all just feeling, taste, or elegance. The fashion continues in the full exercise of its tyranny for a few years or months, when another, perhaps still more whimsical and unmeaning, starts into being and deposes it; all are then instantly astonished that they could ever have been pleased even for a moment with anything so tasteless, barbarous, and absurd. The revolutions in dress only, not to mention those in building, furnishing, gardening, &c., which have taken place within the last two centuries afford ample illustration. . . . . 'Let no one imagine,' says Mr. Knight, 'that he solves the question by saying that there have been errors in taste, as there have been in religion and philosophy; for the cases are totally different: religion and philosophy being matter of belief, reason, and opinion; but taste being a matter of feeling, so that whatever was really and considerately thought to be ornamental must have been previously felt to be so; and though opinions may by argument or demonstration be proved to be wrong, how shall an individual pretend to prove the feelings of a whole age or nation wrong, when the only just criterion he can apply to ascertain the rectitude of his own is their congruity with those of the generality of his species.' (c. i., p. 1.)

This argument is founded on an exaggeration of a fact in reference to the philosophy of taste admitted by those who contend that taste is determined by some definite and invariable principles: the fact may be described under the general head of the influence of association on our emotions of this order. Mr. Dugald Stewart has observed on the exaggeration in question, that the association of ideas can never account for the origin of a new notion, or of a pleasure essentially different from all the others which we know. It may indeed enable us to conceive how a thing indifferent in itself may become a source of pleasure by being connected in the mind with something else which is naturally agreeable; but it presupposes in every instance the existence of those notions and those feelings which it is its province to combine: insomuch that it will be found wherever association produces a change in our judgments in matters of taste, it does so by coöperating with some natural principle of the mind, and implies the existence of certain original sources of pleasure and uneasiness. This suggests a distinction in the circumstances which please in the objects of taste, between those which please in consequence of casual associations and those which are fitted to please by nature. The perfection of taste in reference to the last depends upon the degree in which the mind is free from casual associations; in reference to the first it depends upon the facility with which such associations are formed. (*Elements of the Philosophy of the Human Mind*, c. v., p. ii., p. 364, 4to.)

The different modes in which association operates have been illustrated with much elegance, and their true place in the philosophy of taste distinguished, by Mr. Alison: 'Fashion,' he remarks, 'may be considered in general as the custom of the great. It is the dress, the furniture, the language, the manners of the great world, which constitute what is called the fashion in each of these articles, and which the rest of mankind are in such haste to adopt after their example. Whatever the real beauty or propriety of these articles may be, it is not in this light that we consider them. They are the signs of that elegance and taste and splendour which is so liberally attributed to elevated rank: they are associated with the consequence which such situations bestow; and they establish a kind of distinction between this envied station and those humble and mortifying conditions of life to which no man is willing to belong. It is in the light therefore of this connection only that we are disposed to consider them; and they accordingly affect us with the same emotion of delight which we receive from the consideration of taste or elegance in more permanent instances.' (*Essays on Taste*, Essay i.)

Association then can only modify, it cannot wholly account for our emotion of taste, and it cannot even modify except by operating in a manner which implies certain original sources of pleasure and uneasiness in the objects of our emotion. In some cases association heightens the agreeable or disagreeable effect of objects; in others all the delight or disgust which we experience can be resolved into the influence of association. The distinction implies the fact insisted on. What constitutes the distinction, or where are we to find its explanation? We may with propriety employ our reason in reducing particular phenomena to general principles; but we must in the end arrive at principles of which there is no other account to be given than that such is the will of the author of our nature. We cannot explain why such forms please or displease; we must stop short at the discovery of the respects in which they please or displease. (Stewart.)

Sir Joshua Reynolds has referred the idea of beauty to some 'central form' in the objects of our perception. 'All the objects which are exhibited to our view by nature, upon close examination, will be found,' he says, 'to have their blemishes and defects. The most beautiful forms have something about them like weakness, minuteness, or imperfection: but it is not every eye that perceives these blemishes; it must be an eye long used to the contemplation and comparison of these forms; and which, by a long habit of observing what any set of objects of the same kind have in common, has acquired the power of discerning what each wants in particular. This long laborious comparison should be the first study of the painter who aims at the greatest style. By this means he acquires a just idea of beautiful forms; he corrects nature by herself, her imperfect state by her more perfect. His eye being enabled to distinguish the accidental deficiencies, excrescences, and deformities of things from their general figures, he makes out an abstract idea of their forms more perfect than any one original; and, what may seem a paradox, he learns to design naturally by drawing his figures unlike to any one object. (*Discourse III.*) He observes in explanation in another part of the same discourse: 'To the principle I have laid down, that the idea of beauty in each species of beings is an invariable one, it may be objected, that in every particular species there are various central forms which are separate and distinct from each other, and yet are undeniably beautiful; that in the human figure, for instance, the beauty of Hercules is one; of the Gladiator another; of Apollo another; which makes so many different ideas of beauty. It is true indeed that these figures are each perfect in their kind, though of different characters and proportions; but still none of them is the representation of an individual, but of a class: and as there is one general form which, as I have said, belongs to the human kind at large, so in each of these classes there is one common idea and central form, which is the abstract of the various individual forms belonging to that class. Thus, though the forms of childhood and age differ exceedingly, there is a common form in childhood and a common form in age, which is the more perfect as it is more remote from all peculiarities. But . . . . though the most perfect forms of each of the general divisions of the human figure are ideal, and superior to any individual form of that class, yet the highest perfection of the human figure is not to be found in any one of them. It is not in the Hercules, nor in the Gladiator, nor in the Apollo, but in that form which is taken from all, and which partakes equally of the activity of the Gladiator, of the delicacy of the Apollo, and of the muscular strength of the Hercules. For perfect beauty in any species must combine all the characters which are beautiful in that species. It cannot consist in any one to the exclusion of the rest; no one therefore must be predominant, that no one may be deficient. . . . There is likewise a kind of symmetry or proportion which may properly be said to belong to deformity. A figure lean or corpulent, tall or short, though deviating from beauty, may still have a certain union of the various parts, which may contribute to make them on the whole not unpleasing.'

This theory (the principle of which extends to other objects of taste besides those contemplated by Sir Joshua Reynolds) reconciles the apparent inconsistency, insisted on by Mr. Payne Knight and by other writers of the same school, between the decisions of taste in one country and in another, as tending to show that the standard of taste is wholly arbitrary. The ideal beauty of the African is the result of the process which has been described applied to the coloured inhabitants of Africa, as the ideal beauty of the European is the result of the same process applied to the inhabitants of Europe. To institute a comparison between the beauty of the European and that of the African, and to conclude that taste has no invariable principles as its foundation, from the opposite decisions on such a comparison, involves the same description of error as it would be to arrive at the same conclusion from the opposite decisions in a comparison between the beauty of two distinct species of animals, the one biped and the other quadruped. There is a 'central form' of beauty proper to the different races of mankind; to the two sexes of the different races; to different ages; and so on in reference to inferior animals and objects of inanimate nature. We trespass beyond the province of mere taste when we compare objects in respect to which the principles of beauty are altogether distinct.

Much obscurity has arisen in discussions on the subject of taste from the twofold sense in which the word taste has been employed, as expressive of an emotion, and of something objective in which there exists an aptitude to produce emotion. The term taste strictly applies to the emotion only; the theory of the different causes by which the emotion is produced belongs to the subject of beauty. We have been obliged to refer to the theory of beauty in the preceding part of this article in establishing the reality of certain principles determining our emotions of taste: in what follows we shall confine ourselves to the explanation of taste in its restricted or proper sense.

When any object either of sublimity or beauty is presented to the mind, we are conscious of a train of thought being immediately awakened analogous to the character or expression of the original object. The landscapes of Claude, the music of Handel, the poetry of Milton, excite feeble emotions in our minds when our attention is confined to the qualities they present to our senses, or when it is to such qualities of their composition that we turn our regard. It is then only we feel the sublimity or beauty of their productions, when our imaginations are kindled by their power, when we lose ourselves amid the number of images that pass before our minds, or when we waken at last from the play of fancy as from the charm of a romantic dream. (Alison, c. i., sect. 1.)

The trains of thought which are thus suggested are distinguished in the nature of the ideas or conceptions which compose them, and in the nature or law of their succession. In the case of those trains of thought which are suggested by objects either of sublimity or beauty, they are in all cases composed of ideas capable of exciting some affection or emotion. Mr. Alison has supposed that not only the whole succession is accompanied with that peculiar emotion which we call the emotion of beauty or sublimity, but that every individual idea of such a succession is in itself productive of some simple emotion or other. But to this it has been objected, and we think truly, that such a train of images passing before the mind, and images accompanied with lively emotion, could scarcely fail to be remembered by us; or, at least, if they are not remembered by us, there is no reason, *à priori*, to suppose the existence of them. (Brown, *Lectures on the Philosophy of the Human Mind*, lecture lvii.)

There is this distinction between the emotions of taste and all our different emotions of simple pleasure, that in the case of these last emotions no additional train of thought is necessary. The pleasurable feeling follows immediately the presence of the object or quality, and has no dependence upon anything for its perfection but the sound state of the sense by which it is received. The emotions of envy, pity, benevolence, gratitude, utility, propriety, novelty, &c. might undoubtedly be felt, although we had no such power of mind as that by which we follow out a train of ideas, and certainly are felt in a thousand cases when this faculty is unemployed. In the case of the emotion of taste, on the other hand, it seems evident that this process of mind is necessary, and that unless it is produced these emotions are unfelt. Whatever may be the nature of that simple emotion which any object is fitted to excite, whether that of gaiety, tranquillity, melancholy, &c., if it produce not a train of kindred thought in our minds, we are conscious only of that simple emotion. Whenever, on the contrary, the train of thought which has been mentioned is produced, we are conscious of a higher and more pleasing emotion; and which, though it is impossible to describe in language, we yet distinguish by the name of the emotion of taste. The emotions of taste may therefore be considered as distinguished from the emotions of simple pleasure, by their being dependent upon the exercise of our imagination; and though founded in all cases upon simple emotion, as yet further requiring the employment of this faculty for their existence (*Essay* i., conclusion, s. ii., Alison); or, rather than the *employment* (a word which seems to intimate a deliberate intended act, in the process of imagination), as Dr. Brown would say, the operation of the common laws of suggestion in the mode to which we apply the word imagination.

The suggestion of trains of kindred or harmonising images which has been pointed out as distinguishing the emotion of taste, accounts for the more enlarged susceptibility in some than in others of this emotion. The more our ideas are increased or our conceptions extended upon any subject, the greater the number of associations we connect with it, the stronger is the emotion of sublimity or beauty we receive from it. 'What is it' (says Mr. Alison) 'that constitutes that emotion of sublime delight, which every man of common sensibility feels upon the first prospect of Rome? It is not the scene of destruction which is before him. It is not the Tiber, diminished in his imagination to a paltry stream, and stagnating amid the ruins of that magnificence which it once adorned. It is not the triumph of superstition over the wreck of human greatness, and its monuments erected upon the very spot where the first honours of humanity have been gained. It is antient Rome which fills his imagination. It is the country of Cæsar, and Cicero, and Virgil, which is before him. It is the mistress of the world which he sees, and who seems to him to rise again from her tomb, to give laws to the universe. All that the labours of his youth or the studies of his maturer age have acquired, with regard to the history of this great people, open at once before his imagination, and present him with a field of high and solemn imagery, which can never be exhausted.'

'The beauty of a theory or of a relic of antiquity is unintelligible to a peasant. The charms of the country are altogether lost upon a citizen who has passed his life in town.' It is on the principle in question that Burke remarks that the excellence and force of a composition must always be imperfectly estimated from its effect on the minds of any, except we know the temper and character of those minds. (*Introduction to the Sublime and Beautiful*.)

The rules by which taste is determined vary with the objects to which its decisions refer; but in respect to all, this general principle holds, that a composition is to be judged by its fitness to produce the end designed by it. If to please, to instruct, to move, to create laughter, be its design, its merits are to be determined by its aptitude to produce any of these effects. If its objects be to please, &c. only a particular people or class, it is to be estimated under the given circumstances. If its object be to give pleasure or instruction to all ages and conditions of society, it is to be estimated by its correspondence with those universal principles of human nature which it contemplates. That composition is the highest which is of the last description. (Hume's *Essay on the Standard of Taste*.)

The reader who may desire to see this subject further discussed is referred to the article BEAUTY; to Mr. Alison's *Essays*; to Brown's *Lectures on the Philosophy of the Human Mind*, lecture lvii.; Hume's *Essay on the Standard of Taste*.

TATARS. [TARTARS.]

TATE, NAHUM, was born in Dublin in the year 1652. His father was Dr. Faithful Tate, a clergyman in Ireland. He was educated at Trinity College, Dublin, whence he removed to London. On the death of Shadwell in 1690, the interest of Tate's friends procured him the situation of poet-laureate, which he held till his death. He seems to have been an improvident man, and somewhat addicted to intemperance. In the latter part of his life he resided in the precincts of the Mint, in Southwark, where he died, August 12, 1715. The Mint was then considered a privileged place, where debtors were not liable to arrest. This supposed privilege however was put down by statute 9 Geo. I.

Tate wrote 'Memorials for the Learned, collected out of eminent Authors in History,' 8vo., 1686; 'Characters of Virtue and Vice described and attempted in Verse, from a Treatise of Joseph Hall, Bishop of Exon,' Lond., 1691; 'Miscellanea Sacra, or Poems on Divine and Moral Subjects,' Lond., 1698, 8vo.; 'Panacea, a Poem on Tea, Lond., 1700; besides Birth-Day Odes, and an Elegy on the death of Queen Mary. He was also the author of about ten dramatic pieces, tragedy, comedy, and opera, including an alteration of Shakspere's 'Lear,' which kept the stage many years, but has for some time been superseded by the original.

Tate is chiefly known now by his metrical version of the Psalms, which he executed in conjunction with Dr. Nicholas Brady [BRADY], and which is now commonly annexed to the Book of Common Prayer of the Church of England. This version, though not of high merit, has deservedly taken the place of the former version by Sternhold and Hopkins. [STERNHOLD.] The first publication was an 'Essay of a New Version of the Psalms of David, consisting of the first Twenty, by N. Brady and N. Tate,' Lond., 1695, 8vo.; this was followed by 'A New Version of the Psalms of David, fitted to the Tunes used in the Churches, by N. Tate and N. Brady,' Lond., 1698, with a 'Supplement of Church Hymns,' Lond., 1700, 8vo.

(Baker's *Biographia Dramatica*, by Reed and Jones; Watt's *Bibliotheca Britannica.*)

TATIA'NUS, of Assyria, was a pupil of Justin Martyr, after whose death he wrote an apology for Christianity, under the title of 'A Discourse to the Heathen' (Λόγος πρὸς Ἕλληνας). In this work he gives some account of his own life. He was brought up in heathenism, the different forms of which became known to him by his many travels; and all those forms appeared to him unsatisfactory. He then turned his attention to the Old Testament, on which he thought he saw the impress of truth. Arriving at Rome, where he practised as a rhetorician, he met with Justin Martyr, by whom he was converted to Christianity.

After the death of Justin he embraced some heretical opinions, the germs of which may be seen in his 'Discourse to the Heathen.' The chief of his heresies were the Marcionite doctrines of the two principles of good and evil, and of the evil of matter [MARCIONITES], and the Valentinian doctrine concerning Aeons. His followers were however chiefly remarkable for the practical application they made of their Marcionite opinions by lives of the strictest asceticism. They lived in celibacy, refused all luxuries, and abstained from the use of wine even at the Lord's Supper. Hence they were called Encratites (ἐγκρατῖται), Apotactites (ἀποτάκτικοι), and Hydroparastatae (ὑδροπαραστάται). But it must be observed that these terms were often applied to all ascetics. The Tatianists were Encratites, but all called Encratites were not Tatianists. The date of Tatian's heresy is placed by Eusebius in the year A.D. 172.

Of his lost works the chief were a treatise on 'Perfection after the Pattern of the Saviour' (περὶ τοῦ κατὰ τὸν σωτῆρα καταρτισμοῦ), and a 'Harmony of the Four Gospels' (εὐαγγέλιον διὰ τεσσάρων). The latter work is particularly noticed by Theodoret, who found 200 copies of it in the Syrian churches, which he took away from the people on account of the heresies contained in the book. For this reason, chiefly, Neander supposes that the Harmony of Tatian was not simply compiled from the narratives of the four Evangelists, but contained also many things out of the Apocryphal Gospels. Some writers, among whom is Lardner, think that Tatian's 'Harmony' is still extant in an Arabic MS. in the Vatican Library.

His 'Apology' is usually printed with the works of Justin Martyr. There are separate editions of it by Gesner, Zürich, 1546, fol.; and by Worth, Oxon., 1700, 8vo.

(Eusebius, *Hist. Ecc.*, iv. 29; Hieronymus, *De Vir. Illust.*, c. 29; Clemens Alexand., *Strom.*, iii. 12; Lardner's *Credibility*, pt. ii., c. xiii., &c.; xxxvi., sec. 2; Neander's *Gesch. der Christ. Relig. und Kirche*, i., p. 782, and p. 1131.)

TA'TIUS, ACHILLES. [ACHILLES TATIUS.]

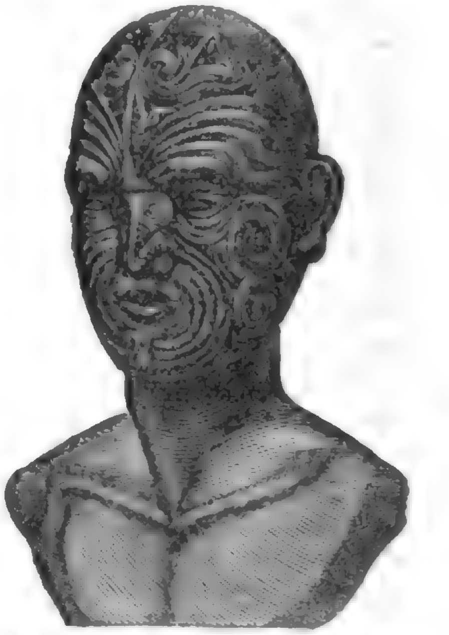
TA'TTA. [HINDUSTAN, xii., 221.]

TATTERSHALL. [LINCOLNSHIRE.]

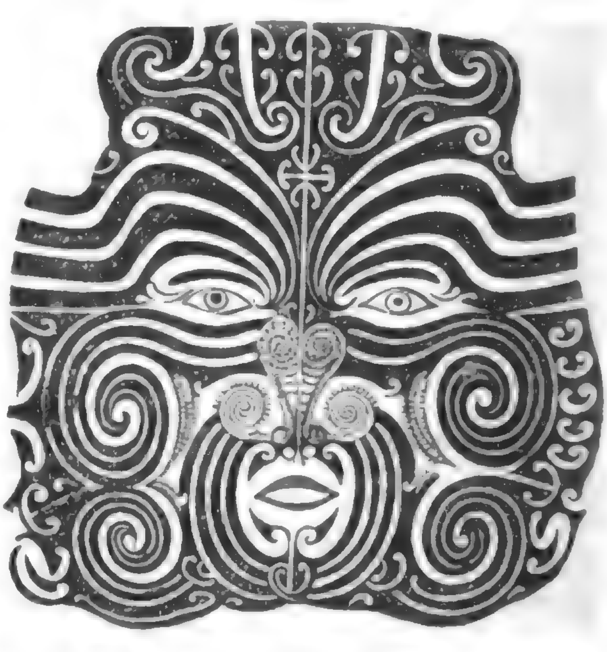
TATTOOING is the name usually given to the custom, common among many uncivilized tribes, of marking the skin by punctures or incisions, and introducing into them coloured fluids, so as to produce an indelible stain. It is mentioned in Captain Cook's account of the South Sea islanders under the name *tattowing;* and, with trifling difference in the orthography, the same name is applied by English writers to similar practices among other people. The word 'tattoo' appears to be formed by a reduplication of a Polynesian verb 'ta,' meaning to strike, and therefore to allude to the method of performing the operation, and, if this supposition be correct, it has a curious resemblance to the English word tattoo, meaning a particular beat of the drum.

From a passage in the book of *Leviticus*, chap. xix., v. 28, in which the Israelites are forbidden to make any cuttings in their flesh for the dead, or to *print any marks* upon their bodies, it has been supposed that some custom resembling tattooing was practised in the time of Moses. A note upon this passage in the 'Pictorial Bible' states, that although tattooing seems to have been commonly regarded in England rather as a custom of savage islanders than anything more, it is also an Oriental custom, and that too among people whose proximity to the Hebrews affords a reason for the prohibition contained in the text referred to. 'The Bedouin Arabs, and those inhabitants of towns who are in any way allied to them,' observes the author of this note, 'are scarcely less fond of such decorations than any islanders of the Pacific Ocean. This is particularly the case among the females, who, in general, have their legs and arms, their front from the neck to the waist, and even their chins, lips, and other prominent parts of the face marked with blue stains in the form of flowers, circles, bands, stars, and various fanciful figures. They have no figures of living objects, such being forbidden by their religion; neither do they associate any superstitions with them, so far as we are able to ascertain. They probably did both before the Mohammedan æra, as their descendants in the island of Malta do at present. The men there generally go about without their jackets, and with their sleeves tucked up above their elbows, and we scarcely recollect ever to have seen an arm, thus bare, which was not covered with religious emblems and figures of the Virgin, or of some saint under whose immediate protection the person thus marked conceived himself to be.' 'Thus also,' proceeds the author, 'persons who visit the holy sepulchre and other sacred places in Palestine have commonly a mark impressed on the arm in testimony of their meritorious pilgrimage.' The works of antient writers contain many notices of the practice of tattooing, as practised by several barbarous races. As to the Britons, Cæsar merely describes their custom of staining their bodies with vitrum, or woad; but 'Solinus represents the process as a laborious and painful one, but permanent in its effect; and speaks of the painting as consisting chiefly of the figures of animals, that grew with the growth of the body. Herodian says they punctured their bodies with the figures of all sorts of animals. Isidore is still more explicit; for, in speaking of the Picts, whose name he derives from their coloured skins, he tells us that the painting was done by squeezing out the juice of certain herbs upon the body, and puncturing the figures with a needle.' (*Pictorial History of England*, vol. i., p. 129.) Cæsar supposed that this practice was adopted for the purpose of terrifying their enemies; but probably this kind of skin-painting was the national dress, and if so, it may have existed in its highest state of perfection at a period anterior to the Roman invasion. Tattooing may also have been practised by our ancestors as a means of distinction, as well as from the love of ornament. Thus Herodotus, who describes the habits of the Thracians, says that to be tattooed or marked (ἐστίχθαι) was an emblem of rank, and the want of it indicated meanness of descent (v. 6). The extended use of clothing at a later period rendered such ornaments superfluous, and led to the decline and subsequent abandonment of the practice. 'It is therefore,' says the 'Pictorial History of England,' 'that we hear no more of this tattooing in the south (of Britain) after it was subdued and civilised into a Roman province, though it still continued among the rude tribes of the north, where it lingered until it was banished thence also by the full attire of civilization.' In a subsequent part of the same volume (p. 329) it is stated that the custom of tattooing, or puncturing the skin, was practised by the Anglo-Saxons as well as by the Britons, and that a law was passed against it in the year 785. It was nevertheless continued during the whole of the Anglo-Saxon period, and is among the English vices reprobated by William of Malmesbury after the Norman conquest. Several other antient notices on the subject are collected by Lafitau, in his 'Mœurs des Sauvages Amériquaines,' which work is cited in the volume on the 'New Zealanders' in the 'Library of Entertaining Knowledge,' where much information respecting tattooing is given.

In modern times the custom of tattooing has been found in most of the islands of the Pacific Ocean, and among many of the aboriginal tribes of Africa and America, as well as, on a limited scale, as before stated, in the East. Much curious information on the various kinds of tattooing is collected in the volume on the 'New Zealanders,' previously cited. From this work we condense the following account of the process of tattooing, as performed in New Zealand upon an English sailor, named John Rutherford, who was captured by the natives in 1816, and resided among them for nearly ten years, and upon some companions who were taken with him:—The natives having seated themselves on the ground in a ring, the Englishmen were placed in the middle, stripped of their clothes, laid down on their backs, and held by five or six men each, while two others commenced the operation of tattooing. Having taken a piece of charcoal, and rubbed it upon a stone with a little water, so as to produce a thick liquid, they dipped into it an instrument made of bone, with a sharp edge like a chisel, and shaped in the fashion of a garden-hoe. They then applied the instrument to the skin, and struck it twice or thrice with a piece of wood, thereby making it cut into the flesh as a knife would have done, and causing a great deal of blood to flow, which they kept wiping off with the side of the hand, in order to see whether the impression was made sufficiently clear. If not, they applied the cutting-instrument again to the same place. Various instruments were however employed in the course of the operation, one sort being made of a shark's tooth, and another having a serrated edge; and they were used of different sizes, to suit the different parts of the work. Rutherford states that the pain was most acute, and that, although the operators were very quick and dexterous, he was four hours under their hands; and he was completely blinded for a time by the operation. In three days the swelling occasioned by it had greatly subsided, and he began to recover his sight; but six weeks elapsed before he was completely well. Rutherford's account agrees with those of other observers, excepting in the circumstance of the whole operation being performed at once, while both Captain Cruise and Mr. Marsden state that it required several months, and sometimes several years, to complete the tattooing of a chief, owing to the necessity of allowing one part of the face or body to heal before commencing the decoration of another part; but, besides the probability that this might apply only to the more intricate patterns, or to cases in which the tattooing extended over a larger portion of the person than in the case of Rutherford, it is possible that the natives may have designed to put his powers of endurance to a severer test than would be required of a native. Captain Cruise states that the New Zealanders occasionally renew their tattooing, as the lines grow faint by lapse of time; and from various accounts it would appear that the tincture introduced into the wound (on the edge of the cutting-instrument) is sometimes obtained from the juice of a tree; and that, before the cutting is commenced, the intended figure is traced upon the skin with a burnt stick, or a piece of red earth. The age for performing the operation appears to vary from eight or ten years up to about twenty; and the females are not required to submit to anything beyond a slight tattooing of the face. Those among whom Rutherford lived had the inside of their lips tattooed,[*] as well as having marks on the chin, forehead, and sides of the nose and mouth; while the men were commonly tattooed on the face, hips, and body, and some as low as the knee. The most complicated patterns are found upon chiefs of the highest order; and their peculiar devices, or, as they are called, *amocos*, form distinctions which, in some cases, take the place of the sign-manual of the individuals to whom they belong. An instance is related in the 'Missionary Register' for 1816, in which a chief in the Bay of Islands, on making a grant or conveyance of a piece of land to some missionaries, had a drawing of the tattooing of his face affixed in lieu of a signature; while an attesting witness added, in like manner, a copy of the pattern on one of his cheeks. Of the character of these patterns a better idea will be conveyed by the annexed bust of Shungie, copied from an engraving in the 'Missionary Register' for 1816, than by the most lengthened description. After it is inserted a copy of a drawing, executed by Tupai Cupa, a New Zealand chief, without the aid of a glass, of his own amoco, or tattooed pattern. This interesting individual also drew from memory, while in England, the amocos of his brother and of his eldest son; and such was the force of association in his mind, that, on finishing the latter, he held it up, gazed at it with a murmur of affectionate delight, kissed it repeatedly, and finally burst into tears.



Head of Shungie, from a carving by himself.



Tattooing on the face of Tupai Cupa, from a drawing by himself.

The process of tattooing as practised, or rather as it was formerly practised, in other islands of the South Sea, was less painful than that followed in New Zealand; for, according to the account of Captain Cook, in some cases the punctures could hardly be said to draw blood. The instruments used were edged with small teeth, somewhat resembling those of a fine comb; and, as in the case of New Zealand, the colouring tincture was introduced at the same operation as that by which the skin was punctured; the substance employed in some places being a kind of lamp-black. On the brown skins of the natives, the marks made with this substance appear black; but on the skin of a European they are of a fine blue colour.[*] Lafitau speaks of powdered charcoal as the colouring-matter commonly used by the American Indians; and states that it was introduced by a process subsequent to that of cutting or puncturing the skin. This insertion of the colour appears to have been the most painful part of the operation of tattooing as practised among them.

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[*] According to the narrative of the voyage of H.M.S. Blonde to the Sandwich Islands, the ladies of Hawaii (the Owhyhee of Captain Cook) follow the singular practice of tattooing the tips of their tongues, in memory of their departed friends.

[*] Rutherford states that the tattooing on the inside of the lips of New Zealand women appears of a blue colour.

In addition to the other reasons which have been alluded to for the general adoption of the practice of tattooing among savage tribes, it is likely that it may be regarded as an important part of the initiation of a warrior, of whose passive courage it is a severe test. 'Thus,' observes the author of the 'New Zealanders,' 'in the account which Rochefort, in his 'History of the Antilles' (p. 108), gives of the initiation of a warrior among the people of those islands, it is stated that the father of the young man, after a very rude flagellation of his son, used to proceed to scarify (as he expresses it) his whole body with the tooth of the animal called the *acouti;* and then, in order to heal the gashes thus made, he rubbed into them an infusion of pimento, which occasioned an agonizing pain to the poor patient; but it was indispensable that he should endure the whole, adds our author, without the least contortion of countenance or other evidence of suffering.'

(*Pictorial Bible*, note on Levit. xix., 28; *Pictorial History of England*, vol. i., pp. 129 and 329; *New Zealanders*, 'Lib. of Ent. Knowledge,' chapters vi. and xiv.)

TAUBMANN, FRIEDRICH, was born at Wonsees, near Baireuth, on the 16th of May, 1565, where his father was a shoemaker. His father died very early; and his mother married a tailor, who wished to bring up his stepson Friedrich to his own business; but as the boy showed little inclination, he was sent, in 1577, to school at Culmbach, where he was obliged to gain his livelihood by singing and begging. In 1582 he went to the gymnasium of Heilbronn, where his Latin verses and the wit displayed in them were so much admired, that he was crowned by Paul Melissus as poet-laureate. Ten years later he went to the University of Wittenberg, where he distinguished himself, and, in 1595, was appointed professor of poetry and eloquence, to which afterwards the honour of court-poet was added. He died at Wittenberg, on the 24th of March, 1613.

Taubmann was conscientious in the discharge of his official duties, and he was a witty and humorous man. During his lifetime he had the reputation of being the greatest wit of the age, and persons of the highest rank sought his society. From all that can be learned about him, it is clear that he did not, like many others in similar positions, forget his own dignity as a man: he never acted as a buffoon or flatterer, but always manifested a straightforward and upright character. In his time philology was sinking very rapidly in Saxony, all attention being absorbed by theological controversies and sophistries, and Taubmann was one of the very few who, both in earnest and in jest, impressed upon his contemporaries the necessity of resuming a thorough study of the antient languages as the only means of raising theological studies to their proper position. This he did more especially in his work, 'Dissertatio de Lingua Latina,' the last edition of which appeared at Wittenberg, 1614. With the same view he exerted himself in his lectures, and in his editions of Plautus (Wittenberg, 1621, 4to.) and of Virgil (Wittenberg, 1618, 4to.), in which he made his countrymen acquainted with the labours of foreign scholars. His poetical works, though very popular in his time, have no great merit. They appeared in several collections, under the titles of 'Columbae Poeticae,' 'Melodaesia,' 'Schediasmata Poetica,' and others. After Taubmann's death, the name of Taubmanniana was applied to all kinds of witty sayings and anecdotes.

(Erasmi Schmidii *Oratio in Taubmanni Memoriam*, Wittenberg, 1613, 8vo.; *Taubmanniana, oder Fr. Taubmann's Leben, Anecdoten, witzige Einfälle und Sittensprüche*, von Simon von Cyrene, Leipzig, 1797, 8vo.; Fr. Brandt, *Leben und Tod Frid. Taubmanni*, Copenhagen, 1675, 8vo.: the best work however is by Ebert, *Leben und Verdienste Fr. Taubmanns*, Eisenberg, 1814, 8vo.)

TAULER, or THAULER, JOHANN, the most celebrated German divine of the fourteenth century. He was born in 1294, as some writers say, at Cologne, but according to others at Strassburg. Respecting his life very little is known. He entered the order of the Dominicans at an early age, and was held in the highest esteem on account of his knowledge of philosophy and mystic theology, as well as for his pious and unblemished conduct, although he fearlessly attacked the vices and follies of his fellow-monks. The latter part of his life he spent in the convent of the Dominicans at Strassburg, where he died on the 16th of June, 1361, as is attested by his tomb-stone, which still exists in that city.

Tauler was a man of extraordinary piety and devotion, a zealous teacher, and a great promoter of mystic theology in Germany, which must regard him not only as the founder of that school of divinity, but at the same time as one of the greatest men that have ever sprung from it. His sermons, as well as his other religious and ascetic works, show a glowing imagination and deep feeling: they are less addressed to the understanding than to the heart. But although this leaning and his love of the mysterious frequently led him to religious sentimentality and absurdities, yet he never sinks down to the level of some modern mystic divines. Tauler was deeply read in scholastic philosophy, and although in his sermons he endeavours to steer clear of it, yet they are not quite free from sophistic subtleties, and there are passages which must have puzzled more than enlightened his audience. In his love of truth, and the earnestness with which he devoted himself to the instruction of the people, he was a worthy predecessor of Luther. Tauler's influence upon the German language and literature has acquired for him as distinguished a place in the history of German literature as that which he occupies among divines. In his time German prose scarcely existed, and the standard of sermon-writing was very low. The creation of a prose literature belongs almost exclusively to him: his style seldom aims at oratorical beauty, his sentences are short and abrupt, but always full of meaning. His language, which is the dialect of the Upper Rhine, is as pure as can be expected. It appears that Tauler did not himself write his sermons, but they were taken down as they were preached, by many of his hearers. We must therefore suppose that in the editions which were published shortly after his death, the form has been somewhat altered by the editors. The first edition of his sermons appeared at Leipzig, 1498, in 4to., under the following title: 'Sermon des grossgelarten in gnaden erleuchteten Doctoris Johannis Tauleri predigerr ordens, weisende auff den nehesten waren wegk, yn geiste czu wandern durch uberschwebenden syn, unvoracht von geistes ynnige vorwandelt ĩ deutsch manchen menschen zu selikeit.' This edition was followed by another at Augsburg, 1508, fol., and a more complete one at Basel, 1521, fol. A translation of these sermons into the dialect of Lower Germany was published at Halberstadt, in 1523, fol., and another into High German by P. J. Spener, at Nürnberg, 1688, 4to. A new edition in modern High German was published at Frankfurt-on-the-Main, in 3 vols. 8vo., 1825, &c. The most interesting among his other religious works is that on the imitation of the life of Christ, 'Nachfolgung des armen Lebens Christi,' which was first printed at Frankfurt in 1621. The most recent edition is that by Schlosser, Frankf., 1833. A collection of all the treatises of Tauler was commenced in 1823, at Luzern, by N. Casseder, but only two volumes have appeared.

Most of the works of Tauler were translated into Latin by Laurentius Surius, Cologne, 1548, fol.: this collection has been reprinted at Macerata and Paris. There are also one Italian and three Dutch translations: the best of the Dutch translations is that of Antwerp, 1685, fol.

A list of the works of Tauler, together with the whole literature on the subject, is given in Jörden's *Lexicon Deutscher Dichter und Prosaisten*, vol. v., p. 1-9.

TAUNTON, an antient town in the south-western part of Somersetshire, situated in a fertile vale called Taunton Dean, and distant 141 miles from London, 44 from Bristol, and 33 from Exeter. Roman coins and other antiquities have been found, from which it has been inferred that there was a Roman station here. Taunton was certainly a place of considerable importance in the Anglo-Saxon period; and in the eighth century a castle was built here by Ina, king of the West Saxons, in which he held his first great council. The building was destroyed by his queen in expelling one of the kings of the South Saxons. Another castle was built after the Conquest by one of the bishops of Winchester, to whom the town and manor were granted; and the present remains are believed to be those of a still more recent edifice. Perkin Warbeck held possession of the castle and town for a short time; and in the civil wars the town sustained a long siege under Colonel (afterwards Admiral) Blake, against 10,000 royalist troops, until relieved by Fairfax.

The town is about a mile long; the principal streets are well paved, and lighted with gas; and the houses of brick, of respectable appearance. Apart from the main thoroughfares are some very poor streets, which, before the enlargement of the borough, were inhabited by persons desirous of profiting by the parliamentary franchise. The woollen manufacture was established at Taunton in the fourteenth century, but has long since decayed; and at present the silk manufacture is carried on, though not to any great extent. The river Tone flows on the north-western side of the town, and is crossed by a stone bridge of two arches; but the river is only partially navigable, and in 1811 a canal was projected between Taunton and Bridgewater, a distance of 12½ miles. This canal is of great importance to the prosperity of the town and district, by enabling it to export agricultural and other produce to Bristol and other places, from which it receives groceries, coal, and other commodities in return: there is a branch from this canal to Chard. In July, 1842, the railway from Bristol to Exeter was opened as far as Taunton, so that there is now a railway communication with the metropolis. The markets, held twice a week, are very abundantly supplied with fish, fruit, and every kind of provisions. The market-house stands in a spacious open area called the Parade, and is a brick building of considerable size; the upper part comprises the guildhall and an assembly-room, and the lower part consists of an arcade on each side, in one of which the corn-market is held. On market-days the Parade, which is enclosed by iron posts and chains, is occupied by butchers' stalls. On the west side of the Parade there is a handsome building of the Ionic order, erected in 1821, the upper part of which is appropriated as a library, museum, and reading-room; and underneath, and in the rear, are the markets for fish, poultry, dairy produce, &c. The Taunton and Somerset Institution, established in 1823, contains a good though not extensive library, and a large public reading and news room. The theatre is a small neat building. Two weekly newspapers are published at Taunton. There are three churches. The church of St. Mary Magdalen is a spacious and very handsome edifice in the florid Gothic style. The quadrangular tower at the west end, 153 feet high, is much enriched, and is a work of great beauty. The value of the living, which is a vicarage, is not given in the Reports of the Ecclesiastical Commissioners. St. James's church is a plain edifice, with an antient square tower formerly belonging to the conventual church of the priory. The living is a perpetual curacy, of the annual value of 255*l*. Trinity church was consecrated 18th June, 1842. It is in the Gothic style, built of white lias stone, with dressings of Bath stone, and contains sittings for above one thousand persons. It stands on elevated ground, about half a mile from the parish church, in a poor and populous part of the town. There are two chapels belonging to the Wesleyan Methodists, one erected in 1778 under the direction of Wesley. The Roman Catholics, Independents, Baptists, Quakers, and Unitarians have chapels. The free grammar-school was founded by Fox, bishop of Winchester, in 1522. The premises are situated within the castle-gate, and consist of a large and antient school-room, and under the same roof is the dwelling-house of the master. The endowment is worth about 36*l*. a year. The number of infant, Sunday, and daily schools at Taunton was stated in 1833 to be very inadequate, and a large number of poor children were at that time receiving no education. There are various almshouses and other charities, all of which are noticed in the Report of the Charity Commissioners (vol. v., p. 484-542). The Taunton and Somerset hospital was opened in 1812; and there are other medical charities.

Charles I. granted the burgesses a charter of incorporation. In the reign of Charles II. they were deprived of this charter, in consequence of the town having displayed so much zeal for the parliament, but it was restored, and in 1792 became forfeited by the corporate body having neglected to fill up vacancies. The town then came under the jurisdiction of the county magistrates, and is still without a municipal government. The bailiffs and constables, as the principal officers of the town, take a prominent part in all public proceedings. Taunton has returned members to parliament since 1295 (23 Henry I.). Before the Reform Act the right of election was in the potwallers who had been six months resident and were not in the receipt of charitable relief. The town having outgrown the antient limits of the borough, which was wholly within the parish of St. Mary Magdalen, a new boundary was adopted, so as to comprise parts of the following parishes:—St. Mary Magdalen on the east, St. James's on the north, Bishop's Hull on the west, and Wilton on the south. By this extension the population of the borough was increased from 5580 to 12,148, according to the census of 1831. In 1826 the number of electors polled was 739; in 1840 the number on the register amounted to 1010, including 216 of the old potwallers. Two members are returned to parliament. The Lent assizes and the Michaelmas quarter-sessions are held at Taunton. There is a court for debts under forty shillings, the jurisdiction of which extends over the hundred. There is no prison, except a lock-up or place of temporary confinement. The county courts and offices are within an irregular quadrangle consisting of the remains of the castle.

(Toulmin's *Hist. of Taunton*, 1791; a new edition by Savage, 1822.)

TAUNUS. [GERMANY.]

TAURELLIUS, L. [TORELLI.]

TAU'RICA CHERSONE'SUS was the antient name of the peninsula which juts out southwards from European Sarmatia, between the Pontus Euxinus (Black Sea) and the Palus Maeotis (Sea of Azof): it is now called the Crimea. It is called Chersonesus Trachea by Herodotus, who compares it to the promontory of Sunium (iv. 99). Its form, size, and physical features are described under CRIMEA. The isthmus which connects it with the mainland was called Taphros or Taphrae (Τάφρος, Τάφραι), and there appears to have been a town of the same name upon the isthmus.* (Strabo, vii., p. 308; Pliny, iv. 26; Mela, ii. 1.) On the west of this isthmus was the Sinus Carcinites (Κόλπος ὁ Καρκινίτης), now the Gulf of Perekop; and on the east the shallow waters then, as now, called the Putrid Sea or Lake (ἡ Σαπρὰ Λίμνη, Palus Putris). The south-western point of the peninsula was the promontory Parthenion (τὸ Παρθένιον), which is either the modern Cape Chersonese, or another promontory farther south, in the neighbourhood of the town of Sviatoi Gheorghi. The southern promontory was called Criu-Metopon (Κριοῦ μέτωπον), and either the south-eastern or the eastern point of the island was called Corax (τὸ Κόραξ ἄκρον). On the east the peninsula is divided from the coast of Asia by the Cimmerian Bosporus (ὁ Κιμμέριος Βόσπορος), now the Strait of Kertch or Yenikale. On the south-western side of the peninsula is a small peninsula terminated by Cape Khersonese, and enclosed on the north by the Gulf of Achtiar, the antient Portus Ktenus (Κτενοῦς), and on the south by the Gulf of Balaklava, the antient Portus Symbolorum (Συμβόλων λιμήν). On this peninsula, at the distance of 100 stadia from the promontory Parthenion (Strabo), stood the city of Chersonesus Χεῤῥόνησος) or Cherrone (Mela), the full name of which was Chersonesus Heracleotica. It was a colony of Heraclea in Pontus. The peninsula itself was called the Small Chersonesus, and the Chersonesus Taurica was sometimes called the Great Chersonesus, to distinguish it from this part of itself. The other important towns were, on the isthmus, Taphros (ἡ Τάφρος), now Perekop; on the west coast Eupatoria (Εὐπατορία), now Eupatoria or Kazlov, built by Mithridates Eupator; on the east coast Theodosia (ἡ Θεοδοσία, or ἡ Θευδοσία), now Kefa or Feodosia, a colony of the Milesians; at the eastern end of the island, on the Bosporus, Panticapaeum or Bosporus (Παντικάπαιον), now Kertch. There were several towns in the interior, of which the only one worth mentioning is Cimmerion, now Eski-Krim, that is, Old Krim.

The earliest inhabitants of the peninsula appear to have been the Cimmerians, some of whom remained in it after the great body of the nation had been driven from their seats round the Palus Maeotis by the Scythians. (Herod., iv. 1, 11, 12.) Clear traces of this people remain in the names of Cimmerion, the Cimmerian Bosporus, the Cimmerian Chersonesus (as the peninsula was sometimes called), and in its modern names of Crimea and Crim-Tartary. In the earliest notices of the Chersonesus, by Greek writers, we find the mountainous region of the south and south-east inhabited by a piratical people, called the Tauri, from whom the Chersonesus was called Taurica, and whose name remains in that of the modern Russian province of Taurida, in which the Crimea is included. Who these Tauri were is a question of some difficulty. Strabo (p. 308) calls them a Scythian people, but Herodotus (iv. 99) clearly distinguishes the Tauri from the Scythians, as being a different nation. The inhabitants of the whole or a part of the peninsula are not unfrequently called Scythotauri or Tauroscythae. Judging from this mixed name, from the testimony of Herodotus to the two facts that the Tauri were a different people from the Scythians, and that the Scythians did not drive out all the Cimmerians from the peninsula, and, lastly, from several analogous cases,* it seems most probable that the Tauri were a remnant of the old Cimmerian inhabitants, who had maintained themselves in the mountains against the Scythian invaders. The name 'Tauri' is supposed to be derived from an old root 'Tau,' meaning a mountain. The Tauri were reputed by the Greeks to be inhospitable and cruel to strangers: they were said to offer human sacrifices, especially of shipwrecked mariners, to a virgin goddess, whom, according to Herodotus, the Tauri themselves identified with Iphigeneia, the daughter of Agamemnon, and whose temple stood on the promontory of Parthenion. (Herodot., iv. 103; Strabo, p. 308; Mela, ii. 1; Diod. Sic., iv. 44.) This legend enters into the composition of the 'Iphigeneia in Tauris' of Euripides, and is several times referred to by the Roman poets.

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* This name was probably derived from a ditch which in very antient times ran across the isthmus, and which appears to have been fortified ever since. This ditch must not be confounded with that mentioned by Herodotus (iv. 3[illegible]), which appears to have been in the peninsula itself, and at the eastern part of it. (Niebuhr's *Vermischte Schriften*, i., p. 157; Bähr's note on the passage in Herodotus, iv. 3.)

From about the sixth century before Christ downwards, several Greek colonies were planted on the Chersonese, and these were gradually formed into two states, that of Chersonesus, comprehending the smaller peninsula on the south-west, and the kingdom of Bosporus on the south-east. These two states were united under Mithridates. [BOSPORUS.]

Further information respecting the geography and history of the peninsula and of the adjoining delta of the Kuban is given under CRIMEA and TAMAN.

TAURI'DA, one of the governments of South Russia, sometimes called the government of Simferopol, situated on the Black Sea, consists of—1st, the Crimea or Tauric Peninsula; 2nd, the Nogay Steppe, with the island of Taman [TAMAN]; 3rd, the country of the Tschernomorsk Cossacks. It is bounded on the north-west by Kherson, on the north-east by the country of the Don Cossacks, on the east by Caucasia, on the south-east by the Kuban, and on the south by the Black Sea. The Crimea and all its principal towns are described under the respective heads. [BAKTSCHISARAI; CRIMEA; KAFFA; SEBASTOPOL; SIMFEROPOL.] The area of the whole is 35,000 square miles, with 520,000 inhabitants of many different nations, Tartars, Cossacks, Russians, Jews, Gypsies, Germans, and other foreign colonists, &c. It lies between 44° 30′ and 47° 50′ N. lat., and between 31° 25′ and 40° 25′ E. long. The Nogay Steppe includes the whole of the extensive country from the Dnieper and its limans to the Buda. It is a dry elevated steppe on a basis of granite. The country has precisely the character of a Russian steppe: the soil is dry, poor, in part sandy, and saltish, without wood; but there are here and there extensive hollows with rich black mould, which produce the finest grass. The climate is extremely mild, and differs little from that of the peninsula. The winter, though short, is severe. The only rivers are those which form the boundaries: the Dnieper on the north-west, the Konski Wodi on the north, and the Buda on the east. On the south-east is the Sea of Azof, and on the west the Black Sea.

The land of the Tschernomorsk Cossacks including the island or peninsula of Taman, is bounded on the north by the country of the Don Cossacks, on the east by Caucasia, on the south by the river Kuban, and on the west by the Sea of Azof, and is separated from the Crimea only by the strait of Yenikale, which connects the Sea of Azof with the Euxine. The coast is sandy, flat, and forms some considerable bays or inlets, called by the Russians limans, the most considerable of which is the Besugakoi, nearly in the middle of the country. It is an immense plain, with a few hills in the south, belonging to the Caucasian system, consisting in general of very fertile lowlands, which are well adapted for agriculture, but are for the most part used as pasture for cattle: the remainder consists of a poor saline soil; and there are some small lakes with salt water: the climate is very mild. The principal rivers are the Kuban, on the south, which separates it from Circassia, and discharges itself on the south of Taman by a very broad liman, and the Iega, on the north frontier next the country of the Don Cossacks, which is joined by several small streams, and empties itself by a considerable liman into the Sea of Azof. The small streams in the interior fall into the Sea of Azof, one of which, the Besuga, forms at its mouth the liman Besugakoi.

The countries forming the government of Taurida were inhabited in antient times by the Scythians and by Greek colonists. Since the time of Herodotus, in the fifth century B.C., they have been successively conquered and ravaged by many different nations. They have been subject to the kings of the Bosporus, the Romans, the Sarmatians, then to the Greek emperors, and at the end of the twelfth century partly to the Genoese; they were conquered in the thirteenth century by the Tartars, and at the end of the fifteenth by the Turks. Mohammed II. made himself master of Taurida in 1475, and expelled the Genoese and the Venetians, the former of whom possessed Kaffa and Kherson, and the latter had the colony of Tana. Subsequently to 1698 the Russian armies repeatedly penetrated into the Crimea, the inhabitants of which often made predatory incursions into the neighbouring countries. It was not however till 1771 that the country was really conquered by Dolgorucky, and the Porte compelled, in 1774, at the peace of Kutschuk-Kainardji, to recognise the Crimea as an independent country, to be governed by a khan chosen by the nation, and to recognise the sultan as their head in religious matters only. The khan Sahen Ghierai, whose election had been supported by the Russians, being pressed by the Turkish party, was at length induced to seek refuge in St. Petersburg. Russia now declared the Crimea to be her property, and the Porte, to avoid a new war, ceded it wholly to Russia, in January, 1784. The khan received a pension from Russia, and in the sequel retired to Turkey, but in 1787 was beheaded in the Isle of Rhodes by the sultan's order. Sultan Kalli Ghierai is his lineal descendant, who lives (or at least did live some years ago) in Simferopol, is a Christian, and is married to a Scotchwoman. The Crimea and the provinces dependent on it were formed into a government in 1784, by the name of Taurida, and incorporated with the Russian empire. The empress Catherine II. added to the imperial titles that of Czar of the Tauric Chersonese, and conferred on Prince Potemkin, who had been instrumental in bringing about, not without violence, the submission of the Tartar inhabitants, the surname of the Taurian. The Porte indeed appointed a new khan in 1786, and demanded that the Crimea should be replaced on the footing stipulated in the last peace; but it was obliged to cede it for ever to Russia in the peace of 1792. Taurida was at first a province of the government of Ekaterinoslav; in 1797 it was incorporated with the government of New Russia; and in 1802 it was made a distinct government by the emperor Alexander.

Among the numerous authorities that might be quoted, besides those already cited under the heads of the CRIMEA, ODESSA, &c., we may mention Muraview Apostol, *Reise durch Taurien*, 1820; Eichwald, *Alte Geographie des Kaspischen Meeres des Kaukasus, und des südlichen Russlands*, 1838; and for the Nogay Tartars, Daniel Schlatter, of St. Gallen, *Bruckstücke aus eigenen Reisen nach dem südlichen Russland in den Jahren* 1822-1828.

TAURINE, a peculiar crystallizable substance contained in the bile. Its properties are, that it has the form of a six-sided prism terminated by pyramids of four or six faces; the crystals are gritty between the teeth, and have a sharpish taste, which is neither sweet nor saline; they undergo no alteration by exposure to the air even at 212°, and have neither an acid nor an alkaline reaction. When heated in the naked fire, this substance becomes brown, fuses into a thick liquid, swells up, exhales a sweetish empyreumatic odour resembling that of burning indigo, and leaves a charcoal, which is readily burnt; when submitted to dry distillation, it yields much thick brown oil, and a little yellow acidulous water, which holds an ammoniacal salt in solution, and reddens a solution of perchloride of iron; one part requires 15½ parts of water at 54° for solution; it is much more soluble in boiling water, and the excess crystallizes on cooling; it is but little soluble even in boiling alcohol of sp. gr. 0·835, and is nearly insoluble in absolute alcohol. Concentrated sulphuric acid dissolves and forms a light brown solution with taurine; nitric acid readily dissolves it, and when the acid is evaporated, it is left unaltered.

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* For example, in our own island the very same thing has happened to a people whom some think (on account of their name) to be a branch of this very Cimmerian family, the Cymry, who, in the mountains of Wales, successfully resisted the Saxon and Norman invaders.

TAURIS. [TABRIZ.]

TAUROME'NIUM, now TAORMI'NA, a town in the northern part of the east coast of Sicily. The antient name, Tauromenium (Ταυρομένιον), like that of the river Tauromenius (the modern Alcantara), at the mouth of which the town was situated, was derived from Mount Taurus, on which the town was built. Diodorus Siculus gives two apparently contradictory accounts of its foundation, though both agree in the main point, that Tauromenium was founded by the inhabitants of the antient town of Naxos, which lay a few miles south of Tauromenium. In one passage (xiv. 59) he states that during the war of Dionysius the Tyrant with Himilco, the latter induced the Siculi, who had previously received from Dionysius the town of Naxos and its territory, to occupy Mount Taurus, and to fortify themselves there; and after the termination of the war in favour of the Carthaginians, the Siculi, about 392 B.C., formed a permanent settlement on Mount Taurus, which they called Tauromenium. The other account (Diodor. Sic., xvi. 7) places the building of the town somewhat later, inasmuch as it states that it was founded by Andromachus, the father of Timaeus the historian, in conjunction with the inhabitants of the destroyed town of Naxos; but in this account Andromachus himself is called a Tauromenian, which implies the previous existence of Tauromenium. Consequently Diodorus can only have meant to say that Andromachus assigned to the homeless Naxians habitations in the already existing town of Tauromenium, and that he agreed with them in the name of Tauromenium being preserved. (Wesseling ad Diodor. Sic., vol. vi., p. 552, ed. Bipont.) Strabo (vi., p. 27, ed. Tauchnitz) calls Tauromenium a colony of the Zanclæans of Hybla. Soon after its foundation the new town appears to have become very wealthy and powerful. Agathocles, the tyrant of Syracuse, put to death a great number of the inhabitants who had opposed his usurpation. (Diodor. Sic., xix. 102.) In the time of Pyrrhus the town was governed by a tyrant, Tyndarion, who supported the king on his landing in Sicily. After the subjugation of Sicily by the Romans, Tauromenium became a 'civitas foederata;' and being thus under the immediate protection of Rome, it enjoyed a long peace, during which its prosperity increased. (Cicero, *In Verrem*, ii., 66.) In the time of Verres the town contained many statues of this propraetor, all of which, after his departure, were destroyed, except the pedestal of one which stood in the market-place, which was left standing to mark the disgrace of the Roman governor. In the war of Cæsar with Pompey, Tauromenium was in the possession of the Pompeian party; but when Cæsar made himself master of it, he expelled the inhabitants, and established a Roman colony there. (Appian, *De Bello Civili*, v. 103, 105, 109; Pliny, *Hist. Nat.*, iii. 14; Velleius Paterc., ii., 79.)

Taormina at present contains about 6000 inhabitants: its situation on a steep rock on the sea-coast is magnificent. It contains considerable ruins of antient buildings, especially a theatre of gigantic dimensions, the seats of which are cut in the rock, which projects into the sea. This theatre and the aqueduct, or, as it is generally called, a naumachia, of which there are remains, were not constructed till the time of the empire. On the hills which rise above Taormina there are ruins of several castles, and among them one is very remarkable, which is called Mola, and was built in the ninth century of our æra by the Saracens, who took the town by storm after a long and brave resistance by the inhabitants.

The principal deity worshipped by the antient Tauromenians was Apollo, which confirms the statement that the town was a settlement of the Naxians, among whom Apollo was the national divinity. An Apollo, with a wreath of laurel round his head, occurs on many coins found at Tauromenium, with the inscription ΑΡΧΑΓΕΤΑ, or ΑΡΧΑΓΕΤΑΣ; and the reverse shows a tripod, which probably indicates that Naxos was founded under the sanction of the Delphic god. Other coins show the head of Dionysius or of Athena. There is one coin, one side of which represents a head of Jupiter, and the other an eagle with the thunderbolts. The name of the town is expressed on the coins by Ταυρο, Ταυρομ, Ταυρομενι, or Ταυρομενιταν. (Eckhel, *Doctrina Num.*, i., part i., p. 247, &c.; Mionnet, i., p. 324, &c.; *Supplem.*, i., p. 448, &c.)

TAURUS, MOUNT (ὁ Ταῦρος), in the opinion of the later Greek geographers, was a great chain of mountains which extended nearly due east and west from the shores of the Ægean to those of the supposed Eastern Ocean, and divided Asia into two parts, Asia within the Taurus (ἐντὸς τοῦ Ταύρου), and Asia without the Taurus (ἐκτὸς τοῦ Ταύρου). Their notions respecting this chain were by no means accurate, and indeed only a small part of it ever really bore the name.

The chain of Taurus, properly so called, commences at the south-western point of Asia Minor, and proceeding eastward parallel and near to the Mediterranean, it encloses between itself and the coast the narrow strip of land which formed Pamphylia and Cilicia. At the river Pyramus the chain divides into two, that of Amanus, which proceeds to the east, dividing Syria from Asia Minor [AMANUS], and the continuation of Taurus, which runs north-east, along the south-east side of Cappadocia, across the Euphrates into the northern part of Armenia, where it joins Mount Masius. This chain now bears the name of Enamas, Ramadan, and Gourin.

In Cappadocia the Taurus throws off a great branch which was called the Anti-Taurus (ὁ 'Αντίταυρος), and which passes through the middle of Cappadocia, north-east to the sources of the Halys, and thence east to the Euphrates. Its modern name is Alidagh. At Sebaste (Siwas) this chain joins that of the Paryadres (Chisheshi), which extends north-east as far as the mountains of Ararat. In modern geography the whole chain from the south-west of Asia Minor to Ararat bears the name of Taurus. The name itself is probably merely a form of a root which occurs in several Oriental languages, meaning mountain.

(Rennell's *Geography of Herodotus*, i. 228, &c.; Schirlitz's *Alte Geographie*.) [ANATOLIA.]

TAURUS (the Bull), the second constellation of the ZODIAC. Its position in the heavens, surrounded by Aries, Eridanus, Orion, and Perseus, is easily obtained by the manner in which its bright star ALDEBARAN is connected with the belt of Orion. In all speculations upon the origin of the zodiac, Taurus must be an important object of consideration, since, at the earliest date which prudent speculation can consider it advisable to begin from, Aldebaran must have been at no great distance from the vernal equinox. Referring this point however to the article on the zodiac, we shall merely notice that the Greeks, as usual, attribute but a paltry mythological origin to this striking constellation; the fables of Europa and Io being the only ones alluded to in statements of its mythological meaning.

The figure is only a part of a bull, the head, shoulders, and fore legs. Aldebaran and the Hyades form the forehead and eye, and the Pleiades are in the shoulder. But Aratus must have drawn the figure differently, for he puts the Pleiades in the knees.

The Hyades form a group, of which five (some of the antients said seven) are distinctly visible to the naked eye, α, θ, γ, δ, and ε of the constellation: there are many more in the cluster. These stars are arranged in the form of a V, α and ε being the extremes, and γ at the angular point. The star α is Aldebaran. The name seems to be derived from ὕειν, to rain. The Latins called them *suculæ* (little pigs, no doubt meaning Aldebaran for the sow, and the others for her offspring), a name which Cicero and others state to have arisen from supposing the Greek word to have been from ὗες (pigs), and not from ὕειν. We think however it may be possible that they were right in their idea of the Greek word: the large star and the cluster of small ones might very easily suggest the notion of a sow and her litter.

The Pleiades are so close a group of stars that it is very difficult to say how many are seen by the naked eye. 'They are called seven,' says Higinus, 'but no one can see more than six:' and six seems to be the number generally visible, though there are many more in the cluster. These stars are 17, 19, 20, 23, 25, and 26 of Flamsteed. There is accordingly a supposition that some one star, once visible, has now changed its magnitude, or disappeared altogether. The name has been derived from πλεῖν, to sail. One of the mythological stories makes these stars the daughters of *Pleione* and Atlas.

The principal stars of Taurus are as follows: (*g*), (*b*), (*m*), (*e*), (*c*), (*d*), (*f*), (*h*) are not Bayer's letters, but Flamsteed's, by which he distinguished stars in the Pleiades.

Character. ( ) not in Bayer.	No. in Catalogue of		Magnitude.	Character. ( ) not in Bayer.	No. in Catalogue of		Magnitude.	Character. ( ) not in Bayer.	No. in Catalogue of		Magnitude.
	Flamsteed. (Piazzi.) [Bradley.]	Astron. Society.			Flamsteed. (Piazzi.) [Bradley.]	Astron. Society.			Flamsteed. (Piazzi.) [Bradley.]	Astron. Society.	
ο	1	372	4	δ^2	64	492	4		121	671	6
ξ	2*	375	4	κ^1	65	496	5		122	683	7
s	4	378	6	*r*	66	494	5	ζ	123	684	3
f	5	379	5	κ^2	67	498	5		125	688	5½
t	6	381	6	δ^3	68	499	4½		126	696	6
	7	383	6	υ^1	69	502	5	(M)	128	703	6
	9†	387	6		70	501	7		129	704	6
(E)	10	388	4½		71	503	7	(N)	130	706	6
	11	392	6	υ^2	72	505	6	(O)	131	707	6
	12	395	6	π	73	504	5	(B)	132	709	5½
(F^1)	13	398	6	ε	74	507	3½		133	708	6
(F^2)	14	401	6		75	508	7	(P)	134	716	6
(*g*)	16	402	7		76	509	7		135	719	6
(*b*)	17	403	5	θ^1	77	510	5	(C)	136	722	5
(*m*)	18	404	7	θ^2	78	511	5	(D)	137	723	5
(*e*)	19	405	5	*b*	79	512	5		139	737	6
(*c*)	20	409	6		80	515	7	(Q^2)	141	745	6
(*d*)	23	410	5		81	517	7		(6)	463	7
η	25	414	3		83	518	7		(32)	359	5½
(*f*)	27	418	6		84	519	7		(37)	624	7
(*h*)	28	419	7½		85	520	7		(43)	627	7
u^1	29	412	6	ρ	86	523	5		(45)	481	6½
e	30	417	5	α	87	528	1		(53)	486	7
u^2	31	427	6	*d*	88	529	5		(60)	374	7
	32	435	6		89	531	7		(69)	497	6½
	33	436	7	c^1	90	533	5		(99)	516	5½
	34	442	7	σ^1	91	536	6		(103)	390	7
λ	35	443	4	σ^2	92	537	6		(111)	522	7
	36	447	7	c^2	93	540	6		(125)	666	6½
A^1	37	448	5	τ	94	543	5		(145)	678	7
ν	38	416	4		95	544	6½		(148)	541	6½
A^2	39	449	6	(K)	96	555	6		(151)	413	7
	41	451	6	*i*	97	559	6		(166)	422	7
ψ	42	453	5	*k*	98	575	6		(169)	547	6
ω^1	43	457	6		101	581	6		(170)	423	6½
p	44	459	6		102	585	4		(179)	550	6
	45	461	7	*m*	104	592	6		(187)	429	7
	46	465	7		105	595	6		(215)	441	6½
	47	466	5½	l^1	106	593	6		(236)	717	7
	48	468	7	l^2	107	602	8		(242)	720	7
μ	49	469	5½		108	615	7		(243)	572	6½
ω^2	50	471	6	*n*	109	623	6		(244)	721	7
	51	473	7		110	638	7	(I)	(246)	573	6½
φ	52	477	5		111	640	6½		(249)	454	6
	53	475	7	β	112‡	642	2		(254)	458	6½
γ	54	478	3		113	649	6		(257)	578	7
	56	476	7	*o*	114	652	5		(282)	587	7
h	57	479	6½		115	651	6		(295)	594	6
	58	480	7		116	654	6½		(298)	596	7
χ	59	484	5		117	655	7		(338)	759	6½
[illegible]	60	487	7		118	657	6		[522]	416	7
δ^1	61	488	4		119	663	6		[774]	656	7
	62	491	7		120	667	7		[823]	701	7
	63	490	6								

TAURUS PONIATOWSKI, a constellation formed by the Abbé Poczobut, a Polish astronomer (born in 1728: we do not know the year of his death; but Lalande mentions his having resumed his observations at Wilna in 1802), in honour of the reigning king of Poland, and adopted in the French (Fortin's) edition of Flamsteed's maps (or rather added to the plates). Poczobut, in 1778, proposed this constellation to the French and other academies, by whom it was received. Bode conjectures that a resemblance of certain very small stars in it to the figure of the Hyades was the reason for the first word of the name. It is situated between Aquila and Ophiuchus, and the Astronomical Society's Catalogue mentions one star of it, of the sixth magnitude, being 2070 of that catalogue, and (328) of Piazzi.

TAUSAN, TAUSSEN, or TAGESEN, JOHN, the first Danish theologian who made his countrymen acquainted with the principles of the Lutheran reformation. He was born in 1494, at Birkinde, a village in the island of Fünen. After he had received his early education in the convent of Antworskow, he wished to continue his studies at some university, and the abbot of the convent fixed upon Cologne. Here he became accidentally acquainted with some of the earliest works of Luther, which excited in him such a desire to study under the reformer, that he defied the opposition of his superiors, and went to Wittenberg. After having spent some time here he went to Rostock, where he took his degree of M.A., and thence proceeded to Copenhagen, to undertake the office of teacher in one of the public schools, 1521. This sphere of action however did not satisfy him: his wish was to proclaim the new doctrines, which he thought he could do more effectually if he withdrew to his former convent of Antworskow. Here he gained great reputation as a preacher, and at first endeavoured privately to make his brother monks acquainted with the reformed doctrines; but in 1524, on the occasion of the abbot being absent, Tausan delivered a sermon, which produced such an effect on his hearers, that most of the monks declared themselves ready to abandon their old belief. The excitement and disturbance arising from such proceedings led to Tausan being transferred to another convent at Wiborg, where however he persevered in his exertions, and again gained a considerable number of followers. King Frederic I. of Denmark, who was favourably disposed towards the doctrines of the German reformers, and wished to favour Tausan, sent him, in 1526, a letter of protection, gave him the title of court preacher, and assigned to him a church at Wiborg, where he might preach without molestation. The bishop of this place opposed him in everything; but his attempts were fruitless, as Tausan was supported by the sympathy of the people. The disputes between the two religious parties now became more vehement every day; and at last the king, in order to save Tausan, invited him, in 1529, to Copenhagen, where he was appointed preacher to the church of St. Nicolas. The reformation in Denmark, the seeds of which had thus been sown, made gradual and steady progress; and in order to settle the question permanently, the king issued a command that deputies of the Roman Catholics and Protestants should appear on the 8th of September, 1530, before the assembly of the states, and explain their creeds and points of dispute. Tausan and the principal men of his party were present, and it was finally settled that the Protestants should preach and propagate their doctrines. The tranquillity thus restored was interrupted by the king's death in 1533, when the Roman Catholic party, and more especially the bishop of Roeskilde, again began to trouble Tausan, who was on the point of being driven out of his country. For a time he absented himself from Copenhagen; but Protestantism in the meanwhile made such progress, that the opposition to it in a short time either ceased or became very weak. In 1537, in which year John Bugenhagen was sent by Luther to Denmark to assist in arranging the ecclesiastical affairs of the country, Tausan was appointed preacher and lecturer on theology at Roeskilde; and four years later he was made bishop of Ripen, an office which he held until his death, on the 9th of November, 1561.

Tausan wrote a considerable number of theological works in Danish: some of them are controversial, others exegetical, and a third class consists of translations of portions of the Scripture and of original hymns. His works, as well as the history of his life, show that he was a simple and straightforward man; but in talent he was far inferior to the great reformers who were his contemporaries.

(L. Holberg, *Dännemarckische, Norwegische Staats-*

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[*] 3 Tauri of Flamsteed has its only existence in a mistaken entry; and 8, 15, 82, 100, and 138 the same.

[†] 'Sir W. Herschel says this star is lost; and M. Lalande says that it is not to be found. It is however still in its place. Probably it is a variable star.' Baily.

[‡] The same as 23 Aurigæ (γ).

und Reichs-Historie, p. 128, &c.; compare Jöcher, *Allgem. Gelehrten-Lexic.*, iv., p. 1030, &c.)

TAUTOCHRON. [TIME OF DESCENT.]

TAUTOLITE, a mineral which occurs crytallized. Primary form a right rhombic prism. Fracture conchoidal, uneven. Hardness 6·5 to 7. Very brittle. Colour velvet black; streak grey. Lustre vitreous. Opaque. Specific gravity 3·865.

Before the blow-pipe on charcoal, melts into a blackish scoria, which is attracted by the magnet: with borax it forms a clear green glass.

It does not appear to have been accurately analyzed, but is stated to be probably silicate of protoxide of iron, and silicate of magnesia. It is found in the volcanic rocks of the Lake of Laach, near Bonn, on the Rhine.

TAVERNIER, JEAN BAPTISTE, BARON D'AUBONNE, the son of an Antwerp engraver who had settled at Paris and dealt in maps, was born in 1605. He was a traveller from his boyhood. The sight of the maps with which he was surrounded and the conversation of the geographers who frequented his father's shop inspired him with a passion for seeing foreign countries, which he soon contrived to gratify, it does not very clearly appear by what means or in what capacity.

Between 1620 and the close of 1630 he visited most of the countries of Europe: this may be considered as his apprenticeship to the profession of a traveller. Between 1630 and 1669 he made six journeys to the East: this was the portion of his life devoted to productive toil. The story of the remainder of his life, from 1670 to 1680, impresses us with the idea of an elastic and untired spirit, which, stimulated in part by his dilapidated fortune, but still more by an incapacity of repose, sunk in an attempt to re-enter that world of active exertion in which his place had been occupied by younger men. To appreciate Tavernier, it is necessary to examine his character as it displayed itself in each of these three periods.

He appears to have left his paternal home before he had completed his fifteenth year; for he tells us that after visiting England, Antwerp, Amsterdam, Frankfort-on-the-Main, Augsburg, and Nürnberg, he was induced, by what he heard at the last-mentioned place of the mustering of armies in Bohemia, to repair to the theatre of war. About a day's journey from Nürnberg, he met Colonel Brener, son of the governor of Vienna, who took him into his service. Tavernier was present at the battle of Prague, 8th November, 1620. Some years later, he followed his master to Vienna, and was presented by him to his uncle, the governor of Raab, at that time viceroy of Hungary, who received the young Frenchman into his family in the capacity of a page. With this nobleman Tavernier remained four years and a half, and ultimately obtained his dismissal with a view to entering the service of the Prince of Mantua. Something appears to have made him change this determination, for after a brief stay in Mantua he left it, about Christmas, 1629; and after making a short tour in Italy, and visiting his friends at Paris, returned to Germany. During the summer of 1629 he made an excursion into Poland; on his return from which he attached himself for a short time to the family of Colonel Butler, 'who afterwards killed Wallenstein.' Hearing a report that the son of the emperor Ferdinand II. (afterwards emperor himself, with the title Ferdinand III.) was to be crowned king of the Romans in Regensburg, Tavernier who had been present at that prince's election as king of Hungary (1625) and his coronation as king of Bohemia (1627), wished to be present at this third solemnity also, and with this view threw up his appointment (whatever it was) in Butler's household.

Tavernier has nowhere explicitly stated what were his rank and occupations while he led this unsettled life. No expression escapes him to intimate that he at any time found himself at a loss for money. The appointment of page in the family of a nobleman holding the high office of viceroy of Hungary was generally the first step to the command of a troop. Yet there is a vagueness in the language of Tavernier while speaking of this part of his history, which leads us to suspect that his station was more of a menial character. His lively and enterprising disposition seems however to have made him a general favourite, and his power of expressing himself—not very elegantly, if we are to judge from his French, yet intelligibly—in several European languages, rendered him an eligible attendant. His position was most probably that of one of the ready-handed, quick-witted, not over-scrupulous attendants, with whom men of high rank in that age found it necessary to surround themselves. From hints dropped in different parts of his travels, it is highly probable that he had picked up some money in the wars; he had acquired some knowledge of the military art; he knew something of watch-making and jewellery; and, above all, he had learned to shift for himself. Beyond such a general acquaintance with maps and geography as he had picked up in his father's shop, he possessed no literary or scientific attainments; and his tastes and habits were those of the young rufflers of his age. A naturally frank and kindly though somewhat boisterous temper had done much to neutralize the worst impressions of the lax school in which he had been educated.

After such preliminary training, and with a character thus far developed, Tavernier commenced his travels in the East. He had already been turning his eyes in that direction, and making interest to be received into the suite of a new ambassador the emperor was about to despatch to the grand seignior, when the confidential agent of Richelieu, Father Joseph, who had known him at Paris, proposed that he should accompany two young French noblemen who were travelling to Palestine by the way of Constantinople. Tavernier closed with the offer, and in company with his employers reached that city during the winter of 1630-31. A recent biographer has stated that he began his first journey in 1636: the origin of the mistake is as apparent as that it is a mistake. Tavernier says 'after the ceremony of the coronation was finished,' and Ferdinand III. was not crowned king of the Romans till December, 1636. Tavernier gives no dates in the account of his first journey; but we know that he embarked at Marseille for his second in September, 1638; and we also know that he arrived at Rome on his return from his first voyage on the day of Easter. He was detained eleven months at Constantinople waiting for a caravan, and seven weeks by a severe attack of sickness at Aleppo: so, if we assume he set out from Regensburg in December, 1636, we have only three months left for the overland journey from Regensburg to Dresden, Vienna, Constantinople, Erzroum, Tabriz, Ispahan, Bagdad, Aleppo, and Scanderoon, and the voyage from Scanderoon to Rome. It is impossible that Tavernier's first journey could have been subsequent to Ferdinand's coronation as king of the Romans. But a strong effort was made by that prince's father to have him crowned at the close of the diet held at Regensburg in 1630; and Tavernier, writing from memory forty years later, may have imagined that the festivities he witnessed at that time were in honour of a coronation which was expected to take place, but did not. Two passages in his Travels seem to place it beyond a doubt that the visit to Regensburg which led to his first journey took place in 1630. In his first volume (p. 689 of the Paris edition of 1676) the expression occurs—'in 1632 on the road from Ispahan to Bagdat.' He only travelled that road once, and that was on his return from his first expedition into Persia. It would be unsafe to rely upon the evidence of a figure in a book not very correctly printed; but in the account of his first journey to Ispahan he mentions having seen at Tocat the vizir, who was executed a few days later, after being obliged to raise the siege of Bagdad. This can only refer to Khosrew pasha, executed there about the end of April, 1632.

This date being ascertained, the chronology of the ensuing forty years of Tavernier's life may be gleaned from his travels with tolerable accuracy. He began his first journey to the East from Regensburg, in December, 1630; penetrated by way of Constantinople and Tabriz to Ispahan, and returned by Bagdad and Aleppo to Europe early in the summer of 1633. From this date till the commencement of his second voyage his history would be a complete blank, had he not told in a parenthesis that he was appointed comptroller in the household of the duc d'Orléans, who gave him leave of absence during his journeys to the East. On the 13th of September, 1638, he embarked at Marseille in a Dutch vessel, and landing at Scanderoon, proceeded by way of Aleppo and the Great Desert west of the Euphrates to Basra. There he embarked in a vessel sailing to Ormuz, and landing at Bushire, proceeded through Shiraz to Ispahan. After some stay in that capital, he travelled by Shiraz and Lars to

Gombroon, where he embarked for Surat. He visited Agra on this occasion; but here again we are at a loss for dates to enable us to trace his routes. We only know that he passed through Burhampore on his return from Agra to Surat in 1641; that he visited Goa and returned to Surat by land about the end of that year; and that he was at Ahmedabad, either going to or returning from Agra, in 1642. That he had revisited Ispahan in the interval is not improbable, since he says that 'for six journeys which I have made between Paris and Ispahan, I have made twice as many from Ispahan to Agra and other parts of the Great Mogul's dominions.' He was at Ispahan towards the close of the year 1642; and probably soon after returned to France. On his third voyage he took with him the brother already alluded to, and left Paris on the 6th of December, 1643. This time, after visiting Ispahan as usual, he embarked at Gombroon for India. In January, 1645, he left Surat on an excursion to the diamond-mines near Golconda. In January, 1648, he made a voyage by sea to Goa; and in April of the same year he embarked at Mingvela for Batavia; whence he returned to Europe in the Dutch fleet in 1649. Tavernier's fourth journey occupied him from the 18th of June, 1651, when he set out from Paris, till 1655. On this occasion he proceeded from Persia to Masulipatan, in May, 1652; he revisited the diamond-mines near Golconda in 1653, and in 1654 he travelled from Ormuz to Kerman, and after spending three months there, took the route of Yezd to Ispahan, and returned to Europe by Smyrna. His fifth journey was begun in February, 1656. He was at Agra in 1659, but we are at a loss for other dates in this journey. The sixth and last expedition that Tavernier made to the East was begun in November, 1663, and was terminated in 1669. The most important novelty of this journey was his tour through the province of Bengal as far as Dacca, which occupied him from November, 1665, till July or August, 1666. He was at Ispahan in July, 1667, and on his return to Europe visited Constantinople for the second time.

The very unsatisfactory arrangement adopted in the narrative of Tavernier's journeys has rendered it advisable to extract from it the preceding incomplete chronology of them. His first publication was an account of the interior of the seraglio at Constantinople (*Nouvelle Relation de l'Intérieur du Serrail*), published at Paris, in a thin 4to volume, in 1675. This was followed by an account of his travels (*Six Voyages en Turquie, en Perse, et aux Indes*), also at Paris, in two quarto volumes, in 1676. A third volume was added in 1679, containing an account of Japan and the origin of the persecution of the Christians in these islands; an account of the proceedings of the deputies from the king and the French company of the Indies both in Persia and India; observations on the commerce of the East Indies; account of the kingdom of Tunquin; account of the conduct of the Dutch in Asia. In preparing the account of the Seraglio and the two first volumes of his Travels, Tavernier employed Chappuzeau, a dull and unintelligent writer: the memoirs contained in the third volume were prepared by Lachapelle, secretary to the president Lamaignon. The account of the seraglio, and the contents of the third volume of the travels, are partly memoirs compiled from the information of others, and partly more full expositions of topics touched upon in his narrative. It is to the first two volumes of Tavernier's travels that we must look for such information of the countries he visited, the time he spent in them, and the adventures he encountered, as is necessary to enable us to determine what he witnessed himself, what he learned from the report of others, how far his informants were worthy of belief, and how far he was qualified to understand their communications. But the arrangement of these two volumes is the very worst that could be conceived for supplying satisfactory information upon these heads. The first volume professes to give an account of the various routes by which the Parisian traveller can reach Constantinople, Ispahan, and the Persian Gulf. It is arranged as a *routier*; the result of all Tavernier's observations upon each line of road is given at once, and it is only from incidental remarks that we learn when and in what direction he travelled it. His remarks upon the customs, government, and commerce of the different countries are thrown into intercalary chapters. A similar arrangement is adopted in his second volume, which contains the fruits of his observations in the south of India, in the region between Surat and Delhi, in Bengal, and in the Dutch possessions in the Eastern Archipelago. The work is neither a systematic account of the geography and statistics of the countries in which Tavernier travelled, nor is it a personal narrative of the traveller. It is an ill-digested and unsatisfactory attempt to combine both.

Yet are the four volumes we have mentioned full of available matter, both for the historian and the geographer. The former will find in it the fruits of the forty years' experience and observation of a European merchant in Turkey, Persia, India, and the Indian Archipelago, in the seventeenth century. Tavernier did not possess either the intellect or the education of Thévénot and Bernier, but his opportunities of observation were more varied and protracted. He was a part of that commercial enterprise and rivalry of which they were only spectators. He is himself a specimen of the kind of adventurers who at that time managed the commerce of Europe with the East. His unconscious revelations of his own character may be relied upon, and the naïveté with which they are made encourages us to believe what he tells us of others. His statements have not passed unchallenged: they wounded the national pride of the Dutch too sore to be left without a reply, and the partisan feelings of the Protestant literati of Europe induced them to embrace the cause of Holland, in opposition to the *protégé* of Louis XIV. Even the Catholic literati took little interest in a writer who frankly confessed that he saw nothing interesting or valuable in the plain of Troy or the ruins of Persepolis. And yet notwithstanding the violent attacks of the Dutch and Calvinist writers, the silence of others, and even of himself (for Tavernier did not engage in a controversy), not one material assertion he made has been disproved. Unfriendly criticism has been confined to the remark that many of his statements regarding the Dutch are trivial, and betray a littleness of mind: this may be, but they are not the less characteristic for that reason. Tavernier's accounts of the principal objects of Oriental commerce in his day, of the leading markets and routes of trade, of the money of the different countries, and the state of the exchanges, are more full and intelligible than those we find in any other cotemporary writer. His success in trade affords a guarantee of the correctness of the opinions he states. We have collated his routes, whenever this was possible, with those of recent travellers, and have found them in general so accurate, that they may be relied upon for the purposes of comparative geography, and in one or two instances as affording information regarding tracts which have not been visited since his time. Tavernier's notices of the route from Casvin to India by Candahar, and of the provinces to the north of Erivan, leave a favourable impression of his talent for extracting information from the native authorities. He has been accused of plagiarism, principally because of the striking coincidence between his account of the Guebres of Kerman, published in 1676, and that which Louis Moreri published in 1671 from the papers of Father Gabriel de Chinon. It deserves to be noticed that Moreri's publication is lucidly arranged and neatly expressed, while the account contained in Tavernier's travels is confused and miserable in point of diction. Had it been taken from Moreri, it is scarcely possible that the latter could have been so wretchedly composed. Add to this that the information found in the papers of Father Gabriel is not said to have been the fruit of personal observation; that Tavernier resided three months among the Guebres at Kirman, and had frequent dealings with them in India and elsewhere; that he and Father Gabriel repeatedly met in Persia; and it must be allowed that the priest is quite as likely to have derived his information from the merchant as otherwise. In judging of the statements made by Tavernier, the school in which he was trained, and his personal character as it appears from his own story, must always be kept in view. He had no knowledge of or taste for science and literature, for art, or antiquarian research. He acted upon impulse, and his instincts were love of travelling, and desire to acquire money for the sake of spending it in feasting and personal display. A diamond was a more interesting object to him than the mysterious remains of Tchelminar. He had no very nice or refined sense of honour, but he was frank and veracious, and little inclined to deck himself with stolen feathers of literature; possibly because he could not appreciate their value.

In this review we have been obliged to anticipate that part of the history of the third period of Tavernier's life, which relates to what may be called his literary labours. We are thus enabled to abridge the sequel of our narrative. On Tavernier's return from his sixth journey he was presented with *lettres de noblesse*, by Louis XIV., and purchased about the same time the barony of Aubonne in the Pais de Vaud. When his travels were published, they were, as has been intimated above, fiercely attacked; in particular, most virulently by Jurieu, in his 'Esprit de M. Arnauld' (December, 1684); more temperately and with a greater parade of evidence by Henrick van Quellenburgh, in 'Vindiciæ Batavicæ' (Amsterdam, 1684). Tavernier made no reply. Bayle has given a characteristic account of his conduct relative to the publication of Jurieu, which was rather a libel than a criticism. 'He made a noise in the taverns and streets, he threatened and even named the day and hour when he would apply to the Walloon consistory of Rotterdam to demand execution of the canonical laws against the minister who had dishonoured him: but his threatenings came to nothing, he retired very peaceably, and never commenced any persecution at all.' The misconduct of a nephew, to whom he had intrusted the management of his affairs in the Levant, obliged him to sell, some time previous to 1688, his hotel in Paris and his estate of Aubonne. He retired first into Switzerland, and subsequently to Berlin, where he was nominated by the elector of Brandenburg director of a projected East India Company. From the time of his first journey he had regretted being prevented from carrying into execution a design which he then entertained of returning from Persia through the Russian dominions. His new appointment afforded him an excuse and opportunity for making that journey, and he set out to travel to the East Indies across Russia in 1688. He was taken ill at Moscow, and died there in the month of July, 1689. The equivocal conclusion of Boileau's inscription on Tavernier's portrait contains a fair enough estimate of his character:—

> 'En tous lieux sa vertu fut son plus sûr appui;
> Et bien qu'en nos climats de retour aujourd'hui
> En foule à nos yeux il présente
> Les plus rares trésors que le soleil enfante;
> Il n'a rien rapporté de si rare que lui.'

(*Les six Voyages de Jean Baptiste Tavernier, Ecuyer Baron d'Aubonne, en Turquie, en Perse, et aux Indes*, à Paris, 1676-9, 4to.; *L'Esprit de M. Arnauld, tiré des écrits de lui et de ses disciples*,' Deventer, 1684, 12mo.; Henrick van Quellenburgh's *Vindiciæ Batavicæ, ofte Refutatie van het Tractaet van J. B. Tavernier, Chevalier, Baron d'Aubonne*, Amsterdam, 1684, 4to.; Bayle, *v.* 'Tavernier;' *Biographie Universelle*, *v.* 'Tavernier, Jean Baptiste,' par Weiss.)

TAVISTOCK, a parliamentary borough and market-town, on the south-western border of Devonshire, 207 miles from London, 34 from Exeter, and 11 from Plymouth. The parish extends between the western extremity of Dartmoor and the river Tamar, and, according to a survey made in 1781, comprises 13,987 acres, or nearly 22 square miles; but it is probable that this survey included lands within the boundary of the borough which are not in the parish: in the census of 1831 the area of the parish is stated to be 11,660 acres. The surface of the parish is diversified by hills from 300 to 600 feet in height, which rise in continued succession and are separated by valleys often deep and narrow, the general direction of which is from north-east to south-west. The higher ground towards Dartmoor is of granitic formation, and the neighbourhood of the town consists of schistose rock. The town is situated nearly in the centre of the parish, on the north-west bank of the Tavy, which here flows rapidly through a narrow valley, from which the ground rises steeply on both sides to the height of several hundred feet. The river is crossed by two bridges within the town. A narrow valley, or gully, from the north, is also covered by houses. The climate is variable, and the average quantity of rain falling in the year is 45 inches.

In 961 an abbey was founded at Tavistock, which was burnt by the Danes, and afterwards rebuilt on a larger scale. Henry I. (1100-1135) granted to the abbot a weekly market and a fair. In 1513 the thirty-fifth abbot was called to the House of Peers, but in 1539 his successor surrendered to the king, when the revenue of the abbey was estimated at 902*l.* A printing-press was established in the abbey soon after the introduction of the art into England. Fragments of the abbey still remain, but are chiefly incorporated with other buildings; and the refectory is used as an assembly-room. John, Lord Russell, ancestor of the Duke of Bedford, obtained a grant of the abbey lands. An antient lazar-house once stood on the site of the workhouse. The parish church is a spacious edifice, with a tower at the west end supported on arches. The interior consists of four aisles and a chancel, and contains some good monuments. The living is a vicarage, valued at 302*l.* per annum. The Independents, Unitarians, Quakers, and Wesleyan Methodists have places of worship. The date of the foundation of the grammar-school is not known, but in 1649 Sir John Glanville left an endowment for the education of one boy, which yields about 4*l.* per annum; and the Duke of Bedford, in whom the school-estate is vested, allows the master the use of a house rent-free besides other advantages, and 20*l.* a-year for the education of eight boys. There is a Lancasterian school chiefly supported by subscription, which in 1833 was attended by 135 boys and 88 girls. At the same period seventeen other schools were attended by 203 boys and 224 girls; and there were five Sunday-schools, in which 381 boys and 333 girls were instructed. There are two almshouses, one for four poor widows, who each receive 2*l.* a-year; and another for fifteen persons, nominated by the Duke of Bedford, who receive 3*l.* a-year each. A sum of 15*l.* is applicable to the apprenticing of poor children.

Tavistock returned two members to parliament previous to the passing of the Reform Act, a privilege which it had enjoyed since 1295 (23 Hen. I.). The right of election was in the resident freeholders. The Tavy formed the boundary of the borough on one side, and on the other its limits were defined by an artificial line. Under the Reform Act the borough was made co-extensive with the limits of the parish, the manor of Cudliptown excepted, and it still returns two members. The number of voters on the register, in 1840, was 347. Tavistock is not incorporated. The portreeve, who is elected annually at the court-leet of the lord of the manor, is the chief public officer, and makes the return of the elections. Tavistock is one of the polling-places for the county.

The parish registers of Tavistock from 1617 to 1836 have been made the subject of a more careful and elaborate examination than those of any other place in England. This task was undertaken by Dr. Barham, and the results are given in a series of tables which are printed in part ix. of the 'Tables' published by the Board of Trade; and an abstract of them is given in vol. iv., part 1, of the 'Journal of the London Statistical Society.' The population of the parish, in 1781, was 3117; in 1811, 4723; in 1821, 5483; in 1831, 5602. The increase between 1811 and 1821 is attributed to the extension of mining operations in the neighbourhood. There are some small manufacturing establishments. Tavistock is one of the four stannary towns in the county. In 1817 a canal was opened, which, after a course of 5 miles, 2 of which are under a tunnel, enters the Tamar at Morwell Ham quay. The head of the canal is connected with the quay by an inclined plane 240 feet high. This canal connects Tavistock with Plymouth. Sir Francis Drake was a native of Tavistock.

TAWI-TAWI. [SOOLOO ARCHIPELAGO.]

TAX, TAXATION. A tax is a portion of the produce and labour of a country placed at the disposal of the government.

Taxation is the general charging and levying of particular taxes by the government upon the community.

OBJECTS OF TAXATION.

In a free state it is assumed that all taxation is necessary for the public good; if it is not necessary, the reason for it no longer exists. The amount of expenditure will in a great measure be determined by the magnitude of a state and by the number and importance of its political relations; yet the prudence with which its affairs are administered will affect the demands of the government upon the people, nearly as much as its necessities. The expenses of a private person must be regulated by his income; but in a state, the expenditure that is needed is the measure of the public income that must be obtained to meet it. A civilized community requires not only protection from foreign enemies and the means of internal security, but it needs various institutions of civil government conducive to its welfare, and which its wealth enables it to maintain without an injurious pressure upon its resources. It is the business of a government to provide these, when proved to be necessary, in the best manner and at the least expense consistent with their efficiency.

The able and laborious committee of the House of Commons upon public income and expenditure in 1828 'unequivocally declared their full assent to the principle, that no government is justified in taking even the smallest sum of money from the people, unless a case can be clearly established to show that it will be productive of some essential advantage to them, and of one that cannot be obtained by a smaller sacrifice.' The committee truly added to the statement of this just principle, that 'nothing requires more wisdom and prudence than to fix the public expenditure at such an amount that the real wants of the people shall not be made to give way to any imaginary wants of the state: the latter arise from so many sources, that it is frequently very difficult to prevent the operation of an undue influence.' (*Second Report*, p. 4.) One of the first duties of representatives of the people is to watch with jealousy the expenditure of the public money. Every tax should be viewed as the purchase-money paid for equivalent advantages given in return. This principle assumes the necessity of moderation in levying taxes, and will scarcely be denied by any one when stated in that form; yet it is not uncommon to hear it argued that so long as taxes are *spent in the country*, the amount is not of consequence, as the money is returned through various channels to the people from whom it was derived. The principle we have just laid down at once exposes the fallacy of this doctrine, by reducing it to a simple question between debtor and creditor. For example, by paying a million of money every year, the people obtain the services of an army: this we will suppose to be an equivalent, and we will further assume that the food and clothing of the force are purchased, and that the entire pay of the men is spent, within the country. The whole of the money will thus be returned: but how? Not as a free gift, not as the repayment of a loan, but in the purchase of articles equal in value to the whole sum. The only benefit obtained by this return of the million is clearly nothing more than the ordinary profits of trade; for the community has already provided the money, and then out of its own capital and industry it produces what is equal to it in value, and this it *sells* to the state, receiving as payment the very sum it and itself contributed as a tax.

In whatever manner taxes may be expended, they must be regarded as injurious to the community. 'Every new tax,' says Mr. Ricardo, 'becomes a new charge on production, and raises the natural price. A portion of the labour of the country which was before at the disposal of the contributor to the tax is placed at the disposal of the state, and cannot therefore be employed productively.' (*Political Economy*, chap. xii., p. 206.)

General Principles of Taxation.

Having settled that taxation should be generally and in amount as light as possible, it must be determined upon what principles and in what manner taxes may best be levied. No other branch of legislation is perhaps so important as the wise application of just principles in the matter of taxation. The wealth, happiness, and even the morals of the people are dependent upon the financial policy of their government.

Adam Smith lays down four general maxims, which we shall briefly cite not only as being perfectly true in themselves and most valuable, but as proceeding from an authority so high that not to notice them might be accounted an omission.

I. 'The subjects of every state ought to contribute towards the support of the government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the state.'

II. 'The tax which each individual is bound to pay ought to be certain, and not arbitrary. The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain to the contributor, and to every other person.'

III. 'Every tax ought to be levied at the time or in the manner most likely to be convenient for the contributor to pay it.'

IV. 'Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state.'

In discussing the merits of particular taxes and classes of taxes, we shall have to consider with some minuteness the application of Adam Smith's first maxim. Its justice requires no enforcement or illustration, although unhappily the object is most difficult of attainment. The second maxim is of great importance, and the necessity of adhering to it must be universally acknowledged. Uncertainty gives rise to frauds and extortion on the part of the tax-gatherer, and to ill-will and suspicion on that of the contributor, while it offers a most injurious impediment to all the operations of trade. Notwithstanding the many evils of uncertainty, it is by no means an uncommon fault even in modern systems of taxation. We would pass over the practices of Eastern despotisms, where uncertainty and caprice prevail instead of fixed rules, but that the vices of their taxation are so exaggerated as to show the evils of a departure from just principles in the broadest light. All taxation is forbidden by the Koran, and although the prohibition has been evaded and broken through by the Turkish government in particular instances, it has always been an obstruction to any general system of imposts. In the absence of regular taxes, partial and irregular exactions are resorted to for supplying the wants of the sultan. Plunder becomes the business of every governor of a province, and thus the Koran, instead of defending Moslems from tax-gatherers, gives them up to public robbers. 'No man is secure in his property for an instant; all are compelled carefully to conceal their possessions, lest they should lose their liberty or possibly their lives and their property too. Industry is thus not merely cramped, but almost prevented or extirpated, by men being deprived of all confidence in their enjoyment of its rewards. The country, fertile in its resources of all kinds, is left waste, or only cultivated as far as the absolute necessities of providing sustenance may require. The nearer you approach the seat of government, this is more the case; and the neighbourhood of the capital, which in other countries is naturally the scene of extended labour, thick population, and great cultivation, is in Turkey marked by barrenness and neglect. Constantinople can only be approached on the land side by travelling through extensive wastes without either man or beast or tillage.' (*Political Philosophy*, ch. 3.)

In Persia the same uncertain and oppressive mode of exacting money for the use of the sovereign is resorted to, and is followed by similar results.

Under the more constitutional governments of Europe the people do not indeed suffer from violent exactions, but industry, production, and commerce are too often restrained by irregular and ill-defined taxes. Spain unhappily affords many examples of misgovernment, and the injurious character of its taxation is shown in reference to this as well as other principles. To select one instance of uncertainty: 'Every landowner is liable to have his property taken in execution for government taxes, if he is not prepared to pay a half-year or more in advance, according to the difficulties of the Exchequer; consequently he is often compelled to make great sacrifices in order to meet such exigencies.' (*Madrid in* 1835, vol. ii., p. 107.)

Perhaps there is no better example of the evils of uncertainty than that of the Stade duties levied by the king of Hanover upon all ships passing up the Elbe from the sea, and upon their cargoes. The tariff taxes 2368 articles of commerce, and lays several duties upon the same articles, so that the whole number of duties is 6688. 'There are 35 different duties upon iron; 32 duties upon yarn or twist; 18 duties upon sugar; 42 upon leather; 36 upon oil; 126 upon wood, and so on with respect to other important articles of trade.' The tariff also 'resorts to all modes and devices of taxation, by weight, by measure, by number, by value; and what is worse, it vests in the custom-house officers the sole discretion of determining by what standard they will charge the duty. The collector imposes that kind of duty which will produce the most money in the particular case. The consequence of this to the merchant is most serious. He cannot calculate or inform himself beforehand how much his goods will have to pay at Brunshausen.' (*Edinburgh Review*, No. cl., p. 361; Hutt's *Stade Duties*.) There are also arbitrary fines for trivial informalities in the ship's papers, and which are said to rest practically with the subordinate officers, who likewise harass the merchants with a multitude of petty exactions for their own advantage. Such a system, it need scarcely be said, is most discouraging and injurious to commerce. British merchants have been loud in their complaints, and the governments of this country and of Hanover have recently engaged in negociations, which, it may be hoped, will settle these obnoxious duties upon more sound and equitable principles.

To levy a tax 'at the time and in the manner most likely to be convenient for the contributor to pay it' is always a wise policy on the part of the state. The time or manner of payment may often be more vexatious than the amount of the tax itself, and thus have the evil effects of high taxation, while it produces no revenue to the state. Suppose, for example, that a merchant imports goods and is required to pay a duty upon them immediately and before he has found a market for them:—he must either advance the money himself or borrow it from others, and in either case he will be obliged to charge the purchaser of the goods with the interest; or he must sell the goods at once, not on account of any commercial occasion for the sale, but in order to avoid prepayment of the tax. If he pays the tax and holds the goods the consumer will have to repay not only the tax but the interest; and if he parts with them at a loss or inconvenience, trade is injured, and the general wealth and consequent productiveness of taxation proportionately diminished. To prevent these evils the *bonding* or *warehousing* system was established, which affords the most liberal convenience to the merchant and a general facility to the trade of a country. Certain warehouses are appointed under the charge of officers of the customs, in which goods may be deposited without being chargeable with duty until they are cleared for consumption, and thus the tax is only paid just when the article is wanted, and when it is least inconvenient to pay it. [WAREHOUSING SYSTEM.]

Similar accommodation is granted on their own premises to the manufacturers of articles liable to excise duties. At present the customs bonding-warehouses are confined to the ports. An extension of them to inland towns would be sound in principle, very convenient to trade, and unattended by any serious risk to the revenue or difficulty of management and supervision.

The evils resulting from inconvenient modes of assessing and collecting taxes have been very seriously felt in this country under the operation of the excise laws. When any manufacture is subject to excise duties, the officers of the revenue have cognizance of every part of the process, inspect and control the premises and machinery of the manufacturer, and often even prescribe the mode of conducting and the times of commencing and completing each process; while the observance of numberless minute regulations is enforced by severe penalties. The manufacturer is put to great inconvenience and expense, and his ingenuity and resources are constantly interfered with in such a manner as to impede inventions and improvement, and to diminish his profits. Some manufactures have been entirely destroyed by oppressive regulations. The making of lenses of telescopes was at one time a flourishing trade. England had the supply of the whole of Europe, but within the last few years the manufacture has been transferred to France and Italy, entirely in consequence of the prohibition of the excise laws against conducting the necessary series of preliminary experiments. (*Digest of Reports of Commissioners of Excise Inquiry*, p. 13.) Trades less unfortunate than that just referred to are nevertheless very severe sufferers. A London distiller stated to the Commissioners of Excise Inquiry, that assuming that the duties on spirits distilled by him should be fully secured to the revenue, 'it would be well worth his while to pay 3000*l*. a year for the privilege of exemption from excise interference.' (*Ibid.*, p. 15.)

Any injury done to trade is injurious to the state by diminishing the national wealth and the employment of labour. It has the same effect also upon the revenue as excessive taxation. The high price of the article limits the consumption and consequently the revenue arising from it. The injurious effects of the excise restrictions 'must be felt in an accumulated degree by the public who are the consumers, against whom the tax operates by the addition made to the price of the commodity, not only by its direct amount, but by the necessity of compensating the manufacturer for his advance of capital in defraying it, and also by the increased cost of production.' (*Ibid.*, p. 15.) In the case of a heavy tax, which also diminishes consumption, the state, at least, derives some benefit: but in the case of onerous restrictions and impediments to trade caused by the mode of collecting a tax, the state gains nothing whatever, and the manufacturer and the consumer are seriously injured, without an equivalent to any party. If the consumer must suffer, it should, at least, be for the benefit of the revenue, for then his contributions may be diminished in some other direction. Great attention has been paid, of late years, to the improvement of the excise regulations, especially by the Commissioners of Inquiry, under the able direction of Sir Henry Parnell. Various restrictions have been removed, and it is to be hoped that the excise revenue may be found capable of being collected without inflicting greater injuries upon trade than other branches of taxation.

The net produce of a tax is all that the state is interested in, and therefore any violation of the fourth maxim of Adam Smith is liable to the same objections as those already stated in reference to the third. Such violation increases the amount of the tax directly, as the former was shown to increase it indirectly, without any advantage to the state. Facility of collection is a great recommendation to any tax, and, on the contrary, a disproportion between the cost of collecting and the amount ultimately secured is a good ground for removing a tax, though founded, in other respects, upon just principles. On this account alone, as well as for the general convenience of trade, it is worthy of serious attention, whether the customs duties upon a great number of articles of import should not be altogether repealed. Although great alterations have recently been made in our tariff, the number of articles remains the same. In 1839 there were 349 distinct articles, each producing less than 100*l*. a year, and in the aggregate only 8050*l*. There are also 132 articles producing from 100*l*. to 500*l*. each, and altogether 31,629*l*., while 46 articles produced 98¾ per cent. of the whole customs revenue. (*Import Duties Report*, 1840, p. 4.) It is obvious that the examination of every description of merchandize and package, and the assessment of nearly 1200 different rates of duty, must greatly increase the establishment required for collecting this branch of the revenue. The cost of collecting the duties upon the larger and more productive articles of import could bear but a small proportion to the amount of the tax.

The following table may be interesting as showing the rate at which the whole revenue is collected in the United Kingdom:—

Table showing the Cost of Collecting the Revenue of the United Kingdom of Great Britain and Ireland for Ten Years, from 1832 *to* 1841 *inclusive* (compiled from the Annual Finance Accounts).

	Gross Receipt of Revenue.			Charges of Collection.			Rate per cent. for which the gross receipt was collected.		
	£	s.	d.	£	s.	d.	£	s.	d.
1832	49,571,459	17	8	3,064,702	13	11	6	3	7¾
1833	52,571,116	14	11	3,560,693	4	4	6	15	5¼
1834	52,753,246	17	11	3,582,635	4	4	6	15	9¾
1835	52,589,992	4	6	3,560,238	18	11	6	15	4¾
1836	54,973,677	0	6	3,493,641	17	1	6	7	1¼
1837	52,287,737	14	0	3,430,679	6	5	6	11	2
1838	52,979,236	13	10	3,450,940	12	4	6	10	3
1839	53,345,498	14	7	3,483,533	4	9	6	10	7
1840	52,916,049	8	3	3,549,009	15	5	6	14	1¼
1841	53,596,250	14	4	3,582,639	7	11	6	13	8¼

There is little variation from year to year on the gross charges of collection, but there is a considerable disproportion in the cost of collecting different branches of the revenue. In 1841 the excise cost 6*l*. 7*s*. 8*d*. per cent. in the collection; the assessed taxes 4*l*. 2*s*. 9*d*.; and the revenue arising from stamps only 2*l*. 3*s*. 4*d*.

The French revenue is collected at a much greater cost. For some years past the average revenue of that country has been 1,020,000,000 francs, or 40,000,000*l*., and the expenses of managing and collecting that sum have amounted to 150,000,000 francs, or 6,000,000*l*., being no less than 15 per cent. (*Commercial Tariffs, Part IV., France*, 1842, p. 11.) It is very probable that many items may be included in the French calculation of the expenses of collection which are not stated in the English accounts; but making liberal allowance on that account, a great disproportion remains between the cost of collecting the revenue in the two countries. It may perhaps be fairly estimated that the revenue of France costs twice as much in the collection as that of England. The expenses of collecting a revenue may be high without any reference to the mode of taxation. An excellent tax may be collected in a bad manner, either by having numerous idle and highly paid officers, or by cumbrous regulations and checks, which may cost the government much and protect the revenue very little. Of these two causes of expense it is difficult to pronounce which is most injurious to a country. The former will generally be found to form part of a general system of ill-regulated expenditure: the latter may arise from unwise precautions for the security of the revenue. In France the prodigious number of official persons is notorious, and in that fact we must seek for the main cause of the enormous cost of collecting the revenue.

Different Classes of Taxes.

In selecting one or more classes of taxes for raising the revenue of a state, the principles already discussed should be adhered to as far as possible; but these do not point out any particular mode of taxation as preferable to others. Whatever mode of raising the necessary funds may be found to press most equally upon different members of the community, to be least liable to objections of uncertainty, or inconvenience in the mode or times of payment, or to be attended with the least expense, is fairly open to the choice of a statesman; unless objections of some other nature can be proved to outweigh these recommendations.

The two great divisions under which most taxes may be classed are *direct* and *indirect*.

I. *Direct Taxes.*

All taxes ought to be paid from the income of the community. To derive revenue from capital is to act the part of a spendthrift; and such a practice, as in private life, must be condemned. If the taxes of any country should become so disproportioned to its income, that in order to pay them continual inroads must be made upon its capital, its resources would fail, employment of labour would decrease, and the revenue must necessarily be reduced by the general impoverishment of the tax-payers. Such a system could not long continue as regards all capital, but it may affect particular branches of capital, or all capital in certain conditions. In whatever degree it is permitted to operate it is injurious. A tax upon legacies is avowedly a direct deduction from capital; and on that account objectionable, although it is profitable to the treasury and very easily collected. In this country legacies left to strangers are charged with a stamp duty of 10 per cent., and even when left to relatives the scale of duties is sufficiently high to cause a serious diminution of the capital. A further duty is charged on proving a will, called *probate-duty*, which is perhaps more frequently paid out of capital than income. The same observations will, of course, apply to duties charged upon succession to the personal property of intestates.

With these exceptions it has been the object of the British legislature to derive all taxes from income, either by direct assessment or by means of the voluntary expenditure of the people upon taxed commodities.

Direct taxes upon the land have been universally resorted to by all nations. Such taxes are obvious, and require but little refinement to devise; and in countries without commerce, land is the only source from which a revenue can be derived. In most of the Eastern monarchies the greater part of the revenue has usually been raised by heavy taxes upon the soil. The tangible nature of land and of its produce offers great temptations to immoderate taxation. In Spain, at the present time, the taxes upon the soil are most oppressive and injurious. 'The tax imposed on corn-fields is so heavy, that farmers in general find it more to their interest not to till their lands at all, than to run the risk of losing their costs and charges, and their labour to boot, by the exorbitancy of the intendiente's demand which they would have to meet. They have adopted the plan therefore of sowing no more wheat than is necessary for the sustenance of their own families. It is quite clear indeed to all who are conversant with the state of agriculture in Spain, that unless a complete change takes place in the system of taxation, so as greatly to reduce the burthens upon the land, there will not only be a stagnation in rural industry, but eventually the country will cease to produce a sufficient quantity for its own consumption of that superior wheat on which Spaniards pride themselves, and which was formerly and might still be grown in sufficient quantities to supply all the markets in Europe.' (*Madrid in* 1835, vol. ii., p. 109.)

The land-tax in England is one of considerable antiquity. We find that under the Saxon kings a tax of this description was in use. When the invasions of the Danes became frequent, it was customary to purchase their forbearance by large sums of money; and as the ordinary revenues of the crown were not sufficient, a tax was imposed on every hide of land in the kingdom. This tax seems to have been first imposed A.D. 991, and was called Danegeld, or Danish tax or tribute. (*Saxon Chronicle*, by Ingram, p. 168.) It was originally one shilling for each hide of land, but afterwards rose so high as seven: it then fell to four shillings, at which rate it remained till it was abolished about seventy years after the Norman conquest. (Henry, *Hist.*, vol. iii., p. 368.) A revenue still continued to be derived under different names from assessments upon all persons holding lands, which however became merged in the general subsidies introduced in the reigns of Richard II. and Henry IV. During the troubles in the reign of Charles I. and the Commonwealth, the practice of laying weekly and monthly assessments of specific sums upon the several counties was resorted to and was found so profitable, that after the Restoration the antient mode of granting subsidies was renewed on two occasions only. (*Report of House of Commons on Land Tax as affecting Catholics*, 1828.) In 1692 a new valuation of estates was made, and certain payments were apportioned to each county and hundred or other division. These payments have varied in amount from 1*s.* in the pound to 4*s.* on the assessed annual value, according to the annual Land Tax Acts, but whatever may have been the variations in the rate levied, the valuation has been the same; and the proportion chargeable to each district has continued the same as it was in the time of king William III., as regulated by the Act of 1692. That assessment is said not to have been accurate even at that time, and of course improved cultivation and the application of capital during the last 140 years have completely changed the relative value of different portions of the soil. On account of the generally increased productiveness of land, the tax bears upon the whole but a trifling proportion to the rent, yet its inequality is very great. For instance, in Bedfordshire it amounts to 2*s.* 1*d.* in the pound; in Surrey, to 1*s.* 1*d.*; in Durham, to 3½*d.*; in Lancashire, to 2*d.*; and in Scotland, to 2¼*d.* (*Appendix to Third Report on Agricultural Distress*, 1836, p. 545.) Adam Smith imagined that this tax was borne entirely by the landlords, but this opinion has been proved to be erroneous by modern political economists, who hold that the tax increases the price of the produce of the land, and is therefore paid by the consumers. Of that we entertain no doubt; but we are unable to agree with Mr. Ricardo, that the English land-tax is not objectionable as regards Adam Smith's first principle, viz. on the ground of inequality. (*Political Economy*, chap. xii.) He assumes that inferior land would not be cultivated until the price of produce had become so high as to remunerate the grower after payment of the tax; and that the owners of the soil therefore would not suffer, but only the consumer. But land is often cultivated for pleasure, for scientific experiment, and for speculative purposes, while in this country the exclusion of foreign supply at a time when population was rapidly increasing has forced inferior soils into cultivation. Then admitting that the consumer pays the tax, the owners of land appear to us to be in the same relation to each other as merchants would be who should be charged unequal rates of duty upon articles in which they deal. In that case the consumer would ultimately pay the tax, but no one will deny that the seller who pays the highest tax in the first instance meets his competitor at a disadvantage in the market. He must wait for very high prices, or must sell at lower profits. Such is actually the case where articles imported from different countries bear unequal rates of duty; and such, we apprehend, must be the case where the land is unequally assessed according to its value. [Land-Tax.]

A tax upon the gross rent of land would fall upon the landlord, and would be in fact a tax upon his annual income, and as such would fall with undue severity upon him, unless other classes of the community should be liable to a proportionate deduction from their respective incomes for the benefit of the state. This brings us to consider the expediency of a general tax upon all incomes.

As the object of taxation should be to obtain from each individual in a state a contribution to the expenses of government in proportion to his means; and as, in whatever form the tax may be levied, the contribution should be paid in every case from income, and not from capital, the simplest and most equitable mode of taxation would appear to be that which, after assessing the annual income of each person arising from all sources, should take from him, directly, a certain proportion of his income as his share of the general contribution. Such a tax, equitably levied, would appear to agree in theory with all the four maxims of Adam Smith; but practically, every tax upon income must abound in inequalities, in uncertainty, and in great personal hardships and inconvenience.

In order to make such a tax fall equally upon all, in the first place, the assessment must be equal. But how is this to be effected? By the voluntary statement of each person, or by investigation and proof? If by the former means, the equality of the tax would depend upon the honesty of parties placed under a temptation to be dishonest: the least scrupulous part of the community would be taxed lightly, and the conscientious would bear the main burthen of the tax. If by the latter means, viz., by investigation and proof, the dishonest still have an advantage over the conscientious: because income arising from some sources, being capable of direct assessment, cannot be concealed; while other descriptions of income are often known only to the possessor, upon whose declaration alone, in such cases, reliance must be placed.

But supposing that either by declaration or by proof, or by both combined, the actual income of each individual could be ascertained, the mere income of persons is a most fallacious test of their means or ability to bear taxation. One man has a fee-simple estate in land, or money in the funds, producing an income of 1000*l*. a year, which will descend to his children after his death; another, by a laborious and uncertain profession, also obtains an annual income of 1000*l*., dependent not only upon his life, but upon his health and a thousand accidents. The annual incomes of these two men are the same, but their circumstances are most dissimilar. Before the latter could be placed in the same position as the former, he must have an income large enough to enable him to insure his life for a sum of which the interest would be 1000*l*. a year, and still have 1000*l*. left to spend annually, after the payment of the premium. But even then, if he should lose his health, his present income would fail him, he would not be able to continue the insurance, and his position therefore would still be more precarious than that of the proprietor of land or funded property. Yet these two men, with means so unequal, would be assessed alike, and charged with equal contributions. But suppose that, instead of insuring his life, the professional man should save half his income every year, he would still be charged upon the whole, and thus his *capital* as well as his income would be taxed.

The case of annuitants also may be instanced as one, amongst numerous others, of peculiar inequality. One person invests his money in permanent securities, and retains his capital, but derives a small income, and therefore contributes a proportionally small rate of tax: another purchases an annuity, and parts with his capital; but as his income is much larger than that of the capitalist, he pays a higher tax. At first sight this may appear a just arrangement; but in fact not only the income of the annuitant is taxed, but also his capital; for that which is taxed as his income is derived partly from the interest of his purchase-money, and partly from an annual repayment of a portion of his principal.

These and many other evident cases of inequality can scarcely be questioned; but it is alleged that other taxes press with as much inequality upon different classes of persons, and that no attempts are made to equalize their pressure, as the causes exist in the circumstances of the people, and not in the nature of the taxes. (Pitt's *Speeches*, vol. iii., p. 9.) It is said that the assessed taxes affect the professional man to the same extent as the man of property. There is however this essential difference between taxes upon income and taxes upon expenditure: the former are compulsory, the latter are voluntary, and paid or avoided at the option of each individual. If a man be saving money, an income-tax seizes upon his accruing capital: a tax upon expenditure is levied upon that portion of his income only which he thinks it prudent to spend.

To smooth in some degree the inequalities of an income-tax, 1st, the annual premiums on policies of insurance should not be reckoned as income in the assessment, being clearly capital, and the payments being no longer optional, as the insurance could not be discontinued without loss; this provision was made by Mr. Pitt in 1798: 2ndly, incomes arising from realized property should be taxed at a higher rate than the profits of trades and professions: 3rdly, annuitants should be rated on such terms as to avoid the assessment of any portion of their capital as part of their income: 4thly, all persons should be liable to the tax, whatever may be the amount of their incomes.

In addition to the unequal pressure of an income-tax, which cannot be altogether corrected by any expedients, there is much uncertainty in the assessment of certain classes of persons. The vicissitudes of trade, bad debts, or deferred payments, render the incomes of commercial and professional men very uncertain; and nominal income therefore, which afterwards cannot be realized, may be charged with the tax.

But the last and strongest of the objections to an income-tax is the inquisitorial nature of the investigation into the affairs of all men, which is necessary to secure a statement of their incomes. This objection indeed is treated lightly by some; but by the mass of the contributors it is considered, beyond all question, as the most inconvenient and unseasonable quality of an income-tax. Even if the exposure of a man's affairs could do him no possible injury, yet as an offence to his feelings, or even caprice, it is a hardship which is not involved in the payment of other taxes. How many persons are anxious to conceal the amount of their wealth? It may be foolish; but they certainly must have strong motives for concealing that which most others are proud of displaying. Then who cannot sympathise with the feelings of an honest man who conceals the extent of his poverty, and, by self-denial and hard economy, is still enabled to bear up against adversity? It is in vain to deny, what all men feel, that the appearance of poverty does degrade a man in the eyes of others; and the feelings of good men ought to be respected. But apart from matters of feeling, injury of a real character is also inflicted upon individuals by an exposure of their means and sources of income. Mercantile men, from the dread of competition, take pains to conceal from others, especially if in the same business, the application of their capital, the rate of profit realized, their connections, and their credit, all of which must be disclosed, perhaps to their serious injury, when there is an investigation of their profits.

For these reasons, the mode of collecting the income tax certainly cannot be approved of as being 'most likely to be convenient to the contributor.' Its general unpopularity when in operation is the best proof of its hardship and inconvenience. Upon the whole, a tax upon income is so difficult to adjust equitably to the means of individuals, and the mode of collection is necessarily liable to such strong objection, that, if resorted to at all, it should be reserved for extraordinary occasions of state necessity or danger, when ordinary sources of revenue cannot safely be relied on.

The English assessed taxes have as few objections in principle as most modes of direct taxation. With an equitable assessment and special exemptions in certain cases, they are capable of being made to bear a tolerably just proportion to the incomes of the individuals paying them. They share, however, in the general unpopularity of all direct taxes, and it cannot be denied that they often press unequally upon particular persons. The number of windows in a house is a very imperfect criterion of its annual value, and in our opinion the house-tax which has been removed was far preferable, in principle, to the window-duty, which is still retained. The inequalities in the assessments were undeniable; but these might have been corrected by careful valuation. Under ordinary circumstances, a tax upon houses will fall upon the occupier, who is intended to pay it; but if a very heavy tax were imposed, it would discourage the occupation of houses, lessen the demand for them, and thereby diminish the rent of the landlord, or, in other words, transfer the actual payment to him. (Adam Smith, book 5, chap ii.; Ricardo's *Political Economy*, chap. xiv.) Such a tax would be attended with very bad consequences; it would compel many persons to live in inferior houses or in lodgings, and thus diminish their comforts and deteriorate their habits of life; and by reducing the demand for houses it would limit the employment of capital and labour in building. The direct taxes upon horses, carriages, hair-powder, armorial bearings &c., being paid voluntarily by the rich to gratify their own taste for luxury or display, are not likely to meet with many objectors. The use of such articles generally indicates the scale of income enjoyed by the contributor, and the tax is too light to discourage expenditure or to make any sensible deduction from his means.

A very fair principle of levying a direct tax is exhibited by the assessment of property in every parish in England and Wales to the poor rates. Local knowledge renders a perfectly correct valuation possible, and every person owning or occupying land, houses, or other property within the parish, is assessed so much in the pound upon the annual value thereof, to raise the necessary funds for the support of the poor.

The various modes of direct taxation are too numerous to enter upon, especially as many of them involve the discussion of principles of political economy which would carry us far beyond our limits. For arguments and illustrations concerning the incidence of tithes, of taxes upon profits, upon wages, and other descriptions of direct imposts, we refer to the able works of Adam Smith, Ricardo, M'Culloch, and other eminent writers upon political economy.

II. *Indirect Taxes.*

In preferring one tax to another, a statesman may be influenced by political considerations as well as by strict views of financial expediency, and nothing is more likely to determine his choice than the probability of a cheerful acquiescence on the part of the people. All taxes are disliked, and the more directly and distinctly they are required to be paid, the more hateful they become. On this, as well as on other grounds, 'indirect taxes,' or taxes upon the consumption of various articles of merchandize, have been in high favour with most governments. 'Taxes upon merchandize,' says Montesquieu, 'are felt the least by the people, because no formal demand is made upon them. They can be so wisely contrived, that the people shall scarcely know that they pay them. For this end it is of great consequence that the seller shall pay the tax. He knows well that he does not pay it for himself; and the buyer, who pays it in the end, confounds it with the price.' (*Esprit des Lois*, livre xiii., chap. vii.) This effect of indirect taxes is apt to be undervalued by writers on political economy; but it is undoubtedly a great merit in any system of taxation (which is but a part of general government) that it should be popular and not give rise to jarring and discontent. A tax that is positively injurious to the very parties who pay it without thought, is, certainly not to be defended merely on the ground that no complaints are made of it; but it may be safely admitted as a principle, that of two taxes equally good in other respects, that is the best which is most acceptable to the people. The very facility, however, with which indirect taxes may be levied, makes it necessary to consider the incidents and effects of them with peculiar caution. The statesman has no warning, as in the case of direct taxes, that evils are caused by an impost which is productive and which every one seems willing to pay. When any branch of industry is visibly declining, and its failure can be traced to no other cause than the discouraging pressure of a tax, the necessity of relief is felt at once; but if trade and manufactures are flourishing, and the country advancing in prosperity, it is difficult to detect the latent influence of taxes in restraining that progress, which but for them would have been greater; and still more difficult to imagine the new sources of wealth which might have been laid open if such taxes had not existed, or had been less heavy, or had been collected at different times or in different ways.

The government is directly interested in the increase of national wealth, and taxes upon commodities should be allowed to interfere with it as little as possible. On this account duties upon raw materials are very objectionable. They increase the price of such materials, and thus limit the power of the manufacturer to purchase them, and to employ labour in increasing their value, and in adding to the production and capital of the country. They discourage foreign commerce and the employment of shipping; for as the power of buying is restrained, so also is that of selling, and the interchange of merchandize between different countries is checked. Moreover, by increasing the price of the exported manufactures, they limit the demand for them abroad and subject them to dangerous competition.

Similar objections may be urged against taxes upon domestic manufactures, since by increasing the price they diminish consumption, and consequently discourage the manufactures, which if left to themselves would have given employment to more capital and labour, and would have added greatly to the amount of national wealth and prosperity. The object of a government should always be to collect its revenue from the results of the successful employment of capital and industry, and not to press upon any intermediate stage of production.

Adopting this view of the objects of taxation, the British legislature has of late years very wisely repealed or reduced various duties upon raw materials and upon manufactures. Of the former we may instance the customs' duties on barilla; on raw, waste, or thrown silk; on cotton-wool and sheep's wool, unwrought-iron, hemp, and flax; which have been from time to time very much reduced. Of the latter, the taxes on printed goods, on candles, and on tiles, have been altogether removed; and those on plate and flint glass, on malt, and on soap, have been partially remitted. There are still many similar taxes which need revision. Of these perhaps the most injurious are the heavy duties upon foreign timber, which we shall show other reasons for condemning, in treating of protective duties; but in this place they must be particularly censured, as offering a serious obstruction to ship-building (one of the most important branches of national industry in a maritime country), and to the construction of buildings for the convenience of trade and manufactures. The amended tariff of 1842, which for many reasons is a most important change in the financial policy of this country, has reduced the duty on colonial timber to a rate perhaps unnecessarily low; that on foreign timber, though much reduced, is still too high.

One of the chief recommendations of indirect taxes is, that, when placed upon the proper description of articles, the payment of them by the consumer is optional. If charged upon what may be strictly called the necessaries of life, their payment becomes compulsory, and falls with unequal weight upon labour. Competition generally reduces a large proportion of the working classes to a state which allows them but little if anything beyond necessaries; consequently a duty upon these, as it will have no effect in diminishing the competition of labour and in raising wages, must reduce the comforts and stint the subsistence of labouring men.

That class of articles commonly called luxuries, of which the consumption is optional, is a very fair subject of taxation. In principle there is no objection to such taxes: they do not interfere with industry or production, but are paid out of the incomes of the contributors, and paid willingly, and for the most part without undue pressure upon their means. But in laying on taxes upon particular articles of this description care must be taken to proportion the charge to the value of the article. Excessive duties fail in the very object they have in view, by rendering the revenue less productive than moderate duties; while the causes of their failure are injurious to the wealth of the country by discouraging consumption, and to its morals by offering an inducement to smuggling. It is only by experience that the precise point can be found at which the revenue is most productive, consistently with an unchecked consumption and an absence of smuggling; but it may be assumed as certain that whenever a tax adds very greatly to the price of an article of general consumption, it puts it out of the reach of many who are anxious to purchase it, and tempts smugglers, by the chance of a large profit, to evade the payment of the duty. On the contrary, when a duty is moderate, it adds so little to the price of an article, that it will scarcely affect its consumption; and the profit arising from evasion of the duty is so small as not to cover the risk and penalties of detection. In proof of these facts there has been ample experience in the taxation of this country, and a few instances may serve as instructive illustrations.

In 1823 the excise duties upon Scotch and Irish spirits were reduced from 5*s*. 6*d*. to 2*s*. per gallon, and the immediate effect produced upon the apparent consumption and upon the revenue will appear by the following statement for the two years preceding and following the reduction.

Quantities of spirits made in Ireland and Scotland which paid duty for home consumption, stating the rate of duty paid, and the net revenue:—

IRELAND.

	Gallons.	Rate of Duty.	Net Revenue.
1821	2,649,170	5*s*. 6*d*. per Irish gallon	£912,288
1822	2,328,397		797,518
1823	3,348,505	2*s*. per English Wine Gallon from 10th October	634,460
1824	6,690,315	Ditto	771,690
1825	9,262,744	Ditto	1,084,191

SCOTLAND.

	Gallons.	Rate of Duty.	Net Revenue.
1821	2,229,435	5*s*. 6*d*. per English Wine Gallon	£727,650
1822	2,079,556	Ditto	691,136
1823	2,232,728	2*s*. from 10th October	536,654
1824	4,350,301	Ditto	520,624
1825	5,981,550	Ditto	682,848

In 1826 6*d*. was added to the duty, and again in 1830 a similar addition was made, the effect of which is shown by a continuation of the statement:—

IRELAND.

	Gallons.	Rate of Duty.	Net Revenue.
1826	6,837,408	2*s*. 10*d*. per Imperial gallon	£964,509
1827	8,260,919		1,122,096
1828	9,937,903		1,395,721
1829	9,212,223		1,306,064
1830	9,004,539	2*s*. 10*d*., 3*s*., & 3*s*. 4*d*.	1,409,128
1831	8,710,672	3*s*. 4*d*.	1,451,580
1832	8,657,756	Ditto	1,442,845
1833	8,168,596	Ditto	1,360,769

SCOTLAND.

	Gallons.	Rate of Duty.	Net Revenue.
1826	3,988,788	2*s*. 10*d*. per Imperial gallon	£563,263
1827	4,752,199	Ditto	672,441
1828	5,716,180	Ditto	809,559
1829	5,777,280	Ditto	818,448
1830	6,007,631	2*s*. 10*d*., 3*s*., & 3*s*. 4*d*.	989,258
1831	5,700,689	3*s*. 4*d*.	950,041
1832	5,407,097	Ditto	901,182
1833	5,988,556	Ditto	998,051

These tables show the effects of taxation in encouraging or repressing smuggling, rather than its influence upon consumption. Taking the case of Ireland, it would be impossible to believe that the actual drinking of spirits could have been increased more than threefold in a few years, even if there had been no evidence of illicit distillation; but before the reduction of duty in 1823, an enormous amount of smuggling had been detected, and there were other means of estimating the extent of frauds practised upon the revenue. For instance, in 1811, the duty had been only 2*s*. 6*d*. a gallon, and in that year no less than 6,500,361 gallons had paid duty; while, in 1822, when the duty was 5*s*. 6*d*., only 2,328,397 gallons were brought to charge. The revenue commissioners, on whose recommendation the duty was reduced in 1823, then estimated the annual consumption of spirits in Ireland at ten millions of gallons, and the illicit supply at about seven millions. (*Fifth Report of Revenue Commissioners*, pp. 8, 19.)

In 1827 the duties on spirits made in England were reduced from 12*s*. 6*d*. to 7*s*. a gallon. The average consumption for three years to 1827 was 3,677,457 gallons, and the revenue 2,281,526*l*. In 1829 (only two years after the reduction) the consumption was 7,700,766 gallons, and the revenue 2,695,268*l*., or 413,742*l*. more than the higher duty had produced. (Parnell's *Financial Reform*, 4th ed., p. 44.)

It has been a common opinion that spirits should not be treated merely as a source of revenue; but that being injurious to the morals of the people, the consumption of them should be repressed by heavy duties. It has accordingly been the object of this and of other governments to limit the consumption of spirits, and at the same time to raise a large revenue from it. The object is unquestionably a good one if it could be secured: but the result of numerous experiments has proved that taxation should be conducted with reference to the immediate object of obtaining a revenue in the best manner; and that the interests of a country are promoted by following out just principles of taxation, rather than by seeking indirectly, and by a violation of those principles, to accomplish objects which, if attainable, can only be attained by other means. The signal failure of a measure in the last century for discouraging the drinking of spirits is a strong example of the futility of attempting to force a change in the habits of the people by a tax. In 1736 a tax of 20*s*. a gallon was imposed upon all spirits, with very heavy penalties for evasion of the duty. The tax was extremely unpopular, and was evaded to such an extent, that in two years no less than 12,000 persons were convicted of offences against the law. Indeed the measure proved altogether so odious and so impracticable, that it was abandoned after six years of vexatious and unprofitable trial.

High duties upon foreign articles imported into a country are liable to all the objections which have been stated as applying to immoderate taxes upon consumption, and they are chargeable with another,—they diminish importation, and thereby restrict commercial intercourse and the demand for and exportation of domestic produce or manufactures.

The number of gallons of brandy and geneva imported and retained for consumption, on an average of four years to 1807, was 1,820,000. The duty was then 14*s*. a gallon, and the revenue 1,370,000*l*. In 1814 the duty was made 18*s*. 10*d*., and on an average for the four succeeding years, the number of gallons entered for home consumption was 742,000, and the revenue 825,000*l*. Thus a loss of 545,000*l*. a year was sustained by the revenue, the legitimate trade in brandy discouraged, and a rich premium offered to the smuggler. The present duty is 1*l*. 2*s*. 6*d*. a gallon, and in the year ended 5th January, 1842, only 1,180,641 gallons were entered for home consumption, the gross revenue on which was 1,347,461*l*., or 23,000*l*. less than in 1807, notwithstanding the great increase of wealth and population since that time. That French brandy is smuggled into this country in large quantities is notorious; and when we consider that the duty is estimated at 400 or 500 per cent. on its original price abroad, the inducement to evade it is so great, that we cannot be surprised if all the vigilance of our customs establishment is rendered ineffectual. Indeed so regular and certain is the smuggling trade, that it is made the subject of insurance, like other commercial risks, and it is even said at premiums of from 10 to 15 per cent., which bear no proportion to the profits, if the speculation be successful.

The success of moderate duties upon articles of consumption, in encouraging the use of them, placing them within the reach of a larger number of persons, and at the same time augmenting the revenue, was never better shown than in the article of coffee. In 1824 the duty on British plantation coffee was 1*s*., upon East India 1*s*. 6*d*. and upon foreign coffee 2*s*. 6*d*. per lb. In 1825 those duties were reduced one-half, and the consequence has been considerably more than a threefold increase in the consumption, while the revenue has been more than doubled. In the three years preceding the reduction, the consumption and revenue were as follows:—

	Quantities cleared for Consumption.	Net Revenue.
1822 .	7,669,351 lbs.	£387,342
1823 .	8,454,920	428,613
1824 .	8,262,943	420,988

In the three years following the reduction, the consumption greatly increased, but not sufficiently to improve the revenue:

	Quantities cleared for Consumption.	Net Revenue.
1826	13,203,323 lbs.	£336,570
1827	15,566,376	399,960
1828	17,127,633	440,245

But the consumption has since been rapidly increasing, and in the last two years the consumption and revenue thus appear:—

	Quantities cleared for Consumption.	Net Revenue.
1840	28,708,033 lbs.	£921,550
1841	28,420,980	887.721

The slight falling off in the last year may be accounted for by the general depression of trade, and perhaps in some measure also by the addition of 5 per cent. to the customs duties, which was then in operation.

In 1835 coffee, the produce of British possessions in India, was admitted at the same duty as plantation coffee, viz. 6*d*. per lb., and the effect of the reduction, in encouraging the growth of the plant in India and the consumption of the berry in this country, has already been very great, and perhaps the coffee trade of the East may as yet be considered in its infancy. In 1834, the year before the reduction, 8,875,961 lbs. were imported from the East India Company's territories and Ceylon; and in 1840, 16,885,698 lbs., or nearly double. The new customs tariff effects a further reduction of duty. That on foreign coffee is for the future to be 8*d*. a lb., and on coffee the produce of British possessions only 4*d*. An increased consumption will doubtless be the effect of this measure, and ultimately the revenue will be improved.

Thus reductions of existing duties are proved by these examples to increase the revenue; but whether the effect of them be immediate or deferred must depend upon a variety of circumstances. If the reduction puts an end to extensive smuggling, the revenue will derive immediate benefit, as both the demand and the supply of the article already exist, and the reduced tax, without affecting production or consumption, acts as a police regulation, and at once protects the revenue from fraud. But where there is little or no smuggling, and the revenue can only be increased by means of additional consumption, the effect of reduced duties may be deferred and even remote. The article may have to be produced; capital, skill, labour, and time may be required to provide it in sufficient quantities to meet the growing demands of the consumer; and even should the supply become abundant, the habits and tastes of a people cannot be changed on a sudden. The high price of an article may have placed it out of their reach, and in the meanwhile they may have become attached to a favourite substitute, or may be slow to spend their money upon a commodity which they have learned to do without. These and other causes may defer for a considerable time such an increase of consumption as would make up for the reduced rate of tax, especially when the reduction has been so great as to require an extraordinary addition to the previous amount of consumption, before the sacrifice made in the revenue can be redeemed. But where the article on which it is proposed to reduce a tax is already in universal request, and the supply immediate and abundant, and where the tax is so heavy as to restrain consumption, no present loss need be apprehended from a remission of part of the tax, and a very speedy increase of revenue may be expected. Sugar is an article of this description. It has become a necessary of life as well as a favourite luxury. There are scarcely any limits to the supply that could be raised, and the present duties add materially to the price and check consumption. As a proof of the suddenness with which the consumption of foreign sugar might be expected to increase if the excessive duty were reduced, we may refer to the effects of equalizing the duties on East and West India sugars in 1836. In that year the duty on East India sugar was reduced from 32*s*. the cwt. to 24*s*. In 1835 the quantity imported had been 137,976 cwts.; and in 1837, one year only after the change, the import had increased to 302,945 cwts.; in 1838, to 474,100 cwts.; and in 1839, to 587,142 cwts. As the tax was diminished only by one-fourth, and the consumption was immediately more than doubled, the revenue at once gained considerably by the reduction of duty.

A recent financial experiment will serve to show how little an increased revenue can be depended upon as the result of an augmentation of taxes upon articles of consumption. In 1840 an addition of 5 per cent. was made to all the duties of customs and excise, and a proportionate increase of revenue was anticipated, but not realized. The net produce of the customs and excise in the year ending January 5th, 1840, amounted to 37,911,506*l*. The estimated produce for the year ending January 5th, 1842, was 39,807,081*l*., 1,895,575*l*. being expected from the additional 5 per cent. The actual increase however was only 206,715*l*., or little more than one-half per cent., instead of the 5 per cent. which had been expected. This result was undoubtedly in part caused by a general stagnation of trade, and by the consequent distress which prevailed in that year, but we notice it because the principle of an indiscriminate augmentation of existing taxes, without reference to their present amount, character, and circumstances, is very unwise. We have said that experience alone can show the precise rate of a particular tax which will not affect consumption and will at the same time discourage smuggling. It must be presumed that existing rates have been fixed in order to secure these results, and that they are justified by experience. To add to them therefore, not because they are insufficient for their immediate object, but because a general addition to the revenue is needed, is to neglect experience and to disturb the proper relations between the amount of tax and the value of particular articles. During the last century it was a common financial course to add a general per centage of increase upon all the customs duties whenever the revenue was found to be insufficient for immediate purposes. To this unwise policy must be attributed many of the strange anomalies which up to this time have existed in the British tariff. Any recurrence to so unscientific a mode of taxation should be avoided. The tax upon each article ought to be adjusted by itself upon sound principles, and then should not be changed merely to save the trouble or to avoid the unpopularity of selecting particular articles for increased taxation or of inventing new burthens.

Protective, Discriminating, and Prohibitory Duties.

The legitimate object of taxation is that of obtaining a revenue in the least injurious manner for the benefit of the community; but this object has constantly been overlooked for the sake of ends not fairly to be accomplished by taxation. It is natural for a legislature to endeavour by every means in its power to encourage agriculture, trade, and manufactures; and it would be culpable to neglect any proper means of encouragement, which are not only beneficial to particular interests, but add to the general prosperity. Unfortunately however the zeal of most legislatures upon this point has been misdirected. They have seized upon taxation as the instrument of protection and encouragement; and, using it as such, have injured the great mass of their own countrymen, and ultimately have failed in promoting the very interests they had intended to serve. All that we can hope in this and other European countries is a gradual adoption of sound principles, and the correction, at some distant period, of the mistakes which have been acted upon for centuries; but it is to be hoped that in the new countries of the world, where systems of revenue are not yet established, or are growing up with the progress of society, none of the errors of the Old World will be suffered to have a beginning. If once the system of protection has existed, severe injuries and even injustice are inflicted whenever an attempt is made to undo the mischief which has been done. Reason and experience unite in teaching the impolicy of protective taxes; and, in our own country, it is now so generally acknowledged, that nothing but the extreme difficulty of withdrawing the protection which has been given obstructs legislation upon sound principles.

The object of a protective duty is to raise artificially the price of the produce or manufactures of one country as compared with the produce or manufactures of another. A heavy tax easily effects this object, and thus prevents competition on the part of that country whose commodities are taxed, and establishes a monopoly in the supply of those commodities in favour of the parties for whose benefit the tax was improved. The revenue, the avowed object of a tax, so far from being improved, is here actually sacrificed by the exclusion of merchandise, which at moderate duties would fill the coffers of the state. The state clearly is a loser; the foreigner, whose goods are denied a market, is a loser. Who then gains by these losses? Not the consumer; for the more abundant the supply, the better and cheaper will he find the market; but the seller, who is enabled to obtain a high price for his wares because he has a monopoly in the sale of them, is the only party who gains. The community at large suffer doubly: first, by having to buy dear instead of cheap goods, or by being denied the use of them altogether; and secondly, by being obliged to pay other taxes which would not have been required, if the very articles which would have made their purchases cheaper had been charged with a moderate impost. Even the sellers, for whom all these sacrifices are made, do not derive the benefit which might be expected. In the goods which they sell themselves, indeed, they are gainers; but in purchasing of other monopolists they lose by an artificially high price, like the rest of the community. It constantly happens, too, that although the prices at which they sell are high, their profits are reduced, by the competition of others selling the same articles, to the general level of profits throughout the country. When this is the case, all parties, without exception, are losers—the state, the community, and the monopolists. The general injury done to trade by the protective system is too extensive a question to enter upon, but it is well illustrated in the 'Report of the Committee of the House of Commons upon Import Duties' in 1840.

Protection may be accomplished by actual prohibition of the import of particular articles, by exorbitant duties which amount to prohibition, or by such duties only as give the home producer an advantage. Duties may also discriminate between the produce of different countries, and give the preference to some, to the injury and exclusion of others.

In this country all these modes of protection have been resorted to. For the protection of agriculture, foreign cattle, sheep, swine, beef, mutton, pork, and other provisions have been entirely prohibited. High duties have been placed upon the importation of corn on a sliding-scale, so devised as to exclude it entirely, except in times of scarcity; and more moderate duties are payable upon various articles of agricultural produce. The prohibitions however have recently been removed, and moderate import duties substituted. The corn-laws, though the sliding-scale is still adhered to, have been considerably modified, and, it is hoped, will hereafter admit a larger amount of foreign grain, and enrich the revenue. The principle of a sliding-scale, we would here observe, apart from its general policy, is very injurious to the revenue. When the high part of the scale is in operation, it acts as a prohibition; and when the lower duties only are payable, they are comparatively unproductive. The loss sustained by the consumer on account of the protective duties on corn has been variously estimated at from 12,000,000*l*. to 50,000,000*l*. a year; and yet it is well known that money invested in the purchase of land produces a very low rate of interest, not exceeding 3 per cent., and that persons engaged in agriculture, for whom the protection is maintained, have been continually complaining to parliament of their distress.

Upon various articles of manufacture there have been prohibitory and highly protective duties. In 1825 the former were removed; and the latter have, in the present session of parliament (1842), been so modified as to be very fair taxes for the purposes of revenue.

Duties are called discriminating when they are not levied equally upon the produce or manufactures of different countries. The object of them is to give an advantage to the country on whose commodities the tax is lightest, as compared with others. To obtain such a preference has been the object of various negociations and commercial treaties between different states, as it opens extensive markets to the industry of the favoured nation. By the present commercial policy of England, the principle of discrimination may be said to be confined to the protection of our colonies against the competition of foreign countries. As regards each other, all foreign countries enjoy equal commercial advantages in their intercourse with England. Our colonial policy is so wide a question, involving political and commercial considerations of high importance, that we can only touch upon it. It may be contended that colonies should form an integral part of the mother country, and that the commercial intercourse between the several parts of the British empire ought to be viewed as a vast coasting-trade. If this principle were acted upon, it would certainly present a grand fiscal union worthy of admiration; but the existing system does not partake in any degree of the character of a coasting-trade. To put it upon such a footing, the duties on colonial produce imported into the United Kingdom should be little more than nominal, and we should rely upon productive imposts upon foreign produce for our revenue. Our practice is the reverse of this. Where our taxes discriminate, we derive our revenue from the colonial produce; and we either exclude foreign produce altogether, or limit its introduction so much as to prevent it from contributing materially to the revenue. The object of the duties upon the foreign produce, which would enter into competition with the colonies, is not revenue, but exclusion, for the sake of creating a monopoly in favour of the latter. This system we have already condemned, even when established for the protection of trade and agriculture in the mother country; and upon fiscal grounds it is equally indefensible when applied to the colonies, and quite as injurious to the community. There are two great articles of consumption, viz., sugar and timber, upon which the discriminating duties deserve especial notice. Sugar imported from the colonies pays a duty of 24*s*. the cwt.; from foreign countries 63*s*. The disproportion is so great, that foreign sugar is comparatively excluded from the consumption of our people, who are forced to rely upon the colonies for the supply of that important article. The population of the country has rapidly increased, and with it the demand for most articles of consumption. It is painful to see the supply of sugar so forcibly restrained by our commercial policy that the consumption has not increased for ten years. In 1831, 3,781,011 cwts. were retained for home consumption; and in 1840 only 3,594,832 cwts. So inadequate have the colonies alone been to supply our wants, that their exports have actually been diminishing. In 1831 the West Indies exported to the United Kingdom 4,103,800 cwts. In no succeeding year has their export been so great; and in 1840 it had sunk so low as 2,214,764 cwts. During this period the consumption of coffee, cocoa, and tea had considerably increased, and the people must therefore have suffered a serious privation on account of the limited supply of sugar. The community is plainly a loser by the colonial monopoly; and the falling off of the produce of the West Indies, in spite of an increasing demand for it, is not the only proof that they have not gained much by their protection: meanwhile the revenue has lost incalculable sums by the exclusion of foreign sugar, which, with moderate duties, might be imported at a low price in unlimited quantities.

The discriminating duties upon timber have been peculiarly injurious to this country, and it is extremely doubtful whether they have conferred any benefit upon the colonies. They have acted as a bounty of 45*s*. the load in favour of timber the growth of British possessions, and have obliged the consumer either to pay a tax of 225 per cent. (not for purposes of revenue, but for the protection of other interests), or to use an inferior article, less suited to his uses, and cheaper only by reason of the duty. Extensive charges are, happily, about to take effect, which will, in some measure, equalize the duties upon foreign and colonial timber. On the 10th October, 1842, the duty upon foreign timber will be reduced from 55*s*. the load, to 30*s*., and on the 10th October, 1843, to 25*s*. The duty on colonial timber is, at the same time, to be reduced from 10*s*. to 1*s*. Eventually therefore the disproportion will be only 24*s*. the load, instead of 45*s*.

Export Duties.

We have hitherto spoken of taxes upon such commodities only as are consumed by the subjects of the state for whose benefit they are imposed, and which are either produced within the country or imported into it. Duties levied upon goods exported to foreign countries are ultimately paid by the foreign consumer, and thus have the effect of making the subject of one state bear the burthens of another. However desirable this may appear to the state, whose treasury is enriched at the expense of foreigners, the expediency of such duties will depend upon peculiar circumstances, and great nicety is required in the regulation of them. If a country possesses within itself some produce or manufacture much in request abroad, and for the production of which it has peculiar advantages, a moderate export duty may be very desirable. In this manner Russia, which has almost a monopoly in the supply of tallow to the rest of Europe, derives a considerable revenue from an export duty upon that article. Upon the same principle a duty upon machinery exported from Great Britain would have been politic. British machinists far excelled all others in skill and ingenuity, and foreign manufacturers were willing to pay almost any price for their machinery. Notwithstanding the prohibition, large quantities have been smuggled abroad at an enormous cost, but the difficulty and expense of evasion have been so great that foreigners have latterly almost confined their purchases, in this country, to models and drawings, and have made the machinery themselves, with the assistance of British artizans, whom they have enticed abroad by extravagant wages. (*Reports of Committees of the House of Commons on Artizans and Machinery*, in 1824 and 1825, and *On the Exportation of Machinery*, 1841.) If, instead of prohibiting the export, a duty of 7½ or 10 per cent. *ad valorem* had been imposed, foreign manufacturers would have paid much less for the machinery purchased by them in England than they could have had it made for abroad; there would have been a large export trade from this country, and a considerable revenue. The partial relaxation of the prohibitory law in 1825, by granting licences to export certain kinds of machinery, has shown the extent to which the trade might have been carried under a more liberal policy. The official value of machinery exported under licence in 1840 was 593,064*l*., in addition to various tools allowed by law to be exported, of which no account was taken. (*Sess. Paper*, 1841, No. 201, p. 257.)

On the same grounds a moderate duty on the export of coal, being a product peculiarly abundant and of good quality in this country, is a legitimate tax, which would be paid by the foreigner, and, if sufficiently moderate, would not be injurious to the coal trade.

But while moderate export duties upon articles of which a country has almost the exclusive supply may be advisable, heavy duties will check the demand abroad in the same manner as they have been shown to affect the consumption of commodities at home. In the same manner also they are injurious to trade and unprofitable to the revenue.

All duties whatever should be avoided upon the export of produce or manufactures which may be also sent from other countries to the same markets. They would discourage trade and offer a premium to foreign competition.

Although the temptation is great to shift taxes from one country to another by means of export duties, this temptation is equally great in all countries; and if their several governments should be actuated by the desire to make foreigners contribute to their revenue, their opportunities for carrying out such a system would probably be equal, and thus retaliations might be made upon each other, which, after all, would neutralize their efforts to tax foreigners, and leave them in the same position as if they had been contented to tax none but their own subjects. In this power of retaliation lies the antidote to the evil of one state being forced to bear the burthens of another as well as its own. Every state would naturally resist such an imposition upon its subjects, and export duties can therefore only be safely resorted to in such peculiar cases as we have noticed, where foreigners are willing to pay an increased price for commodities which they must have, and which they cannot obtain so good or so cheap from any other place.

[Customs; Excise; Land Tax; Post-Office; Stamps; Taxes; Tithes; Warehousing System.]

TAXA'CEÆ, a natural order of plants belonging to the class Gymnospermæ:—This order possesses the following essential characters. The flowers are monœcious or diœcious, and are naked, or solitary surrounded by imbricated bracts, or in spikes surrounded by bracts. The male flowers have no calyx, and several stamens, mostly united at the base, with the anthers either combined or distinct. The female flowers are solitary and naked; the ovules are naked, with the foramen at the apex. The seeds are hard, and are sometimes surrounded by a succulent, coloured, cup-shaped pericarp: they possess fleshy albumen, and a straight dicotyledonous embryo. The plants of this order are trees or shrubs, having a woody tissue marked with circular disks, with evergreen and mostly narrow, rigid, entire, and veinless leaves.

This order is very characteristic of the class to which it belongs, in the absence of any regularly formed ovary, and the consequent exposed or naked state of the ovule and seeds. In this respect it offers a lower state of organization than the Coniferæ, or Pine tribe, the ovules of which have a kind of protection in the hardened scale-like bracts which constitute the cones of that order. The foliage also of Taxaceæ differs from Coniferæ, in their possessing a greater tendency to expand and form veins within their tissue. In the few species of Taxaceæ that possess veins, they are not straight and parallel, as in Endogens, but are forked and of a uniform thickness, similar to those possessed by the higher forms of Cryptogamia, as the Ferns.

This order consists of plants that are but thinly distributed on the surface of the earth. They are mostly natives of temperate parts of Europe, Asia, Africa, and America. The order yields trees which are valued for their timber, and, like Coniferæ, possess resinous properties. The branches of the *Dacrydium taxifolium* are used in New Zealand for making spruce-beer. [Taxus; Salisburia.]

TAXA'TIO ECCLESIA'STICA, signifies the assessment and levy of taxes upon the property of the church and of the clergy. The pope once claimed in all countries the first year's whole profits and the tenth part of the whole annual profits of every ecclesiastical benefice. These were called 'First-Fruits and Tenths' [First-Fruits; Tenths], and were, for the most part, paid willingly by the clergy to their ecclesiastical superior. The popes founded their claim upon scriptural precepts and practice. They referred to Abraham, a priest, paying tithes to Melchizedeck, the high priest (*Gen.*, xiv. 20; and *Hebr.*, vii. 4); and to the Levites, in the Mosaic law, paying the second tithes, that is, the tithes of their tithes, to the priest: 'Thus shall you offer an heave-offering unto the Lord of all your tithes which ye receive of the children of Israel, and ye shall give thereof the Lord's heave-offering to Aaron the priest.' (*Numb.*, xviii. 28; Fuller's *Church History*, p. 226.)

The pope had his collectors in every diocese, who sometimes by bills of exchange, but generally in specie, yearly returned the tenths and first-fruits of the clergy to Rome.

But while the clergy were thus liable to taxation by their ecclesiastical head, it was maintained by the Roman Catholic church that their property enjoyed complete immunity against all claims of temporal powers, being set apart for the service of God, the support and dignity of the Christian church, and for works of charity. Upon this point frequent contests very naturally arose, and the vast possessions of the church tempted the pope and temporal princes by various modes to exact contributions from the clergy. The means resorted to by these respective powers to raise a revenue from the clergy, and the laws and customs that prevailed upon the matter, may be conveniently stated by dividing the subject into—

1. Taxation of the church or clergy by the pope for ecclesiastical purposes.

2. By temporal princes for the service of the state.

1. The pope was by no means satisfied with the regular contributions of the clergy, but continually applied to them for extraordinary funds for special purposes. In 1199 Pope Innocent III. issued a bull commanding the prelates and clergy of the Christian church to pay the 40th part of all their revenues to defray the expenses of a crusade. This is said to have been the first attempt to impose a tax on the clergy of all nations by the authority of the pope as head of the church. To enumerate only a small portion of the instances in which the pope afterwards exacted taxes from the clergy in the various countries of Europe would occupy much space; but a few examples from English history may be collected.

In 1225 the pope entertained a project by which the revenues of two prebends in every cathedral, and the portion of two monks in every monastery, in all the countries in communion with the church of Rome, were to have been granted to the pope for the better support of his dignity. When this project was laid before the parliament of England in 1226, they evaded a direct answer to the papal legate, by alleging 'that this affair concerned all Christendom; and that they would conform to the resolutions of other Christian countries.' (Wilkin's *Concilia*, vol. i., p. 620.)

Two years afterwards the king of England, Henry III., in order to induce the pope to interfere in a dispute concerning the appointment of an archbishop to the see of Canterbury, recently vacant by the death of Cardinal Lang-ton, promised him a tenth of the moveables not only of the clergy, but of the laity. In this proceeding there appears to have been a twofold peculiarity. First, a temporal prince offered the pope a contribution from his clergy, which commonly originated with the pope; and secondly, a tax was to be levied upon the laity not for the service of the state, but for the benefit of a foreign ecclesiastic. The strangeness of the circumstances however did not prevent the pope from taking immediate advantage of the king's offer, and he accordingly sent a legate into England to collect the tenths. His demand met with some opposition, indeed, chiefly from the barons, but the pope and the king together were too powerful to be resisted. The legate, to shorten the work of collection, obliged the bishops to pay the tax for their inferior clergy; and when any of them complained that they had no ready money, he introduced them to certain Italian usurers whom he had brought with him for that purpose, who lent them the sums demanded at an exorbitant rate of interest. (Matthew Paris, p. 362.)

In the same reign the pope's legates were constantly demanding presents from the bishops, monasteries, and clergy, and convening assemblies of the church with no other object than to extort money. Their proceedings created such disgust that the great barons sent orders to the wardens of the seaports to stop all persons bringing any bulls or mandates from Rome, and at last succeeded in driving the legate himself out of the kingdom. (Matthew Paris, p. 659.) Little good however was effected by these measures, for we find that in 1246 the pope demanded the half of all the goods of the non-resident clergy and the third of those who resided. (Ibid., 708.) The resistance met with in this case deterred the pope from enforcing his demand; but the sums which he continued to draw from the clergy at that time appear to have been enormous, and the histories of that period are full of complaints and remonstrances against papal exactions. An act was passed by the parliament in 1307 (*Statute of Carlisle*, 35 Edward I.), to restrain, in some measure, the exactions of the see of Rome, but apparently with little good results; for seventy years afterwards we find the Commons in parliament still protesting against the extortions of the pope. In their remonstrance to the king upon that grievance they asserted, 'that the taxes paid to the pope yearly, out of England, amounted to five times as much as the taxes paid to the king.' (Cotton's *Abridgment*, p. 128.)

Although complaints continued long after this period, no measures were effectual in limiting the demands of the court of Rome until the pope's authority was altogether suppressed in England at the Reformation in the reign of Henry VIII.

2. The immunities claimed by the church were not effectual in protecting its revenues from being laid under contribution for the service of the state. The kings of England, sometimes by the pope's authority, sometimes by forced or voluntary compliance on the part of the church, and sometimes by their own direct power, obtained large sums from the clergy.

William the Conqueror found the church very wealthy, and subjected it to much spoliation. (Matthew Paris, p. 5.) A singular occasion for taxing the clergy arose in the reign of Henry I., A.D. 1129. An ecclesiastical council, assembled at London, denounced all married clergymen, and decreed that they should put away their wives. The council committed to the king the execution of their decrees, but he, instead of compelling the clergy to send away their wives, imposed a tax on those who chose to retain them, which is said to have been very productive.

The pope was not unwilling to assist in oppressing the clergy for the benefit of kings, when they were inclined to further his own objects, either by undertaking crusades, carrying on wars against his enemies, or making concessions to him. He could not suffer the immunities of the church to be infringed by the temporal power, but often placed at the disposal of princes the revenues of the church by his own authority. Thus the pope, by virtue of his apostolical power, granted King Henry III., by several bulls, the goods of all clergymen who died intestate, the revenues of all vacant benefices, and of all non-residents. In 1253 Pope Innocent XXII. gave the first-fruits and tenths of all ecclesiastical benefices to the king for three years. This grant made a valuation or taxation of the benefices necessary, which was accordingly undertaken in the following year, and is sometimes called the 'Norwich Taxation,' and sometimes 'Pope Innocent's Valor.' The same prince, with the pope's concurrence, extorted large sums from the clergy in 1255 to carry on his wars with Sicily. Bills amounting on the whole to 150,540 marks were drawn upon all the bishops, abbots, and principal clergymen of the kingdom by Walleran, bishop of Hereford, who resided at Rome as an agent for the church of England: these bills were made over to Italian merchants, who, it was pretended, had already advanced the money for the Sicilian war. All resistance on the part of the church to these unjust demands of their own spiritual superior was unavailing, and after much remonstrance and opposition the money was paid. (Matthew Paris, pp. 615-619.)

In 1288 Pope Nicholas IV. granted the tenths to King Edward I. for six years, towards defraying the expenses of an expedition to the Holy Land; and in order to collect them at their full value, a taxation by the king's precept was begun in that year, and finished, as to the province of Canterbury, in 1291, and as to that of York in the following year, the whole being under the direction of the bishops of Winchester and Lincoln. This taxation is a most important record, because all the taxes of the church, as well to the kings of England as to the pope, were afterwards regulated by it until the survey made by Henry VIII.; and because the statutes of colleges which were founded before the Reformation are also interpreted by this criterion, according to which their benefices, under a certain value, are exempted from the restriction in the statute 21 Henry VIII. concerning pluralities. (*Preface to Taxatio Ecclesiastica, P. Nich. IV., by the Record Commissioners.*)

In 1295 Edward, notwithstanding the pope's grant, and numerous exactions from the clergy in the meantime, being still in great need of money to carry on his wars, summoned deputies from the inferior clergy for the first time to vote him supplies from their own body. In the preceding year he had, by threats and violence, exacted a tax of half the revenues of the clergy; but now he thought it prudent to obtain their consent to his demands in a more regular manner. The clergy however would not obey the king's writ of summons, lest they should appear to acknowledge the temporal power; and in order to overcome this objection, the king issued his writ to the archbishop, who, as their spiritual superior, summoned the clergy to meet in convocation. (Gilbert's *History of the Exchequer*, p. 51; *Hume*, vol. ii., pp. 278, 279.)

This was the commencement of the constitutional practice of the clergy meeting in Convocation at the same time as the Lay Parliament, and voting subsidies by its own voluntary act for the service of the state. It was not viewed without alarm by the pope and the high church dignitaries; and in order to put a stop to all such exactions of princes from the clergy, Pope Boniface VIII. issued a bull in 1296, which, after stating that temporal princes were in the habit of extorting heavy contributions from ecclesiastical persons, who, fearing to offend temporal power more than the eternal, had unwisely acquiesced in such extortions, proceeded to forbid churchmen of every degree to pay any tribute, subsidy, or gift to laymen, without authority from the see of Rome; and declared that if they should pay, or princes exact, or any one assist in levying such unauthorised taxes, all such persons respectively would incur the sentence of excommunication. (Rymer's *Fœdera*, vol. i., part 2, p. 836; Record Commissioners, ed. 1816.)

In the same year however Edward I. demanded of the clergy a fifth of their moveables, which they resisted, on the ground that they could not disobey the pope: but the king was not inclined to desist; and in order to force the acquiescence of the clergy, he put them out of the pale of the laws. Orders were issued to the judges to hear no cause brought before them by the clergy, but to decide all causes in which they were sued by others. The clergy were immediately exposed to violence and spoliation on all sides, in spite of a general sentence of excommunication pronounced by the archbishop against all persons who should attack the persons or property of ecclesiastics. The clergy could not long resist these oppressions; and although they were unwilling to disobey the Papal bull, they evaded it by voluntarily depositing a sum equivalent to the amount demanded of them in some church, whence it was taken by the king's officers. In this expedient the whole ecclesiastical body acquiesced, and thus yielded up their spiritual privileges, under coercion by the temporal power.

At the Reformation, the chief source of revenue to the pope, viz., first-fruits and tenths, was transferred to the king 'for more augmentation and maintenance of the royal estate of his imperial crown and dignity of supreme head of the church of England.' (Stat. 26 Henry VIII., c. 3.) In order to collect this revenue a court of first-fruits was established, and the king ordered a valuation to be made of all the episcopal sees and benefices in England. The book which contains this valuation is called the 'Liber Regis,' and all the benefices which have not since been exempted still pay first-fruits and tenths according to this valuation. The first-fruits and tenths continued to form part of the royal revenue until Queen Anne, by the Act 2 & 3 of her reign, c. 11, gave up the proceeds thereof on the part of herself and her successors, and assigned them for ever to the augmentation of poor livings.

It now only remains to notice more particularly the practice of taxing the clergy in convocation, which continued in full force till the reign of Charles II. It had afforded the kings of England a lucrative revenue from the church. Their influence as heads of the church, and as having ecclesiastical preferments to bestow, was very great after the Reformation, and enabled them very commonly to obtain larger subsidies from the convocation than those that were voted by parliament. The church therefore was not unwilling to be deprived of the expensive privilege of voting separate subsidies; and acquiesced in an arrangement proposed in 1664-5, by which the Commons have ever since voted taxes upon the possessions of the church and of the clergy, in the same manner as upon the laity. As a boon for this submission of the church to temporal authority, two subsidies which the convocation had granted were remitted, and the parochial clergy were allowed to vote at elections. [CLERGY; CONVOCATION; TITHES.]

TAXES. The general objects, character, and principles of taxation, and of different classes of taxes, are treated of under the head of TAX, TAXATION. In this place it is proposed to give a short summary of the amount and description of taxes paid in this and some other countries, whether assessed directly upon property, or collected indirectly upon articles of consumption; including not only such taxes as are paid to the general government, but also all municipal and local assessments or contributions.

United Kingdom.

The chief sources of revenue are from indirect taxes, as will be seen by the following statement, made up to 5th January, 1842:—

	Gross Receipt.	Rate per cent. at which collected.		
	£	£	s.	d.
Customs	23,821,486	5	6	4
Excise	15,477,674	6	7	8½
Stamps	7,404,239	2	3	4
Taxes (Assessed, &c.)	4,720,457	4	2	9½
Post-Office	1,539,274	60	9	6¼
Duties on Pensions and Salaries	5,752	1	17	6¼
Crown Lands	438,29[illegible]	[illegible]	18	3¼
Small branches of hereditary revenue	5,562			
Surplus fees of public offices	93,504			
Total ordinary revenues	53,596,250	6	13	8¼

To these parliamentary taxes may be added the following local assessments:—

Poor-rates	£6,351,828 (which includes county rates, 700,000*l.*)
Church-rates	600,000 (in round numbers).
Highway-rates	1,312,812
Turnpike-tolls (England and Wales)	1,577,764
Grand-jury presentments (Ireland)	1,265,866
Total of local taxes	11,108,270

(*Parliamentary Papers*, 1839 (562), 1841 (344) (421), 1842 (135) (235).)

These include all the local taxes of which any account can be given, but there are still many others, such as rates for paving, lighting, and watching particular cities and towns, and for other municipal purposes. It may also be added that the tithes of Great Britain and Ireland amount to 4,000,000*l.*

It is instructive to compare the present amount of taxes with that rendered necessary by a war expenditure. From 1805 to 1818 the payments into the British exchequer from taxes and loans in no one year amounted to less than 100,000,000*l.*, and in 1813 arose to the enormous and scarcely credible sum of 176,346,023*l.*

Denmark.

The total amount of all state and provincial or country commune taxes amounted in 1841 to 2,020,000*l.*, upon a population of 2,100,000.

Sweden.

The state taxes amount to	£753,404
Provincial	522,720
Municipal—Stockholm	28,035
All other towns	50,675
Total	£1,354,834

Kingdom of the Netherlands.

Total of government and provincial taxes £5,368,874

France.

Direct contributions for the state	£11,433,204
" " for the provinces	2,743,131
" " for the communes	337,918
Additional	27,948
Total	£15,842,184
Indirect taxes for the state	£29,544,203
Miscellaneous items	453,738
Other sources of revenue	585,600
General total	£46,425,725

Saxony.

The state taxes are:—

	Prussian Dollars.
Direct	1,063,584
Indirect	1,709,610
	2,073,194 or £310,929

Wirtemberg.

State taxes	£534,445
Provincial and municipal	100,938
Total	£635,383

Baden.

State taxes:—	
Direct	£158,333
Indirect	344,000
Total	£502,333

Bavaria.

Direct state taxes	£511,407
Indirect	895,119
Which, with other sources of income, produce a revenue of	2,501,039

Sardinia.

State taxes:—	
Direct	£500,264
Indirect	1,090,000
Total	£1,590,264

Rome (Papal States).

State taxes:—	
Direct	£497,413
Indirect and Miscellaneous	1,261,989

Kingdom of Naples and Sicily.

Naples:—State taxes (exclusive of Sicily)	£3,994,957
Municipal taxes	155,267
Total	£4,150,224
Sicily:—Direct state taxes	£232,500
Indirect	630,639
Total	£862,869
Municipal taxes	£1,163,212

Portugal.

	£	s.	d.
Crown rents . .	157,964	10	3
Direct taxes . .	668,074	18	6
Indirect taxes . .	1,070,780	4	9
Various rents . .	434,046	7	3
Total . .	£2,330,866	0	9

Further interesting particulars concerning the several taxes of European States will be found in the Parliamentary Paper, No. 227, of 1842, ordered by the House of Commons to be printed, 3rd May, 1842.

TAXO'DIUM, from *taxus*, the name of a genus of plants belonging to the natural order Coniferæ. The plants of this genus are monœcious. The male flowers are arranged in catkins of a roundish form, disposed in racemose panicles; the pollen of each flower is contained in five cases, which are attached to the scale at its inner face. The female flowers are also arranged in small round catkins, two or three of which are attached near to the base of the spike of the catkins of male flowers. The ovules are two in each receptacle. The fruit is a globose strobule, with peltate angled scales; the seeds are angled with very thick integuments; the embryo, with from 5 to 9 cotyledons. The leaves are linear, disposed in two ranks, and are deciduous. This genus has been distinguished from Cupressus principally on account of the arrangement of its male catkins in racemose panicles, the small number of flowers in the female catkins, and the numbers of cotyledons possessed by the embryo.

This genus is well known through the *Taxodium distichum*, deciduous Cypress, a tree that was introduced into Europe from North America as early as 1640. This species is characterized by two-rowed, flat, deciduous leaves; leafless and panicled male flowers, and somewhat globose strobils. It is an elegant tree, and attains a height of 120 feet in its native soil. The first plant that is mentioned as existing in this country was grown in South Lambeth, and was raised from seeds brought from Virginia. Since then it has been introduced in various parts of Great Britain, and many fine specimens are now to be found. In its native districts in North America it is exceedingly abundant, and in many parts, as in Louisiana, it entirely occupies thousands of acres of the low grounds, which are thence called *cyprières*, or cypress swamps. It is found in Delaware, on the banks of the Indian River, in 38° 50′ N. lat., which is its northern boundary, and, proceeding southward, it is abundant in the swamps of Virginia, the Carolinas, Georgia, and the Floridas.

In America, where the tree grows, its wood is used for all the purposes to which timber is applied. In 1819, according to Michaux, almost all the houses of New Orleans were constructed of the wood of this tree. It is considered very durable, and is employed where this quality is an object. In Louisiana it is used for making the masts and sides of vessels, and also canoes, which are fashioned out of a single trunk, and are said to be more durable than when made from any other wood. The bark of the tree exudes a resin of an agreeable odour and a red colour which is used by the negroes for dressing wounds, but it cannot be obtained in sufficient quantities to constitute an article of commerce. The roots of this tree are remarkable for the production of knobs or protuberances, which are sometimes five or six, and, according to some observers, many more feet in circumference. They have generally a conical form, and are hollow inside, with a covering of red bark, similar to that of the roots. In America, they are called 'cypress knees,' and are used by the negroes for bee-hives.

In the cultivation of the deciduous cypress, a rich moist soil must be selected in a low situation. It may be increased by seeds from the imported cones, or it may be propagated by cuttings, planted in autumn in a moist sand or heath soil, situated in a shady damp place. Layers also, when put down in moist soil, will root freely the first year.

During cultivation, this tree is exceedingly prone to sport, so that no two individuals have precisely the same appearance. On this account, a number of varieties have been named. The most common is the *T. d. patens*, which has horizontal branches. Another, with pendulous branches, is known as *T. d. pendulum*; a third, with pendulous first-year's shoots, as *T. d. nutans*. Other species of the genus have been described, but are not yet used or cultivated. For further information on this genus, see Loudon's 'Arb. et Frut. Brit.,' vol. iv.

TAXUS (*taxus*, Latin), the name of a genus of plants, the type of the natural order Taxaceæ. This genus is monœcious; the perianth of the barren flowers is single at the base; the stamens are numerous, with peltate anthers 6-8-celled, the cells opening beneath. The fertile flowers have a single, urceolate, scaly perianth; no style; and a fleshy drupaceous fruit, perforated at the extremity. The species of this genus are evergreen trees, with numerous, mostly linear, entire leaves. They are natives of Europe and North America.

T. baccata, Common Yew, has its leaves 2-ranked, crowded, linear, flat, with the flowers axillary, sessile; the receptacle of the barren flowers globular. The common yew is well known: it is indigenous to most parts of Europe, and is found in every part of Britain and Ireland. It is seldom seen growing in company with its own species, but alone, or with other species of plants.

The yew is a low tree, the trunk rising three or four feet from the ground, and then sending out numerous spreading branches, forming a head of dense foliage, which, when full grown, may be sometimes 30 or 40 feet high. It is of slow growth, attaining under favourable circumstances a height of 6 or 8 feet in ten years, and 15 feet in twenty years. The tallest yew in England is in the churchyard at Harlington, near Hounslow, which is 58 feet high. A tree continues growing for about one hundred years; it mostly ceases to grow at that age, but will live for many centuries. The yew-trees at present existing at Fountain's Abbey in Yorkshire are supposed to have attained their full growth when the abbey was erected in 1132.

The remarkable characters and properties of the yew have drawn towards it at all times much attention. Dioscorides, Pliny, and Theophrastus mention its poisonous properties. Cæsar (*Bell. Gall.*, vi. 31) relates that Cativolcus, king of the Eburones, committed suicide by swallowing the juice of the yew. Plutarch says that its fruit is poisonous, and that its shade is fatal to all who sleep under it. This is also stated by Pliny; but there must have been some mistake on some of these points, as it is now well known that the fruit of the yew may be eaten with impunity, and that its shade is not more deadly than that of other trees.

The yew appears to have been employed from the earliest times in the manufacture of bows, and was used for this purpose by the nations of antiquity. The bows used by the English previous to the introduction of gunpowder were made of yew, and there are many allusions amongst English poets to this use of its wood. The battles of Cressy and Poictiers were gained by the English yew-bows, and the same weapon was used in the wars of York and Lancaster. In the course of time the supply of yew was deficient, and other woods came to be used; but the introduction of gunpowder soon after put a stop to the use of the bow as a weapon of war altogether. Bows are now seldom made of the yew, various ornamental woods from South America being preferred. In Switzerland the yew tree is called William's tree, because the bow of William Tell is said to have been made of that wood. The yew is a common ornament of the churchyard. The origin of the practice of planting this tree in such situations is not at all clearly made out. Their dark foliage and supposed deadly shade may have pointed them out as the fit emblems of silence and death. Mr. Bowman (*Magaz. of Nat. Hist.*, vol. i.) observes that 'it seems most natural and most simple to believe, that being indisputably indigenous, and being, from its perennial verdure, its longevity, and the durability of its wood, at once an emblem and a specimen of immortality, its branches would be employed by our pagan ancestors, on their first arrival here, as the best substitute for the cypress to deck the graves of the dead, and for other sacred purposes.'

The yew used to be frequently planted in gardens as an ornament, on account of the facility with which it may be cut into various fantastic shapes. During the past century it was not uncommon to meet with these trees cut into the forms of balls, pyramids, beasts, birds, and men; but this practice having fallen under the well-merited censure of Pope and other writers, only a remnant of it here and there is seen at the present day. Although the fruit of the yew is not poisonous, there are many well-authenticated instances of the leaves producing death. Deer and goats are said to feed upon them with impunity, but to cows and horses they prove an active poison. The yew has not been at any time used generally as a medicine, although its effects on the system have been represented as similar to those of digitalis, and as being more manageable and less liable to accumulate in the system than that medicine. Professor Wiborg of Copenhagen states that the leaves of the yew are only poisonous to animals when they are eaten alone, but that if eaten with three or four times the quantity of other food they are innocuous.

There are several remarkable specimens of old yews existing in this country. Those at Fountains Abbey are said to have sheltered the monks whilst that magnificent pile was erecting. The Tytherley, Fortingal, Arlington, and Loch-Lomond yews are remarkable for their size and age. Many of them, if we estimate their age in the mode proposed by De Candolle, must exceed considerably a thousand years.

The wood of the yew is used extensively in cabinet-making. It is very hard, compact, and of a fine close grain, which arises from the smallness of its annual layers, 280 being sometimes found in a piece not more than 20 inches in diameter. It is also much used by the turner for making snuff-boxes, musical instruments, &c.

There are several varieties of the common yew; the most remarkable is the Irish yew, which Professor Lindley has made a distinct species, *Taxus fastigiata*. It is distinguished by its upright mode of growth, and by its leaves not being arranged in ranks, but scattered. It was first discovered at Florence Court, on the mountains of Fermanagh, and has since been observed in other parts of Ireland. Other varieties are described, produced by difference in cultivation, soil, &c. The Canada or North American yew is described as a species, *T. Canadensis*. The leaves are narrower and smaller than those of the common yew, and are revolute at the margin, and the male flowers are solitary in the axis of the leaves. It is found native in Canada, and on the banks of a river in Maryland.

In the cultivation of the yew, a moist soil should always be selected; but it thrives best on clays and loams, on rocks, and in shady places. It is best propagated by seeds, which, if sown as soon as they are gathered in autumn, surrounded by the pulp of the fruit, will come up the next or following spring; but if dried, will not come up till the third year. Where the object is to form a fence, cuttings may be employed. Before transplanting, whether they be raised from seeds or cuttings, the plants should be three or four feet high.

For further information concerning the yew, see Loudon's *Arboretum et Fruticetum Britannicum*.)

TAY, River. [PERTHSHIRE.]

TAY, LOCH. [PERTHSHIRE.]

TAYGETUS. [LACONIA.]

TAYLOR, ROWLAND, LL.D., was a clergyman eminent for his learning and piety, who was burnt at the stake in the reign of Queen Mary. He is said by Bishop Heber to have been an ancestor of Jeremy Taylor. He was chaplain to Archbishop Cranmer, by whom he was appointed rector of Hadleigh, in Suffolk, where he went to reside.

Dr. Taylor was summoned, in the year 1553, to appear in London before Gardiner, bishop of Winchester, who was then lord chancellor, for resisting the performance of mass in his church at Hadleigh. He was strongly persuaded to escape, but refused, and presented himself before Gardiner, by whom, after a long conference, in which he defended his cause with unshrinking firmness, he was committed to the King's Bench prison. There he remained till the 22nd of January, 1555, when he and other prisoners were cited before Gardiner, and the bishops of London, Norwich, Salisbury, and Durham, who were joint commissioners with the chancellor. The chief offence of which Dr. Taylor was now accused was his marriage; but he defended the right of priests to marry with so much learning, that no sentence of divorce was pronounced, though he was deprived of his benefice. At the end of January the prisoners were again brought before the commissioners, by whom they were sentenced to death. Dr. Taylor was committed to the Poultry Compter, where, on the 4th of February, he was visited by Bonner, bishop of London, who went there for the purpose of making him put on the dress of a Roman Catholic priest. Dr. Taylor resisted with his usual courage, and the dress was put upon him by force: he treated the whole proceeding with the utmost contempt, as a piece of mummery, and Bonner would have struck him with his crosier if he had not been restrained by his chaplain. On the following day the procession set forth which was to conduct him to the place of execution. In the course of the journey much persuasion was used by the sheriff and others to induce him to recant, but without making the smallest impression upon him. The procession passed through Hadleigh, where he was consoled and cheered by the blessings and prayers of his parishioners. The execution took place on the 8th of February, 1555, on Aldham Common, near Hadleigh. A stone, with the following inscription, perhaps still remains to mark the spot:—'1555. Dr. Tayler in defending that was gode at this plas left his blode.'

Bishop Heber, in his 'Life of Bishop Jeremy Taylor,' says, 'There is nothing indeed more beautiful in the whole beautiful Book of Martyrs than the account which Fox has given of Rowland Taylor, whether in the discharge of his duty as a parish priest or in the more arduous moments when he was called on to bear his cross in the cause of religion. His warmth of heart, his simplicity of manners, the total absence of the false stimulants of enthusiasm or pride, and the abundant overflow of better and holier feelings, are delineated, no less than his courage in death and the buoyant cheerfulness with which he encountered it, with a spirit only inferior to the eloquence and dignity of the "Phædon."'

(Fox's *Acts and Monuments*.)

TAYLOR JEREMY, was born at Cambridge in 1613, where he was baptized on the 15th August in that year. His ancestors had been wealthy and respectable, one of whom, Dr. Rowland Taylor, is mentioned in Fox's 'Book of Martyrs' as bringing upon himself the persecution of the popish party in the reign of Mary, not only by the popularity of his character and talents, but also his wealth. Taylor's father was a barber, a calling generally united in those days with surgery. At an early age Taylor was sent to Perse's grammar-school in Cambridge, and in his fourteenth year he was entered at Caius College as a sizar, an order of students which, Bishop Heber informs us, were then what the 'servitors' still continue to be in some colleges in Oxford, and what the 'lay brethren' are in the convents of the Romish church. At little more than twenty years of age, having taken the degree of master of arts, and been admitted to holy orders, he attracted the notice of Laud, then archbishop of Canterbury, before whom he was invited to preach at Lambeth. Laud appreciated his eloquence and his talents, which he encouraged in the most judicious manner by having him settled at Oxford, where he was admitted to the degree of master of arts, and by the powerful interposition of the archbishop, in 1636, nominated to a fellowship. Taylor does not appear to have remained long or uninterruptedly at Oxford. In 1637-8 he was presented by Juxon, bishop of London, to the rectory of Uppingham in Rutlandshire. About this time an acquaintance which, in common with Laud, he maintained with a learned Franciscan friar, Francis à Sancta Clara, exposed him to the suspicion of a concealed attachment to the Roman church—a suspicion to which the character of his mind, which tended to asceticism in religion, and to an extravagant veneration for antiquity, and which cherished a love of the gorgeous and imposing in the ceremonial of worship, gave some plausibility. At a later period in life however Taylor solemnly denied that there had ever been any solid ground for questioning the sincerity of his Protestantism.

In the civil wars he followed the fortunes of Charles, whose chaplain he was, and in 1642, when the king was at Oxford, he published there his 'Episcopacy asserted against the Acephali and Aerians New and Old,' in which he sought to maintain a cause that had then however, unfortunately, passed from the controversy of the pen to that of arms. Charles rewarded Taylor in the only way which it remained in his power to do, by commanding his admission to the degree of doctor of divinity. This honour was diminished by the indiscriminate manner in which it was conferred upon many other loyalists at the same time, so as to provoke an expression of dissatisfaction from the heads of the University; and its advantages were overbalanced by the loss which Taylor encountered in the same year, in the sequestration of his rectory of Uppingham by the parliament. In 1647, when the crisis of the civil war impended, he published his discourse, 'The Liberty of Prophesying.' After the defeat of the royalists Taylor was repeatedly imprisoned, but only for short periods. During the first years of the protectorate he supported himself by keeping a school, in Wales, in company with Nicholson, afterwards bishop of Gloucester, and Wyat, afterwards prebendary of Lincoln, by his occasional writings, and by whatever contribution the friendship of the earl of Carbery, on whose estate he exercised his ministry, might afford to him. In the year 1658 he was encouraged by Lord Conway to settle in Ireland, where he divided his residence between Lisburn and Portmore, and he officiated in the ministry at both these places. The provision which he received was however so inadequate to his wants, that he was obliged to remain under obligations to his friend John Evelyn, who generously allowed him a yearly pension. In the obscurity of Portmore Taylor did not escape the unhappy persecutions of that period. He was charged by an informer with having used the sign of the cross in baptism, and dragged before the Irish privy council, from a distance and in the middle of a severe winter, to be examined. A fever was the consequence of his arrest, which probably induced the council to act leniently towards him.

In 1660 he travelled to London to prepare for publication his 'Ductor Dubitantium,' when he attached his signature to the declaration of the royalists, dated April 24th, in which they expressed the moderation of their views, and their confidence in the wisdom and justice of Monk. Taylor was thus favourably brought under the notice of Charles II., whose restoration took place this year, and to whom he dedicated the 'Ductor Dubitantium.' The king nominated him under the privy seal to the bishopric of Down and Connor, to which he was consecrated in January, 1661: in the following month he was made a member of the Irish privy council; and in the next, in addition to his original diocese, he was intrusted with the administration of the small adjacent one of Dromore, on account, in the words of the writ, 'of his virtue, his wisdom, and industry.' In the course of the same year he was elected vice-chancellor of the University of Dublin. Bishop Heber has deemed it necessary to account for Taylor's not having received an English bishopric. Besides his eminent abilities, and his faithful adherence to the cause of the church and the king, he had married the natural daughter of Charles I., who was his second wife, and then living. This last circumstance however, if pleaded with the king in favour of preferment for Taylor, as Bishop Heber thinks, may have contributed to determine the scene of his promotion: 'Charles may not have been unwilling to remove to a distance a person whose piety might have led him to reprove many parts of his conduct, and who would have a plausible pretence for speaking more freely than the rest of the dignified clergy.'

The new station which Taylor was called upon to fill had peculiar and great difficulties connected with it. In the revolution through which religion had passed, livings had been conferred on men whose feelings were at variance with episcopacy, and they had to be conciliated to a willing obedience, or, as time proved, to submit to the severest test of principle in the sacrifice of their emoluments. In Ireland there were additional circumstances to contend with. The Episcopal or Protestant church was unpopular; the preachers were almost exclusively English; the ritual was English, and to the mass of the natives unintelligible; there was no translation of the Scriptures, and yet attendance at the established churches was compulsory. Bishop Taylor laboured with much zeal and energy for the establishment of the Protestant religion; but with little effect. He was attacked by fever on the 3rd August, 1667, at Lisburn, and died in ten days, in the fifty-fifth year of his age, and the seventh of his episcopacy. The children of his first wife died before him; by his second, who survived him, he left three daughters.

The writings of Jeremy Taylor may be brought under four descriptions: practical, theological, casuistic, and devotional. The first comprises his 'Life of Christ,' which he published in 1653; 'Contemplations on the State of Man,' a posthumous work; 'Holy Living and Holy Dying,' 1651; and his Sermons, which appeared at various periods. A work entitled 'Christian Consolation' has been referred to him, and published in the collected edition of his writings by Bishop Heber in 1820-2; but it has since been published in the name of Bishop Hackett, who appears to have been its true author. The second comprises his 'Episcopacy asserted against the Acephali and Aerians New and Old,' 1642; 'An Apology for Authorized and Set Forms of Liturgy,' 1644; his 'Discourse of the Liberty of Prophesying, with its just limits and temper; showing the unreasonableness of prescribing to other men's faith, and the iniquity of persecuting differing opinions,' 1647; the 'Unum Necessarium; or the Doctrine and Practice of Repentance,' 1665; 'Deus Justificatus, or a Vindication of the Glory of the Divine Attributes in the question of Original Sin, against the Presbyterian way of understanding it,' 1656; 'The Real Presence and Spiritual of Christ in the Blessed Sacrament, proved against the Doctrine of Transubstantiation,' 1654; 'A Dissuasive from Popery,' 1664. The third includes his 'Discourse of the Nature, Offices, and Measures of Friendship, with Rules of Conducting it,' 1657; and the 'Ductor Dubitantium, or Rule of Conscience in all Her general Measures,' 1660. The fourth comprises his 'Clerus Domini, or a Discourse of the Divine Institution, Necessity, Sacredness, and Separation of the office Ministerial, together with the Nature and Manner of its Power and Operation,' 1651; 'The Golden Grove, or a Manual of Daily Prayers and Litanies, fitted to the Days of the Week,' 1654; 'The Psalter of David, with Titles or Collects, according to the Matter of each Psalm,' 1644; 'A Collection of Offices or Forms of Prayer in cases ordinary and extraordinary; taken out of the Scriptures, and the Ancient Liturgies of several Churches, especially the Greek,' 1658; 'Devotions for Various Occasions;' and 'The Worthy Communicant, or a Discourse of the Nature, Effects, and Blessings consequent to the worthy receiving of the Lord's Supper, and of all the Duties required in order to a worthy preparation; together with the Cases of Conscience occurring in the duty of him that ministers and of him that communicates,' 1660.

Mr. Hallam ranks the Sermons of Bishop Taylor 'far above any that had preceded them in the Church of England. An imagination essentially poetical, and sparing none of the decorations which by critical rules are deemed almost peculiar to verse; a warm tone of piety, sweetness, and charity; an accumulation of circumstantial accessories whenever he reasons, or persuades, or describes; an erudition pouring itself forth in quotation till his sermons become in some places almost a garland of flowers from all other writers, and especially from those of classical antiquity, never before so redundantly scattered from the pulpit, distinguish Taylor from his contemporaries by their degree, as they do from most of his successors by their kind. His sermons on the Marriage Ring, on the House of Feasting, on the Apples of Sodom, may be named without disparagement to others, which perhaps ought to stand in equal place. But they are not without considerable faults, some of which have just been hinted. The eloquence of Taylor is great, but it is not eloquence of the highest class; it is far too Asiatic, too much in the style of Chrysostom and other declaimers of the fourth century, by the study of whom he had probably vitiated his taste; his learning is ill-placed, and his arguments often much so; not to mention that he has the common defect of alleging nugatory proofs; his vehemence loses its effect by the circuity of his pleonastic language; his sentences are of endless length, and hence not only altogether unmusical, but not always reducible to grammar. But he is still the greatest ornament of the English pulpit up to the middle of the seventeenth century; and we have no reason to believe, or rather much reason to disbelieve, that he has any competitor in other languages.' (Hallam's *Introduction to the Literature of Europe*, vol. iii., c. ii., p. 125-6.)

He has been accused of having copied a work of a similar character by Ludolphus de Saxonia, a Roman Catholic writer, in his 'Life of Christ;' but Bishop Heber, who had examined both works, asserts that there is scarcely any resemblance between them, and none which authorizes the imputation of plagiarism.

'The Liberty of Prophesying' (that is of interpretation) is the most popular in the second divison of Taylor's writings. A very good sketch of it will be found in the third volume of Mr. Hallam's 'Introduction to the Literature of Europe, and a more detailed one in the first volume of Heber's edition of Taylor's works. But the discourse itself is not long, and will well repay the reading. It considerably diminishes the admiration with which we are disposed to connect this production of Taylor with the man, his order, and the times, when we take into account the motives which he afterwards assigned for its publication. 'In the dedication to Lord Hatton of the collective edition of his controversial writings after the Restoration, he declares that when a persecution did arise against the Church of England, he intended to make a reservation for his brethren and himself, by pleading for a liberty to our consciences to persevere in that profession, which was warranted by all the laws of God and our superiors.' (Hallam, *Introduction to the Literature of Europe*, vol. iii., p. 116.) Bishop Heber has vindicated Taylor from the charge of tergiversation, founded not upon the above testimony which Taylor himself furnishes, but upon the character of his proceedings when episcopacy was restored. If we must allow in reference to his Sermon preached before the Irish Privy Council, that the obedience which he there insists upon is only, as Bishop Heber suggests, that obedience to the laws of ecclesiastical superiors which is paid by the members (clergy) of their own communion; and that it is in fact no more than the privilege (which every Christian society exerts and must exert for its own preservation) to have the offices of its ministry supplied by such men as conform to the regulation imposed by the body at large on those to whom its powers are delegated; we ought to add that this distinction is left in much ambiguity; that principles are maintained with a much more general signification than this explanation allows; and, in one word, upon ninety-nine out of a hundred readers the sermon before the Irish Privy Council would produce impressions totally inconsistent with those derived from the 'Discourse on the Liberty of Prophesying.' After expressing his sorrow at seeing the horrid mischiefs which come from rebellion and disobedience, and his hopes of better things, the bishop of Down and Connor proceeds in his sermon before the Privy Council to say that he sees no objection 'against his hopes but that which ought least of all in this case to be pretended: men pretend conscience against obedience, expressly against St. Paul's doctrine teaching us to obey for conscience sake; but to disobey for conscience in a thing indifferent is never to be found in the books of our religion. It is very hard when the prince is forced to say to his rebellious subjects, as God did to his stubborn people, 'Quid faciam tibi?' 'I have tried all the ways I can to bring thee home, and what shall I now do unto thee?' The subject should rather say, 'Quid me vis facere?' 'What wilt thou have me to do?' This question is the best end of disputations. 'Corrumpitur atque dissolvitur imperantis officium, si quis ad id quod facere jussus est, non obsequio debito, sed consilio non considerato, respondeat,' said one in A. Gellius; When a subject is commanded to obey, and he disputes, and says, 'Nay, but the other is better,' he is like a servant that gives his master necessary counsel when he requires of him a necessary obedience. 'Utilius parere edicto quam efferre consilium;' 'he had better obey than give counsel;' by how much it is better to be profitable than to be witty, to be full of goodness rather than full of talk and argument.' Farther on, in the same sermon, he distinguishes between a 'tender conscience,' which is such in reference to age or ignorance, or of 'new beginners,' and that which is the 'tenderness of a boil; that is soreness indeed, rather than tenderness, is of the diseased, the abused, and the mispersuaded.' The first is to be dealt tenderly with. 'But for that tenderness of conscience which is the disease and soreness of a conscience, it must be cured by anodynes and soft usages, unless they prove ineffective, and that the lancet may be necessary.'

Mr. Hallam refers to the 'Ductor Dubitantium' as the most extensive and learned work on casuistry which has appeared in the English language. 'As its title shows, it treats of subjective morality, or the guidance of the conscience. But this cannot be much discussed without establishing some principles of objective right and wrong, some standard by which the conscience is to be ruled. "The whole measure and rule of conscience," according to Taylor, "is the law of God, or God's will signified to us by nature or revelation; and by the several manners and times and parts of its communication it hath obtained several names: the law of nature, the consent of nations, right reason, the Decalogue, the sermon of Christ, the canons of the apostles, the laws ecclesiastical and civil of princes and governors, expressed by proverbs and other instances and manners of public honesty. . . . These being the full measures of right and wrong, of lawful and unlawful, will be the rule of conscience and the subject of the present book." The heterogeneous combination of things so different in nature and authority, as if they were all expressions of the law of God, does not augur well for the distinctness of Taylor's moral philosophy, and would be disadvantageously compared with the Ecclesiastical Polity of Hooker. Nor are we deceived in the anticipations we might draw. With many of Taylor's excellencies, his vast fertility, and his frequent acuteness, the "Ductor Dubitantium" exhibits his characteristic defects: the waste of quotations is even greater than in his other writings, and his own exuberance of mind degenerates into an intolerable prolixity. His solution of moral difficulties is often unsatisfactory; after an accumulation of argument and authorities we have the disappointment to perceive that the knot is neither untied nor cut; there seems a want of close investigation of principles, a frequent confusion and obscurity, which Taylor's two chief faults, excessive display of erudition and redundancy of language, conspire to produce. . . . Taylor seems inclined to side with those who resolve all right and wrong into the positive will of God. The law of nature he defines to be "the universal law of the world or of mankind, to which we are inclined by nature, invited by consent, prompted by reason, but which is bound upon us only by the command of God." Though in the strict meaning of the word law, this may be truly said, it was surely required, considering the large sense which that word has obtained as coincident with moral right, that a fuller explanation should be given than Taylor has even intimated, lest the goodness of the Deity should seem something arbitrary and precarious. And, though in maintaining against most of the scholastic metaphysicians that God can dispense with the precepts of the Decalogue, he may be substantially right, yet his reasons seem by no means the clearest and most satisfactory that might be assigned. It may be added, that in his prolix rules concerning what he calls a probable conscience, he comes very near to the much-decried theories of the Jesuits. There was indeed a vein of subtlety in Taylor's understanding which was not always without influence on his candour.' (*Introduction to the Literature of Europe*, chap. iv., vol. iv.)

Bishop Heber has also remarked on some of Taylor's positions to the same effect; instancing his admission that private evil may be done by public men and for the public necessity; his justification on moral grounds of the supposed fraud of the children of Israel in borrowing jewels of the Egyptians without any intention of restoring them. 'In the first chapter of the third book, which treats of human laws and their obligations, a case occurs in illustration of Rule iv., that "a law founded on a false presumption does not bind the conscience," in which the Romish canonists seem to have given a more just decision than Taylor: Biretti, a Venetian gentleman, pretends a desire to marry Julia Medici, the daughter of a neighbour, with a purpose to seduce and desert her. A contract is made; but before its execution he gains his end, and leaving her, marries another. The canonists declare the former contract, followed by congress, to be a marriage, and that he is bound to return to Julia. "No," says Taylor, "if he did not lie with her, 'affectu maritali,' "he was extremely impious and unjust; but he made no marriage; for without mutual consent marriages are not made."' To these illustrations, adduced by Heber, may be added another, referred to elsewhere: Rule xi., 484, he maintains the right of using arguments and authorities in controversy which we do not believe to be valid; a rule of which he appears to have taken advantage; for, 'in the *Defence of Episcopacy*, published in 1642, he maintains the authenticity of the first fifty of the apostolic canons, all of which, in the "Liberty of Prophesying," a very few years afterwards, he indiscriminately rejects.' (Hallam.)

On devotional subjects the character of Taylor's mind fitted him to write with most success. In these we find his most glowing language, his aptest illustrations; and 'whether he describes the duties, or dangers, or hopes of man, or the mercy, power, and justice of the Most High; whether he exhorts or instructs his brethren, or offers up his supplications in their behalf to the common Father of all, his conceptions and his expressions belong to the loftiest and most sacred description of poetry, of which they only want what they cannot be said to need, the name and the metrical arrangement.' (Heber, *Life and Works of Jeremy Taylor*, 15 vols., 1820-22.)

TAYLOR, JOHN, best known by the title, which he seems to have given to himself, of *The Water-Poet* ('The King's Majesty's Water-Poet'), was born in the city of Gloucester in the year 1580. His education was limited, for he himself informs us that he was 'gravelled' in his 'Accidence,' and could get no farther. He came to London, and was bound apprentice to a waterman, an occupation from which he derived his title of 'Water-Poet,' and which afforded him the means of subsistence during a great part of his life. He had however for fifteen or sixteen years some situation in the Tower of London; and he afterwards kept a public-house in Phœnix-Alley, Long Acre. Being an enthusiastic royalist, when Charles I. was beheaded he hung up the sign of the Mourning Crown, which however he was compelled to take down, and he then supplied its place by a portrait of himself, with the following couplet under it:—

'There's many a king's head hang'd up for a sign,
And many a saint's head too: then why not mine?'

Taylor was not satisfied with the distinction which his literary productions procured for him: he was fond of fixing public attention by other extraordinary performances. He once undertook to sail from London to Rochester in a boat made of paper, but the water found its way into his boat before he reached his destination, and he had some difficulty to get safe ashore. A journey which he performed by land is described in one of his tracts, entitled 'The Pennyless Pilgrimage, or the Moneyless Perambulation of John Taylor, alias the King's Majesty's Water-Poet; how he travelled on foot from London to Edinburgh in Scotland, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging.' He left 'the Bell Inn that's extra Aldersgate' on the 14th of July, 1618. A full account of this journey, abstracted from Taylor's pamphlet, is given in the 'Penny Magazine,' Nos. 622 and 623. He was attended by a servant with a horse, and they had a small stock of provisions and provender, which more than once relieved them when the occasional inhospitality which they met with had reduced them to the extremity of hunger. His course was through St. Albans, Stony Stratford, Coventry, Lichfield, Newcastle-under-Lyne, Manchester, Preston, Lancaster, Penrith, Carlisle, Edinburgh, Dunfermline, Stirling, Perth; and being then in the Highlands, he had an opportunity of seeing, at 'the Brae o' Mar,' one of those great deer-hunts which were then frequent in that part of Scotland, and of which he gives in his pamphlet an entertaining and picturesque description. The whole journey till his return to London occupied about three months. But a sort of voyage which he afterwards performed was apparently not less difficult. He published, as usual, an account of it himself, 'John Taylor's last Voyage and Adventure, performed from the 20th of July last, 1641, to the 10th of September following; in which time he passed with a sculler's boat from the citie of London to the cities and townes of Oxford, Gloucester, Shrewsbury, Bristol, Bathe, Monmouth, and Hereford.' From this title it might be supposed that he went all the way by water, a feat which, seeing the courses of the rivers, and the want of canals in those days, was an obvious impossibility; but the fact is, that when a river ceased to be navigable, or ran in a wrong direction, he shipped his boat and himself in a wain or waggon, and voyaged overland till he came to another river which suited his purpose: still a great part of the voyage was performed by water, and thus, to use his own words, 'in lesse than twenty days' labour, 1200 miles were passed to and fro, in most hard, difficult, and many dangerous passages.'

Taylor died in 1654, in his 75th year, and was buried in the church-yard of Covent-Garden, London.

His publications, which amount to upwards of eighty, are some in prose, some in verse, and many both in prose and verse. As literary productions they are of little or no value, the verse mere doggrel, and the prose such as might be expected from a writer not without observation, but of no great power of mind, and almost entirely uneducated. Still they are by no means without their value. Nearly all of them being short occasional productions arising out of the circumstances in which he was placed, they afford many curious descriptions, as well as interesting glimpses of the opinions and manners and general state of society of the times in which he lived. Sir Egerton Brydges, in his 'Censura Litteraria,' has given a full list of Taylor's writings, and a tolerably copious one is also given in Watt's 'Bibliotheca Britannica.'

(Baker's *Biographia Dramatica*, by Reed and Jones, in which work he has obtained a place in consequence of having written a pageant, 'Triumphs of Fame and Honour,' 4to., 1634.)

TAYLOR, SILAS, otherwise called Domville, or D'Omville, by Antony Wood, was the son of Sylvanus Taylor, one of the commissioners during the civil wars for ejecting those of the clergy called 'scandalous and insufficient ministers.' Silas Taylor was born at Harley near Much-Wenlock, in Shropshire, July 16, 1624, and after being educated at Shrewsbury and Westminster schools, became a commoner of New Inn Hall at Oxford in 1641. He was taken thence by his father to join the parliamentary army, in which he had a captain's commission. After the war he was appointed by the interest of his father sequestrator of the royalists in Herefordshire, in discharge of which office he conducted himself with so much moderation as to conciliate the king's party. Part of the bishop's palace at Hereford fell to his own share in the general spoliation, and he acquired considerable wealth, all of which he was compelled to restore at the Restoration.

On that event he was treated by the royalists with great lenity, and appointed commissary of ammunition, &c. at Dunkirk, and about 1665 made keeper of the king's stores and storehouses for shipping at Harwich. He died November 4, 1678, and was buried at Harwich. Taylor was much interested in the antiquities of his country, and was enabled in the confusion of the civil wars to ransack the libraries of Hereford and Worcester cathedrals, and in the course of these researches is said to have discovered the original charter in which King Edgar asserts his claim to the sovereignty of the seas, which is printed in Selden's 'Mare Clausum,' lib. ii. He left materials for a history of Herefordshire, which afterwards came into the hands of Sir Edward Harley of Brampton Brian in that county. To this collection belong Nos. 4046, 4174, 6726, 6766, 6856, and 6868 of the Harleian MSS., containing part of a general history with notes and special topographical information under the several parishes, extracts from 'Domesday,' Leland, &c. From these papers Mr. William Brome, a subsequent collector for the same county, is said to have borrowed largely. (Gough, *Catalogue of Topographical Works*, 'Herefordshire.') In the Sloane MSS. is a paper of Taylor's on the making of cider. (Ayscough's *Catalogue*, 'Taylor.')

His published works are, 'The History of Gavelkind—with some observations and remarks upon many special occurrences of British and English history. To this is added a short history of William the Conqueror, written in Latin by an anonymous author in the time of Henry I.,' London, 1663, 4to.

A History of Harwich was published from his papers by Samuel Dale, in 1730, and another edition, or the same with another title-page, London, 1732.

Wood (*Athen. Oxon.*) states, that Taylor wrote many pamphlets before the Restoration, but without his name; that he was a good classical scholar and mathematician, and possessed of much general information; that he was an excellent musician, and that he composed several anthems, and edited 'Court Ayres,' &c., 1655, 8vo., printed by John Playford.

TAYLOR, BROOK; TAYLOR'S THEOREM. In referring all matters connected with algebraical development to Taylor's Theorem, we were partly moved by the idea that so little was known of the life of the discoverer of that theorem, that the additional space required by our plan would not appear more than was due to the celebrity of the subject. We find ourselves however very much deceived in two points, since both the history of Taylor himself, and that of his theorem, are to be, and can be, recovered from the neglect into which they have fallen, at least in this country.

Nothing is said of Brook Taylor in the 'Biographia Britannica,' or Martin's 'Biographia Philosophica;' and Hutton, &c., give nothing but the date of his birth and death, entrance into college and the Royal Society. The 'Biographie Universelle' was the first work which gave any detail of his life, and this is due to the following circumstance:—In 1790, some members of the French Academy, struck with the scantiness of the existing information relative to so celebrated a man, requested Mr. William Seward to make some inquiry on the subject in England. This gentleman applied to Sir William Young, Brook Taylor's grandson, who accordingly drew up an account[*] of his ancestor from family materials, and printed and circulated it privately. It is from this work that the following account is taken, as to the facts of his private life:—

Brook Taylor was born at Edmonton, August 18, 1685, and was the son of John Taylor, of Bifrons House in Kent, by Olivia, daughter of Sir Nicholas Tempest, of Durham, Baronet. John Taylor was the son of Nathaniel, who, to use a phrase of his own[†] diary, 'tugged and wrestled with the Lord in prayer,' and was member (elected by Cromwell's summons) for the county of Bedford in the (Barebones) parliament of 1653. Brook Taylor's father was the most despotic of parents: his son was educated at home, where, besides enough of the usual learning to enable him to begin residence at St. John's Cambridge, in 1701, he became excellent both in music and painting. 'His numerous family were generally proficient in music, but the domestic hero of the art was the subject of this memoir. In a large family picture he is represented, at the age of thirteen, sitting in the centre of his brothers and sisters, the two elder of whom crown him with laurel bearing the insignia of harmony.' The paintings of the future writer on perspective are represented as not needing the allowance always made for amateurs, but as capable of bearing the closest scrutiny of artists. At Cambridge he applied himself to mathematics, and acquired early the notice of Keil, Machin, and others. His first writing was on the centre of oscillation, in 1708, as appears by a letter to Keil, (afterwards given in *Phil. Trans.*, 1713, No. 337). In 1709 he took the degree of LL.B., in 1714 that of LL.D.: in 1712 he was elected to the Royal Society. As yet he had published nothing: his letters to Machin (preserved in his family), from 1709 to 1712, treat of various subjects; and, in particular, contain a solution of Kepler's problem. We may here conveniently put together a complete list of his works.

In the *Philosophical Transactions*, 1712 (No. 336), On the ascent of water between two glass planes; 1713 (No. 337), On the centre of oscillation; also on the motion of a vibrating string: in the same year, a paper on Music, not printed. 1713 (No. 344), Account of experiment made with Hawksbee on the law of attraction of the magnet. 1717 (No. 352), Method of Approximation to the roots of equations; (No. 353) Appendix to Montmort on infinite series; (No. 354) Solution of a problem proposed by Leibnitz. 1719 (No. 360), Reply to the accusations of John Bernoulli. 1721 (No. 367), Propositions on the parabolic motion of projectiles; (No. 368) Experiments on magnetism. 1723 (No. 376), On the expansion of the thermometer. Besides these, the separate publications are:—

1715. Methodus incrementorum directa et inversa. Londini.

1715. Linear perspective, or a new method of representing justly all manner of objects as they appear to the eye in all situations. London.

1719. New principles of Linear perspective, or the art of designing on a plane the representations of all sorts of objects in a more general and simple method than has been done before. London. A different work from the former: its second edition (called the third, by an obvious mistake) bears 'revised and corrected by John Colson, London, 1749.' Joshua Kirby's well-known work, though called Brook Taylor's perspective, is not an edition of Taylor, but a new work founded on his methods.

In January, 1714, he was chosen secretary of the Royal Society. In 1716, he visited his friends Montmort and Conti at Paris. He had just had a warm correspondence with the former on the Newtonian doctrine, and on the tenets of Malebranche.[*] His posthumous work, or rather tract, the 'Contemplatio Philosophica,' seems to contain his latest thoughts on the opinions of Malebranche and Leibnitz. In France he formed the acquaintance of Bishop Bossuet and Lord and Lady Bolingbroke, with all of whom Sir W. Young has printed some of the correspondence. He returned to England in February, 1717; but his health was now impaired, and, throwing up the secretaryship in October, 1718, he retired to Aix-la-Chapelle. On returning to England early in 1719, he seems to have abandoned the mathematics almost entirely; among his papers of this period are essays on Jewish Sacrifices, and on the lawfulness of eating blood. At the end of 1720 he went to visit Lord Bolingbroke at La Source, near Orleans, and returned to England in 1721. After the middle of this year he wrote nothing for publication, nor could his grandson find anything of a mathematical character among his papers, with the exception of reference to a treatise on logarithms, which it seems he had placed in the hands of his friend Lord Paisley (afterwards Abercorn) to prepare for the press, but which was never printed.

At the end of 1721 he married a young lady of small fortune, a circumstance which occasioned a rupture with his father. Some months after his marriage, and when there appeared hope of issue, his wife was informed that the birth of a son would probably accomplish a reconciliation between her husband and his father. On this she fixed her mind with such earnestness, that on finding herself in due time actually delivered of a son, she 'literally died of joy:' the infant also perished. This melancholy event led to the reconciliation the hope of which had caused it, but not till the autumn of 1723. Dr. Taylor returned to his father's house, and in 1725, with his father's consent, married the daughter of a neighbouring proprietor. In 1729 he succeeded to the family estate by the death of his father, and in the following year his wife died in giving birth to a daughter, afterwards the mother of the writer of the memoir from which we cite. This blow was fatal; Lord Bolingbroke, now settled again in England, endeavoured to divert the thoughts of his friend by inducing him to pass some time in his house, but in about a year after the stroke, Dr. Taylor died of decline (in London, we suppose), December 29, 1731, and was buried in the churchyard of Saint Anne's, Soho. The family estate of Bifrons is still in the possession of the descendants of his brother Herbert.

We shall dismiss other points with brief notice, and as well known, in order to come to the history of *the* theorem: such are the celebrity of Taylor's solution of the problem of vibrating chords, the questions he proposed to the foreign mathematicians in the war of problems, his answer to those of Leibnitz, the accusation of plagiarism made against him by John Bernoulli, and his reply. With reference to the celebrated works on perspective, the first was mathematical, the second intended for artists who hardly knew anything of geometry. Bernoulli charged Taylor with having taken his method from another, and Prony states that it is in fact the one given by Guido Ubaldi, though he thinks Taylor could not have seen that method. The work referred to is 'Guidi Ubaldi Perspectivæ Libri Sex,' Pisauri, 1600, at which we have looked in consequence. Nothing is more easy than assertion about old books: if Prony had really looked attentively at the works of Ubaldi and of Taylor together, he would have seen that whereas the former[†] only introduced the use of vanishing points as to lines which are horizontal (the picture being vertical), Taylor introduced the method of vanishing points for all lines whatsoever, and made them of universal application. We cannot think that he had never seen Ubaldi's work: a man of learning, an artist from early youth, was not likely to be ignorant of so celebrated a production. He must have seen, and generalized, the method given by Ubaldi. If indeed any one between the two is asserted to have a claim, that claim, when proposed, must be discussed: but a general charge of plagiarism from John Bernoulli is literally no more than a record of the fact that the party accused and John Bernoulli had had a quarrel, while what relates to Ubaldi is only so far true in that Ubaldi used the particular and Taylor the general method. It is not credible that Ubaldi was ignorant of the general proposition, or if he were so, Stevinus (whose *Sciagraphia* was published in 1608) was not;* but Stevinus did not *use* any vanishing points, except those of lines parallel to the ground, nor Ubaldi neither: while Taylor did *use* them, which is the distinctive feature of his system. Again, it is a strong presumption in favour of Taylor's originality in this point, that works published abroad shortly after his time do not contain it. For example, the 'Kurzgefasste Einleitung zur Perspectiv, von J. C. Bischoff, 1741,' a quarter of a century after the time of Taylor's publication, contains no use of vanishing points except at the height of the eye.

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[*] 'Not published. Contemplatio Philosophica, a posthumous work of the late Brook Taylor, LL.D., F.R.S., some time secretary of the Royal Society. To which is prefixed a Life of the author, by his grandson, Sir William Young, Bart., F.R.S., A.S.S. with an appendix, containing sundry original papers, &c., London, printed by W. Bulmer and Co., Shakspeare Printing-office, 1793.' The account given by Prony in the 'Biographie Universelle' (1826) is, we are almost sure, one drawn up at the time from Sir W. Young's manuscript account as forwarded to Paris; with parenthetical sentences inserted just before publication.

[†] His grandson's baptismal name was probably in memory of the noted puritan, Lord Brook.

[*] Fontenelle, in his Eloge of Malebranche, says that the 'Recherche de la vérité' was translated into English by a relative of Taylor of the same name.

[†] The very title page of Ubaldi's work announces by a diagram that its distinctive feature is the use of vanishing points all at the height of the eye,

The *Methodus Incrementorum* is the first treatise in which what is at this day called the calculus of finite differences is proposed for consideration. Besides what are now the most common theorems in this subject, there are various purely fluxional or infinitesimal theories, such as the change of the independent variable, integrations, J. Bernoulli's series, &c., and various applications to interpolation, the vibrating chord, the catenary, dome, &c., centre of oscillation and percussion, law of density of the atmosphere, refraction of light. The first enunciation of the celebrated theorem is as follows:—

PROP. VII. THEOR. III.

Sint x et z quantitates duæ variabiles, quarum z uniformiter augetur per data incrementa $\underset{.}{z}$, et sit $n\underset{.}{z}=v$, $v-\underset{.}{z}={}^{\prime}v$, ${}^{\prime}v-\underset{.}{z}={}^{\prime\prime}v$, et sic porrò. Tum dico quod quo tempore z crescendo fit $z+v$, x item crescendo fiet

$$x+\underset{.}{x}\frac{v}{1\underset{.}{z}}+\underset{..}{x}\frac{v\,{}^{\prime}v}{1.2\underset{.}{z}^{2}}+\underset{\therefore}{x}\frac{v\,{}^{\prime}v\,{}^{\prime\prime}v}{1.2.3\,\underset{.}{z}^{3}}+,\ \&c.$$

Corollary I. expresses the corresponding theorem for decrements.

COROLL. II.

Si pro Incrementis evanescentibus scribantur fluxiones ipsis proportionales, factis jam omnibus ${}^{\prime\prime}v$, ${}^{\prime}v$, v, ${}_{\prime}v$, ${}_{\prime\prime}v$, &c. æqualibus quo tempore z uniformiter fluendo fit $z+v$ fiet x,

$$x+\dot{x}\frac{v}{1\dot{z}}+\ddot{x}\frac{v^{2}}{1.2\,\dot{z}^{2}}+\dddot{x}\frac{v^{3}}{1.2.3\dot{z}^{3}}+\ \&c.$$

vel mutato signo ipsius v, quo tempore z decrescendo fiet $z-v$, x decrescendo fiet

$$x-\dot{x}\frac{v}{1\dot{z}}+\ddot{x}\frac{v^{2}}{1.2\dot{z}^{2}}-\dddot{x}\frac{v^{3}}{1.2.3\dot{z}^{3}}+,\ \&c.$$

Taylor does not make much use of his own theorem in the *Methodus Incrementorum*, but he shows his command over it in the paper above cited on the roots of equations, in which he extends Newton's method to other than algebraical equations.

One would have supposed that such a theorem as that of Taylor, the instant it was proposed, would have been hailed as the best and most useful of generalizations. Instead of this, it sunk, or rather never rose, till Lagrange pointed out its power. This is perhaps an assertion which some may doubt: we proceed to make it good. The first criticism upon the whole work (without a word about the theorem) was that of Leibnitz, in a letter to John Bernoulli (June, 1716, vol. ii., p. 380, of their correspondence), and it will show of what sort of view the neglect of this theorem was the consequence. The translation is as follows:—'I have received what Taylor calls his Method of Increments. It is an application of the differential and integral calculus to *numbers, or rather to general magnitude*. Thus the English have placed the horses, according to the proverb, behind the cart. I began the differential calculus from series of numbers .... and so came naturally from the general calculus to the special geometrical or infinitesimal calculus. They proceed the other way, because they have not the true method of investigation. .... It is written obscurely enough.' Bernoulli answers (August, 1716, p. 389):—'I have at length received Taylor's book. What, in the name of God, does the man mean by the darkness in which he involves the clearest things! No doubt to conceal his habit of thieving; as far as I can make it out, I see nothing but what he has stolen from me, through his thick cloud of obscurity.' The notion of Leibnitz prevailed for a long time, and is not quite extinct in our own day, though rapidly expiring: the Differential Calculus was to be used only as the medium in which pure algebra was to be applied to geometry and physics, and even a generalization of existing theorems, expressed in the language of that Calculus, was a positively erroneous mode of proceeding.

In Britain, two really great disciples of Taylor soon appeared, **STIRLING** and **MACLAURIN**. The first (*Meth. Diff.*, p. 102) repeated the theorem as given by Taylor himself, and adds that Herman had also given it in the Appendix to his *Phoronomia;* and as this last work was published in 1716, were Stirling's assertion true, Herman must probably be considered an independent inventor. But on examining the appendix to the *Phoronomia* (p. 393), to which Stirling refers, we find only the theorem in book v., lemma 3, of the Principia, and John Bernoulli's series for integration. Maclaurin (*Fluxions*, 1742, p. 610) proved Taylor's theorem again in the way which has since become common. But both Stirling and Maclaurin use only a particular case of Taylor's theorem, expanding not $\phi(x+z)$, but $\phi(0+z)$, or expanding ϕz in powers of z. Neither thought he was doing more than proving Taylor's theorem, and both attribute the result to Taylor. Nevertheless this particular case has been since called Maclaurin's theorem, though, if not Taylor's, it is Stirling's. Maclaurin's book was, no doubt, more read than either of the other two; it was the answer to Berkeley's metaphysical objections, and contained great power and vast store of instances; and this may have been the reason why a theorem which was best used in, and best known by, Maclaurin's book, should be called after his name. It is well that it should be so, or rather, it would be well that the development of $\phi(0+z)$ in powers of z should be called by the name of Stirling: for in truth the development of $\phi(a+b)$ in powers of b is one theorem or another in its uses, and in the consequences it suggests, according as a or b is looked at as the principal letter.

In the interval between Taylor's death and Lagrange's paper in the Berlin Memoirs for 1772, in which he first proposed to make Taylor's theorem the foundation of the Differential Calculus, the theorem was hardly known, and even when known, not known as Taylor's. We cannot find it in Hodgson's Fluxions (1736), in Maria Agnesi's Institutions (1748), in Landen's Residual Analysis (1764), in Simpson's Fluxions (1737), in Emerson's Increments 1763), in Emerson's Fluxions (1743), in Stone's Mathematical Dictionary (1743), nor in the first edition of Montucla's History (1758). We have examined various other places in which it should be, without finding it anywhere, except in the great French Encyclopædia (article 'Series'), and there we certainly did find it, mentioned only incidentally, and attributed by no less a person than Condorcet to D'Alembert. The Abbé **BOSSUT**, who wrote the preliminary essay, knew nothing about the theorem at that time; though afterwards, when he published his history of mathematics, he was better informed. We found afterwards that Condorcet (Lacroix, tom. iii., p. 396) was in the habit of assigning this theorem to D'Alembert; not with any unfair intention, but in pure ignorance. The fact was that D'Alembert (*Recherches sur différens points*, &c., vol. i., p. 50, according to Lacroix) gave for the first time the theorem accompanied by a method of finding the remnant of Taylor's series after a certain number of terms have been taken; and Condorcet, who probably had never seen the theorem elsewhere, thought it was D'Alembert's. In fact, D'Alembert himself gave the theorem as if it were new, and without mentioning the name of any one, which Lacroix says is 'assez singulier,' an opinion in which we cannot agree. Unless D'Alembert read English, we cannot imagine how he should have known Taylor's theorem, nor even then, unless Taylor, Stirling, Maclaurin, or an old volume of the Philosophical Transactions, be supposed to have fallen in his way. We have no doubt that D'Alembert was a new discoverer of the theorem, and that Condorcet never saw it except in his writings. Our wonder rather where Lagrange could have found the name of Taylo connexion with it. For the use which Lagrange proposed to make of it, see DIFFERENTIAL CALCULUS, and FUNCTIONS, THEORY OF. From the time of the publication of the works cited in the article last referred to, Taylor's theorem takes that place which, if it had always occupied, we should not have had to write any history of it. Full justice is done to the discoverer: it only remains to restore to Stirling the view of the theorem which has hitherto been given to Maclaurin.

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* Sciagraphiæ, prop. iii.: 'Si adumbrandæ parallelæ rectæ per vitreum ipsis non parallelum conspiciantur, illarum umbræ continuatæ concurrent in eodem puncto radii adumbrandis rectis paralleli: et si adumbrandæ pavimento parallelæ sint, punctum concursus eadem altitudine supra pavimentum extat qua oculus.'

TAYLOR'S THEOREM. We propose in this part of the article to give some account of the methods of algebraical development which are consequences of the celebrated theorem, the history of which is given in the last article. The simplest parts of the Differential and Integral Calculus will be presumed known. It is not usual in works on that subject to bring together in one place the most conspicuous theorems which have arisen out of that of Taylor; which makes it the more desirable that such a thing should be done in a work of reference. It is to be particularly remembered that we do not here profess to teach the subject of development, but only to recall the steps of the several processes to those who have already learnt them, and to present the theorems in a form which can be easily referred to.

As to notation, we shall frequently signify differentiation by accents: thus $\phi''x$ is the second differential coefficient of ϕx with respect to x; $(\phi x\psi x)'''$ is the third differential coefficient of the product of ϕx and ψx. And $[n]$ will signify the product $1\times2\times3\times\ldots\ldots\times(n-1)\times n$. Moreover when a series is written, three terms will be written down, and the general term appended.

Taylor's theorem is as follows:—

$$\phi(x+h)=\phi x+\phi'x.h+\phi''x\frac{h^2}{2}+\text{\&c.}\quad\left\{\phi^{(n)}x\ \frac{h^n}{[n]}\right\}$$

This theorem is true whenever x has such a value that—1. No one of the set ϕx, $\phi'x$, &c. is infinite. 2. All of them do not vanish. Thus neither of the following could be allowed to be treated by it when $x=a$:

$$\sqrt{(x^2-a^2)}\ .\log x \quad\text{and}\quad \varepsilon^{-(x-a)^{-1}}.$$

In the first function, $\phi'x$, and all which follow, are infinite when $x=a$; in the second ϕx and all its differential coefficients vanish when $x=a$. The meaning of this circumstance is as follows: the form of Taylor's theorem essentially requires that $\phi(x+h)$ should be developed in ascending integer powers of h; consequently when such form of development is impossible, this theorem must show signs of being inapplicable. Now, the first of these functions (when $x=a$) can only have $\phi(a+h)$ expanded in ascending fractional powers; and the second only in descending integer powers. Those who will only allow the use of converging series may require also that h should be so small that the resulting series is convergent: but this objection will afterwards be inapplicable, as will be seen.

We shall state five proofs of this theorem briefly, being substantially those given by Taylor, Maclaurin, D'Alembert, Lagrange, and Ampère.

Taylor's Proof.—Let $n\theta=h$, and form differences of ϕx from the series ϕx, $\phi(x+\theta)$, $\phi(x+2\theta)$, ... $\phi(x+n\theta)$. Consequently we have [DIFFERENCE]

$$\phi(x+n\Delta x)=\phi x+n\,\Delta\phi x+n\,\frac{n-1}{2}\Delta^2\phi x+,\ \text{\&c.}:$$

where $\Delta x=\theta$. Throw this into the form

$$\phi(x+h)=\phi x+\frac{\Delta\phi x}{\Delta x}\,h+\frac{\Delta^2\phi x}{(\Delta x)^2}\,h\,\frac{h-\Delta x}{2}+,\ \text{\&c.}$$

Let n increase without limit, Δx at the same time diminishing, so that $n\Delta x$ remains always $=h$. Then

$$\phi(x+h)=\phi x+\left(\substack{\text{Limit of}\\ \Delta\phi x\,:\,\Delta x}\right)h+$$

$$\left(\substack{\text{Limit of}\\ \Delta^2\phi x\,:\,(\Delta x)^2}\right)\frac{h^2}{2}+,\ \text{\&c.}$$

So that Taylor's theorem is proved when we know that $\phi^{(k)}x$ is the same as the limit of $\Delta^k\phi x:(\Delta x)^k$. This was an assumption* of Taylor's: but in the modern differential calculus it is a better plan to prove Taylor's theorem in another way, and then from the preceding follows the simplest manner of showing the identity of $\phi^{(k)}x$ and the limit of $\Delta^k\phi x:(\Delta x)^k$.

Maclaurin's Proof.—The method here given was first used by Maclaurin, and though it was only applied to develop $\phi(0+h)$, yet it will do equally well for $\phi(x+h)$; and Maclaurin himself saw no difference (as indeed there is none, ϕ being any function whatever) between the two cases. It turns upon $\phi(x+h)$ giving the same result, whether differentiated with respect to x or h, and assumes the form of the development, which is a radical defect. It is as follows: Let $\phi(x+h)=\text{A}+\text{B}h+\text{C}h^2+$, &c.; then $\phi'(x+h)=\text{B}+2\text{C}h+3\text{D}h^2+$, &c., $\phi''(x+h)=2\text{C}+3.2\text{D}h+$, &c., $\phi'''(x+h)=3.2\text{D}+$, &c., which, when $h=0$, give $\phi x=\text{A}$, $\phi'x=\text{B}$, $\phi''x=2\text{C}$, $\phi'''x=3.2\text{D}$, &c.; from which the theorem readily follows. The common proof, given in most elementary works on the differential calculus, is but a less commodious form of this.

D'Alembert's Proof.—The first principles of the Integral Calculus give

$$\phi(a+h)=\phi a+\int_a^{a+h}\phi'x\,dx.$$

Let $x=a+h-z$; $\displaystyle\int_a^{a+h}\phi'x\,dx=-\int_h^0\phi'(a+h-z)dz$

$$=\int_0^h\phi'(a+h-z)dz=\phi'a.h+\int_0^h\phi''(a+h-z).z\,dz;$$

the last step being made by parts. Similarly

$$\int_0^h\phi''(a+h-z)z\,dz=\phi''a\frac{h^2}{2}+\int_0^h\phi'''(a+h-z)\frac{z^2dz}{2}$$

$$\int_0^h\phi'''(a+h-z)\frac{z^2dz}{2}=\phi'''a\frac{h^3}{2.3}+\int_0^h\phi^{\text{iv}}(a+h-z)\frac{z^3dz}{2.3}$$

and so on: whence it appears that if we go up to h^n in the series, the term involving h^n may be followed by another, expressed in the form of a definite integral, and which alone represents all the remnant of the series; as follows:—

$$\phi^{(n)}a\,\frac{h^n}{[n]}+\frac{1}{[n]}\int_0^h\phi^{(n+1)}(a+h-z).z^n\,dz.$$

The conditions of integration require that neither ϕx, $\phi'x$, ... $\phi^{(n+1)}x$ should be infinite from $x=a$ to $x=a+h$, both inclusive: this one condition being satisfied, the difficulty of divergent series disappears; for the theorem does not give an infinite series at all, but only any number we please of the terms of a series together with a concluding quantity which is finite both in form and reality. This integral might frequently be difficult to use, but limits for its value may be readily obtained. Let P and p be the greatest and least values of $\phi^{(n+1)}x$ from $x=a$ to $x=a+h$, both inclusive: then the concluding integral lies between

$$\text{P}\int_0^h z^n dz\ \text{and}\ p\int_0^h z^n dz\ \text{or}\ \frac{\text{P}h^{n+1}}{n+1}\ \text{and}\ \frac{ph^{n+1}}{n+1}.$$

Now when a continuous function does not become infinite between two values of x, every quantity which lies between its greatest and least value is one of its intermediate values: or anything between P and p is a value of $\phi^{(n+1)}(a+\theta h)$, for some value of θ which is either 0 or 1, or between them. Hence the preceding expression may be written

$$\phi^{(n)}a\ \frac{h^n}{[n]}+\phi^{(n+1)}(a+\theta h)\frac{h^{n+1}}{[n+1]}.$$

The following form has been given by M. Cauchy. Let P and p represent the greatest and least values of $\phi^{(n+1)}(a+h-z).z^n$ from $z=0$ to $z=h$, both inclusive: precisely similar reasoning will give for the last term chosen of Taylor's series, and the value of the remnant,

$$\phi^{(n)}a\ \frac{h^n}{[n]}+\phi^{(n+1)}(a+h-\theta h).\,\theta^n\,\frac{h^{n+1}}{[n]}$$

where θ is either 0 or 1, or between them.

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[*] 'Si pro incrementis evanescentibus scribantur fluxiones ipsis proportionales, &c.' See the statement in TAYLOR, BROOK.

We call the preceding D'Alembert's proof, but it is rather D'Alembert's result, and even that in a different form: his real process is as follows:—To take a case, integrate $\phi^{\text{iv}}(x+h)$ four times with respect to h, beginning at $h=0$: the results are ($x+h=\text{X}$ for abbreviation)

$$\phi'''\text{X}-\phi'''x=\int dh\,.\,\phi^{\text{iv}}\text{X}$$

$$\phi''\text{X}-\phi''x-\phi'''x\,.\,h=\left(\int dh\right)^2\phi^{\text{iv}}\text{X}$$

$$\phi'\text{X}-\phi'x-\phi''x\,.\,h-\phi'''x\frac{h^2}{2}=\left(\int dh\right)^3\phi^{\text{iv}}\text{X}$$

$$\phi\text{X}-\phi x-\phi'x\,.\,h-\phi''x\frac{h^2}{2}-\phi'''x\frac{h^3}{2.3}=\left(\int dh\right)^4\phi^{\text{iv}}\text{X},$$

and from this sort of process the result is

$$\phi(x+h)=\phi x+\phi'x\,.\,h+\phi''x\frac{h^2}{2}+\dots$$
$$+\phi^{(n)}x\,\frac{h^n}{[n]}+\left(\int_0^h dh\right)^n\phi^{(n)}(x+h),$$

the two sides presenting the most identical forms which have yet occurred. The integral may easily be reduced to the form already given (Lacroix, vol. iii., p. 397). D'Alembert finished with the preceding form: it was Lagrange who first gave the limits which we have appended above.

Lagrange's Proof.—By this we do not mean the fallacious proof referred to in FUNCTIONS, THEORY OF, but that by which Lagrange established the limits of the value of the remnant, which, on the ordinary definition of a differential coefficient, is a proof, and a very satisfactory one, of the whole theorem. It rests upon the proposition that if a function of x have always one sign from $x=a$ to $x=a+h$, the integral of that function taken between those limits will have the same sign.

If then we wish to establish Taylor's theorem as far as, say, the term involving h^3, and to give the limits of the remainder, let P and p be the greatest and least values of $\phi^{\text{iv}}(a+z)$ from $z=0$ to $z=h$. Between those limits then $\phi^{\text{iv}}(a+z)-\text{P}$ is negative: integrate from $z=0$ to $z=$ any value not greater than h, and, by the preliminary theorem, $\phi'''(a+z)-\phi'''a-\text{P}z$ is negative. Integrate successively under the same conditions, and we learn, step by step, that

$$\phi''(a+z)-\phi''a-\phi'''a\,.\,z-\text{P}\frac{z^2}{2}$$

$$\phi'(a+z)-\phi'a-\phi''a\,.\,z-\phi'''a\frac{z^2}{2}-\text{P}\frac{z^3}{2.3}$$

$$\phi(a+z)-\phi a-\phi'a\,.\,z-\phi''a\frac{z^2}{2}-\phi'''a\frac{z^3}{2.3}-\text{P}\frac{z^4}{2.3.4}$$

are severally negative. But $\phi^{\text{iv}}x-p$ is positive from $x=a$ to $x=a+h$; consequently, proceeding in the same manner, we find that, z being not greater than h,

$$\phi(a+z)-\phi a-\phi'a\,.\,z-\phi''a\frac{z^2}{2}-\phi'''a\frac{z^3}{2.3}-p\frac{z^4}{2.3.4}$$

is positive. If then we make $z=h$, we find that $\phi(a+h)$ lies between

$$\phi a+\phi'a\,.\,h+\dots+\text{P}\frac{h^4}{2.3.4}\text{ and }\phi a+\phi'a\,.\,h+\dots+p\frac{h^4}{2.3.4},$$

and the rest is as in the last proof.

There is a proof given by M. Cauchy which resembles the preceding in its principle, though of very different details, which may be seen in the *Lib. U. K.*, Differential Calculus, pp. 68, &c., 767. But this proof, though very well in a treatise on the subject, on account of the collateral uses of the preliminary theorems which it requires, is not so well suited to an isolated article on Taylor's theorem.

Ampère's Proof.—Let $\phi x=\phi a+\text{P}(x-a)$; differentiate successively with respect to a, and we have

$$0=\phi'a+\text{P}'(x-a)-\text{P}$$
$$0=\phi''a+\text{P}''(x-a)-2\text{P}'$$
$$0=\phi'''a+\text{P}'''(x-a)-3\text{P}'',\ \&\text{c.},$$

substitute for P, P′, &c. their values: that is, substitute from each equation to the preceding, and we have, making $x=a+h$, Taylor's theorem with the following result for the remnant following the term which has h^n in it

$$\frac{d^n}{da^n}\left(\frac{\phi x-\phi a}{x-a}\right)\frac{h^{n+1}}{[n]},$$

making $x=a+h$ after differentiation.

It gives some trouble to show the limits of this expression, for which we may refer to Ampère, 'Précis de Calcul Différentiel,' &c., Journ. Ec. Polytechn., cah. xiii., p. 120. This tract of Ampère is one of the purest deductions extant of the Differential Calculus from the theory of limits.

In looking through all the proofs which give limits to the remnant of the series, it will be seen that neither ϕx nor any differential coefficient employed can be allowed to become infinite between $x=a$ and $x=a+h$. When such a circumstance does occur, the theorem relative to the limits may cease to be true. For instance, let $\phi x=(x-m)^{-1}$, and stop the series after the first term, which gives

$$\frac{1}{a+h\quad m}=\frac{1}{a-m}-\frac{1}{(a+\theta h-m)^2}\,.\,h$$

if $a+h$ and a be both greater or both less than m, a value of θ lying between 0 and 1 will be found to satisfy this equation, as it should do from the theorem. But if $x=m$ between $x=a$ and $x=a+h$, none but an imaginary value of θ will satisfy this equation.

Stirling's theorem, as it should be called, Maclaurin's as it is called, is found simply by making $a=0$ in the development of $\phi(a+x)$. It gives

$$\phi x=\phi 0+\phi'0.x+\phi''0\frac{x^2}{2}+\dots\dots$$
$$+\phi^{(n)}0\,\frac{x^n}{[n]}+\phi^{(n+1)}(\theta x)\frac{x^{n+1}}{[n+1]}$$

θ being either 0 or 1, or between them. Here $\phi^{(n)}0$ means that ϕx is to be differentiated n times, and x made $=0$ *after all the differentiations*. This is the most useful form of Taylor's theorem, with which it may be considered as identical in one point of view, and of which it is a particular case in another: for $\psi(a+x)$ absolutely developed by Stirling's theorem is simply $\psi(a+x)$ developed from ψa by Taylor's theorem.

John Bernoulli's theorem, as given in the Leipsic acts for 1696, is as follows:—

$$\int_0^x\psi x\,dx=\psi x.\,x-\psi'x\,.\frac{x^2}{2}+\psi''x\,\frac{x^3}{2.3}-\&\text{c.}$$

Here is an instance very much resembling the connexion of the BINOMIAL THEOREM (p. 412) with Wallis's previous investigations. If Wallis had looked at his own result in a new point of view, he might not have left the binomial theorem for Newton: if John Bernoulli had done the same, he might have given the law of development of $\phi(x+h)$. The preceding is a case of Taylor's theorem, as follows: by that theorem

$$\phi(x-x)=\phi x-\phi'x\,.\,x+\phi''x\frac{x^2}{2}-\dots$$
$$\pm\phi^{(n)}x\,\frac{x^n}{[n]}\mp\phi^{(n+1)}(x-\theta x)\,.\,\frac{x^{n+1}}{[n+1]}$$

and $x-\theta x$ is the same in meaning as θx, an undetermined fractional part of x. Let $\phi x=\int_0^x\psi x\,dx$, then $\phi 0=0$, and substitution and transposition give

$$\int_0^x\psi x\,dx=\psi x.\,x-\psi'x\frac{x^2}{2}+\psi''x\frac{x^3}{2.3}$$
$$\pm\psi^{(n-1)}x\frac{x^n}{[n]}\mp\psi^{(n)}(\theta x)\frac{x^{n+1}}{[n+1]}$$

This theorem is not of much use as a method of development, so that we need say no more of it in the present article.

Some views of Lambert on the reduction of the roots of equations (*Acta Helvetica*, 1758) into series were generalized by Lagrange (*Mém. Acad. Sci.*, 1768) into a celebrated theorem of development bearing his name; and this again was generalized in form by Laplace (*Méc. Cél.*).

The problem is as follows: given

$$y=\mathrm{F}\,(z+x\,\phi y)\ \ldots.\ (\mathrm{A})$$

required the expansion of ψy, when possible, in powers of x. Since ψy is, by the preceding equation, a function of x and z, if z be constant, and we differentiate with respect to x, and then make $x=0$, or $y=\mathrm{F}z$, we may use Stirling's theorem. But this differentiation would be laborious and indirect; it was made more direct (by Laplace) in the following manner:—A constant may have any value given to it, or may be made to vanish, either before or after differentiation with respect to a variable: if then we can express differentiations with respect to x in terms of differentiations with respect to z only (in which x is constant), it will be in our power to make x vanish *before* the differentiations, which will reduce the indirect or implicit to direct differentiation. This substitution of z-differentiations in place of those of x is done as follows:—Differentiate (A) both with respect to x and z separately, and we have

$$\frac{dy}{dx}=\mathrm{F}'\,(z+x\phi y)\left\{\phi y+x\phi' y\,\frac{dy}{dx}\right\}\qquad\text{whence}$$

$$\frac{dy}{dz}=\mathrm{F}'\,(z+x\phi y)\left\{\,1+x\phi' y\,\frac{dy}{dz}\right\}\quad \frac{dy}{dx}=\phi y\,\frac{dy}{dz}$$

Let u be a function of y only, that is, not of x or z except as these variables are contained in y: then

$$\frac{du}{dy}\,\frac{dy}{dx}=\phi y\,\frac{du}{dy}\,\frac{dy}{dz}\quad\text{or}\quad\frac{du}{dx}=\phi y\,\frac{du}{dz}$$

From this equation only it may be shown (by INDUCTION) that

$$\frac{d^nu}{dx^n}=\frac{d^{n-1}}{dz^{n-1}}\left(\overline{\phi y}^{\,n}\,\frac{du}{dz}\right)$$

as follows. Assume the preceding to be true for one value of n, and, since $(\phi y)^n\times\,du:dy$ is a function of y only, let it be $dv:dy$, v being another function of y.

$$\frac{d^nu}{dx^n}=\frac{d^{n-1}}{dz^{n-1}}\left(\frac{dv}{dy}\,\frac{dy}{dz}\right)=\frac{d^nv}{dz^n}$$

$$\frac{d^{n+1}u}{dx^{n+1}}=\frac{d^n}{dz^n}\left\{\frac{dv}{dx},\text{ or }\phi y\,\frac{dv}{dz},\text{ or }\phi y\,\frac{dv}{dy}\,\frac{dy}{dz},\text{ or }\right.$$

$$\left.\phi y\,(\phi y)^n\,\frac{du}{dy}\,\frac{dy}{dz},\text{ or }(\phi y)^{n+1}\,\frac{du}{dz}\right\}$$

whence the theorem remains true after writing $n+1$ for n. But it is true when $n=1$; therefore it is true for all values of n. If then we make $x=0$, or $y=\mathrm{F}z$, which may be done before the differentiations on the second side of the equation, we have (u being ψy)

$$\left\{\frac{d^n\psi y}{dx^n}(x=0)\right\}=\frac{d^{n-1}}{dz^{n-1}}\left\{(\phi\mathrm{F}z)^n\,\frac{d\psi\mathrm{F}z}{dz}\right\}$$

Apply this to Stirling's Theorem, and we have *Laplace's Theorem*, namely,

$$y=\mathrm{F}\,(z+x\phi y)\text{ gives }\psi y=$$

$$\psi\mathrm{F}z+\left(\phi\mathrm{F}z\,\frac{d\psi\mathrm{F}z}{dz}\right)x+\frac{d}{dz}\left((\phi\mathrm{F}z)^2\,\frac{d\psi\mathrm{F}z}{dz}\right)\frac{x^2}{2}+,\ \&c.$$

$$\text{the general term, }\frac{d^{n-1}}{dz^{n-1}}\left\{(\phi\,\mathrm{F}\,z)^n\,\frac{d\psi\mathrm{F}z}{dz}\right\}\,\frac{x^n}{[n]}$$

Lagrange's theorem, from which Laplace generalized, is the case in which $\mathrm{F}x=x$; namely,

$$y=z+x\phi y\text{ gives }\psi y=$$

$$\psi z+(\phi z\,\psi' z)x+\frac{d}{dz}\left(\overline{\phi z}^{\,2}\,\psi' z\right)\frac{x^2}{2}+,\ \&c.$$

$$\text{the general term }\frac{d^{n-1}}{dz^{n-1}}\left\{(\phi z)^n\,\psi'\,z\right\}\frac{x^n}{[n]}$$

$$y=z+\phi z\,.\,x+\frac{d(\phi z)^2}{dz}\,\frac{x^2}{2}+\frac{d^2(\phi z)^3}{dz^2}\,\frac{x^3}{2.3}+,\ \&c.$$

Lagrange's theorem leads to *Burmann's Theorem* (presented to the institute in 1796). The second is in fact the same as the first, though very different in form, and arrived at independently. It is required, when possible, to expand ψx in powers of ϕx. This might be done indirectly, by expanding $\psi\phi^{-1}x$ in powers of x, and substituting ϕx for x in the result. The form in which Burmann obtained Lagrange's theorem avoids the indirect process. Let ϕx vanish when $x=a$, and let $\phi x=(x-a):\chi x$, or $x=a+\phi x\,.\,\chi x$. We can now employ Lagrange's theorem to expand ψx in powers of ϕx, and we have

$$\psi x=\psi a+\chi a\psi' a\,.\,\phi x+\frac{d}{da}\left(\overline{\chi a}^{\,2}\,\psi' a\right)\frac{(\phi x)^2}{2}+,\ \&c.$$

Now the general term of this has for its co-efficient the value of

$$\frac{d^{n-1}}{dx^{n-1}}\left((\chi x)^n\,\psi' x\right)\text{ or }\frac{d^{n-1}}{dx^{n-1}}\left\{\left(\frac{x-a}{\phi x}\right)^n\psi' x\right\}$$

when $x=a$: consequently ψx, expanded in powers of ϕx, is found by making $x=a$ in the co-efficients of the powers of ϕx in the following series:—

$$\phi a+\left\{\frac{x-a}{\phi x}\cdot\psi' x\right\}\phi x+\left\{\frac{d}{dx}\left(\left(\frac{x-a}{\phi x}\right)^2\psi' x\right)\right\}\frac{(\phi x)^2}{2}+,\ \&c.$$

When in a function of any number of variables x_1, x_2, &c., the variables are severally to receive increments h_1, h_2, &c., the law of the development is best seen by the calculus of operations. [OPERATION.] To change x into $x+h$ is to perform the operation $\varepsilon^{h\mathrm{D}}$, D being the symbol of differentiation with respect to x: the condensed form of the development now before us is

$$\varepsilon^{h_1\mathrm{D}_1+h_2\mathrm{D}_2+\ldots.}\ \phi(x_1,\ x_2,\ \ldots..)$$

where D_1, D_2, &c. refer to x_1, x_2, &c. The general term of the development is

$$\frac{(h_1\mathrm{D}_1+h_2\mathrm{D}_2+\ldots..)^n}{[n]}\,\phi(x_1,\ x_2,\ \&c.)$$

which must itself be developed. It is not worth while to pursue this case further; we shall only observe that when it is desired to stop, the remnant may be obtained by writing in the last term $x_1+\theta h_1$ for x_1, $x_2+\theta h_2$ for x_2, &c., where θ, the same in all, is either 0 or 1, or between them.

The value of x which makes $\phi x=0$ is represented by

$$a-\frac{\phi}{\phi'}-\frac{\phi''\phi^2}{2\phi'^3}-\frac{(3\phi''^2-\phi'\phi''')\phi^3}{2.3\phi'^5}$$

$$-\frac{(15\phi''^3-10\phi'\phi''\phi'''+\phi'^2\phi^{\mathrm{iv}})\phi^4}{2.3.4\phi'^7}$$

$$-\frac{\{105\phi''^2(\phi''^2-\phi'\phi''')+10\phi'^2\phi'''^2+15\phi'^2\phi''\phi^{\mathrm{iv}}-\phi'^3\phi^{\mathrm{v}}\}\phi^5}{2.3.4.5\phi'^9}$$

— &c.: where a is any assumed value (the nearer the root the better) and ϕ, ϕ', &c. represent ϕa, $\phi' a$, &c. This series is obtained by common reversion from $\phi(a+h)=0$. For the forms which Paoli gave to this series, and also to Burmann's, see Lacroix, vol. i., pp. 306-308. The preceding series has been used, as far as three terms, in the article APPROXIMATION.

All that precedes is found in elementary treatises, with the exception of a few terms of the last series: we now come to matter which has been hitherto only the property of the well-read mathematician, but which well deserves to be made as common as Taylor's Theorem. We refer to ARBOGAST'S *method of derivations.* Few, even among mathematicians, are aware of the power of this process, which may perhaps arise from their taking Lacroix's account of it, instead of consulting the work of Arbogast himself: the former has only exhibited it to show that it may be reduced to processes of the differential calculus; and even the latter has so loaded his method with heavy applications, that he has concealed much of its beauty and simplicity.

The foundation of Arbogast's methods is a contrivance for expediting the expansion of $\phi(a+bx+cx^2+\ldots.)$ into a series of the form $\mathrm{A}+\mathrm{B}x+\mathrm{C}x^2+\ldots..$ The process by which B is formed from A, C from B, &c. is uniform, and is called derivation; and A being ϕa, B may be called $\mathrm{D}\phi a$, C may be called $\mathrm{DD}\phi a$, or $\mathrm{D}^2\phi a$, and so on. Hence b ought to be called $\mathrm{D}a$, C ought to be D^2a, and so on. This notation is not precisely that of Arbogast, but will do for our purpose. For more detail,* see the Differential Calculus (*Library of Useful Knowledge*), pp. 328-334.

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* There is a great deal on the subject in the 'Mathematical Treatises' (posthumous) of the Rev. John West, published at Edinburgh in 1838. Mr. West

If, for a moment, we write the expansion thus—

$$\phi(a_0+a_1x+a_2x^2+\text{ \&c.} = A_0+A_1x+A_2x^2+\text{ \&c.};$$

and if we differentiate both sides with respect to a_m, x and all the other coefficients remaining constant, we have

$$\phi'(a_0+a_1x+\text{ \&c.})\,.\,x^m=\frac{dA_0}{da_m}+\frac{dA_1}{da_m}x+,\text{ \&c.}$$

which shows that a_m cannot enter any coefficient preceding A_m, or

$$\phi'(a_0+a_1x+\text{ \&c.})=\frac{dA_m}{da_m}+\frac{dA_{m+1}}{da_m}x+,\text{ \&c.}$$

The first side of this is the same series, whatever letter a_m was made to vary; the second side is therefore always the same series; whence we collect that $dA_{m+n}:da_m$ does not alter with the value of m, being always the coefficient of x^n in the development of $\phi'(a_0+a_1x+,\text{ \&c.})$. It is enough to satisfy this condition for each letter and its preceding one; that is to say, each co-efficient differentiated with respect to any one letter, is to yield the same result as the directly preceding co-efficient differentiated with respect to the directly preceding letter. The following rules are found sufficient. To pass from any one derivative of ϕa to the next, arrange the letters a, b, c, &c., or a_0, a_1, a_2, &c., whichever may be used, in order, in every term: differentiate with respect to the last letter in each term, and multiply by the letter which comes next to it. And when the last but one immediately precedes the last in the alphabet or other consecutive system, do the same with the last but one, and divide by the exponent of the last letter, as it becomes after the increase which it receives from the process of the preceding letter; but in no case use any letters but the last or the last but one. For instance, beginning with ϕa, in which is only one letter, we have $\phi'a\,.\,b$, or

$$D\phi a=\phi'a.b;$$

in which are two letters, a and b, consecutive. Operate upon b, and we have $\phi'a\,.\,c$; operate on $\phi'a$, and we have again $\phi''a\,.\,b$, which, with the b which was in before, is $\phi''a\,.\,b^2$, which we divide by the new exponent of b, or by 2, whence

$$D^2\phi a=\phi'a.e+\frac{\phi''a}{2}b^2.$$

In forming $D^3\phi a$, we use only c in $\phi'a\,.\,c$, because a does not immediately precede c; and we get (the succession being a, b, c, e, f, g, h, k, &c.)

$$D^3\phi a=\phi'a\,.\,e+\frac{\phi''a}{2}\,.\,2bc+\frac{\phi'''a}{2.3}b^3;$$

and so on. As soon however as the law is established, it is best to form a table of the successive derivatives of the powers of b by this same law: we then have

$$D^n\phi a=\phi'aD^{n-1}b+\frac{\phi''a}{2}D^{n-2}b^2+\frac{\phi'''a}{2.3}D^{n-3}b^3+\text{ \&c.}$$

$$\text{as far as }\frac{\phi^n a}{[n]}\,b^n;$$

in which $\phi'a$, $\phi''a$, &c. are to be taken from the function by common differentiation, and the derivatives of the powers of b from the table. This being done, we have

$$\phi(a+bx+cx^2+ex^3+fx^4+gx^5+,\text{ \&c.})=$$
$$\phi a+D\phi a\,.\,x+D^2\phi a\,.\,x^2+D^3\phi a\,.\,x^3+,\text{ \&c.};$$

and the process is shortened to its utmost extent; all that is not differentiation being merely reference to a table and writing the result.

We shall give materials for proceeding as far as the term $D^{12}\phi a\,.\,x^{12}$, not that so much will often be necessary, but because it is desirable to show with how little trouble questions of enormous labour in the ordinary way, such, for instance, as that solved in Reversion of Series, may be looked at without dismay. We have to form every derivative of every power of b, $D^m b^n$, in which $m+n$ does not exceed 12.

$Db=c$ $D^2b=e$ $D^3b=f$ $D^4b=g$
$D^5b=h$ $D^6b=k$ $D^7b=l$ $D^8b=m$
$D^9b=n$ $D^{10}b=p$ $D^{11}b=q$

$Db^2=2bc$
$D^2b^2=2be+c^2$
$D^3b^2=2bf+2ce$
$D^4b^2=2bg+2cf+e^2$
$D^5b^2=2bh+2cg+2ef$
$D^6b^2=2bk+2ch+2eg+f^2$
$D^7b^2=2bl+2ck+2eh+2fg$
$D^8b^2=2bm+2cl+2ek+2fh+g^2$
$D^9b^2=2bn+2cm+2el+2fk+2gh$
$D^{10}b^2=2bp+2cn+2em+2fl+2gk+h^2$

$Db^3=3b^2c$
$D^2b^3=3b^2e+3bc^2$
$D^3b^3=3b^2f+6bce+c^3$
$D^4b^3=3b^2g+6bcf+3be^2+3c^2e$
$D^5b^3=3b^2h+6bcg+6bef+3c^2f+3ce^2$
$D^6b^3=3b^2k+6bch+6beg+3bf^2+3c^2g+6cef+e^3$
$D^7b^3=3b^2l+6bck+6beh+6bfg+3c^2h+6ceg+3cf^2+3e^2f$
$D^8b^3=3b^2m+6bcl+6bek+6bfh+3bg^2+3c^2k+6ceh$
$\quad+6cfg+3e^2g+3ef^2$
$D^9b^3=3b^2n+6bcm+6bel+6bfk+6bgh+3c^2l+6cek$
$\quad+6cfh+3eg^2+3e^2h+6efg+f^3$

$Db^4=4b^3c$
$D^2b^4=4b^3e+6b^2c^2$
$D^3b^4=4b^3f+12b^2ce+4bc^3$
$D^4b^4=4b^3g+12b^2cf+6b^2e^2+12bc^2e+c^4$
$D^5b^4=4b^3h+12b^2cg+12b^2ef+12bc^2f+12oce^2+4c^3e$
$D^6b^4=4b^3k+12b^2ch+12b^2eg+6b^2f^2+12bc^2g+24bcef$
$\quad+4be^3+4c^3f+6c^2e^2$
$D^7b^4=4b^3l+12b^2ck+12b^2eh+12b^2fg+12bc^2h+24bceg$
$\quad+12bcf^2+12be^2f+4c^3g+12c^2ef+4ce^3$
$D^8b^4=4b^3m+12b^2cl+12b^2ek+12b^2fh+6b^2g^2+12bc^2k$
$\quad+24bceh+24bcfg+12be^2g+12bef^2+4c^3h$
$\quad+12c^2eg+6c^2f^2+12ce^2f+e^4$

$Db^5=5b^4c$
$D^2b^5=5b^4e+10b^3c^2$
$D^3b^5=5b^4f+20b^3ce+10b^2c^3$
$D^4b^5=5b^4g+20b^3cf+10b^3e^2+30b^2c^2e+5bc^4$
$D^5b^5=5b^4h+20b^3cg+20b^3ef+30b^2c^2f+30b^2ce^2+20bc^3e$
$\quad+c^5$
$D^6b^5=5b^4k+20b^3ch+20b^3eg+10b^3f^2+30b^2c^2g+60b^2cef$
$\quad+10b^2e^3+20bc^3f+30bc^2e^2+5c^4e$
$D^7b^5=5b^4l+20b^3ck+20b^3eh+20b^3fg+30b^2c^2h+60b^2ceg$
$\quad+30b^2cf^2+30b^2e^2f+20bc^3g+60bc^2ef+20bce^3$
$\quad+5c^4f+10c^3e^2$

$Db^6=6b^5c$
$D^2b^6=6b^5e+15b^4c^2$
$D^3b^6=6b^5f+30b^4ce+20b^3c^3$
$D^4b^6=6b^5g+30b^4cf+15b^4e^2+60b^3c^2e+15b^2c^4$
$D^5b^6=6b^5h+30b^4cg+30b^4ef+60b^3c^2f+60b^3ce^2+60b^2c^3e$
$\quad+6bc^5$
$D^6b^6=6b^5k+30b^4ch+30b^4eg+15b^4f^2+60b^3c^2g+120b^3cef$
$\quad+20b^3e^3+60b^2c^3f+90b^2c^2e^2+30bc^4e+c^6$

$Db^7=7b^6c$
$D^2b^7=7b^6e+21b^5c^2$
$D^3b^7=7b^6f+42b^5ce+35b^4c^3$
$D^4b^7=7b^6g+42b^5cf+21b^5e^2+105b^4c^2e+35b^3c^4$
$D^5b^7=7b^6h+42b^5cg+42b^5ef+105b^4c^2f+105o^4ce^2$
$\quad+140b^3c^3e+21b^2c^5$

$Db^8=8b^7c$
$D^2b^8=8b^7e+28b^6c^2$
$D^3b^8=8b^7f+56b^6ce+56b^5c^3$
$D^4b^8=8b^7g+56b^6cf+28b^6e^2+168b^5c^2e+70b^4c^4$

$Db^9=9b^8c$
$D^2b^9=9b^8e+36b^7c^2$
$D^3b^9=9b^8f+72b^7ce+84b^6c^3$

$Db^{10}=10b^9c$ $D^2b^{10}=10b^9e+45b^8c^2$

$Db^{11}=11b^{10}c$

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has substituted a notation, for that of Arbogast, in which he will probably have few followers. The student who is not repelled by this, and cannot procure Arbogast's work, will find West's treatise abounding in derivations.

To verify these results, observe that if we consider each letter as of the first dimension, every term of $D^n b^r$ is of the rth dimension; but if we consider each letter as of the dimension following:—

$$\begin{matrix} b & c & e & f & g & h & k & l & m & n & p & q \\ 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12: \end{matrix}$$

then every term of $D^n b^r$ is of the $(n+r)$th dimension. To find out if all the proper terms be there, and with the proper exponents, write down the number of ways in which $n+r$ can be made out of r numbers. Thus to verify this point for D^7b^3, write down the ways in which 10 can be made out of three numbers, namely,

$$8+1+1,\ 7+2+1,\ 6+3+1,\ 6+2+2,\ 5+4+1,\ 5+3+2,\ 4+4+2,\ 4+3+3;$$

take the letter answering to each number, in the above list, and multiply the letters of each set together, which gives

$$b^2l,\ bck,\ beh,\ c^2h,\ bfg,\ ceg,\ cf^2,\ e^2f,$$

which are, coefficients excepted, the terms of D^7b^3 in the table. To verify the coefficients separately, observe that the coefficient of that term of $D^n b^r$ which contains the sth power, tth power, &c., is

$$\frac{1.2.3\ldots.(r-1)r}{1.2.3\ldots s \times 1.2.3\ldots t \times \ldots\ldots}.$$

Thus in D^4b^8, the term containing b^5c^2e ought to be multiplied by

$$\frac{1.2.3.4.5.6.7.8}{1.2.3.4.5 \times 1.2 \times 1}, \text{ or 168, as is the case.}$$

But the best general mode of verification is derived from the theorem

$$D^n b^{r-1} = \frac{1}{r}\frac{dD^n b^r}{db}, \text{ or } D^{n+1} b^{r-1} = \frac{1}{r} D\left(\frac{dD^n b^r}{db}\right);$$

that is, having a certain derivative of a certain power, the next higher derivative of the next lower power may be found by differentiating with respect to b, dividing by the exponent of the original power, and then performing the derivation. Thus:

$$D^3b^9 = 9b^8f + 72b^7ce + 84b^6c^3,$$

differentiate with respect to b, and divide by 9. which gives

$$8b^7f + 56b^6ce + 56b^5c^3.$$

Now derive, which gives

$$8b^7g + 56b^6cf + 28b^6e^2 + 168b^5c^2e + 70b^4c^4,$$

the same as is found in the table for $D^{3+1}b^{9-1}$. Here we verify the earlier result of the table from the later: to verify the later from the earlier, use the following:—

$$D^n b^r = D^{n-1}c \,.\, rb^{r-1} + D^{n-2}c^2 \,.\, r\frac{r-1}{2}b^{r-2} +, \text{\&c.}$$

$$\text{up to } c^n \frac{r(r-1)\ldots\ldots(r-n+1)}{1.2\ldots\ldots n} b^{r-n},$$

in which the derivatives of powers of c must be formed from the corresponding tabular ones of b, by changing each letter into the next following. There are thus abundant means of verification. We will mention yet one method more. Only the last letter and the last but one (and that only when the two letters are consecutive) are used in the derivations. If we use any letter, no new term is produced, but only a repetition of those which other terms give. For instance, in D^6b^5 is the term $60b^2cef$; and in passing to D^7b^5, we derive from f because it is the last letter; and from e because, being the last but one, it immediately precedes f in the series. We do not here use b and c at all; but if we did use them, we should only repeat terms which will come into D^7b^5 from other sources. Thus:— $60b^2cef$ gives, from f, $60b^2ceg$, which is set down in D^7b^5: from e, $60b^2cff \div 2$, or $30b^2cf^2$, which is also set down: from c, if c had been used, we should have had $60b^2eef \div 2$, or $30b^2e^2f$, which, on looking, we find set down, as arising from the last letter of $10b^2e^3$. From b, in $60b^2cef$, had it been used, we should have got $120bccef \div 2$, or $60bc^2ef$, which is also found, and arises from the last letter of $30bc^2e^2$. If then we ever find that derivation from one of the unused letters gives anything but what arises from some of the letters which are used, it is a sign that some error has been committed.

By help of the preceding method, expansions which analysts usually avoid as much as possible, at almost any expense of circumoperation, are carried with the greatest facility even further than is necessary. The development of $\phi\,(a+bx+cx^2+\text{\&c.})$, already given, is one instance; the process in REVERSION OF SERIES is another. This last is done* by expanding x in powers of $ax+bx^2+$, &c., by Burmann's Theorem, and making the expansion of the negative powers of $(a+bx+cx^2+, \text{\&c.})$, which will be wanted, by the method of derivations. We shall state some further applications:—

$$(b+cx+ex^2+\text{\&c.})^m = b^m + Db^m \,.\, x + D^2b^m \,.\, x^2 +, \text{\&c.}$$

When m is integer, these derivatives are in the table. When $b+cx+$ &c. is a finite series, the whole result is brought out with great ease, compared with the trouble of the common algebraical operation: in this case the value of every letter after the last in the finite series is 0, or the last letter of that series is not to be employed in derivation. Let the reader try for himself $(b+cx+ex^2+fx^3)^3$ by this mode and then in the common way, going only so far in the latter as to feel sure that the former is of no trouble compared with it. Let m, $m\frac{m-1}{2}$, &c. be denoted by m, m_2, &c.

$$\begin{aligned}(a+bx+cx^2+\text{\&c.})^m &= a^m + mba^{m-1}x \\ &+ (mac + m_2b^2)\,a^{m-2}x^2 \\ &+ (ma^2e + m_2aDb^2 + m_3b^3)\,a^{m-3}x^3 \\ &+ (ma^3f + m_2a^2D^2b^2 + m_3aDb^3 + m_4b^4)\,a^{m-4}x^4\end{aligned}$$

+, &c.; the law of which is evident, the only thing left being the substitution of the values in the tables instead of the derivatives of b. This form is convenient for fractional or negative powers. The following case is worth exhibiting separately:—

$$\begin{aligned}\frac{1}{a+bx+,\text{\&c.}} &= \frac{1}{a} - \frac{b}{a^2}x + \frac{b^2-ac}{a^3}x^2 \\ &- \frac{b^3 - aDb^2 + a^2e}{a^4}x^3 + \frac{b^4 - aDb^3 + a^2D^2b^2 - a^3f}{a^5}x^4\end{aligned}$$

−, &c. We have avoided the formality of writing Db for c, D^2b for e, &c.

$$\begin{aligned}\frac{A+Bx+Cx^2+,\text{\&c.}}{a+bx+cx^2+,\text{\&c.}} &= \frac{A}{a} - \frac{Ab-Ba}{a^2}x \\ &+ \frac{A(b^2-ac) - Bab + Ca^2}{a^3}x^2 \\ &- \frac{A(b^3-aDb^2+a^2e) - Ba(b^2-ac) + Ca^2b - Ea^3}{a^4}x^3 +, \text{\&c.}\end{aligned}$$

The law is here evident enough; the next numerator would be

$$\begin{gathered}A(b^4-aDb^3+a^2D^2b^2-a^3f) - Ba(b^3-aDb^2+a^2e) \\ + Ca^2(b^2-ac) - Ea^3b + Fa^4\end{gathered}$$

The derivatives of the general term b^n may be readily formed, but the particular cases are more useful; see the derivatives of a^m in the general form above given. We shall not overload this subject with further examples: enough have been given to show those who require developments of some extent how much labour they might save.

It frequently happens that the form given is not

$$\phi\,(a+bx+cx^2+,\text{\&c.}) \text{ but } \phi\left(a+bx+\frac{cx^2}{2}+\frac{ex^3}{2.3}+,\text{\&c.}\right),$$

in which case the occurrence of the fractions in the denominator renders the process more complicated than it need be. We put down tables for the development of this function, derived from the preceding tables, as far as the tenth power of x: to be used as follows:—

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* M. Wronski has given elegant forms of transformation and development, which are most accessible in Montferrier's 'Dictionnaire des Sciences Mathématiques,' Paris, 1838. The author of these developments has wrapt himself in a cloud of obscurity, and adopted the tone of an assailant, with not a little of the manner of a charlatan, which has hindered his really remarkable extensions from receiving the notice to which they are entitled, and himself from obtaining the character as a mathematician which no one who reads his works can for a moment deny him. We do not enter into his methods, because, though good in theory, they are not easily used, from their excessive generality. For instance, in the article on Reversion of Series, in the dictionary cited, the author of which is a partizan of M. Wronski, the results are carried as far as L of our article on that subject, not by the vaunted methods, but by the old method of indeterminate coefficients, an immense labour, after which the name of the undertaker is very properly recorded. To repeat the same process and to carry it two terms further, by Arbogast's and Burmann's methods combined, did not take us three hours.

Let

$$\phi\left(a+bx+c\,\frac{x^2}{2}+e\,\frac{x^3}{2.3}+\&c.\right)=A_0+A_1x+A_2\frac{x^2}{2}+\&c.$$

Then $A_n=\phi'a\,.\,D^{n-1}b+\phi''a\,.\,D^{n-2}b^2+\ldots+\phi^{(n)}a\,.\,b^n$

where the derivatives of the powers of b, which do not mean the same as hitherto, are to be taken from the following table:—

$D\,b=c$

$D^2b=e,\qquad D\,b^2=3bc$

$D^3b=f,\qquad D^2b^2=4be+3c^2,\qquad Db^3=6b^2c$

$D^4b=g,\qquad D^3b^2=5bf+10ce,\qquad D^2b^3=10b^2e+15bc^2,\qquad Db^4=10b^3c$

$D^5b=h,\qquad D^4b^2=6bg+15cf+10e^2,\qquad D^3b^3=15b^2f+60bce+15c^3$

$D^2b^4=20b^3e+45b^2c^2,\qquad Db^5=15b^4c$

$D^6b=k,\qquad D^5b^2=7bh+21cg+35ef$

$D^4b^3=21b^2g+105bcf+70be^2+105c^2e$

$D^3b^4=35b^3f+210b^2ce+105bc^3$

$D^2b^5=35b^4e+105b^3c^2,\qquad Db^6=21b^5c$

$D^7b=l,\qquad D^6b^2=8bk+28ch+56eg+35f^2$

$D^5b^3=28b^2h+168bcg+280bef+210c^2f+280ce^2$

$D^4b^4=56b^3g+420b^2cf+280b^2e^2+840bc^2e+105c^4$

$D^3b^5=70b^4f+560b^3ce+420b^2c^3$

$D^2b^6=56b^5e+210b^4c^2,\qquad Db^7=28b^6c$

$D^8b=m,\qquad D^7b^2=9bl+36ck+84eh+126fg$

$D^6b^3=36b^2k+252bch+504beg+315bf^2+378c^2g+1260cef+280e^3$

$D^5b^4=84b^3h+756b^2cg+1260b^2ef+1890bc^2f+2520bce^2+1260c^3e$

$D^4b^5=126b^4g+1260b^3cf+840b^3e^2+3780b^2c^2e+945bc^4$

$D^3b^6=126b^5f+1260b^4ce+1260b^3c^3$

$D^2b^7=84b^6e+378b^5c^2,\qquad Db^8=36b^7c$

$D^9b=n,\qquad D^8b^2=10bm+45cl+120ek+210fh+126g^2$

$D^7b^3=45b^2l+360bck+840beh+1260bfg+630c^2h+2520ceg+1575cf^2+2100e^2f$

$D^6b^4=120b^3k+1260b^2ch+2520b^2eg+1575b^2f^2+3780bc^2g+12600bcef+2800be^3+3150c^3f+6300c^2e^2$

$D^5b^5=210b^4h+2520b^3cg+4200b^3ef+9450b^2c^2f+12600b^2ce^2+12600bc^3e+945c^5$

$D^4b^6=252b^5g+3150b^4cf+2100b^4e^2+12600b^3c^2e+4725b^2c^4$

$D^3b^7=210b^6f+2520b^5ce+3150b^4c^3$

$D^2b^8=120b^7e+630b^6c^2,\qquad Db^9=45b^8c.$

We shall conclude this article by recommending that the process of derivation should be introduced, without demonstration of course, into elementary books of algebra, as one of the best exercises of simple algebraical operation. We are firmly of opinion that the arithmetician and the analyst should be trained early in the performance of operations in which numerous details, each very simple in itself, follow one another in rapid succession with much sameness and some diversity. For this reason we should recommend, in arithmetic, Horner's process [INVOLUTION AND EVOLUTION]; and in algebra, Arbogast's derivation. We proceed accordingly to divest this method of the phraseology of the differential calculus, and to put it before the elementary student in algebra.

The name of the process is *derivation*; its primary object the raising of any power of an expression of the form $b+cx+ex^2+fx^3+$, &c. immediately, that is to say, by writing down the result at once, without any but simple mental processes in passing from term to term. The rules are as follows:

1. Begin with that power of b which is to be raised.

2. To pass from the coefficient of one power of x to that of the next, multiply each letter by its exponent; then diminish that exponent by a unit; then introduce the next letter. And if this last process increase an exponent, owing to the letter newly introduced having been in the term before, divide by the increased exponent. *But remember never to operate on any letter except the last in the term, or the last but one;* upon the last always, upon the last but one when it immediately precedes the last in the original series b, c, e, f, &c.

3. If $b+cx+$, &c. be not an infinite series, but a finite number of terms, operate as if the succeeding letters were severally equal to 0: for instance, if g be the last letter, drop every term in which h should appear, as fast as it arises.

For example, the fifth power of $b+cx+ex^2+fx^3$. Begin with b^5, derive from it $5b^4c$, the two first terms are $b^5+5b^4c\,.\,x$.

To form the coefficient of x^2, take $5b^4c$, and observe that b and c follow each other in the series, so that in the next derivation there are two processes. First, use c or c^1, the last letter, which by the rule gives $1c^0e$ or e: so that derivation applied to the first power of a letter gives merely a change of that letter into the next: hence $5b^4c$ gives $5b^4e$. But b^4, which must also be used, gives $4b^3c$, and $5b^4c$ gives $5(4b^3c)c$; so that c becomes c^2, and we must therefore divide by the increased exponent 2, giving $10b^3c^2$. Hence the next term is

$$(5b^4e+10b^3c^2)x^2.$$

In the next derivation $5b^4e$ gives only $5b^4f$, for b not immediately preceding e in the series b, c, e, &c. is not used. But $10b^3c^2$ gives

$$10b^3(2ce)+\frac{10(3b^2c)\,c^2}{3},\text{ or }20b^3ce+10b^2c^3.$$

Next term $(5b^4f+20b^3ce+10b^2c^3)x^3$.

In the next derivation $5b^4f$ must be neglected entirely, because f is the last letter, and b is not the one immediately preceding. Also $20b^3ce$ gives $20b^3cf$ and $20b^3ee\div2$ or $10b^3e^2$; while $10b^2c^3$ gives $30b^2c^2e$ and $2\times10bc\,.\,c^3\div4$, or $5bc^4$. The whole value of $(b+cx+ex^2+fx^3)^5$ is as follows, and a little practice would enable any one to write it down at once, without any intermediate operations:

$$\begin{aligned}&b^5+5b^4cx+(5b^4e+10b^3c^2)x^2+(5b^4f+20b^3ce+10b^2c^3)x^3\\&+(20b^3cf+10b^3e^2+30b^2c^2e+5bc^4)x^4\\&+(20b^3ef+30b^2c^2f+30b^2ce^2+20bc^3e+c^5)x^5\\&+(10b^3f^2+60b^2cef+10b^2e^3+20bc^3f+30bc^2e^2+5c^4e)x^6\\&+(30b^2cf^2+30b^2e^2f+60bc^2ef+20bce^3+5c^4f+10c^3e^2)x^7\\&+(30b^2ef^2+30bc^2f^2+60bce^2f+5be^4+20c^3ef+10c^2e^3)x^8\\&+(10b^2f^3+60bcef^2+20be^3f+10c^3f^2+30c^2e^2f+5ce^4)x^9\\&+(20bcf^3+30be^2f^2+30c^2ef^2+20ce^3f+e^5)x^{10}\\&+(20bef^3+10c^2f^3+30ce^2f^2+5e^4f)x^{11}\\&+(5bf^4+20cef^3+10e^3f^2)x^{12}+(5cf^4+10e^2f^3)x^{13}\\&\qquad+5ef^4x^{14}+f^5x^{15}\end{aligned}$$

This process, so simple as compared with the actual performance of the four multiplications, has hitherto lain hid in works on the higher parts of the differential calculus: it is time it should take its place in every system of algebra which contains the binomial theorem, of which it is the legitimate extension.

TAYLOR, JOHN, LL.D., was born about the year 1703, at Shrewsbury, where his father, according to some writers, was a poor shoemaker, or, according to others, a barber. He received his early education at the grammar-school of his native place, and afterwards went to Cambridge, where he entered St. John's College, of which he became a fellow in 1730. The great reputation which he soon acquired as one of the best Greek scholars in the University, procured him the office of librarian of the University library, which however he afterwards exchanged for that of registrar of the University. His first work of importance was his edition of the Greek orator Lysias, under the title 'Lysiae Orationes et Fragmenta, Graecè et Latinè: ad fidem codicum MSS. recensuit, notis criticis, interpretatione, caeteroque apparatu necessario donavit Joannes Taylor,' London, 1739, 4to. The year after he edited at Cambridge an octavo edition of the same orator for the use of students, with short notes and a useful index of the language. The study of the Attic orators led him to the study of the Attic law, of which he probably possessed a better knowledge than any man of his age. He was also fond of the study of the Roman and English law, and he resolved to devote himself to the legal profession. In 1741 he was admitted an advocate in Doctors' Commons, and the year after he took his degree of doctor of laws. On this occasion he published a Latin dissertation, 'Commentarius ad Legem Decemviralem de Inope Debitore in partes dissecando,' which is a very unsatisfactory explanation of this difficult subject. Soon after this he published an edition of two Greek orations, 'Orationes duae, una Demosthenis contra Midiam, altera Lycurgi contra Leocratem, Graecè et Latinè,' with notes and emendations, Cambridge, 1743, 8vo., and in the same year he published the 'Marmor Sandvicence, cum Commentario et Notis,' Cambridge, 1743, 4to. This volume also contains a useful dissertation on this celebrated inscription, which had been brought from Athens to London by Lord Sandwich in 1739. In 1744 Dr. Taylor was made chancellor of Lincoln; and some years later he took holy orders, though without abandoning the study of the law and of the antient writers. He was now successively made archdeacon of Buckingham and rector of Lawford in Essex, to which, in 1757, was added the lucrative place of canon residentiary of St. Paul's. In 1755 he published at London, in 4to., his 'Elements of Civil Law,' a second edition of which appeared in 1769. Dr. Taylor undertook this work at the suggestion of Lord Carteret, who had intrusted him with the education of his grandsons, whom he wished to be instructed in the principles and history of the civil law. The work displays great learning and knowledge of the subject, but it is not well adapted for the use of beginners; an abridgement of it appeared in 1773, in London, under the title 'A Summary of the Roman Law.' During the last period of his life, Dr. Taylor had made extensive preparations for a new edition of the Greek orators. One volume (which is the third) appeared in 1748 at Cambridge, but his death on the 4th of April, 1756, prevented the author himself from completing the work, though all the materials were ready for press. The second volume appeared after his death, in 1757. The work bears the title, 'Demosthenis, Æschinis, Dinarchi, et Demadis Orationes: Graecè et Latinè, cum notis edidit J. Taylor.' The notes, which were published at a later time, are incorporated in Reiske's 'Apparatus Criticus' to Demosthenes. In a critical point of view the edition of Taylor is not of any great worth, and its chief value consists in his notes in illustration of the history of the orations and the Attic law. Dr. Taylor is said to have been a most amiable and disinterested man: he had considerable taste for poetry, and some specimens of his muse are printed in the 'Gentleman's Magazine,' and in Nichols's 'Select Collection of Poems.'

(Aikin and Johnston's *General Biography*, vol. ix., p. 337, &c.; Reiske, *Praefatio ad Demosthenem*, p. 42, &c.)

TAYLOR, SIR ROBERT, born in 1714, was the son of a London stone-mason, who was more prosperous than prudent, for he affected a style of living very unusual at that period among persons engaged in business: he kept his carriage, and also his country-house in Essex. Towards his son, on the contrary, he appears to have been far from liberal, as he bestowed on him only a common school education, and then placed him under Sir Henry Cheere, a sculptor, whose chief work of note is the statue of Col. Codrington, in the library of All Souls, Oxford. On quitting Cheere, he was furnished by his father with just sufficient money to proceed to Rome, where he was obliged to live with the utmost frugality. His studies in Italy were however of no long continuance, for he was soon summoned home by the intelligence of his father being dangerously ill; upon which he hurried back to England with as much expedition as the state of the Continent would then permit, and was obliged to disguise himself as a Franciscan friar. On reaching home, he found that his father was dead, and that he had left nothing. Thus thrown entirely upon his own resources and ability, all that remained for him was to set up business as a statuary, and he first brought himself into notice by Cornwall's monument. His principal other works in sculpture are Guest's monument, near the north door of Westminster Abbey, the figure of Britannia at the Bank of England, and the bas-relief in the pediment of the Mansion-house, London. After this he abandoned sculpture for architecture, and one of his earliest productions in his new profession was the mansion erected by him for Mr. Gower, near the South Sea House. In 1756-58 he was employed in the alterations of old London Bridge in conjunction with Dance, and thenceforth upon a number of buildings both public and private; yet very few among which display much architectural taste, and least of all any of that richness in decoration and detail which might have been expected from one who had been brought up and had practised as a sculptor. The wings added by him to the Bank of England (afterwards swept away by his successor Soane) were at the time termed 'magnificent,' but then it could only be by comparison with the older building by Sampson, to which they were attached. This design itself was only borrowed from one of Bramante's [Bramante], and was upon so small a scale as to look insignificant in such a situation. The 'Stone Buildings' at Lincoln's Inn are such a mere architectural blank, that the columns, instead of diminishing the poverty of its character, serve only to render it the more apparent. There is however some architectural character displayed in that which is called the 'Six Clerks' Office,' situated between the other building and Chancery Lane. The villa which he built for Sir Charles Asgill at Richmond is at least unexceptionable in taste, though it hardly deserves the admiration it has obtained. Among his other works, Lord Grimston's seat at Gorhambury is one of the best. If not very great, he was eminently successful, in his profession, and obtained several lucrative appointments and surveyorships to the Admiralty, Foundling Hospital, Greenwich Hospital, and the Bank of England, for which he was well qualified, being a man of most business-like habits, and of most extraordinary diligence and assiduity. He was rarely in bed after four in the morning; was most abstemious in his diet, and drank no wine. Whether in consequence of taking warning from his father's example or not, he seems in almost all respects to have been the very reverse of him in his mode of living; and it is not surprising that his economy, together with the appointments which he held, should have enabled him to realize a fortune of 180,000*l*., though, as he himself used to say, he began the world with hardly eighteen pence. He died at his own house in Spring Gardens, September 27, 1788, and was buried in St. Martin's church. He gave the whole of his property to his only son, the late Michael Angelo Taylor, M.P., with the exception of a sum to the university of Oxford, to accumulate for a certain term of years and then to be applied to found an institute for the study of modern languages. This bequest having been incorporated with a similar one by Dr. Randolph for a picture and statue gallery, a building was begun in 1841, under the name of the 'Taylor and Randolph Institute,' from the designs of C. R. Cockerell, Esq., professor of architecture at the Royal Academy. Taylor was knighted when sheriff of London in 1783.

(*Gentleman's Magazine*; Cresy's *Milizia*; Dallaway's *Arts in England*; *Companion to Almanac*, 1842.)

TAYLOR, THOMAS, was born in London on the 15th May, 1758: his parents were respectable in their calling, but not wealthy. At a very early age he was sent to St. Paul's school, and after remaining there about three years he was placed under the care of a relation who held a situation in the dockyard at Sheerness, with whom he resided several years. During this time he applied himself assiduously to the study of mathematics, and also obtained some knowledge of chemistry: he next became a pupil of the Rev. Mr. Worthington, a dissenting minister who possessed considerable classical acquirements, ultimately intending to complete his studies at Aberdeen with a view to the ministry. But a premature marriage and pecuniary difficulties compelled him to relinquish this plan, and to accept a junior clerkship in Messrs. Lubbock's banking-house. While in this employment he devoted his spare hours to the study of Plato and Aristotle and their commentators. At this time, and to the end of his life, Mr. Taylor always devoted at least six hours of every day to study, and when not engaged in business they were generally the first six. Poverty, and the difficulties attending it, were no obstacles to him, and he always hoped to emerge from the obscurity they placed him in. He first attracted public notice by an attempt to discover the secret of the perpetual lamp, upon which he gave a lecture and exhibited his experiments at the Freemasons'

Tavern. Though it was a failure, it was marked by some ingenuity and great and curious research; it made him some valuable acquaintances, who encouraged him in another undertaking, which was to deliver a course of lectures on the Platonic philosophy. Introducing himself by such means, he was enabled to procure pupils, to whom he taught the languages and mathematics, having also been appointed to the office of assistant-secretary to the Society for the Encouragement of Arts, Manufactures, and Commerce, which he held for several years: he of course gave up and was glad to be emancipated from the less interesting labours of the banking-house. It was in this situation that he made a more extensive acquaintance among learned and scientific men of all professions, and among men of various ranks who are promoters of arts and sciences, than usually falls to the lot of an obscure individual: but he made something more than mere acquaintance; he acquired many friends who were able and willing to assist him in all his undertakings, and with whose help he finally accomplished all that he had in view, which was to translate the works of all the untranslated antient Greek philosophers. It was an arduous task for one man, and apparently a hopeless one, seeing that Sydenham, with the advantage of a more regular education, being a graduate of Oxford, and a known and acknowledged scholar, had not only failed in his desire to impart knowledge to his less learned countrymen by means of translations, but had been suffered to perish in the attempt for want of patronage, 'to the sorrow and shame (as his biographer says) of every friend of literature:' yet Sydenham was a good man, highly respected, and had many friends, or believed he had: he must have been a recluse, for the circumstances of his death seem to have caused surprise. Mr. Taylor was fond of society, and always in it: there was no appearance of abstraction about him; and a stranger would not have suspected him of being studious; he was always ready to join in conversation with any one who happened to be near him, and upon any subject; there were few subjects upon which he had not read, and he could always amuse or instruct if required. 'Being gifted with a very extraordinary memory, he not only retained the immense store of knowledge he had amassed, but he could bring it all into use at his will:' he was deeply read in things that many like to hear of, though they are no longer studied, sorcery, witchcraft, alchemy, &c., and his fund of anecdote was quite inexhaustible: all this, joined to simple and unobtrusive manners, and irreproachable conduct, made him not only an agreeable companion to many, but to some he became almost a necessary one. Men whose occupations had prevented their reading, though they were desirous of knowledge, were particularly delighted with the company of Mr. Taylor, and such were his great supporters. It was by making friends chiefly that Mr. Taylor, who was as poor as Sydenham, contrived to print works that must have cost more than 10,000*l*., that were not of the most saleable description, and that upon the whole produced no pecuniary profit. The duke of Norfolk printed Plato, and from some unaccountable whim locked up nearly the whole edition in his house, where it remained till long after his decease, but he was attached to Mr. Taylor, and frequently made him his companion at Arundel. Mr. Meredith, a wealthy tradesman retired from business, was a man possessed of sound mental faculties, with no aversion to exercise them. Having read Plato he wished also to read Aristotle in an English translation, and Mr. Taylor was ready to help him to it upon no other condition than his undertaking to print it, which he did; and though he made a losing speculation of it, by printing too few copies, he was so well satisfied with Mr. Taylor's exertions, that he not only assisted him in bringing out some of his minor publications, but settled a pension of 100*l*. a year upon him, which he enjoyed till his death: such munificence and friendship in a man who had earned his money, and knew the value of it, is truly honourable. Mr. Meredith, though not versed in the antient languages, obtained a great knowledge of antient literature; he was a man who thought for himself, and came to just conclusions upon most subjects. Among Mr. Taylor's minor works some will be found dedicated to persons who printed them upon similar terms, and in a few cases gave him the benefit of the whole edition. He never exacted payment for his labour, except in one or two cases with the booksellers, and then he had little enough. But with such means he got over all his difficulties, and he had some, for he was twice married and had several children; his income altogether was about 200*l*. a year. There are some persons who are not at all pleased with Mr. Taylor's attempt to revive certain antient opinions; they neither wished to see some of the works he has translated, nor his remarks upon them in English; but they are the very persons who brought the writers into notice by constantly referring to them, and speaking of them in terms that are neither liberal nor entirely merited. These writers were the supporters of antient opinions and establishments, the failure of most of which is now complete and past recovery; there can therefore be little to object to in their writings, and there is much that is good and worth preserving. For these reasons they found translators in every civilized country but England. It seems then that our professed scholars have not done their duty to the public: if they had given us good translations with their own annotations, the labours of Mr. Taylor would not have been called for, and any remarks he might have made elsewhere would have had little weight, and have been overlooked. There are important works yet untranslated, and there are many translations which are disgraceful to the literary character of our country: it is time then that our scholars should look to these matters, and see that things which must and will be done are well done.

Mr. Taylor, during the last forty years of his life, resided in a small house at Walworth, leading a life of perfect uniformity, and dividing his time between his labours and his attentions to his friends and family. He died on the 1st of November, 1835, of a very painful disease in the bladder, which he bore with extraordinary fortitude and without complaining. He was an Academician by profession and a Stoic in practice; a sincere friend and a delightful companion. His works and translations are:—1, 'The Elements of a New Method of Reasoning in Geometry,' 4to., 1780, a juvenile performance lost or suppressed; 2, a Paraphrase of part of Ocellus in the *European Magazine*, 1782; a translation of the whole work in 1831, 8vo.; 3, 'The Hymns of Orpheus,' 12mo., 1787; second edition, 1824, augmented; 4, 'Plotinus on the Beautiful,' 12mo., 1787; 5, 'A Dissertation on the Eleusinian and Bacchic Mysteries,' 8vo., no date; 6, 'The Rights of Brutes,' 12mo., 1792, in ridicule of Paine's 'Rights of Man;' 7, 'Sallust on the Gods and the World,' 8vo., 1793; 8, 'The Phædrus of Plato,' 4to., 1792; 9, 'The Cratylus, Phædon, Parmenides, and Timæus,' 8vo., 1793; 10, 'Proclus on Euclid,' 2 vols. 4to., 1792; 11, 'Two Orations of the Emperor Julian to the Sovereign Sun and to the Mother of the Gods,' 8vo., 1793; 12, 'Pausanias' Description of Greece,' 3 vols. 8vo., 1794: for this translation, made in such haste that Mr. Taylor nearly lost the use of his right hand from continued exertion, he received 18*l*. The work was in such demand that it sold for a high price, and a second edition was printed in 1824 without consulting the translator, who heard of it accidentally, when it was too late to correct it; a slight compensation was made to him, and he added some notes: this is an illustration of the remarks already made; a work like this should not have been left to a necessitous writer: 13, Five books of Plotinus, 'On Felicity; on the Nature and Origin of Evil; on Providence; on Nature, Contemplation, and the One; on the Descent of the Soul,' 8vo., 1794; 14, 'Cupid and Psyche,' from Apuleius, 8vo., 1795; 15, 'Metaphysics of Aristotle,' 4to., 1801; 16, Hederic's 'Greek Lexicon,' edited, 4to., 1803; 17, 'The Dissertations of Maximus Tyrius,' 2 vols. 12mo., 1804; 18, 'An Answer to Dr. Gillies' Supplement to his New Analysis of the Works of Aristotle, 8vo., 1804; 19, 'The Works of Plato,' 5 vols. 4to., 1804; including reprints of the parts previously translated, and many commentaries taken from MSS., some of which have since been printed in the original language; 20, 'The Pythagoric Sentences of Demophilus;' these are printed with Mr. Bridgeman's translations, 8vo., 1804; 21, 'Miscellanies in Prose and Verse,' 12mo., 1805, 2nd ed. 1820; 22, 'Collectanea,' 8vo., 1806; 23, 'The Emperor Julian's Arguments taken from Cyril, with Extracts from his other Works relative to the Christians,' 8vo., 1809; 24, 'The Works of Aristotle,' 9 vols. 4to., 1812, with copious extracts from the antient commentators, to which are added a dissertation on the philosophy of Aristotle, and a treatise on the elements of the true arithmetic of infinites, both of which had appeared in a separate form; 25, 'The Six Books of Proclus on the Theology of Plato,' 2 vols. 4to., 1816; 26, 'Theoretic Arithmetic,' 8vo., 1816, containing what had been written on this subject by Theon of Smyrna, Nicomachus, Iamblicus, and Boethius; with remarks on amicable and other numbers, and a specimen of the manner in which the Pythagoræans philosophised about numbers; 27, 'Select Works of Plotinus,' 8vo., 1817; 28, 'Life of Pythagoras by Iamblicus,' 8vo., 1818; 29, 'Iamblicus on the Mysteries of the Egyptians, Chaldæans, and Assyrians,' 8vo., 1821; 30, 'The Commentaries of Proclus on the Timæus of Plato,' 2 vols. 4to., 1820; 31, 'Political Pythagoric Fragments and Ethical Fragments of Hierocles,' 8vo., 1822; 32, 'The Metamorphoses and Philosophical Works of Apuleius,' 8vo., 1822; translated gratuitously at the request of a friend, but purchased by a publisher for 100*l.*: Mr. Taylor had a few copies for his benefit; 33, 'Select Works of Porphyry,' 8vo., 1823; some Essays are added; 35, 'All the Fragments that remain of the Lost Writings of Proclus,' 8vo., 1825; 36, 'Arguments of Celsus relative to the Christians, taken from Origen, with Extracts from other Writers,' 12mo., 1830; 37, 'Proclus on Providence and Evil,' 8vo., 1833; 38, 'Plotinus on Suicide, with Extracts from Olympiodorus, and two books on Truly Existing Being, &c., with Notès from Porphyry and Proclus,' 8vo., 1834. Besides these, there are many papers written by Mr. Taylor in the 'Classical Journal' and other periodicals, amongst which may be specified a complete and valuable collection of the Chaldæan oracles, republished by Mr. Cory.

TAYLOR'S THEOREM. [Taylor, Brook.]

TAYWAN. [Taï-wan.]

TCHAD, LAKE. [Soodan, p. 249.]

TCHERNIGOV. [Czernigov.]

TEA. [Thea.]

TEA, PARAGUAY, or MATE', is the produce of a plant belonging to the family Aquifoliaceæ. It was formerly supposed to be the produce of the *Ilex vomitoria*, which is found in North America, in the Carolinas, and Florida; but, from specimens sent from Brazil to Mr. Lambert, it appears to be a distinct species, which he has named *Ilex paraguanensis*. It is a shrub attaining the size of the orange-tree; it is quite smooth, with bluntish wedge-shaped remotely serrated leaves, with umbelliferous flowers seated in the axils of the leaves. It is the *Ilex Maté* of Saint Hilaire, and grows wild in Paraguay and Brazil, and is called by the Spaniards *Yerva Mate*. The leaves of this shrub are in great repute amongst the inhabitants of South America, and are used in infusion in a similar manner to the tea of China. Upwards of 5,000,000 lbs. of the leaves of this tree are annually collected in Paraguay, and are sent to Chili and the viceroyalty of Buenos Ayres. It is not cultivated, and merchants carry various articles of use into the interior, which they give the natives for their labour in collecting the leaves of the plant. After the branches are cut away, the ground is heated by means of a fire, and the branches, being laid upon the heated ground, are dried, and afterwards they are beaten and pressed into bags, in which state it comes into the market. There are three kinds known in the market: the *Caa-cuys*, which is the bud of the leaf; the *Caa-mini*, the leaf torn from its midrib and veins without roasting; and the *Caa-guazu*, or *Yerva de Palos* of the Spaniards, the whole leaf with the petioles and small branches roasted. The first does not steep well, and is seldom seen. The plant when used is steeped in boiling water, to which a little sugar and sometimes lemon-juice is added. It is drunk out of a vessel called *maté*, which has a spout perforated with holes for the purpose of preventing the powdered herb from passing out with the fluid. The Creoles are passionately fond of this infusion, and never partake of a meal without it. The properties of this plant are sedative and stimulant.

Another species of Ilex, the *I. Gonghona*, found in Brazil, is applicable to the same purposes as the last; and although inferior in quality, was used extensively as a substitute for the true Paraguay tea, when the export of the latter from Paraguay was forbidden by the dictator Francia.

The *Ilex vomitoria* produces the *Cassena* of Florida and the Carolinas, which is used for the purpose of correcting the flavour of water.

TEAK. [Tectona.]

TEAL (*Querquedula crecca*, Steph.; *Anus crecca*, Linn.), one of the smallest of the *Anatidæ*, and most beautiful of the Ducks, in which article will be found Mr. Swainson's observations on the subgenus denominated *Teals*, together with a description of the *Blue-winged Teal*.

Description of the *Common Teal.*—*Adult Male.*—Top of the head, cheeks, and neck of a deep chestnut; throat black; a broad band of fine glossy green passing from the eyes to the back of the neck, bordered by a pale margin inclining to yellowish; head and cheeks chestnut; back, scapulars, and flanks zigzagged with irregular alternate lines of black and white; breast and under parts yellowish-white, but the breast is spotted with blackish; wing-coverts brown; beauty-spot (speculum) rich glossy green, deepened at the sides into a velvety black; quills brownish-black; under tail-coverts buff, with a longitudinal black band; bill black; iris brown; legs blackish-brown.

This is the nuptial dress; but, in July and August, this brilliant livery is exchanged for the more sober hues of the

Female.—Top of the head Sienna yellow, with dashes of deep brown; throat and cheeks dusky white, sprinkled with brown spots; plumage above tarnished or dull brown, each feather with a margin of a lighter colour; under parts yellowish-white; beauty-spot green.

This is the *Sarcelle*, *Petite Sarcelle*, *Cercelle*, *Cercerelle*, *Alebrande*, *Garsote*, and *Halebran* of the French; *Cercedula*, *Cercevolo*, *Scavolo*, *Sartella*, *Anitrella*, and *Anitra d' Inverno* of the Italians; *Spiegel-Entlein* and *Kriekente* of the Germans; *Winter Taling* of the Netherlanders; *Arta* and *Kræcka* of the Swedes; *Kestelort-And* of the Norwegians; *Krik-And* of the Danes; *Cor Hwyad* and *Brach Hwyad* of the antient British.

Habits, Geographical Distribution, &c.—Mr. Yarrell, in his 'British Birds,' now nearly complete, and forming a most valuable addition to British ornithology, thus sums up the information extant relative to the habits and locality of this pretty species, which he notices 'as an early and constant winter visitor, making its appearance by the end of September, sometimes sooner than that, and remaining with us till spring has made considerable progress; their numbers are constantly recruited through the winter months by additional arrivals from the northern parts of Europe, and our markets in consequence obtain a regular supply from the various decoys and other modes of capture. Although numbers in spring return again to more northern localities to breed, many remain in this country and pass the summer near fresh-water lakes. That some of them breed here also, in suitable localities, is proved by the fact that, in the summer of 1817, Mr. Youell of Yarmouth had four young birds of the Teal brought to him, which were hatched at Reedham in Norfolk. The authors of the Catalogue of Norfolk and Suffolk birds say also that very small ones have been obtained in company with their parents upon Ranworth Broad, by Mr. Kerrison of that place; and that they breed also on Scoulton Mere. The Rev. Richard Lubbock of Norfolk, in his note to me on this species, says, "the Teal must, in some years, either breed abundantly with us, or migrate hither very early: I have known sixty or seventy Teal come in small parties to the same plash of water at sun-down by the first week in August." The Teal bear confinement well; and at the gardens of the Zoological Society, though restricted to a very small pond, with a margin of thick and high grass, with some low shrubs, have bred regularly for the last five seasons' (Feb., 1842). The eggs are white, tinged with buff, measuring one inch three lines in length, by one inch four lines in breadth. The food of the Teal consists of seeds, grasses, water-plants, and insects in their various states. In confinement they require grain. Some Teal breed about the lakes of Wales, and a few in Romney Marsh. Mr. Selby, who has paid attention to the habits of this species in Northumberland, says, 'our indigenous broods, I am inclined to think, seldom quit the immediate neighbourhood of the place in which they were bred, as I have repeatedly observed them to haunt the same district from the time of their hatching, till they separated and paired on the approach of the following spring. The Teal breeds in the long rushy herbage about the edges of lakes, or in the boggy parts of the upland moors. Its nest is formed of a large mass of decayed vegetable matters, with a lining of down and feathers, upon which eight or ten eggs rest. Dr. Heysham, in his catalogue of Cumberland animals, says that a few Teal certainly breed in the mosses of that county every year.'

White, in a letter to the Hon. Daines Barrington, dated Selborne, July 8, 1773, says, 'Some young men went down lately to a pond on the verge of Walmer Forest to hunt flappers, or young wild ducks, many of which they caught, and, among the rest, some very minute, yet well-fledged wild fowls alive, which, upon examination, I found to be teals. I did not know till then that teals ever bred in the south of England, and was much pleased with the discovery: this I look upon as a great stroke in natural history.'

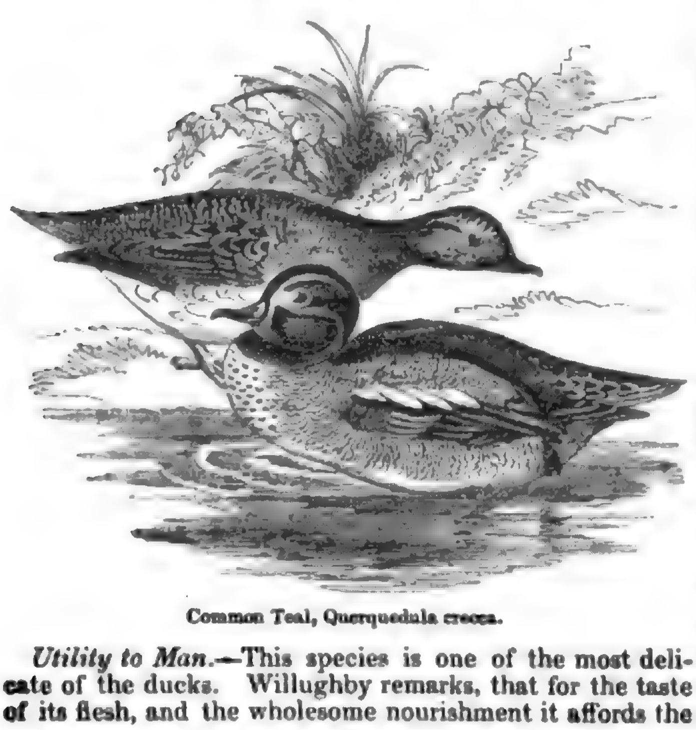
But to return to Mr. Yarrell, who thus proceeds: 'In Ireland the Teal is found in great numbers throughout the winter, and a few are resident there all the year. Sir Robert Sibbald, and other authorities since his time, notice the teal as inhabiting the edges of the Scottish lakes; Mr. Dunn however says that it is not numerous either in Orkney or Shetland, although the most so in winter; but that a few pairs occasionally remain during summer and breed. They prefer the inland lakes to the sea-shore. Richard Dunn, Esq., sent me word that this beautiful little duck is widely and numerously dispersed over the whole of Norway and Sweden, but is most plentiful in the north during the breeding season. It breeds all over Lapland, both western and eastern, and is very abundant in the Dofre Fieli, within the range of the birch-trees. The eggs vary in number from ten to fifteen. It breeds also in the cultivated districts in all the mosses and bogs. Mr. Proctor says the Teal is pretty common in Iceland. Eastward of Scandinavia it is found in Russia, and is abundant in Germany, Holland, France, Spain, and Italy; visits North Africa in winter, and has been noticed at Smyrna and Trebizond. The Teal was found in the vicinity of the Caucasian range, by Russian naturalists, and is included in catalogues of the birds of various parts of India, China, and Japan. The Teal of North America is distinct from the Teal of Europe and Asia.' (*British Birds.*)

Mr. Gould, in his great work, 'The Birds of Europe,' remarks that M. Temminck names Northern America as among the native localities of the Teal; but Mr. Gould says that he is inclined to dissent from this opinion, for the American examples may always be distinguished by a white crescent-shaped band on each side of the chest near the shoulders. This, together with the absence of the white tertial feather, will constitute, he thinks, fair grounds for a genuine specific distinction.

M. Temminck, in the fourth volume of his 'Manuel,' has himself corrected this error, acknowledging the difference, and referring to Dr. Richardson, 'Fauna Boreali-Americana,' vol. ii., p. 443.

The teal flies vigorously. Drayton, in the 'five and twentieth song' of his 'Polyolbion,' alludes to this power. After celebrating the Duck and Mallard, he continues:—

'And neere to them ye see the lesser dibbling Teale,
In bunches,[*] with the first that fly from mere to mere,
As they above the rest were lords of earth and ayre.'



Common Teal, Querquedula crecca.

Utility to Man.—This species is one of the most delicate of the ducks. Willughby remarks, that for the taste of its flesh, and the wholesome nourishment it affords the body, it 'doth deservedly challenge the first place among those of its kind.'

In the 'Portraits d'Oyseaux' (1557), the following quatrain celebrates its excellence and alludes to its habits:—

'Bien peu souvent se plonge la sarcelle
Entre deux eaux, de laquelle la chair
Est delicate: aussi couste-elle cher
Autant qu'oyseau, qui soit petit comme elle.'

Accordingly we see it holding a high place in antient feasts. We find it among the 'goodly provision' at the banquet given at the enthroning of George Nevell, archbishop of York, in the reign of Edward IV.: 'Mallardes and Teales, 4000.' The price, in the Northumberland Household Book, is 'Teylles, 1*d*.,' mallards being 2*d*.

In the provision for the marriage of Roger Rockley and Elizabeth Nevile, 14th January, 17th Henry VIII., there appear among the dishes for the first course at dinner 'Teals, 7 of a dish;' and in the account of the expense in the week for flesh and fish for the same marriage, 'Mallards and Teal, 30 dozen,' are charged '£3 11 8.' Also in the charge of Sir John Nevile of Chete, the father of the bride above mentioned, at Lammas assizes, in the 20th Henry VIII., he then being sheriff of Yorkshire, we find 42 shillings charged for 'Mallards, Teal, and other wild fowl.'

TEAM. Nothing is of greater importance in the management of a farm than the cattle which perform the necessary work in ploughing and other operations on the soil, in drawing manure to the land and carrying the produce to market. It is evident that the smaller the expense of the team which does the requisite work in proper time, the greater the profit of the farmer, and every saving in this part of the expense of cultivation is so much added to the clear gain. Wherever the land is only partially cultivated, and a portion of it remains in coarse pasture, which costs little or nothing to the occupier, or where extensive open commons afford cheap food for oxen, these last are naturally employed in farm labour. If four oxen do only the work of two horses, they are maintained at a much smaller expense, and, after working for two or three years, their value is improved for the purpose of fatting for the butcher. The necessary gear is much less expensive, especially where the old yoke is still in use, whether across the neck or the horns. In fact for a poor man who has only a few acres of land, and who is situated near a waste or common, oxen, and even cows and heifers, are by far the most economical team. Many writers on agriculture, who in general have more theoretical than practical knowledge of husbandry, have maintained the general superiority of an ox team over that composed of horses, and have given calculations which appear clearly to establish their point. But, on the other side, it may be observed, that wherever arable land is the chief object of the farmer's attention, and the tillage of the soil is brought to any degree of perfection, there oxen are never seen at work, but have been invariably superseded by active horses.

It has been urged that at Windsor Park, where it may be supposed that the farms in which George III. took so much interest were conducted by the most experienced agriculturists, a considerable team of oxen was kept, and did most of the work, even the carrying on the roads. This is a confirmation of what we have observed before. The oxen feed on the grass of an extensive park, the value of which is not brought to account. They are very lightly worked, and fatten well after two or three years' work: but if a rent had to be paid for their pasture, or if it were calculated how many young oxen and heifers or sheep could have been kept on the pasture consumed by the oxen, and the profit of these were set against the value of the work done, it would probably appear that there was no great economy in the ox-team compared with the horses. In Switzerland, which is tolerably advanced in its agriculture, oxen are very generally used for the work of the farm; but there the system of stall-feeding is universal, and having a considerable portion of grass-land, which can be irrigated by the streams from the mountains, they cut the coarse long grass produced there for their cows and oxen; and this food is more congenial to their nature than to horses, which do not thrive on coarse watery grass, and require hay and corn nearly all the year round. But where there is less grass-land and more artificial grass, such as lucerne, sainfoin, and clover, which is the case in all extensive farms, there horses are chiefly used, this food being suited to their constitution. Not to enter further into the comparative advantage of oxen and horses, we shall turn our attention to the most profitable management of the latter, which now almost universally compose the farmer's team.

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[*] 'The word in Falconry for a company of Teale.'

The choice of the horses for a farm is of great importance. It may be very satisfactory to a rich farmer to see fine large well-fed horses in his waggon, moving along as if they followed a procession, with bright harness ornamented with shining brass. This is a luxury like that of the rich man's coach-horses, and as such is very natural and innocent. It is the pride of many a wealthy yeoman, and we would not curtail his pleasure or despise his taste; but as a matter of profit or loss the case is very different: a fat horse does little work, no more than a fat coachman. Horses to be in working condition should be muscular and active. The great heavy cart-horse may, for a moment, be capable of a greater exertion at a dead pull, his weight assisting him; but in a long day the thin active horse will do with ease what would sicken, if not kill, his heavy companion. Horses about fifteen hands high, with short legs and broad chests, such as the Suffolk punches, which walk as fast as an ordinary man, or the active Scotch horses, which have more blood and will readily trot with a moderate load, are the most economical for farm-work. A pair of such horses will draw a load in a cart sixteen miles and return, or plough a Scotch acre of land, equal to one acre and a quarter imperial measure, in ten working hours, having a rest of two hours; while the heavy slow South-country horses could not walk the distance in the time without being over-driven. This is more than the average work; but in the busy time of the year it is a great advantage to have horses which can, with good feeding, work longer and faster without suffering in their health. The carriers on the roads, who live entirely by the work of their horses, know how to choose them and how to feed them to the greatest advantage, and, without over-working them, to make them do as much as is consistent with their health. If hard work is the cause of some diseases in horses, comparative indolence causes many more. Where horses are sluggish, the men soon become so likewise. To see a waggon with four strong horses returning empty, at the rate of two miles in the hour, with two men, or at least a man and a boy, lying lazily in it, is a sure sign that the work on the farm to which they belong is done at the same rate. A single-horse cart, or a light spring waggon with two horses, driven by a man or boy with reins and a whip, and trotting at the rate of five miles an hour, is a perfect contrast to this, and no doubt the owner has his work done much more expeditiously, and consequently at a cheaper rate. The stage-coach proprietors have generally very light four-wheeled carriages to carry their corn from their chief stations to places where they keep horses, and they often carry as heavy loads as a farmer's waggon does when carrying corn to market; yet the two horses in the light carriage trot with their load, and the three or four heavy horses of the farmer move at the rate of two miles and a half in the hour at most, both going and returning. It is evident that there is a waste of time and power here, which is so much lost. Horses half-bred between a cart-mare and a blood-horse are reared by some spirited farmers, and if they are more delicate and susceptible of cold than the common cart-horses, they have many advantages: sometimes they inherit so much courage and vigour from their sire, that they become valuable as carriage-horses or hunters, and well repay the expense incurred in rearing them; and at all events they are superior to any others for the work of the farm, and are in general docile and tractable. The only inconvenience arises from their spirit. When any sudden obstruction arises in ploughing, such as a considerable root of a tree or a large stone, they make violent exertions, and sometimes break the ploughs or other implements. In this respect oxen are more phlegmatic, and stop when the collar presses on them; so that in breaking up rough commons or newly cleared woods oxen may be preferred. This is almost the only case where spirit and courage are not an advantage.

With respect to the food of farm-horses, as we observed before, a great saving may be effected by a judicious use of many vegetables and roots which are easily raised on arable land. Various modes of preparing the food have been recommended, such as steeping corn til. it sprouts, baking it into bread, or mixing it with boiled roots. All these may have their advantage where economy is the object; but, with the exception of baked bread made of rye, barley, and oats, and slightly leavened, which is perhaps the best food which can be given to slow-working horses, there is nothing so congenial to the healthy stomach of a horse as good hay and dry oats, or beans bruised in a mill and mixed with cut chaff. They require no cooking to be fully digested, and the digestive power of the horse will extract all the nourishment which they contain. But there are cheaper fodders than hay and corn, especially in summer, when they can be given fresh and green. Tares, clover, lucern, and sainfoin, cut as they are wanted, will keep a horse in health and working condition with little or no corn, and at a comparatively trifling expense; carrots are peculiarly relished by horses, and are very wholesome; and Swedish turnips, or ruta baga, given raw in moderate quantities make their skins shine, and thus prove that they tend to keep them in condition. Every prudent farmer takes care to have a sufficient supply of these cheaper substitutes for hay and corn, keeping these last as a reserve and auxiliary to the former. In a prize Essay of the Highland and Agricultural Society on the comparative advantages of raw and boiled grain as food for farm-horses, the author adduces some experiments, which lead to the conclusion that there is no advantage in boiling grain, but rather the contrary. The cost of keep of a horse per day on different food has been given as follows:—

10 lbs. of straw cut into chaff . .		1*d.*
10 lbs. of oats, at 3*s.* per bushel .		9
16 lbs. of turnips, at 10*s.* per ton .		1
Expense of cutting . . .		1½
	1	0½
or—16 lbs. of hay, at 3*s.* 6*d.* per cwt. .		6*d.*
5 lbs. of oats, at 3*s.* per bushel .		4½
16 lbs. turnips, at 10*s.* per ton .		1
		11½
or—28 lbs. of steamed turnips . .		3½*d.*
7 lbs. of coals, at 1*s.* per bushel .		1
Expense of steaming . . .		¼
16 lbs. of straw, at 1*l.* per ton . .		1½
		6¼

This last appears the most economical food, but steamed turnips and straw only would probably not keep a horse in good working condition, and it is not said how long the experiment was continued, nor whether the horses thus fed lost weight. The food is also valued at a low rate.

It is evident that if farm-horses can be kept in condition for 6¼*d.* a day, which is not 4*s.* a week, while on hay and oats, in the common mode of feeding, they will cost more than double that sum, the saving in a year would amount to nearly 10*l.* on each horse; and as every twenty-five acres of a farm of moderately light land will require one horse for its cultivation, there will be a saving of 8*s.* per acre, probably half the rent, and more than half the profit. However this may be, there is no doubt that it is of great importance to ascertain what is, on the whole, the best and cheapest mode of feeding farm-horses; and without entering into minute calculations, it will be found that various artificial grasses may be made to succeed each other, by successive sowings, so regularly, that the horses shall be kept for six months of the year entirely on succulent green food, which will enable them to do all the necessary work, and keep them in good health and condition. Thus with the help of carrots, potatoes, and ruta baga, a great saving of hay and oats may be effected in winter, and these crops will take up much less land for their production than hay and oats, and exhaust the soil less; if we except potatoes, which are more profitably used as human food or to fatten pigs.

The example of tradesmen and manufacturers who keep horses, and cut all the hay which they use into chaff, mixing it with oats, may be good for a farmer to follow, where hay is scarce and beans a good price: but otherwise it is fully as economical to give the hay in racks, provided no more be given at once than a horse will eat up entirely, and a certain ration be allowed for each horse, which experience has shown to be sufficient. In the cavalry, where great attention is paid to economy, the horses have their rations of hay, oats, and straw according to the exercise they take, or the fatigue they are exposed to: so likewise it should be with a farmer's team. In the old mode of feeding horses with as much hay as they would eat, and two bushels of oats for each horse per week, during at least nine months in the year, and giving them tares or artificial grasses between spring sowing and harvest, when there was less to be done, the expense of a horse was much greater than most farmers could now afford; and more land was devoted to the keep of the team than was necessary. The following is the calculation of the cost of the keep of a horse in this way:—

	£	*s.*
32 weeks, at 2 bushels of oats per week, at 3*s.* 6*d.* per bushel	11	4
20 weeks, at 1 bushel of oats per week, at 3*s.* 6*d.* per bushel	3	10
Tares 20 weeks, at 6*s.* (⅛ of an acre per week)	3	0
Hay 32 weeks, 1½ cwt. per week at 4*s.* per cwt.	9	12
Shoeing	0	15
Farrier	0	5
Total	£28	6

The hay and oats are at high prices, but at all events a horse cannot be kept in this way under 10*s.* per week. They are then however in excellent condition, and able to work ten hours per day in summer and eight in winter.

On poor land, where gorse or furze grow readily, a very cheap food is obtained by bruising or crushing the young shoots of the gorse to destroy the sharp spines which injure the mouths of the cattle. Horses reared in large commons are often seen beating the gorse with their feet, and then eating it greedily: instinct here teaches them to prepare their own food; and, if they have a sufficient quantity of it, they get fat and in good condition.

It is of great importance to a person about to hire a farm to know exactly what number of horses will be required for its proper cultivation, and this depends upon many circumstances which must all be taken into consideration, and which will make a very material difference, often as much as half the rent of the land. He is to consider the situation of the farm-buildings, especially the stalls and cattle-yards, where the manure is to be made, with respect to their distance from the fields; the state of the roads and the access to the fields; the distance of a good market-town, and whether the fields lie in a ring-fence or are scattered. A farm of good light loam will require one horse for every twenty-five acres for its cultivation, with an additional one for every 200 acres; that is, 9 horses for 200 acres. The additional horse should be lighter and more active than the rest, for the farmer to ride on and to drive in a light cart: yet it should be capable of supplying the place of any of the others in case of illness or accident, or when extra work is required, as in harvest or seed time. The larger the farm, or rather the fields, the fewer horses are required in proportion to its size, because much time is lost in turning the plough where the furrow is short; and ploughing is always the principal work of the team. If more than two horses are required to plough the ground, the soil must be very compact and heavy, and if this is not compensated by greater fertility, the expense of the horses will much reduce the profit of the farmer. It is the custom in some farms for each ploughman to have the charge of his own horses: but it is far better to make the feeding and cleaning of horses the business of regular servants, who should sleep in or near the stables, and rise very early, so that the horses may be fed and ready to go to work as soon as the ploughman comes. When a man has been eight or ten hours holding a plough, he is not so capable of cleaning and rubbing the horses as one who has only had light work in the day. The horse-keepers can prepare manure, make composts, cut hay and straw into chaff for the horses, mow tares or other green food, or hoe the crops in the season while the horses are at work, and the last thing before they lie down at night should be to give the horses their proper ration of hay and see that their beds are comfortable and everything in proper order in the stables: good grooming is of as great use to a horse as good feeding, and without it they will never be in perfect working condition. The harness should always be cleaned and oiled, and hung up in a separate place, not, as is too commonly done, hung up behind the horses in the stables. There should be no unnecessary ornaments, but strength and simplicity should be studied. The weight and size of the collars is in many places absurd: they cannot be too light, provided they are of sufficient strength. The work in the field when the days are long should be divided so as to give the horses at least two hours rest, during which they should be fed with bread or corn. When the fields are near the stables the horses may be brought home, but a portable manger is easily carried into the field, such as is used at the inns on the roads where carriers stop to bait. In winter it may be as well to finish the day's work with only an interval of half an hour. The time in summer should be from 5 in the morning till 10, and from 2 till 7 if the weather is very warm, resting 4 hours; or from 6 till 11 and from 1 till 6, resting 2 hours. In winter the time is from 7 till 3, resting half an hour or an hour between 11 and 12. With good feeding and grooming this is by no means too hard work when the work requires to be carried on briskly. The heavier and lighter kind of work should be so arranged that when horses have worked hard for a day or two, they may have one or two days of lighter work. In most parts of England the pace of the horses and their daily work are much less than in Scotland: two horses should plough an acre a day or more, on an average, but few farmers can get much more accomplished than three-quarters of an acre, if they plough a good depth or break up clover or grass lays. In the light sands of Norfolk and Lincolnshire they go over much ground; but there the furrows are wide and shallow, and the horses might easily trot with the plough if the ploughman could keep up with them. In Flanders such land is ploughed with one horse only; and the work is well done. There is yet much room for improvement in the use and management of the team on most farms in England.

TEANO. [LAVORO, TERRA DI.]

TEARS. [EYE, p. 142.]

TEAZLE (*Dípsacus Fullónum*) is a plant which grows wild in the hedges, but an improved variety is carefully cultivated in those districts of England where cloth is manufactured. It is used for the purpose of forming a species of brush with which the finer hairs of the woollen fabric are drawn to the surface, where they produce what is usually called the *nap* of the cloth. The teazle has a fine hooked awn, which very readily insinuates itself into the woollen web, and draws out with it some of the fine fibres of the wool; these are afterwards shorn smooth, and leave the cloth with the fine velvet-like nap which is its peculiar appearance. A further account of the operation of teasling, in the woollen manufacture, is given in Ure's 'Philosophy of Manufactures,' p. 192.

Teazles will grow in any soil; but they grow strongest and best in a stiff loam. They require the soil to be in good heart, and are supposed to exhaust it much; but no great portion of manure is required to obtain a good crop. Like all the tribe of thistles, they grow best on ground newly turned up from grass which has lain some time, and the same ground will not again produce them of so good a quality till after a considerable interval. The wild teazle which grows in hedges appears at first sight to be the same as the cultivated variety: but it is of no use to the cloth-worker from the weakness of the awns, which break off, instead of drawing the wool out of the surface of the web.

The growing of teazles is a peculiar trade, and a kind of speculation. The teazle-grower hires a piece of ground suited to his purpose from the farmer for two years, and pays a considerable rent. If the ground is broken up from grass, it is ploughed as deep as the staple of the soil permits, and as early as possible, if before winter so much the better: the ground is laid in narrow stitches, on which the seed is drilled in April, in rows from 12 to 18 inches apart: moisture is necessary to make the seed germinate. As soon as the plants appear, they are thinned out, and the intervals carefully hoed and weeded. During the summer, the ground is several times dug, or *spaded*, as it is called, to a considerable depth, with very narrow and long spades; this greatly invigorates the plants. In November, some plants may be transplanted from where they stand too thick, to the places where they have failed. They should stand about a foot apart in the rows. During the ensuing spring, the cultivation is repeated, and earth is drawn up to the plants, but without burying the heart. They soon begin to push up their stems, and are fit to be cut in July, just when the blossom has fallen. As they do not come to proper maturity at the same time, several successive gatherings are made. They are cut with a sharp knife about nine inches below the head, and tied in small bundles or handfuls: thick gloves are very necessary in this operation. They must be carried under cover before night, as the rains or heavy dews would injure them. When the sun shines, they are exposed to dry in the same manner as is done with onion seed, and they are never packed close until they are perfectly dry. When drying they are usually hung on poles; so that the air may circulate between the bundles. The bundles are afterwards opened, and the teazles sorted into kings, middlings and scrubs, according to their size; 9000 kings or 20,000 middlings make a pack. The scrubs or refuse are of little value: sometimes the grower places a certain number in a flat bundle by means of cleft sticks, in which the stems are held and the heads spread out like a fan. In this state they are not only more easily packed, but more readily fixed to the circumference of the drum, on which they form a continuous card, which brushes the cloth as it is drawn along while the drum revolves.

Teazles are a very precarious crop; sometimes they produce a very great profit, and at other times a serious loss. Care and cultivation lessen the chances of failure greatly: but the price also fluctuates so much that it is an uncertain speculation, resembling in this respect the cultivation of hops. Hence it is undertaken by men who are prepared for the event, and who make the profits of one year repay the loss of another.

Several attempts have been made to substitute artificial teazles, formed of hooks of very fine and elastic steel wire; and at one time there was so much appearance of success, as to cause the cultivation of teazles to be neglected: but it was soon found that the wires tore the fine fibres of the wool, especially where there were knots in the thread, whereas the hooks of the teazles gave way, and either bent or broke off before the fibre of the wool was injured. The card made of natural teazles was found far superior to the artificial substitutes, and for a time the price of teazles rose to an extravagant height from their scarcity, while some time before they were quite unsaleable. A quantity of teazles which was sold at one time in Berkshire for 5*l.*, being thought perfectly useless, was taken into Gloucestershire, and there produced the next year 150*l.* The grower was dead, and they were sold by his executors for what they would fetch. This was exactly at a time when the artificial cards were given up, and no teazles were to be had. A good crop of teazles is about 10 or 12 packs on an acre: this is sometimes exceeded, but more often it fails by one-half, and a total failure is not uncommon. The price may average six or seven pounds a pack, so that a good crop is worth more than the land it grew on. The expenses, however, are great, and, taking all the chances, it is a crop which, except in very particular situations and circumstances, is not suited to the regular farmer, who should never speculate to any extent.

Although teazles are said to exhaust the ground much, yet from the continual stirring of the soil they render it very fit to grow other crops, provided a proper quantity of manure is used: thus very good crops of wheat have been obtained after a crop of teazles.

Every piece of fine broad-cloth requires from 1500 to 2000 teazles to bring out the proper nap, after which they are useless, the hooks being mostly broken off or worn out. This causes a considerable demand for them in the neighbourhood of cloth manufactories, as in Wilts, Gloucestershire, and Somersetshire. In the new tariff the duty is 3*d.* per thousand, whether from foreign countries or British possessions.

TEBALDE'O or TIBALDE'O, ANTO'NIO, born at Ferrara about 1463, studied medicine, but afterwards devoted himself chiefly to literature and poetical composition, both Italian and Latin. The first edition of his Italian poems appeared at Modena in 1498, by his cousin Jacopo Tebaldeo, apparently unknown to the author, who was vexed at it because he thought that his compositions required some final touches: 'Sonetti, Capitoli, e Rime, chiamate Opere d'Amore,' 4to., Modena, 1498, afterwards reprinted several times at Milan, Venice, and other places. In 1519 appeared at Milan another small poem of Tebaldeo, with the title, 'Stanze nuove ad un Vecchio che non amando in gioventù fu costretto ad amare in vecchiezza.' A correct edition of Tebaldeo's works is however still wanted. A selection from his pastoral poems has been inserted in the collection entitled 'Poesie Pastorali e Rusticali, raccolte ed illustrate con note dal Dottore Giulio Ferrario,' Milan, 1808. Bembo and Giraldi, contemporaries of Tebaldeo, speak of his Italian poems with praise, but they regret that they were too hastily published. Tebaldeo afterwards applied himself to Latin poetry, in which he acquired great reputation. He was for a time at the court of Mantua, and afterwards settled at Rome, where he became a favourite of Leo X., who speaks very highly of him in some of his epistles, and is said to have made him very liberal presents. After Leo's death Tebaldeo fell into distress, and was obliged to borrow money of Bembo and others. He died at Rome in 1537. A few of his Latin epigrams and other small poems are in several collections.

(Tiraboschi, *Storia della Letteratura Italiana*; Zeno, *Note alla Biblioteca dell' Eloquenza Italiana del Fontanini*.)

TECTIBRANCHIA'TA, Cuvier's name for his fourth order of Gastropods, described by him as having the branchiæ attached along the right side, or on the back, in form of leaves (feuillets) more or less divided, but nonsymmetrical. The mantle covers them more or less, and contains nearly always in its thickness a small shell. The *Tectibranchiata* approach the PECTINIBRANCHIATA in the form of the organs of respiration, and live, like them, in the waters of the sea, but they are all hermaphrodites, like the NUDIBRANCHIATA and the Pulmoniferous mollusks.

The following genera are comprehended, by Cuvier, under this order:—*Pleurobranchus*, Cuv.; *Pleurobranchæa*, Meckel (*Pleurobranchidium*, Bl.); *Aplysia*, Linn.; *Dolabella*, Lam.; *Notarchus*, Cuv.; BURSATELLA, Bl.; *Akera*, Müll.; *Gastropteron*, Meckel; and *Umbrella*, Lam.

Of these *Pleurobranchus*, *Pleurobranchæa*, and *Umbrella* are treated of in the article SEMIPHYLLIDIANS; and *Akera* or *Acera*, and *Gastropteron* or *Gastroptera*, under the article BULLADÆ. *Aplysia* or *Laplysia* (for Linnæus writes it both ways), *Dolabella*, and *Notarchus* therefore remain to be noticed here.

Aplysia.

M. de Blainville thus defines the Aplysians (*Aplysiacea*) the second family of his MONOPLEUROBRANCHIATA:—

Body not divided, or forming a single soft fleshy mass; four tentacular appendages always distinct, flattened, auriform; the mouth in the shape of a vertical slit, with two lateral subcorneous labial plates, and a cordiform tongue beset with denticles; eyes sessile between the two pairs of tentacles; the branchiæ covered by a sort of operculum; orifices of the generative apparatus more or less distant, and united together by an external furrow.

Shell null or incomplete, constantly internal.

M. Rang's definition is—

Animal not divided, furnished with four tentacles with eyes at their anterior base, and sometimes with membranes proper for swimming; the branchiæ in form of a plume, in a dorsal cavity, protected most frequently by a free operculum at the right side, or simply by the approximated edges of the mantle; organs of generation very distant.

Shell rudimentary or null.

The following is Cuvier's description of *Aplysia*:

Edges of the foot raised into flexible crests and surrounding the back on all sides, being capable even of being reflected upon it; head carried on a neck more or less long; two upper tentacles hollowed like the ears of a quadruped; two others flattened at the edge of the lower lip; eyes below the first. On the back are the branchiæ, in form of very complicated leaves (feuillets), attached to a large membranous pedicle, and covered by a small pedicle equally membranous, which contains in its thickness a horny and flat shell. The anus is pierced behind the branchiæ, and is often hidden under the lateral crests. The vulva is in front on the right, and the penis comes out under the right tentacle. A furrow, which extends from the vulva to the extremity of the penis, conducts the semen at the time of coition. An enormous membranous crop leads to a muscular gizzard, armed within with cartilaginous and pyramidal corpuscles, which accompany a third stomach beset with pointed hooks, and a fourth in form of a cæcum. The intestine is voluminous. These animals feed on sea-weed (*fucus*). A particular gland pours out by an orifice situated near to the vulva a limpid humour, which is said to be very acrid in certain species; and from the borders of the mantle there oozes abundantly a deep purple liquor, with which the animal colours the sea for a considerable distance around when it perceives any danger. The eggs are disposed in long interlaced glairy filaments, delicate as packthread.

Cuvier instances as examples from the European seas, *Aplysiæ fasciata*, *punctata*, and *depilans*.

The acrid humour noticed above probably gave rise to the accounts of the poison of the *Lepus marinus* (an *Aplysia*, and most probably *Aplysia depilans*) among the antients. See, for example, Pliny, *Nat. Hist.*, lib. xx., c. xxi.; lib. xxiii., c. vi., &c.

In the museum of the Royal College of Surgeons in London, No. 625 of the *Physiological Series*, is an *Aplysia alba*, in which the mantle has been laid open on the left side, and the peritoneal membrane dissected away, to show the intestinal canal winding among the lobes of the liver: the tunics of the intestine being thin and transparent, permit the contents of the canal to be distinctly seen; these consist of particles of sand with comminuted fragments of zoophytes and shells: so that it appears that their diet is not merely vegetable, as Cuvier seems to have thought. Bristles are inserted at the mouth and anus; the latter orifice is situated in the branchial cavity, below the gills. No. 626 is the intestinal canal of a larger species of *Aplysia*, distended with similar particles of earthy matter; and the author of the Catalogue remarks that this preparation affords a striking example of the powers of living organized matter, and cannot be contemplated without surprise, when we consider the force that must be exerted to propel a column of such heavy and rude materials along a tortuous canal provided with parietes apparently so inadequate to sustain the necessary pressure. No. 1011 is a small *Aplysia alba*, Cuv., with a portion of the mantle dissected away to expose the branchiæ of an arborescent structure, but more complex and better defended than in the *Doris*, the respiratory cavity being shielded by a thin horny plate or rudimentary shell. No. 1012 is a larger specimen of the same species of *Aplysia*, further dissected, so as to show, in addition to the branchiæ, the heart and pericardium, the mouth and masticatory organs, the stomach, nervous ganglia, and the penis on the right side of the neck. A portion of the shell is left to show how loosely it is lodged between the layers of membrane forming the roof of the branchial chamber; and No. 1013 exhibits another species (*Aplysia Camelus*, Cuv.), showing the branchiæ in their natural position, without dissection, by merely separating the dorsal lobes of the mantle and elevating the roof of the branchial chamber. (*Cat.*, vols. i. ii.)

M, de Blainville divides the genus *Aplysia* into the following sections:

A. Species whose lateral appendages are very wide, divided behind, and depressed.

Example, *Aplysia depilans*.

B. Species whose narrower appendages are united and elevated behind.

Example, *Aplysia vulgaris*.

C. Species whose appendages are very wide, and which have only two tentacles, behind which are the eyes. (Genus *Actæon*, Oken.)

Example, *Aplysia viridis*.

D. Elongated species with a subulate tail; the four tentacles long and slender; the branchial cavity subdorsal, without operculum or shell.

Example, *Aplysia Brongniartii*.

The other genera arranged by De Blainville under the Aplysians are *Dolabella*, *Bursatella*, *Notarchus*, and ELYSIA.

M. Rang divides Aplysia into two subgenera:

I. The Aplysiæ, properly so called (*Laplysia*, Linn.; *Dolabella*, Lam.; and *Actæon*, Oken).

This subgenus is thus characterized by M. Rang:—

Animal furnished with a dorsal slit, always median and longitudinal; foot large, branchiæ enclosed in the bottom of a cavity, whence their length does not permit them to be protruded, and protected above by an operculum.

Shell rudimentary, calcareous, membranous, hidden in the thickness of the operculum.

1st Group.

Body convex behind, an oblique posterior disk, borders of the mantle closed on the back, and improper for swimming.

Shell triangular and very calcareous.

This group comprises the genus *Dolabella* of Lamarck.

Example, *Aplysia Rumphii*, &c.

2nd Group.

Body narrowed at the two extremities, no disk, borders of the mantle very small and improper for swimming.

Shell subquadrangular and calcareous.

This group, M. Rang observes, is composed of new species, with the exception of one, which was erroneously arranged among the *Dolabellæ*.

Example, *Aplysia dolabrifera*.

3rd Group.

Body narrowed at the two extremities; borders of the mantle dilated and proper for swimming.

Shell subrounded, membranous, and solidified by a calcareous stratum.

M. Rang remarks that this group has for its type the genus *Laplysia* of Linnæus, and he divides it into two sections.

A. A tube at the membrane of the operculum.

Example, *Aplysia fasciata*.

B. An aperture at the membrane of the operculum.

II. Subgenus: *Notarchus*, Cuv.

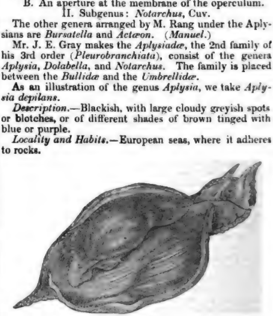
The other genera arranged by M. Rang under the Aplysians are *Bursatella* and *Actæon*. (*Manuel*.)

Mr. J. E. Gray makes the *Aplysiadæ*, the 2nd family of his 3rd order (*Pleurobranchiata*), consist of the genera *Aplysia*, *Dolabella*, and *Notarchus*. The family is placed between the *Bullidæ* and the *Umbrellidæ*.

As an illustration of the genus *Aplysia*, we take *Aplysia depilans*.

Description.—Blackish, with large cloudy greyish spots or blotches, or of different shades of brown tinged with blue or purple.

Locality and Habits.—European seas, where it adheres to rocks.



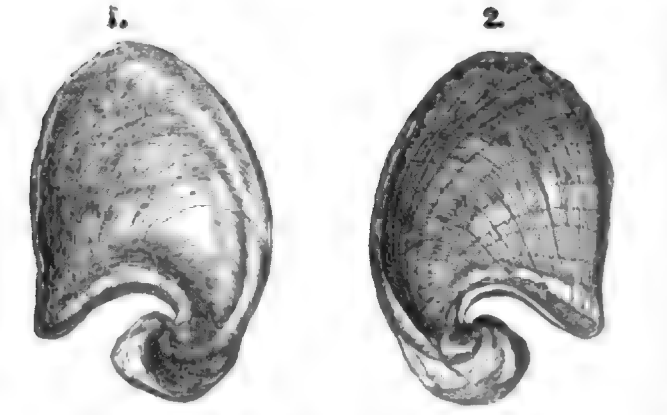
Aplysia depilans.

Dolabella.

Cuvier observes that this form only differs from the *Aplysiæ* in having the branchiæ and that which surrounds them at the posterior extremity of the body, which resembles a truncated cone. Their lateral crest, he adds, does not close on the branchial apparatus, leaving a narrow furrow, and their shell is calcareous.

Locality and Habits.—East Indian seas, and Mediterranean, where it has been found at a depth of six fathoms on sands.

The Laplysians of Lamarck consist of the genera *Aplysia* and *Dolabella* only; and M. Deshayes, in the last edition of the 'Animaux sans Vertèbres,' thus sums up the information on the subject. Lamarck, he observes, knew little of the animals of this family, though he had indeed seen some species preserved in spirit of wine in the anatomical collection of the museum. Thus he only admitted the two genera last above named into the family. Since the publication of Lamarck's work, M. de Blainville, in his monograph of the *Aplysiæ*, and, above all, M. Rang, in his



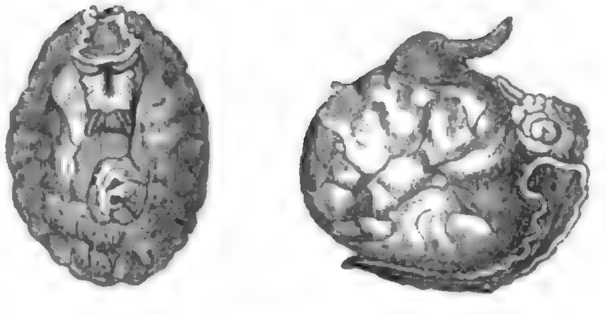
Shell of Dolabella Rumphii. 1, inside; 2, outside.

Natural History of the Aplysians,' have, he remarks, added many important observations on the animals of this group. M. Rang, in his work, having especially studied the Aplysians, has, as we have above seen, proposed to admit into this family three genera only, *Aplysia*, *Bursaletta*, and *Actæon*, and he divides the great genus *Aplysia* into subgenera, among which is found the genus *Dolabella*, Lam. There too is to be found the genus *Notarchus*, Cuv. This last, observes M. Deshayes, has in fact much analogy with the Aplysians, but it preserves some peculiar characters capable of easy distinction; and he thinks that the great genus *Aplysia*, as considered by M. Rang, ought to be adopted. Lamarck established his genus *Dolabella*, and separated it from *Aplysia* because the shell is calcareous, and not entirely corneous, as in that genus. Lamarck, without doubt, continues M. Deshayes, would have perceived the little value of this character if he had been able to examine as many species as did M. Rang: he then would have seen the establishment by insensible gradations of a passage between *Dolabella* and *Aplysia*, not only with reference to the form of their shells, but with regard to their consistence also. With regard to the posterior truncation of the animal of *Dolabella*, *that* may be seen to disappear insensibly, so that there exist *Dolabellæ* with a calcareous shell, having entirely the external form of *Aplysiæ*. If, on the one hand, we see the *Aplysiæ* with calcareous shells (Dolabellæ) pass into those with corneous shells, we perceive on the other hand *Aplysiæ* with horny shells pass into species which have no trace of such protecting body. These remarkable species have the lobes of the mantle less slit, more closed upon the back, and nevertheless preserving the principal characters of the true *Aplysiæ*. M. Rang has established on these species his subgenus *Aclesia*, remarkable for the singular tentaculiform appendages on the bodies of the species which form it. Next to *Aplysia* M. Rang places *Notarchus*, and the *Notarchi* are *Aplysiæ* which have only two tentacles, and whose mantle is more closed on the back than it is in the preceding genus; the foot is extremely narrow, it is terminated anteriorly by a double lip, and resembles rather the foot of the *Scyllææ* and other mollusks which creep on the stems of sea-weeds, than that of the *Aplysiæ*. It is to be wished, adds M. Deshayes, that the *Notarchi* could be found in sufficient numbers for dissection, by which means all doubt with regard to them would vanish. After the genus *Aplysia*, M. Rang places *Bursatella*; and M. Deshayes remarks that this genus has so great an analogy with *Notarchus*, that a new anatomy of the former is much to be desired. The animal seen by M. de Blainville was much contracted in the spirit, and its body was beset with a small number of tentacular appendages, which approximate it to the subgenus *Aclesia*, whilst in form it appears to come nearer to *Notarchus*. The last genus, says M. Deshayes in conclusion, placed in the family of Aplysians by M. Rang, is the *Actæon* of Oken, which is not sufficiently known to be definitively admitted into the system; so that the family of Aplysians may be rigorously reduced to the genus *Aplysia*, as considered by M. Rang.

Notarchus.

Animal furnished with a very small dorsal slit, which is sometimes oblique; foot elongated, and rather narrow; branchiæ often very long, and capable of being protruded out of the cavity: operculum rudimentary or null.

Shell null.



Notarchus Cuvieri.

TE'CTONA, a genus of the natural family of Verbenaceæ, so named by Linnæus from the Indian name (*Tekka*) of the famous Teak-tree (called also *Sagoon*), which is a native of different parts of India, as well as of Burma, chiefly along the banks of the Irrawady, and of the islands from Ceylon to the Moluccas. The genus is characterised by having a 5-6-toothed calyx, which becomes inflated over the growing pericarp. Corol 1-petalled, 5-6-cleft. Stamens 5, but often 6. Germ superior, 4-celled, cells 1-seeded, attachment central. Drupe obtusely 4-sided, woolly, spongy, dry, hid in the calyx. Nut hard, 4-celled. Seed solitary. Embryo erect, without perisperm.

The teak-tree grows to an immense size, and is remarkable for its very large leaves, which are from 12 to 24 inches long and from 8 to 16 broad, and are compared by Oriental writers to the ears of the elephant. The petioles, as well as the young branches and flower-stalks, are all 4-sided and the sides channelled. The inflorescence is in very large terminal panicles, of which the divisions are first cross-armed and finally dichotomous, with a sessile fertile flower in each cleft, the whole covered with a hairy farinaceous substance. The flowers are small, white, and very numerous. As teak timber is so highly valued both for domestic purposes and for ship-building, it is desirable to notice its distribution a little more in detail. The best timber for ship-building was supplied to Bombay from the mountains of the Malabar Ghauts, where the tree is found rather in detached clumps, of some extent however, than in extended forests. It is also found on the mountainous parts of the Coromandel Coast, along the banks of the Godavery up to Poloonsha. It proceeds far into the interior of India, and may be seen in the mountains of Bundelcund, in the form however of only a moderate-sized shrub. Dr. Roxburgh introduced the teak into the low grounds of the Circars as early as 1790, and Lord Cornwallis and Colonel Kyd planted it in Bengal about the same time. The Calcutta Botanic Garden contains a number of these trees. From the Saharunpore Botanic Garden, in 30° 0' N. lat. (where, its buds being covered with scales, it is enabled to resist cold, besides its leaves falling and giving it a season of rest), the tree has been spread along the Doab Canal; the whole of the intermediate country is suited to its cultivation, and the East India Company have recently ordered the Malabar forests to be preserved. The most extensive forests are however those extending along the banks of the Irrawady, especially in Pegu. A considerable timber-trade has been established at Moulmein, whence Calcutta is supplied with some of the finest teak timber. So much straight timber is taken and the crooked left, that thousand of pieces called 'shin-logs,' and admirably adapted for ship-timbers, are left. The tree grows quickly, straight, and lofty, but requires from 60 to 80 years to attain the proper size and maturity for ship-building.

From extensive experience teak timber has been found the most valuable timber for ship-building, and has been called the oak of the East. The wood is light, brownish-coloured, easily worked, but at the same time strong and durable. It is soon seasoned, and, from containing a resinous oil, resists the action of water, as well as insects of all kinds. It does not injure iron, and shrinks but little in width. Some of the old trees have been found by Dr. Horsfield to have large and beautiful burrs like the Kiabouca wood of commerce. No other part of the tree is known to be converted to much use; but the leaves are said to dye cotton and silk of a purplish colour. They have lately been imported into the London docks carefully rolled up, but for what purpose is not known.

TECTUS. (Conchology.) [TROCHIDÆ.]

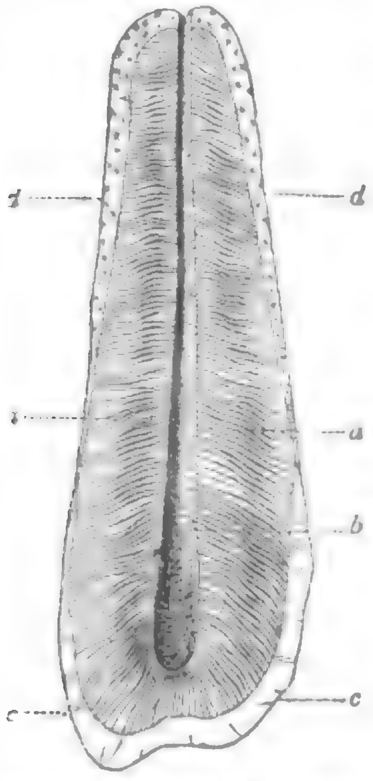
TEES. [DURHAM.]

TEETH. Since the article DENTITION was written, the teeth have been subjected to the most careful microscopic examination, and the result has been the acquisition of a great amount of knowledge in regard to both their structure and their mode of growth. Indeed there is probably no part of physiology in which more remarkable and important progress has been made during the last ten years than in this, to which the name of Odontography has been given. The chief discoveries were made coincidentally by Professor Purkinje of Breslau and Professor Retzius of Stockholm. The former published his observations in 1835, in the inaugural dissertation of Dr. Fraenkel (*De penitiori Dentium Structura*), and in that of Dr. Raschkow (*Meletemata circa Dentium Evolutionem*); and the latter communicated his descriptions to the Royal Academy of Sciences at Stockholm, in whose Transactions they were published in 1836. In 1839 Dr. Schwann published, in his 'Mikroskopische Untersuchungen,' an account of the modes in which the several constituent tissues of the teeth are developed; and in the same year Mr. Goodsir (*Edinburgh Medical and Surgical Journal*, vol. li.), carrying out the view before suggested by Professor Arnold, described that method of their early growth which is now generally received as the truth. Mr. Owen also, in his 'Odontography,' and in various papers, at the same time that he has confirmed and greatly added to the facts described by those already mentioned, has proved, by his investigations into their comparative anatomy, that the minute structure of the teeth may be taken as one of the most certain characters for the discrimination of the genera, and even of the species, of both existing and extinct animals; and he has already applied his knowledge of them to the determination of some of the most difficult questions of palæontology.

In the following account scarcely any of the discoveries will be detailed except such as relate to the structure and physiology of the human teeth; for, various as the structures are in the different classes of animals, yet there is so much analogy among them, that the description of the tooth of one will, in great measure, explain the general plan of structure in the rest. Besides, the lately published articles on comparative anatomy contain nearly all the important facts regarding the structure of the teeth in the animals of which they treat.

The best method of preparing teeth for microscopic examination is to immerse them in dilute hydrochloric acid, till their earthy matter is so far dissolved that thin transparent slices may be cut from them with a knife; or, without softening them in acid, to make thin sections, in the vertical and other directions, with a fine saw, and to reduce these to the necessary thinness and transparency by filing them, and polishing them on a hard and smooth whetstone. For general examination, lenses magnifying about 50 diameters are sufficient.

Fig. 1.

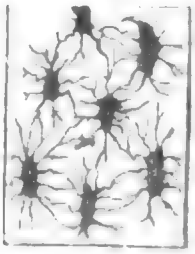


Magnified section of a bicuspid tooth.

In such a vertical section of a tooth three distinct substances are seen; namely, the dentine or ivory (*Fig.* 1, *a a*), which forms the greater mass, and, as it were, the mould of the tooth, and which contains the pulp cavity (*b*); the enamel (*c c*), by which the crown or exposed part of the tooth is covered; and the bone, cement, or crusta petrosa (*d d*), which forms a thin layer around the fang, except at that part at which the vessels enter the pulp, and is continued in a finer and scarcely perceptible layer over the enamel.

The bone, or cement, has in each animal a minute structure similar to that of which the bones of its skeleton are composed. In man it consists of a basis of homogeneous substance, a compound of cartilage and earthy matter, in which there are minute cavities (*Fig.* 2), with delicate branched canals leading from one to the other. On the walls of these canals and cells the earthy matter is deposited more thickly than in the intermediate spaces, so that when examined by transmitted light they appear black or dark grey. The cavities, or *bone-corpuscles*, in man are round or oval, and flattened; most of them are between $\frac{1}{1800}$ and $\frac{1}{1000}$ of an inch in length, about one-third as much in breadth, and one-sixth as much in thickness. They have somewhat jagged edges, from all parts of which there proceed the fine branching canals, to which the name of *calcigerous* has been given, and which traverse the homogeneous basis of the bone, and communicate irregularly with one another. The diameter of these canals, at their largest parts, is not more than $\frac{1}{10000}$ of an inch; that of their smaller branches is between $\frac{1}{20000}$ and $\frac{1}{60000}$. Their general direction is towards the axis of the tooth, around which the corpuscles are arranged in concentric circles.

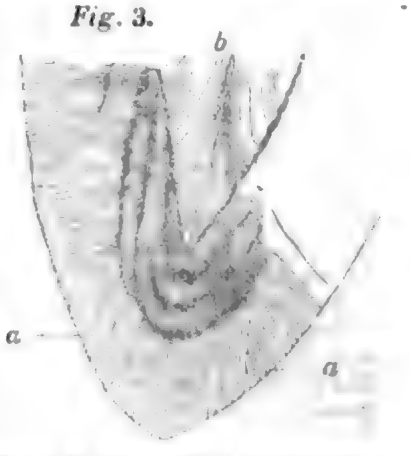
Fig. 2.



Microscopic view of bone-corpuscles and calcigerous canals.

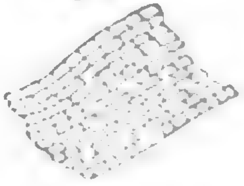
The enamel is composed of solid prisms, or fibres (*Fig.* 3, *a a*), about $\frac{1}{5600}$ of an inch thick, set side by side and upright upon the ivory of the crown of the tooth (*b*). One end of each prism is fixed in a little depression on the rough outer surface of the ivory; the other, which is somewhat larger, is turned towards the masticating surface of the tooth in the direction in which the chief external pressure is to be resisted. The course of the prisms is more or less wavy, their curves being, for the most part, parallel (*Fig.* 4), but sometimes opposed. Most of them extend from the ivory to the surface of the tooth, and where they do not, small complemental prisms fill up like wedges, the vacant spaces.

Fig. 3.



View of the arrangement of the enamel-fibres on the crown of an incisor tooth.

Fig. 4.



Small collection of enamel-fibres.

In the perfect state the enamel contains so small a quantity of animal matter, that it cannot be demonstrated to the sight, and the prisms are inseparably consolidated: but in young teeth it is soft, and may be broken up into its elementary parts. In the early state also it exhibits portions of a membranous animal substance, consisting of the cells in which each of its prisms was formed; for, as will be presently shown, the earthy matter is deposited in what might be called a set of moulds formed by the primary cells of the enamel membrane, and, as it accumulates, the membrane of the cell is so nearly removed, that in the perfect tooth no portion of it can be discerned. Its former existence however seems to be indicated by fine close-set transverse striæ upon each prism of the enamel.

The dentine, or ivory, is composed of a hard fibrous basis of cartilage and earthy substance, traversed by very fine, branching, cylindrical tubules, which run in an undulating course from the pulp-cavity, on whose internal surface they open (see *Fig.* 1, *b*) towards the adjacent part of the exterior of the tooth. Each tubule in its course outward makes two or three chief curves ('primary curvatures,' Owen), and is besides bent at every part in minute and very close undulations, or secondary curvatures; but the course of those tubules, which are adjacent to each other, is very nearly parallel. It is from the parallelism of these secondary curvatures of the tubules, that the appearance arises, as if the ivory were composed of concentric lamellæ arranged round the pulp-cavity.

The chief branchings of the tubules of the dentine are dichotomous (*Fig.* 5); but they also frequently give off minute branches, which again sending off smaller ones, fill up the spaces between the trunks (*Fig.* 6). At the trunk each tubule has an average diameter of about [illegible] of an inch, and the distance between each two tubules is nearly equal to the width of three of them. Both the walls and the cavities of the tubules, as well as the substance between them, are filled by the earthy constituent of the ivory, which is deposited in fine granules. The basis of the intertubular substance seems to be composed of bundles of flat, pale, granular fibres, whose course is parallel to that of the tubules.

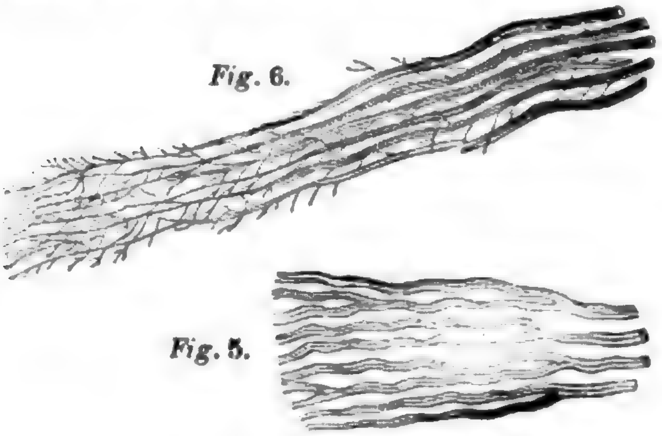


Fig. 6.

Fig. 5.

Views of the tubules of dentine.

A separate organ is provided for the formation of each of these three constituent parts of the tooth, though, when they are perfected, they contain no vascular tissue but the pulp within the pulp-cavity, and it is doubtful whether, in the human subject, fresh material is ever formed from this after the tooth has once attained its complete development. The first appearance of the pulp of each tooth is in the form of a minute process or papilla rising from the bottom of a groove in the mucous membrane of the mouth behind the edge of the jaw. In course of time, as the borders of the groove grow around it, the papilla seems to sink into the mucous membrane; and it now appears as if rising from the base of a follicle, or of a flask-like depression, in the edge of the jaw. And lastly, processes of membrane, or *opercula*, grow from the sides of the mouth of the follicle, and as they approach each other and adhere by their mutually opposed edges, they gradually close it, and convert it into a capsule or sac, to the base of which the first-formed papilla is affixed. In the first-appearing tooth, the papillary state may be seen in the human embryo an inch in length: the capsular stage is completed at about the fifteenth week of embryonic life.

These three stages of the formative organs of the tooth, namely, the papillary, the follicular, and the capsular, being completed, the substances of the tooth itself begin to be produced. The dentine is developed from the papilla, which gradually assumes the form and relations of the proper tooth-pulp; the enamel, from a special organ developed at that part of the capsule which is opposite to the papilla; and the bone probably from the interior of the capsule itself.

The papilla and the sac both gradually increase in size, but the growth of the latter is at first more rapid than that of the former, and the space between them is thus enlarged. Within this space there is deposited from the wall of the sac a soft, granular, non-vascular substance, the enamel-organ, or, as Mr. Hunter (*Natural History of the Teeth*) termed it, the external pulp. And at the same time as this is being produced from the interior of the sac, there is formed on the surface of the papilla a peculiar structureless membrane, which has been called the *preformative membrane*, and which, when the papilla begins to ossify, presents numerous little elevations and depressions, on which the enamel fibres are afterwards fixed; for as the papilla enlarges, the preformative membrane comes in contact with the enamel-organ, and they are exactly moulded the one upon the other.

Both the papilla, or as it may now be called, the pulp, and the enamel, are composed of primary cells [Nutrition], and it is by the transformation of these that the tubules of the dentine and the fibres or prisms of the enamel are severally produced. The exact mode however in which the change is effected is not yet known. All that can be seen is that the superficial cells of the pulp, which are at first round or oval, and nucleated, assume the same diameter and direction as the trunks of the dentine tubules, and then have earthy matter deposited in and around them. And these changes go on gradually from without inwards: as fast as the elongated and branching cells of one layer are ossified, those of the layer beneath them become elongated in preparation for the same change; and so on, till a great part of the pulp is hardened. It is due to this gradual ossification of the pulp from without inwards, that in growing animals, to whom madder is alternately given and omitted in their food, the dentine is found to consist of alternate rings of red and white ivory; for while madder is being taken, all the earthy matter that is deposited in the most superficial layer of the unossified pulp-cells is dyed by its colouring principle, and when it is discontinued the same material is deposited uncoloured in the layer of cells which is subjacent to that already ossified and reddened. When nearly the whole of that part of the pulp which was formed in the original papilla is thus hardened by the deposition of earthy matter, its base begins to grow into one or more conical processes, and by a hardening of these, through a process like that just described, the fangs are formed, and the tooth rises to the surface of the gum.

In the formation of the enamel, the primary nucleated cells on the inner surface of the enamel-organ become elongated and cylindrical, or prismatic; they assume a direction which is perpendicular to the surface of the hardening pulp; and then, their nuclei disappearing, they also are hardened by the deposition of earthy matter within them, which is continued till they are inseparably compacted, and their original membranous wall is not discernible. These changes also, like the preceding, make progress in layers; but the progress is here from within outwards, and it goes on till nothing is left but a thin external *enamel-membrane* on the surface of the crown of the tooth. As the enamel organ and the papilla, both growing and hardening, approach more nearly to each other, the preformative membrane also disappears.

By the transformation of this enamel-membrane, or of the superficial part of the capsule itself, that part of the bone is produced which envelopes the enamel; and by similar changes in that part of the capsule which has grown in company with the fang-processes of the pulp, that part of the bone is formed which invests the fangs. The changes in this part of the process are probably exactly similar to those through which new bone is produced between a periosteum and the old bone which it surrounds.

TEETH OF WHEELS. [Wheels.]

TEFLIS. [Tiflis.]

TEFZA. [Marocco.]

TE'GEA. [Arcadia.]

TEGERNSEE, THE, is a lake in the circle of the Isar in the kingdom of Bavaria, about thirty miles from Munich, at the foot of the Bavarian Alps. It is about four miles long, one mile and a quarter broad, and 300 feet deep. This lake gave its name to a Benedictine abbey, which was founded by the Agilolfingers, in the time of King Pepin, was destroyed by the Hungarians, restored in 979, and not abolished till some years after the beginning of this century. The abbots were princes, and had four hereditary offices in their household which were held by noblemen. The late king of Bavaria, Maximilian Joseph, had the abbey converted into a fine palace, which he presented to his consort the late Queen Caroline, with the lordship depending on it, which is about 60 square miles in extent, including the village of Tegernsee, with 300 inhabitants. This palace is situated in a beautiful country surrounded with lofty mountains, among which the Waldberg and the Setzberg are sometimes illuminated when there are royal visitors at the palace. The grounds are laid out with great taste, and the village church is very handsome, and contains some fine paintings. In the vicinity there are quarries of fine marble of various colours, and the mineral springs of Kreuth and Schwaighof. Kreuth is in a very romantic situation, at the foot of high mountains, and is much frequented for its sulphureous waters. Near Tegernsee naphtha is found, which is here called St. Quirinus oil, because it was formerly pretended that it issued from the corpse of St. Quirinus, to whom a chapel in the vicinity is dedicated.

(Hassel, *Geographie;* Stein, *Geographisches Lexicon;* Cannabich, *Lehrbuch der Geographie*, Hübner, *Zeitungs-Lexicon.*)

TEHERAN, or TEHRAN. [PERSIA.]

TEHUACAN. [MEXICAN STATES.]

TEHUANTEPEC. [MEXICAN STATES.]

TEIGNMOUTH. [DEVONSHIRE.]

TEIGNMOUTH, JOHN SHORE, LORD, was the eldest son of Thomas Shore, Esq., sometime of Melton in Suffolk, and of his wife Dorothy (other authorities say Deborah) Shepherd. The family was originally of Derbyshire, Lord Teignmouth's great-grandfather having been a Sir John Shore, of Derby, M.D., who was knighted in 1667. Lord Teignmouth was born, it is believed, in Devonshire, October 8, 1751: his father died in 1759, his mother in 1783, and his only brother, the Rev. Thomas William Shore, who was vicar of Sandal in Yorkshire, and of Otterton in Devonshire, in 1822.

Lord Teignmouth went to Bengal in 1769, as a cadet in the Company's civil service, and was first stationed at Moorshedabad as an assistant under the council of revenue. In 1773 his knowledge of that language procured him the appointment of Persian translator and secretary to the Provincial Council of Moorshedabad; and this was followed the next year by a seat at the Calcutta revenue board, which he retained till the dissolution of the board in 1781, when he was appointed second member of the general committee of revenue, established by the new charter granted that year. While holding this situation, Mr. Shore lived in terms of intimacy with Warren Hastings, the governor-general; and when Hastings came home in 1785 he accompanied his friend to England. During this visit to his native country he married Charlotte, only daughter of James Cornish, Esq., a medical practitioner at Teignmouth; and a few weeks after, in April, 1786, he set out again for Calcutta, having been appointed one of the members of the Supreme Council under the new governor-general Lord Cornwallis. To his activity and ascendency in the council is mainly attributed the adoption of Cornwallis's great measure, the new settlement, in 1789, of landed property in the presidency of Bengal, by which the zemindars, hitherto only the revenue agents or tax-gatherers of the government, were made the hereditary proprietors of the estates which they farmed, and the ryots, or peasantry, who had till now a right of occupation so long as they paid their assessments, were declared the tenants of the zemindars, and made removable at the will of their landlords. The new judicial system which was introduced towards the close of Lord Cornwallis's government in 1793, also owed its establishment in a principal degree to Shore, who had been made a baronet the preceding year. On the retirement of Cornwallis, in August, 1793, Sir John Shore was appointed to succeed him as governor-general; and he held that high office till the close of the year 1797, when he resigned it to the earl of Mornington, and was created an Irish peer by the title of Baron Teignmouth.

Upon the death of Sir William Jones, in April, 1794, Sir John Shore was elected president of the Asiatic Society; and taking his seat in that capacity on the 22nd of May, he delivered a discourse on the merits of the late president, which is printed in the fourth volume of the Society's 'Transactions.' After his return home Lord Teignmouth published, in 1804, a 4to. volume, entitled 'Memoirs of the Life, Writings, and Correspondence of Sir William Jones;' and in 1807 he produced an edition, in 13 vols. 8vo., of Jones's Works, with this Life prefixed. Upon his leaving India Lord Teignmouth had been succeeded as president of the Asiatic Society by Sir Robert Chambers, in a discourse by whom, delivered at a meeting of the Society on the 18th of January, 1798, and printed in the sixth volume of their 'Transactions,' there is a sketch of the character and career of his predecessor. In 1804, on the formation of the British and Foreign Bible Society, Lord Teignmouth was elected its first president: and this situation he retained till his death, though for some years before that event he was obliged to devolve its active duties upon his successor, Lord Bexley. In the prosperity of the Society he at all times took the liveliest interest.

On the 4th of April, 1807, Lord Teignmouth was appointed one of the commissioners for the affairs of India, or, in other words, a member of the Board of Control; and on the 8th of the same month he was sworn of the Privy Council. He retained his seat at the Board of Control for some years; and his death took place on the 14th of February, 1834.

Besides the publications already mentioned, Lord Teignmouth is the author of 'A Letter to the Reverend Christopher Wordsworth, D.D., on the subject of the Bible Society,' 8vo., London, 1810; and 'Considerations on communicating to the Inhabitants of India the Knowledge of Christianity,' 8vo., London, 1811. (*Gent. Mag.* for 1834, pt. i., p. 552.)

TEISSIER, ANTOINE, was born at Montpellier, 28th January, 1632. His family, which was originally of Nîmes, was Protestant; and his father was receiver-general of the province of Languedoc, but he was deprived of that appointment, and also of whatever else he possessed, a few months after the birth of his son, for having joined the revolt of Henri, Duc de Montmorenci, or at least given up to him the public money which was in his hands. Montmorenci was taken prisoner at the affair of Castelnaudari, on the 1st of September, 1632; his insurrection was suppressed, and on the 30th of October he was beheaded. After the ruin of his family it was determined that Antoine Teissier should be educated for the ministry of the Protestant church, and with that view he studied theology for some time at the Protestant seminaries of Nîmes, Montauban, and Saumur. But in the end he made up his mind to adopt the profession of the law, induced, it is said, by the weak state of his health; and after having gone through the usual course of study at Bourges, and taken his doctor's degree, he commenced practice as an advocate before the district court called the Presidial, at Nîmes. His bodily strength however proved to be no more sufficient for the bar than it had been thought to be for the pulpit; and after some time he gave up his profession, and took to literature as a means of subsistence. On the revocation of the Edict of Nantes, in 1685, Teissier took refuge in Switzerland, having, according to the 'Biographie Universelle,' although in extreme distress, declined very tempting proposals which were made through the chancellor D'Aguesseau, to induce him to remain in France. But it would no doubt be made a condition that he should abjure Protestantism. He supported himself chiefly at first by publishing a French newspaper at Berne; then by giving a course of public law (droit public) at Zürich; and the works he sent to the press from time to time also brought him something. At length, in 1692, he was invited by Frederic III., elector of Brandenburg (afterwards king Frederic I. of Prussia) to come to Berlin; and there he resided till his death, on the 7th of September, 1715. Immediately on his arrival he had been nominated a councillor of state, and appointed to the office of historiographer; and part of his time was also occupied for some years in superintending or directing the education of the hereditary prince, afterwards Frederic William

l. A complete list of Teissier's numerous publications is given in the 'Biographie Universelle.' The most celebrated among them is his 'Eloges des Hommes Savans, tirées de l'Histoire de M. de Thou,' first published at Lyon and at Geneva, in a 12mo. volume, in 1683; then at Utrecht, in 2 vols., in 1696; and again at Leyden, in 4 vols., in 1715. In the two latter editions the text of De Thou is accompanied by numerous annotations, which display much curious research. Teissier was an accurate inquirer; but there is no artistic quality or vital power in any of his books, and all of them, even including his 'Eloges,' may be said to be now superseded and nearly forgotten. One of the most creditable is a Catalogue, in Latin, of the authors who have written catalogues, indexes, &c., in two parts, 4to., Geneva, 1685 and 1705; some others relate to parts of the history of Prussia; and a great many are translations, which have the character of being generally faithful enough, but of little elegance or spirit, from St. Clement, St. Chrysostom, Calvin, Sleidan, and other Greek and Latin writers, the latter mostly, if not exclusively, moderns.

TEIXEIRA. [Texeira.]

TEJEN. [Persia.]

TEJUCO. [Brazil, p. 368.]

TEJUS. [Sauvegarde.]

TE'LECLES. [Sculpture.]

TELEGRAPH (from τῆλε, 'distant,' and γράφω, 'write'), a machine or contrivance for communicating intelligence to a distance, usually by means of preconcerted signals, to which some conventional meaning is attached. On this account telegraphic communications may be as remarkable for their impenetrable secrecy as for their rapidity. The name semaphore (from σῆμα, 'a sign,' and φέρω, 'bear'), is commonly applied to some of the machines used for effecting telegraphic communication; which, in an extended sense, may be considered to embrace every means of conveying intelligence by gestures and visible signals, as flags, lanterns, rockets, blue-lights, beacon-fires, &c., or by audible signals, as the firing of guns, the blowing of trumpets, the beating of drums or gongs, &c., as well as by the machines called telegraphs or semaphores.

Although telegraphic communication, as a means of conveying *any* required intelligence, is an invention of recent date, the use of signals for the speedy transmission of such brief messages as might be previously arranged between persons, is a practice derived from the most remote antiquity. The use of beacon-fires, for example, as a means of giving speedy warning of the approach of an enemy, is alluded to by the prophet Jeremiah, who wrote about six centuries before the Christian æra, and who warns the Benjamites to 'set up a sign of fire in Beth-haccerem; for evil,' he adds, 'appeareth out of the north, and great destruction.' (*Jeremiah*, vi. 1.) The fine description given by Æschylus, in his 'Agamemnon,' of the application of a line of fire-signals to communicate the intelligence of the fall of Troy, is often referred to as an early instance of this kind of telegraphic despatch; but if the æra of the writer, and not that of the event, is referred to, the passage above quoted affords an earlier illustration. This simple means of spreading an alarm, or communicating intelligence in time of war, is practised by many nations; and, to come nearer home, we may refer to the graphic stanzas of the 'Lay of the Last Minstrel' (canto iii., st. xxv.-xxix.), descriptive of the rapid communication of the approach of the English forces from the border stations, along 'height, and hill, and cliff,'—

'Till high Dunedin the blazes saw,
From Soltra and Dumpender Law;
And Lothian heard the Regent's order,
That all should boune them for the border.'

In a note illustrative of this description, Scott refers to an Act of the Scottish parliament in 1455, c. 48, which directs that one bale or faggot shall be warning of the approach of the English in any manner; two bales, that they are *coming indeed*; and four bales blazing beside each other, that the enemy are in great force. Such signals, though best adapted to give information by night, were also available in the daytime, when they appeared as columns of dense smoke. Torches held in the hand and moved in any particular manner, or alternately displayed and hidden behind a screen, were also used in antient times as signals, as we learn from several early writers on military subjects; but as they were merely arbitrary signals, which admitted of very little variation, such devices could only be rendered available by previous concert.

That some attempts were made by the antients to improve upon such simple signals is evident from the tenth book of Polybius, in which allusion is made to a device of Æneas (Tacticus), who proposed to write several sentences, such as it might be desirable to communicate, upon two oblong boards, one of which should be kept by each of the parties. These boards were to be affixed to cork floats capable of rising and falling in cylindrical vessels of similar form and size, one of which was placed at each station. Matters being thus prepared, and the vessels filled with water, the person desiring to send intelligence allowed the water to escape from his vessel by a small opening until the suitable sentence on the inscribed board had sunk to a certain mark; making torch signals to indicate the moment of allowing the water to run out, and that at which the board sank to its proper level. The person at the distant station regulated the egress of water from his vessel by the torch signals, and was thus enabled to ascertain which of the sentences written on the board conveyed the required intelligence. Complicated as was this arrangement, it afforded very little more scope than the use of simple torches or fires. Polybius however describes a much more perfect method of telegraphic communication, which, he says, was invented either by Cleoxenus or Democlitus, but improved or perfected by himself. This method is capable of communicating any required intelligence with the greatest precision, the signals being made to represent the letters of the alphabet, and the message being displayed letter by letter. Instead of quoting the description of Polybius himself, which refers to the use of the Greek aphabet, we shall adopt that of Bishop Wilkins, who describes the plan as applied to the English alphabet. The alphabet must be divided for this purpose into five portions of five letters each (excepting the last, which has but four, *j* and *v* being omitted as unnecessary), and inscribed upon tablets, as in the following diagram:—

	I.	II.	III.	IV.	V.
1	*a*	*f*	*l*	*q*	*w*
2	*b*	*g*	*m*	*r*	*x*
3	*c*	*h*	*n*	*s*	*y*
4	*d*	*i*	*o*	*t*	*z*
5	*e*	*k*	*p*	*u*	

This being done, each of the corresponding parties is to be provided with a copy of the tablets, and also with ten torches, five of them on the right hand and five on the left. Any letter may then be expressed by first lifting up on the right hand so many torches as may indicate the number of the tablet in which it is contained, as I., II., III., &c., and then so many on the left as may show the number of the particular letter in the tablet, as 1, 2, 3, &c. Thus the word *hasten* would be expressed by displaying the torches six times, in the following order, in which the Roman letters indicate the number of torches raised on the right hand, and the Arabic numerals those on the left:—

Right hand.		Left hand.
II.	*h*	3.
I.	*a*	1.
IV.	*s*	3.
IV.	*t*	4.
I.	*e*	5.
III.	*n*	3.

Polybius observes that dioptrical instruments, framed with two holes or tubes, should be used to enable the observer to distinguish accurately the right and left hand lights; and that solid fences should be erected upon each side, behind which the torches might be concealed when out of use. Bishop Wilkins, in his curious work entitled 'Mercury; or the Secret and Swift Messenger,' after describing this telegraph of Polybius, mentions another which requires only three lights or torches. The twenty four necessary letters of the alphabet are, according to this plan, which he gives on the authority of Joachimus Fortius, to be divided into three classes of eight letters each. The first class is represented by one torch, the second by two, and the third by three; and the number of the letter by the number of times which the torches are elevated or discovered. Thus one torch raised once would represent *a*, or raised eight times, *h*; two torches raised once would indicate *i*, raised twice, *k*; or eight times, *q*; and three torches raised from once to eight times would give the remaining letters, from *r* to *z*. Similar to this, but still easier of application, is the night-telegraph contrived by the Rev. James Bremner, of the Shetland Islands, and rewarded by the Society of Arts in 1816. A single light constitutes the whole apparatus in this plan, and the whole operation consists in its alternate exhibition and concealment. The alphabet is divided into four classes or divisions, of six letters each; and the number of obscurations is to indicate, first, the number of the division, and secondly, the number of the letter in that division; a pause being made between the obscurations which indicate the number of the division and those which show the number of the letter in that division; and a longer pause between the double set of movements thus required for every letter. Two lights, one to represent the division, and the other the number of the letter, might in some cases be used; but Mr. Bremner conceives that, especially in long distances, one is preferable, as affording less risk of error. His plan had been found suitable for distances of twenty miles and upwards, and had been successfully put in operation between the lighthouse on Copeland Island and Port Patrick on the opposite side of the Irish Channel. Further particulars respecting this, and a description of another telegraph for day-service, by the same author, are given in the thirty-fourth volume of the Society's 'Transactions,' pp. 213-227. Tedious as Mr. Bremner's method may appear, it is stated that, supposing the whole alphabet to be used, sixty letters might easily be given in five minutes; while the communication might be effected more rapidly if, as in some telegraphic systems, only sixteen letters were used. In addition to the alphabetic systems which depend merely upon the number or alternate display and concealment of lights, Bishop Wilkins describes one which depends upon the relative positions of two lights attached to long poles, and which, he says, 'for its quickness and speed is much to be preferred before any of the rest.' It will thus be perceived that that ingenious writer came very near to the principle upon which many of the modern telegraphic systems depend. In suggesting the use of extended lines of telegraphic communication, he further hints at the application of the telescope (or, as he styles it, 'Galileus his perspective'), to the deciphering of distant signals.

Among the scientific writers who seem to have had some notion of the modern telegraph are Kircher, Schottus, and Kessler; the latter of whom proposed to cut out such characters as it was desired to show in the ends of a cask, which was to be elevated with a light enclosed in it. The Marquis of Worcester also, in his 'Century of Inventions,' 1663, announces, 'How at a window, as far as the eye can discover black from white, a man may hold discourse with his correspondent, without noise made or notice taken,' &c.; and again, 'A way to do it by night as well as by day, though as dark as pitch is black.' The earliest well-defined plan of telegraphic communication appears however to be that described in a paper addressed to the Royal Society in 1684, by Dr. Robert Hooke, and published in 1726 in Derham's collection of his 'Philosophical Experiments and Observations,' pp. 142-150, 'showing a way how to communicate one's mind at great distances.' Hooke states that he had discoursed on the subject some years before, but that the then recent siege of Vienna by the Turks had revived the matter in his mind. His scheme will be readily understood by the annexed cut, *Fig.* 1, which represents an elevated frame-work supporting a panel or screen, *a*, behind which were to be suspended a number of symbols or devices, formed of deal plank, of the various shapes represented by the small black figures. The first twenty-four of these, which consist entirely of straight lines, were to stand for alphabetic characters; and the six devices consisting of curved lines were to be used as arbitrary signals. Whenever it was desired to display any of these characters, they were to be drawn from behind the screen by a rope *c*, passing over pulleys in the frame-work, and so rendered visible in the open space at *b*. These telegraphs were to be erected upon elevated stations, so chosen that, if possible, there might be no refraction of the atmosphere to impede vision, and so that no intervening objects or disturbed background might interfere with the clearness of the prospect; and telescopes were to be used by the observers. The order of connection between the signs employed and the letters of the alphabet might, it is explained, be infinitely varied, for the sake of secrecy; and none of the parties employed, excepting those at the terminal stations, need have any knowledge of the message communicated. Hooke further proposed a scheme for night communication by means of lights disposed in a certain order. About twenty years after the date of Hooke's paper, Amontons brought forward a very similar plan in France, and made public trial of his contrivance before several persons of rank. Some other individuals subsequently devised similar schemes, but nothing was effected in the practical application of telegraphic communication until the war of the French revolution. Macdonald states that, 'Following the principles laid down by Dr. Hooke, in 1684, Dupuis, in France, invented the French telegraph, which Don Gualtier, a monk of the order of Citeaux, in 1781, modified, and proposed to Condorcet, Milli, and Dr. Franklin, who recommended it to the French government.' The telegraph brought into use in 1793 or 1794, by M. Chappe, was, as will be seen by *Fig.* 2, a very superior machine to that of Dr. Hooke.

Fig. 1.

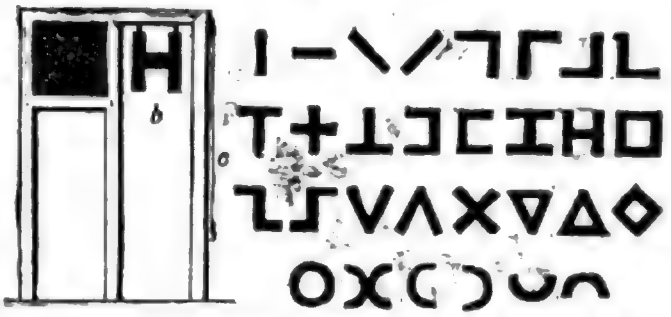
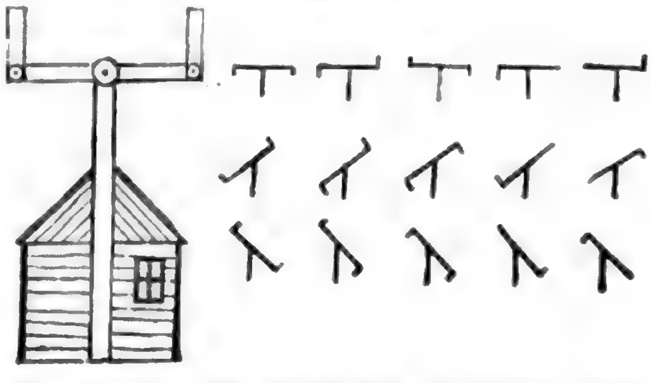


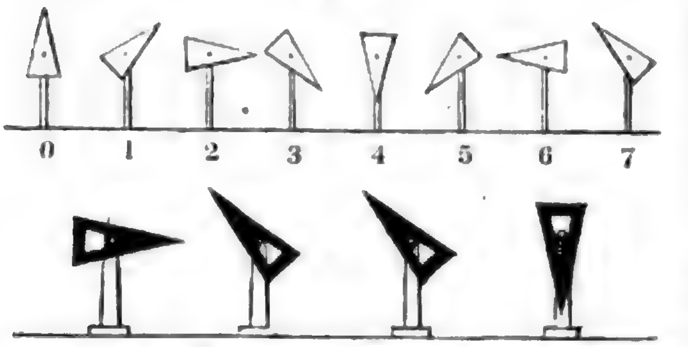
Fig. 2.



Chappe's telegraph, which, from its position when at rest, is sometimes called the T telegraph, consisted of an upright pole or post, at the top of which was pivoted, by its centre, a transverse beam, which, by means of ropes worked in the chamber below, that served also for an observatory, might be made to assume any required angle with the post. Each end of this moveable beam carried a short arm, that was capable of assuming any required angle with it; and these arms also were worked by ropes, which were conducted through the axis of the beam, in order that the necessary degree of tension might not be disturbed by the action of the machine. By this contrivance, without the use of any angles of less than 45° (which might be indistinct when viewed from a great distance, or under the influence of a refractive atmosphere), as many as 256 different signs might be made. A much smaller number was however sufficient, as M. Chappe communicated his intelligence letter by letter, and simplified the movements by using an alphabet of only sixteen letters. The small figures in the cut show some of the different positions assumed by the beam and arms; and, as the connection between these and the letters they were made to represent was quite arbitrary, their signification might be changed as often as was necessary for the purpose of secrecy; it being only necessary that the key should be known to the parties sending and receiving the message, although it might be transmitted through a great number of intermediate stations. Such telegraphs were first erected on a line commencing at the Louvre, in Paris, and proceeding by Montmartre and other elevated points to Lisle, in order to communicate between the Committee of Public Welfare and the combined armies in the Low Countries. Telescopes were used at each station, and the signals displayed at one station were immediately repeated at the next; four seconds being found sufficient for effecting the required motions, and sixteen seconds the time allowed for observing and noting down each signal, during which the machine remained stationary. Barrère, in announcing the invention of the telegraph to the Convention, on the 17th of August, 1794, stated that the news of the recapture of Lisle had, by means of this machine, reached Paris in an hour after the troops of the republic had entered that place. (*Annual Register*, 1794, p. 51.)

The advantages of such extraordinary celerity of communication were so obvious that, in England and other countries, many plans were immediately brought forward, some of which differed materially from that which had been successfully put in practice in France. Among these was that contrived by Mr. R. L. Edgeworth, who states that he had made experiments as early as 1767, when he proposed to use the sails of a windmill as a means of conveying intelligence by signals. The report of Chappe's telegraph revived the matter with him, and late in 1794 he, with some friends, tried experiments with a numerical telegraph (or a telegraph expressing numbers, which numbers refer to letters, words, or sentences, in a dictionary), on the principle shown in the cut *Fig*. 3. An index, or pointer, in the form of an isosceles triangle, was so mounted upon a post, or on a portable triangular stand, that it might be turned into any of the eight positions shown in the upper part of the cut; these positions indicating, respectively, 0 and the numerals 1 to 7. Four such pointers, mounted side by side by side, as in the lower part of the figure, afford power for expressing any number from 1 to 7777, excepting 8, 9, 18, 19, 28, 29, and all others in which the numerals 8 and 9 are required: the first pointer representing thousands, the second hundreds, the third tens, and the fourth units. Thus the four black pointers in the figure, being, respectively, in the positions indicating 2, 7, 7, and 4, express, collectively, the number 2774. The numerical system affords at least equal facilities with the alphabetic or lettering plan for secrecy in the communications; since the connection between the numbers expressed and the sentences to which they refer may be changed at pleasure, and none of the persons employed in transmitting the intelligence need to possess the dictionary, the *number* being all that they require to know. In reference to this distinctive feature of his plan, Edgeworth observes that, while '*telegraph* is a proper name for a machine which describes at a distance, *telelograph*, or, contractedly, *tellograph*, is a proper name for a machine which describes *words* at a distance;' and therefore he uses the latter term. In his 'Essay on the Art of Conveying Secret and Swift Intelligence,' published in the sixth volume of the 'Transactions of the Royal Irish Academy,' in which the details of his plan are fully given, Edgeworth notices the great advantages derivable from the application of telegraphic communication to commercial and general purposes, as, for instance, to the speedy announcement of market-prices at a distance; and even hints at the possibility of a line of telegraphs between Europe and the East Indies. He also published a pamphlet entitled 'A Letter to the Right Honourable the Earl of Charlemont on the Tellograph, and on the Defence of Ireland,' which was reprinted at London in 1797.

Fig. 3.



Another of the individuals whose attention was directed to this subject by Chappe's telegraph, was the Rev. J. Gamble, then chaplain to the Duke of York. He issued a thin quarto pamphlet, without date, entitled 'Observations on Telegraphic Experiments,' in which, after noticing several suggestions which had been made for effecting rapid communication, he propounds another, of which he believed himself to be the inventor. The apparatus which he proposed consisted of a frame-work containing five boards, or shutters, arranged vertically one above the other, and pivoted in such a way that any or all of them might be closed, so as to present their broad surfaces to the eye, or opened, so as to present merely a thin edge, which would be invisible at a distance. The various signals produced by closing one or more of these shutters may be applied either to a numerical or an alphabetical system. A similar plan submitted to the Admiralty in 1795, by Lord George Murray, was adopted in the first government line of telegraphs established in England, in 1796, between London and Dover. The 'Annual Register' for that year (p. 4 of the 'Chronicle') mentions the erection of the telegraph over the Admiralty on the 28th of January, and states that information had been conveyed from Dover to London in seven minutes. The action of this kind of telegraph, which was continued in use by the Admiralty until the year 1816, is illustrated by *Fig*. 4, in which A represents a square frame-work with six octagonal shutters, 1, 2, 3, 4, 5, and 6, arranged in two vertical columns, or sets, and turned into a vertical position, so as to display their broad surfaces completely, and B represents the same apparatus with the boards or shutters placed horizontally, or turned one-quarter round upon their respective axes, so as to present nothing but their edges to the eye. The central space between the two columns of shutters serves to render them more distinct to a distant observer, and affords room for the ropes and pulleys by which the telegraph is worked, and which are managed by persons in the observatory below. As shown by the following table, the six-shutter telegraph is capable of expressing sixty-three different signals, by closing one, two, three, or more of the shutters, according to the Arabic numerals in the table, which refer to the numbers inserted in the cut *Fig*. 4, A. The position of the apparatus shown in *Fig*. 4, B, is not counted as a signal; it being the position of rest.

Fig. 4.

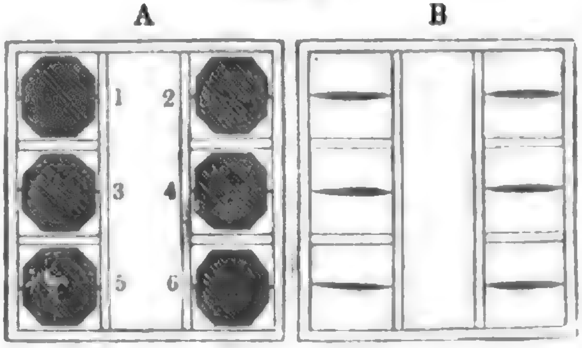


Table of the Separate or Distinct Signals given by the Six-shutter Telegraph.

1	23	124	236	1245	3456
2	24	125	245	1246	12345
3	25	126	246	1256	12346
4	26	134	256	1345	12356
5	34	135	345	1346	12456
6	35	136	346	1356	13456
12	36	145	356	1456	23456
13	45	146	456	2345	123456
14	46	156	1234	2346	
15	56	234	1235	2356	
16	123	235	1236	2456	

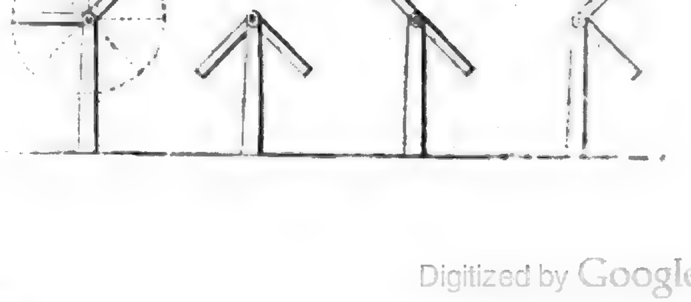
These signals affords the means of expressing each letter of the alphabet, and each of the Arabic numerals, by a distinct and simple sign, and still leave several signs unappropriated, which may be applied to words or sentences of common use, or to arbitrary signals; and the connection between the signals given in the table and the letters or numerals they represent may be varied almost infinitely; so that if, in time of war, the key were to fall into the hands of the enemy, it might be immediately changed. In a modification of this kind of telegraph, intended for night as well as for day service, which was submitted to the Society of Arts, in 1805, by Mr. Joseph Davis, a seventh shutter or board is added, which, instead of being poised on an horizontal axis, is made to slide up and down in grooves in the centre of the framework; so that it may either range with the shutters 1 and 2, 3 and 4, or 5 and 6, or, if not required at all, may descend into a space provided for it in the roof of the observatory. By this simple device the power of the machine is quadrupled; it being rendered capable of making the sixty-three signals shown in the table without the sliding-shutter, and the like number with it in each of its three visible positions, or two hundred and fifty-two changes in the whole.

About the same time that shutter-telegraphs were being introduced in England, the Chevalier A. N. Edelcrantz, of Stockholm, was devising similar machinery for use in Sweden. In 1796 he published an account of his experiments and inventions in the Swedish language, which in 1801 was translated into French and published at Paris, and was noticed in Nicholson's 'Journal' in 1803. A few years later Edelcrantz communicated a model of his telegraph to the English Society of Arts, in whose 'Transactions' for 1808 (vol. xxvi., pp. 184-189), it is minutely described. He commenced his experiments in September, 1794, with a machine resembling that first employed in France; but he soon abandoned it, and adopted a shutter-telegraph with ten boards or vanes, arranged in three vertical ranks, of which the centre one has four, and the others three boards each. By this arrangement 1024 changes or signals may be clearly shown; and it would be possible, by observing the *order* in which the shutters are exhibited, to show 4,037,912 changes. The minute attention required in this case would, however, occasion some uncertainty; and it is not likely that any circumstances could render so many changes at all desirable. Edelcrantz recommends that the vanes or shutters, which are represented as of a square form, should be painted black, and the frames which support them either white or red; and he says that the intervals between the shutters should be greater than their diameters. The apparatus for working the telegraph is ingenious, but too complicated for description here. It is sufficient to state that, when out of use, the shutters are held open by weights, and that the leverage afforded by the apparatus for closing them is such as to enable one man to hold them all, if necessary, against a high wind, which, it is added, could not be done with the English six-shutter telegraph, notwithstanding the smaller number of vanes, without employing several men. This inconvenience led Mr. Henry Ward, who had observed the difficulty of working the telegraph at Blandford, in Dorsetshire, to contrive an ingenious apparatus which is described in pages 207-8 of the same volume of the 'Transactions' of the Society of Arts as that which contains the communication of the Chevalier Edelcrantz. In this apparatus the grooved wheel or pulley which is fixed upon the axis of the shutter, to receive the rope by which it is turned, has the grooved portion of its rim formed in two segments, which are so attached to the periphery of the wheel by steel springs that they fly off and remain at a little distance from it when there is no strain on the rope; although, so soon as the rope is pulled, its pressure forces the segments into close contact with the solid rim of the wheel. In the segments are formed two notches, which, when the shutter is in either of its required positions, engage with a fixed catch so soon as the strain on the rope is relaxed, and so hold the shutter steady without any aid from the attendant. The pulling of the rope, by drawing the segments close to the wheel, releases the catch, and consequently enables the attendant to return the shutter to its original position. The ten-shutter telegraph of Edelcrantz had, at the date of his letter to the Society of Arts, been in constant use for twelve years, on both sides of the Baltic, and in other places in Sweden; 'chiefly in facilitating the communication of posts between Russia and Finland on one side (of the Baltic), and Sweden and England on the other.' He states that one person was sufficient for working it and making the observations, especially at the terminal stations; and that six signals were usually given in a minute.

Lieutenant-Colonel Macdonald, who greatly prefers the numerical to the spelling or lettering system, recommends a shutter-telegraph of still greater power, and consequently of greater complexity, than that of Edelcrantz. His terrestrial telegraph, the advantages of which he has pleaded at length in two treatises, published in 1808 and 1817, consists of thirteen shutters, arranged, like those of Edelcrantz, in three vertical sets, which represent, respectively, hundreds, tens, and units. As three boards in each set would only afford seven combinations for each column, he uses four, which give fifteen combinations, ten of which are used to express the numerals from 1 to 9, and 0, and the remaining five for abbreviations and arbitrary signals. The twelve ordinary boards are capable of producing 4095 distinct combinations, and the thirteenth, or auxiliary board, which is mounted over the centre of the machine, doubles that number. A flag or vane is added to the hundred side of the apparatus, to distinguish it in whatever direction it may be viewed, and a ball sliding upon the staff which supports it affords the means of again doubling the number; so that, in the whole, 16,380 distinct signs may be made with this machine. Macdonald recommends that the shutters be made about five feet square; in which case they may be seen with a moderate telescope, in clear weather, at a distance of ten or eleven miles.

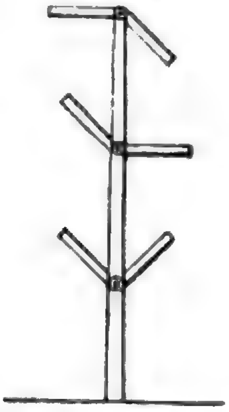
Although the shutter-telegraph was originally considered an improvement upon that of M. Chappe, which was so complex as to lead to considerable risk of error, unless it were worked by a practised person, experience has established the superiority of telegraphs or semaphores with moveable arms; and these have been greatly simplified, so as to avoid the objection raised to the old French telegraph. Among the schemes proposed soon after the first practical application of telegraphs, was one which consisted in dividing a large circle into twenty-four parts, for the letters of the alphabet, and employing a traversing radius, or index, to point them out; wires being fixed before the object-glass of the telescope to enable the distant observer to determine the position of the radius. This plan could only be applied to short distances, because refraction might render it difficult to distinguish between positions so little varying from each other. The same radiating principle was, however, adopted in some machines of more practical character; among which was a telegraph contrived by the Rev. J. Gamble (whose original shutter-telegraph has been before mentioned), consisting of five beams or arms pivoted at the top of a post, upon one axis, and capable of producing many different combinations without using angles of less than 45°. On a similar principle were constructed the French coast telegraphs adopted in 1803, to which the name of *semaphores* was first applied, and from which it has been given to other telegraphic machines, the action of which is dependant upon the motion of arms around pivots placed at or near their extremities. These French semaphores, or, as they were sometimes called, *signal-posts*, consisted of upright posts with two or three moveable arms, turning upon separate pivots, one above the other. Before they were much known in this country, Captain (now Major-General) Pasley had been led to observe the inferiority of the common land-telegraph to that used at sea, which consisted of coloured flags, and by which three numbers, or rather three numerals combined to form one number, might be readily expressed. To remedy this defect, he, in 1807 (before he had seen the French semaphore), devised what he termed a 'polygrammatic telegraph,' of which he published a description in the twenty-ninth volume of Tilloch's 'Philosophical Magazine.' This machine, which is represented in *Fig* 5, consisted of four posts, at

Fig. 5.



the top of each of which was pivoted a pair of arms. Each pair of arms was capable, by assuming the various positions indicated by the dotted lines added to the first pair, of forming more than a sufficient variety of distinct signals to express any of the numerals or the 0; and consequently the whole machine could represent any number composed of not more than four figures, besides having several signals to spare. In 1809 Captain Pasley saw the French semaphore, which he described in the following year, together with a modification of his own polygrammatic telegraph, founded upon it, in the thirty-fifth volume of the periodical just mentioned. This simplified polygrammatic telegraph, represented in *Fig.* 6 has three pairs of arms, representing hundreds, tens, and units, pivoted to different parts of the same vertical post. This contrivance is adopted by Lieutenant-Colonel Macdonald, with very trifling variation, in his 'Treatise explanatory of a new System of Naval, Military, and Political Telegraphic Communication,' published in 1817. By the addition of a ball and vane at the top of the mast, it becomes a machine of the same power as Macdonald's thirteen-shutter telegraph; as each pair of arms is capable of assuming fifteen distinct positions. Another semaphore on the same principle was submitted to the Society of Arts in 1821, by Lieutenant N. H. Nicolas, and described, together with a method of applying a shifting key to telegraphic communications, for the purpose of insuring their secrecy, in the thirty-ninth volume of the Society's 'Transactions;' where, although allusion is made, in a note, to the similar plan published by Colonel Macdonald, nothing is said of the earlier invention of Pasley. The telegraph of Lieutenant Nicolas consists of a lofty pole with four pairs of arms, one above another, the lowest pair representing units. For each of the three lower pairs of arms nine positions are all that are required, 0 being indicated by both arms being closed into the post, and therefore concealed from sight; but the upper pair are made to represent any number from 1 to 15, so that the total range of the machine is from 1 to 15,999.* This is effected by making the right arm represent 1, 2, or 3, according to its position as inclined upwards, extended horizontally, or inclined downwards; and assigning to the left arm the number 4 if inclined downwards, or 8 if extended horizontally. 5, 6, 7, and 9 are formed, respectively, by the combination of the signs for 4 and 1, 4 and 2, 4 and 3, and 8 and 1: and, in the case of the pair of arms which represent thousands, the left arm when inclined upwards indicates 12; and 10, 11, 13, 14, and 15 are produced by 8 and 2, 8 and 3, 12 and 1, 12 and 2, and 12 and 3, respectively. The telegraphs upon the commercial line of communication recently established between London and the Downs are constructed upon another modification of the polygrammatic principle; four pairs of arms being employed, but mounted upon two posts instead of one, as in the semaphore last described, or four, as in the original design of Captain Pasley.

Fig. 6.



In 1816 it was determined to change the Admiralty telegraphs into semaphores constructed on the principle of those used in France, with the improvements suggested by Sir Home Popham, who had previously done much for the improvement of naval signals. The action of Popham's semaphore is explained by *Fig.* 7, in which dotted lines are added to show the various positions in which the arms may be placed, and numerals to show the numbers indicated by those positions. Only two arms are employed; but as they are mounted upon separate pivots, each of them can assume six different positions, and the two together are capable of affording forty-eight signals; which number, though less than that given by the six-shutter telegraph, is sufficient to express the letters of the alphabet and the Arabic numerals, and to leave thirteen signals unappropriated, for abbreviations and arbitrary signs. This kind of semaphore is still used at the government stations; and for the following table of its various changes or positions, and of the letters and numbers indicated by them, we are indebted to the article 'Telegraph,' in the seventh edition of the 'Encyclopædia Britannica,' by Sir John Barrow, one of the secretaries to the Admiralty.

Fig. 7.

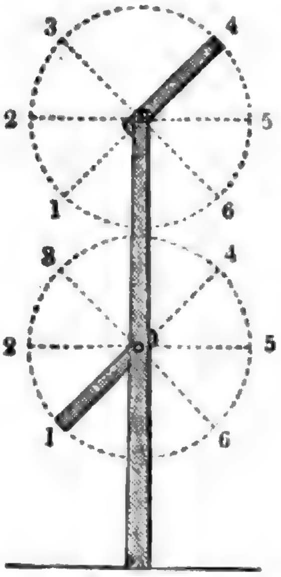


Table of the separate or distinct Signals given by the Admiralty Telegraph, with their respective Significations.

Signals by one and two arms.	Signification.	Signals by two arms.	Signification.	Signals by two arms.	Signification.
1	1	15	G	43	X
2	2	16	H	44	Y
3	3	21	I	45	Z
4	4	22	K	46	
5	5	23	L	51	
6	6	24	M	52	
1	A	25	N	53	
2	B	26	O	54	
3	C	31	P	55	
4	D	32	Q	56	
5	E	33	R	61	
6	F	34	S	62	
11	7	35	T	63	
12	8	36	U	64	
13	9	41	V	65	
14	0	42	W	66	

Sir Home Popham's telegraph, in addition to its superiority in the important quality of simplicity, was a great improvement upon those which preceded it in the details of mechanical construction and in the mode of effecting the required movements. These are minutely detailed and illustrated with engravings, in the thirty-fourth volume of the 'Transactions' of the Society of Arts, in whose museum a model of the telegraph is deposited. The vertical post or beam is not a solid mass of timber, but a hollow hexagonal mast, which, turning on a pivot at its foot, and in a collar where it passes through the roof of the cabin used as an observatory, may be moved so as to display its signals in any direction. The moveable arms are provided with balance-weights in the form of masses of metal attached to their shorter ends, very near to the pivots upon which they turn, by which means they are enabled to move in any direction with the exertion of a very small force; and they are made, when out of use, to fall into grooves or recesses in the post, so as to become wholly invisible. The movements are effected by means of two winch-handles near the base of the mast, within the cabin, one for each arm. The winch-handles turn two small vertical bevil-wheels, which communicate motion by means of two horizontal bevil-wheels to long upright shafts or rods, which pass up the inside of the hollow post of the telegraph. At the upper ends of these rods, which are held steady by suitable bearings, are endless screws, which work into toothed wheels fixed upon the axes of the arms, and thereby communicate motion to them. In order that the person who works the machine may know precisely when the arms are brought to the required positions, similar endless screws are added near the lower ends of the vertical rods, to give motion by toothed wheels to indexes, which give a miniature representation of the motion of the arms. Excepting these indexes and the winch-handles, the whole apparatus is enclosed in the vertical shaft of the telegraph, on the outside of which small blocks may be added, to enable a person, with the assistance of a rope from the top of the post, to ascend the machine for the purpose of cleaning and oiling it.

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* 16,999 is the maximum number stated in the description of the machine; but this is probably a misprint for 15,999, as no means is described for producing the number 16, although it is easy to conceive how it might be done, if necessary.

About the same time Sir Home Popham proposed a modification of the semaphore for marine purposes, which, he conceived, would be found very advantageous for the merchant-service, by superseding the necessity for a costly set of signal-flags; the expense and wear and tear of which formed a serious objection to a system of general telegraphic communication at sea, excepting in the ships of the East India Company. His proposed sea-telegraph would not, it is stated, cost more than fifty shillings at first, and its wear and tear would not amount to five shillings a year. As the height of an apparatus resembling his land-semaphore would be objectionable for marine purposes, Popham proposed to use two posts twelve feet two inches high and six inches thick, each having a single arm six feet four inches long and ten inches broad, pivoted to the top, but not falling into a slot in the post, as in the last-described machine. In a small slot at the top of each post is a grooved pulley or sheave fixed upon the same axis as the arm; and at a convenient height from the bottom of each post another precisely similar pulley is mounted in like way, its axis passing through the post, and carrying a small wheel with four handles at right angles with each other, by which the machine is worked; the motion of the lower pulley being communicated to the upper one, and consequently to the arm, by an endless rope, which has two or three turns round each of the sheaves, and passes up by the sides of the post. When the telegraph is in use, the posts may be attached to the side of the vessel by stepping their lower ends into blocks fixed for the purpose, and lashing them to the bulwarks; or they may be mounted upon trucks, so as to be readily moved from one part of the ship to another. The description of this machine in Sir Home Popham's communication to the Society of Arts mentions but four positions for each arm, and states that when placed in the four positions diagonally to the post, one arm denotes 1, 2, 3, and 4, and the other 5, 6, 7, and 8. This arrangement gives twenty-four distinct signals, and avoids the possibility of mistaking the horizontal for an inclined position of either arm, of which there might, owing to the motion of the ship, be some risk.

Major-General Pasley, in a pamphlet published in 1823, entitled 'Description of the Universal Telegraph for Day and Night Signals,' states that, although he at one time considered Popham's arrangements to be judicious, he now deems the use of two separate pivots in the land-semaphore, and of two posts in that for marine use, unnecessary; and that, conceiving simplicity to be of more consequence than the power of making many changes or distinct signals, he has abandoned the polygrammatic principle, and adopted the simple form shown in the next cut, *Fig.* 8, which represents what he styles the 'universal telegraph,' as adapted for day-service. It consists of an upright post with two arms, both attached to one pivot at its upper extremity. Each arm is capable of assuming the seven positions indicated in the cut, besides what is called the *stop*, which is made when turned down and obscured by the post. Twenty-eight distinct signals may therefore be made by the apparatus, as shown in the subjoined table; these being more than sufficient for the letters of the alphabet, though not numerous enough to allow of a full alphabet and the numeral characters.

Fig. 8.

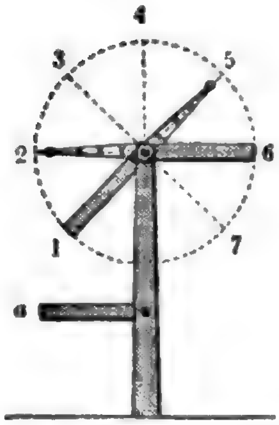


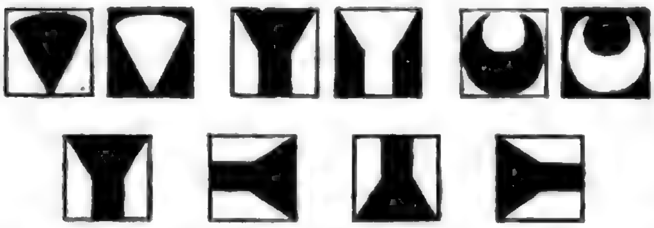
Table of the separate or distinct Signals given by Pasley's Universal Telegraph.

1	6	15	25	36	56
2	7	16	26	37	57
3	12	17	27	45	67
4	13	23	34	46	
5	14	24	35	47	

It had been found, in using Sir Home Popham's ship-semaphores, that inconvenience and uncertainty was occasioned by the signals being sometimes seen in reverse, in which case one number or sign would be confounded with another; and this circumstance having been mentioned to Pasley by an officer in the navy, he provided against its occurrence with his universal telegraph by the addition of the auxiliary arm, or indicator, marked *a* in the cut, which, in whatever direction the machine may be viewed, distinguishes the side at which the numeral signs commence. It serves also to prevent the position marked 4 from being confounded with the stop, which it might be if there were nothing to indicate that the telegraph is at work, and to enable the eye to measure its height. The arms and indicator of this telegraph are framed and pannelled, for the sake of lightness, and the former move respectively before and behind the post; the indicator only turning up, by means of a rope from below, into a cavity in the shaft, like the arms of Popham's semaphore. The counterbalance weights of the arms are not fixed close to the pivot, but extend to some distance from it, in the form of a slender framework of iron, with a ball at the outer extremity, their light appearance rendering them almost invisible at a distance. The motions are effected by an endless chain or rope, with a contrivance for keeping it at the necessary degree of tension, as this plan is quicker in action than that of Popham; but Pasley observes that if, as in a ship-telegraph, a rope or strap be used instead of a chain, the index attached to the lower pulley must not be implicitly depended upon. In a subsequent part of his pamphlet he states that, in working with a rope, it is best to have the pulley-grooves of a triangular form, or with notches of the same form, cut into projecting cleats fixed to their circumference, in which case the turns of the rope round the pulleys may be dispensed with. A friend who was well acquainted with the effects of the climate of India, recommended to him that no iron should be used in semaphores to be exposed to it, and no wood, excepting for the post, which may be of teak, and for some additional parts required to convert the machine into a night-telegraph, for which bamboo may be used. The pannels of the arms should, in such a case, be made of thin sheet-copper, and the other parts of the machine of brass or bronze. Pasley states that telegraphs should in general be painted black, and, if possible, so placed that they may be seen without any background. If however a background be unavoidable, the telegraph should be of such a colour as to contrast with it. In some cases, where the appearance of the background varies much at different periods of the day, it has been found useful to paint the arms white and black, in large chequers, each occupying half of the width and half of the length of the arm.

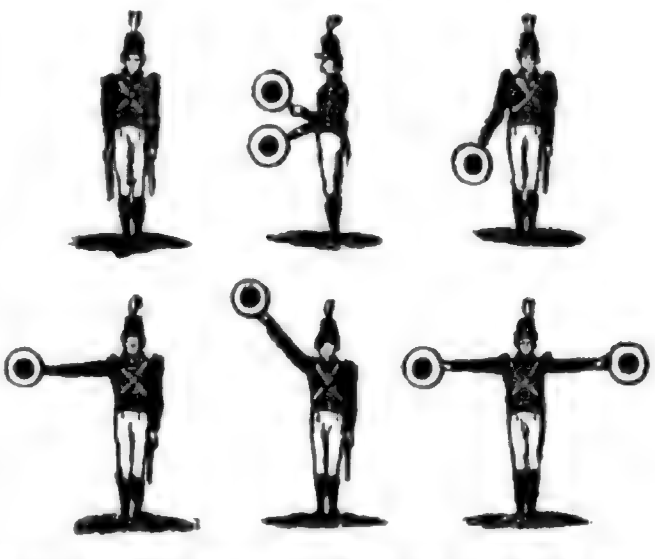
The ingenious contrivances which have been suggested for effecting telegraphic communication are so very numerous, that anything like an enumeration of them is impossible in this place. Several depend upon the application of arms of various forms to a semaphoric telegraph. A two-armed telegraph, of which the two arms are differently shaped, would be capable of making twice as many signals as a two-armed telegraph with both arms of the same form; but, for ordinary purposes, such an arrangement would have many disadvantages. A machine of this character, contrived by Mr. Alexander Law, for both land and sea service, is described in the thirty-third volume of the 'Transactions' of the Society of Arts. Another class of telegraphic contrivances depend upon the exhibition of devices or symbols, in a manner somewhat resembling the original contrivance of Dr. Hooke. Of this sort Macdonald describes one under the name of the 'symbolic telegraph,' in which symbols resembling those of Hooke, but representing numerals instead of alphabetic characters, are dropped from three boxes or screens into as many open spaces, which have the values of hundreds, tens, and units respectively. An auxiliary shutter, a ball, and a vane or flag, as in his shutter-telegraph, serve to increase the powers of the machine at pleasure. Another contrivance, which, like the last mentioned, is well adapted for a portable telegraph for use in moderate distances, was invented about the year 1817 by Mr. Conolly, and described by him in a pamphlet published in that year, in English and French, entitled 'An Essay on universal Telegraphic Communication,' and also in the thirty-sixth volume of the 'Transactions' of the Society of Arts. Conolly's 'Portable Telegraph' consists simply of three square boards painted with simple devices in black and white, as shown in *Fig.* 9, the colours on one side being the reverse of those upon the other. The six figures in the upper row are thus produced upon three boards, and each of these six figures is capable of producing four different signals, by turning each side of the board downwards in succession, as shown in the four devices at the lower part of the cut. Thus the three boards afford twenty-four distinct signals, which are sufficient for alphabetic communication; and one only is sufficient for making numerical communications, with the assistance of a smaller paddle-shaped board, the two sides of which, when it is used separately, denote affirmation or negation. In experiments made at Chatham, boards but eighteen inches square were found sufficient for a distance of two miles, with a telescope with a magnifying power of twenty-five; and Mr. Conolly had also, it is stated, exhibited these signals between Gros-nez and Sarque, a distance of seventeen miles, with boards twelve feet square. The day-telegraph of the Rev. James Bremner, alluded to in a previous column, consists of a framework with two circular openings, in each of which a semicircular screen or shutter revolving upon an axis in the centre of the circle, is capable of assuming four different positions. This machine expresses an alphabet of sixteen letters, by dividing the letters into four classes or sets of four each, and making one shutter express the class, and the other the number of the letter in that class. Major Charles Le Hardy communicated to the Society of Arts, in 1808, a telegraphic scheme of very different character to most that have been proposed. His telegraph consists of a large frame-work with nine radiating bars, representing the numerals from 1 to 9, and four sets of other bars intersecting them in such a manner as to form four concentric polygons (the whole apparatus having somewhat the appearance of a spider's web), which polygons express respectively units, tens, hundreds, and thousands; thousands being shown by the innermost polygon. Attached to the centre of the machine by pivots are four slender arms, carrying as many square boards of sufficient size to be visible at a distance; the respective lengths of these arms being such that the board of one may, during the revolution of the arm, traverse the polygon which represents thousands, that of another the hundreds polygon, &c. The action of the apparatus is as follows:—If it be desired to express the number 9202, the shortest arm is placed in such a position that its board may rest upon the radius 9, at the point where it is intersected by the thousands or innermost polygon; the next arm is turned to the radius 2, its board covering the point of intersection between it and the second, or hundreds polygon; the third arm and board is not called into action at all; and the fourth is, like the second, turned to the radius 2, the board covering the intersection between it and the outermost or units polygon. Thus far therefore the machine can express any number from 1 to 9999; but its power is increased by the addition of two other boards at the upper corners, one of which denotes 10,000, and the other 20,000, or, when displayed together, 30,000; so that the total range of the telegraph is from 1 to 39,999.

Fig. 9.



Several modes of telegraphic communication without machinery, or with nothing which cannot be conveniently carried by hand, have been devised, especially for the purpose of directing military operations, or of conveying speedy intelligence in time of war, where no line of ordinary telegraphs can be established. In 1808 such a plan, under the name of an 'anthropo-telegraph,' was laid before the Society of Arts by Mr. Knight Spencer, whose communication was printed in the twenty-seventh volume of their 'Transactions.' Mr. Spencer had observed, in the volunteer service, the inconvenience and loss of time occasioned in passing the orders of the commander-in-chief to the officers commanding distant divisions, when a great number of men were manœuvred together, and this led him to devise the plan alluded to, which he put in practice for the first time in 1805. His apparatus consisted simply of two circular discs of wicker-work, about eighteen inches in diameter, with handles six inches long, painted white, with a black circle or ball in the centre. As these did not weigh more than about a pound each, a man could easily hold them, one in each hand, in any required position. Standing in the position of the first figure in the subjoined cut, *Fig.* 10, with both discs held down and turned edgewise to the observer, the telegrapher indicated 'attention'; in the second position, he expressed a desire to convey intelligence to the correspondent at a distance; turning one-quarter round again, and displaying one disk as shown by the third figure, he expressed the number 1; in the next position, 2; in the fifth, 3; 4, 5, and 6 were expressed by positions the reverse of 1, 2, and 3; the right-hand disk being held edgewise, and the other displayed; 7 was shown by displaying both discs in the lowest position; 8, as shown by the last figure in the cut, by both held out at arm's length; and 9, by both elevated; 0 was given by holding both discs above the head, one behind the other, so as to appear but one; and the signal of 'point' or 'period,' used at the close of every number, by placing the right hand disc in front of the breast, and the other behind the back, so that, like all the other signals, it might be seen both in front and rear. Another position, formed by displaying the right hand disc in the position 1 and the left hand disc in the position 6, formed a signal of 'error,' to be used in case of any mistake which might require the repetition of a signal. By this simple arrangement any

Fig. 10.



number might be readily expressed; and consequently it might be applied to any numerical dictionary whatever. Signals might also be made at night, by attaching reflector-lamps to the discs, in such a manner that they might hang vertically in every position of the discs, and strapping another lamp, glazed with green glass, upon the breast of the telegrapher. If intermediate stations be required, there must also be lamps upon the back of the man and of the discs. The difference of colour between the lamps upon the body of the telegrapher and those attached to the discs is essential to the distinct perception of some of the signals; and the difference between 'attention' and 'point' or 'period,' in nocturnal telegraphing, depends solely upon it. A letter from Admiral Hunter accompanies the description; in which, after expressing a very favourable opinion of the plan, he recommends enlarging the discs to two feet diameter, and painting one side as above described, and the other with a white centre and black rim, so that either might be used, according to the state of the weather.

In the volume from which the above details are taken, there is also an account of a yet simpler contrivance, invented by Lieutenant Spratt, for telegraphing by means of a white handkerchief, held in various positions to express the numeral characters and a few other convenient signs. The inventor employed this mode of communication some time before the battle of Trafalgar, as a means of carrying on conversation with a distant vessel; and he had used it successfully to converse between Spithead and the green ramparts at Portsmouth, &c. With a common telescope it may be used at a distance of four miles. Macdonald describes some more complicated contrivances of similar character, by the display of small flags, or of two white handkerchiefs and a black hat; by the latter of which plans between fifty and sixty distinct signals may be made. He also shows how signals may be made to any required extent by men changing their positions from sitting to standing, &c. Twelve men, arranged in three sets of four men each, may in this way be used instead of his large shutter-telegraph.

Some of the earliest methods of telegraphic communication which have been noticed above were essentially adapted for nocturnal use; but in modern times the use of night-signals has not been extensively required, although provision might have been made for their exhibition in connection with many day-telegraphs. Thus, for instance, it was proposed to add lamps to the moveable parts of Chappe's telegraph; and Edelcrantz suggested the application of lamps to his ten-shutter machine. In Davis's seven-shutter telegraph, previously described as applied to day-service, night-signals were to be given by a coloured lamp mounted in the centre of the seventh or sliding shutter, and six white lights attached to the outside of the frame, to produce, by their display or concealment by slides, the same signals as, under ordinary circumstances, are given by the opening and closing of the shutters. These side-lamps were to be secured to upright pieces of wood, sliding up and down in dovetailed grooves in the outside of the frame-work, so that they might be readily withdrawn when not in use. Provision is made for the adaptation of Pasley's universal telegraph to nocturnal communication by adding a central light at the top of the post, a lamp to the extremity of each arm, and an additional light as an indicator, suspended from a light derrick or crane projecting horizontally beyond the range of the arms, and on a level with the top of the post. This, the lamps themselves, and the additional counterweights required with them, should all be removed during the day. How little necessity there is, under ordinary circumstances, for the use of telegraphs by night, at any rate in connection with the navy, may be assumed from the statement of Sir John Barrow, that no attempt was ever made to add lamps to the six-shutter telegraphs formerly used by the Admiralty, notwithstanding the ease with which it might have been done. The semaphores now used by the Admiralty are also constructed without any provision for the display of night-signals. Macdonald's treatise (1817) contains several schemes for night-telegraphs, both for land and sea; one of which, consisting of three sets of four lights each, with an additional or director light to each set, has the same extensive powers as his favourite large shutter-telegraph.

Marine telegraphic communication is an object of even greater importance than that which has been principally treated of in this article, since there are many circumstances which render personal communication between vessels at sea impracticable, and that sometimes in cases of the greatest emergency. But, although naval signals have been, of necessity, long used, and flags of various forms and colours have been extensively employed for the purpose of making them, it was not till within a comparatively recent period that they were reduced to anything like an efficient telegraphic system. Sir John Barrow states (*Ency. Brit.*, art. 'Navy') that 'The idea of *numbering* the flags, and of assigning a certain number of corresponding sentences to certain combinations of these numbers, was reduced to something approaching a regular system in the fleet of Lord Howe;' and that in the year 1798 a new signal-book was issued by the Admiralty, the references to which were made by a numerical arrangement of flags. This book contained about four hundred sentences, expressive of the most usual operations of the fleet; but it was so imperfect that, if any order had to be transmitted which was not to be found in the dictionary, it became necessary to make the signal for 'a boat from each ship;' an order which could not always be complied with. This inconvenience was remedied by the plan, suggested by Sir Home Popham, of making the flag-signals represent the letters of the alphabet, as well as words and sentences, in connection with numbers. This individual also printed, at Calcutta, a new code of naval signals, which was subsequently reprinted in England, greatly extended, and adopted for use in the navy. Among the numerous improvements introduced by him is a new method of cutting the signal flags, so that, as he explained to the Society of Arts in 1816, 'the selvages of the buntin are brought on the outer edges of the flags, and the gorings in the centre; by which means the outer edge is susceptible of the least air of wind, and when the flag blows out, the gorings assist in keeping it out; whereas the old flags had a hem on the outside, which rendered them difficult to be moved without a fresh breeze, especially in damp and rainy weather, as the hem then became very heavy.' 'Besides,' he adds, 'it is impossible, from the nature of the buntin, to sew a straight seam, for the instant it is cut it will become in some degree curved.' (*Transactions*, vol. xxxiv., p. 174.) The only objection urged by Barrow to the code of naval signals now in use is one which is also applicable, more or less, to all that have been subsequently proposed, namely, the great number of flags, &c., required for making numerical signals to the extent laid down; which, in the code in question, amount to nine flags, five cornettes, five triangles, and five pendants. With such a number, he states, it is next to impossible, in calm weather, to make out the figure and colour of the flags; and equally so when, though expanded by the wind, the situation of the observer causes them to present only an edge towards the eye. He conceives that Popham's sea-telegraph, before described, is capable of entirely removing this difficulty; and that possibly Pasley's universal telegraph might be applied in like way with advantage.

The principle of the numerical system as applied to flag-telegraphs in the navy is briefly explained by Macdonald. Nine different variegated flags are employed to express the numerals 1 to 9, another for 0, and another, called a *substitute*, to repeat any flag under which it is hoisted, in case of the same numeral occurring twice in the number to be expressed. A pendant is also used in some cases as a substitute for the uppermost figure: and thus, by the use of eleven different flags and a pendant, any number from 1 to 999 may be expressed without displaying more than three flags, or two flags and a pendant, at once. In a telegraphic system devised by Mr. Conolly, and fully explained in the 'Transactions' of the Society of Arts for 1817 (vol. xxxv., pp. 205-208), flags are applied to express numbers in a different manner to the above. The basis of the system is an alphabetical list of the most necessary English words, arranged in a tabular form like the figures in the common multiplication table; the columns and horizontal lines being numbered. There are ninety-nine of each; and consequently the number of squares or divisions is 9801. The number of words is however greater, because in some cases, where no ambiguity is likely to be occasioned by it, the radical word and several of its modifications are placed in a single square or division of the table. The signals consist of twelve square flags (ten for the numerals and 0, a substitute, and a preparative signal), the same number of triangular flags, of similar colours and devices, and a pendant; and any word contained in the table may be expressed by one or two square flags to indicate the number of the vertical column in which it occurs, and one or two triangular flags hoisted beneath them, to point out the horizontal column. In case of both the square and the triangular flag requiring to be doubled at once, instead of the two substitutes, the pendant is hoisted between them; and if it be necessary to spell any name or word not contained in the vocabulary, the twelfth triangular flag (answering to the square preparative signal) is hoisted to indicate that the twenty-four flags are to be taken for the letters of the alphabet, according to a preconcerted order.

We should not quit the subject of marine telegraphs without adverting to the very important advantages likely to accrue to the commercial shipping interest by the general adoption of a simple and uniform code of communication between vessels at sea, and from them to coast stations, or *vice versâ*. This desirable object is now being greatly promoted by the commercial telegraphic association superintended by Mr. B. L. Watson, whose signal books are, in future, by the direction of the Lords of the Admiralty, to be supplied to all the government vessels, in order that they may communicate with such merchant vessels using the code as they may meet with at sea. The whole code consists of thirteen flags, by which any message may be communicated from one vessel to another, or between a vessel at sea and any of the coast-stations established by the association at prominent points around the British islands. In connection with these coast-stations there are lines of semaphores from the Downs to London; from Holyhead to Liverpool; and from the Spurn to Hull; and from all of them communications are transmitted to a central office in London, and also to the owners or consignees of vessels entered in the telegraph list; for which privilege a subscription of twenty shillings per annum is paid to the association for each vessel. In like manner any message from the owners of a vessel, relative to change of destination, or otherwise, can be communicated from any station within sight of which she may pass.

Having now noticed the principal varieties of telegraphs which act by displaying signals visible at a distance, whether for use on land or at sea, it only remains, before alluding to contrivances of a different character, very briefly to touch upon a few points which bear upon telegraphic communications generally, but more especially upon land. The subject has been so ably treated by Sir John Barrow, in the article before alluded to, with the peculiar advantages derived from his connection with the Admiralty, that we cannot do better than condense some of his remarks on the comparative merits of different telegraphic systems. He observes that a telegraph employed for public purposes should be possessed of *power*, *certainty*, *simplicity*, *celerity*, and *secrecy*. It should have sufficient power to express, by distinct positions or combinations of moveable parts, any possible order or information, either by letters, words, or sentences. Its certainty will depend upon all its parts being clearly defined, wholly within the field of the telescope, and so distinct that there shall be no risk of mistaking one signal for another; whence the importance of simplicity becomes obvious. Bearing these points in mind, Barrow conceives that the choice will be found to lie between the six-shutter telegraph, Popham's semaphore, and Pasley's universal telegraph. Macdonald thinks that the arms of the semaphore are not so distinguishable even in clear weather, and not near so visible in cloudy weather, as the boards of a shutter-telegraph; but Barrow cites some observations of Mr. Gamble, which tend to a contrary result; making it appear that, owing to the confusion in the image on the retina, occasioned by the refraction of the atmosphere, the property which he terms *insulation* is generally more requisite than mere superficial magnitude, to give distinctness to a distant object. This point is illustrated by supposing a person to look at the letter I in the midst of a printed page, and to remove the paper from the eye until the image becomes indistinct from being confused with the surrounding letters; and observing how much more distinct the image would appear if the letter were printed alone upon a sheet of white paper. This question however does not rest upon mere theory or analogy; for it is stated that every officer upon the Admiralty line bears testimony to the superior distinctness of the semaphore at all times, and especially in cloudy weather. In order fully to decide the question, the shutter-telegraph at Nunhead, near New Cross, was left standing for some time on the same hill as the new semaphore; and the result of the trial for a whole winter was, 'that the semaphore was frequently distinctly visible when the boarded telegraph was so much enveloped in mist and fog that the particular boards shut or thrown open could not be distinguished;' and that the number of days in the course of the winter upon which the semaphore was visible exceeded those upon which the shutters could be seen by fully one-third. Even in the six-shutter telegraph one shutter was occasionally mistaken for another, and such accidents would doubtless have been more common had a more complicated shutter-telegraph, like that of Macdonald, been employed. The objection urged against the semaphore on the ground of the longer time taken to move the arms, because they describe arcs of larger circles than the boards of a shutter-telegraph, is hardly deserving of notice, as the difference (which may, Barrow says, amount to one second in each signal) is amply compensated by the greater facility of reading off. The semaphore has also the advantage in the greater simplicity of its machinery, which is much less liable to get out of order than that of the boarded telegraph.

As shown by the tables given in the previous descriptions of the three machines particularly noticed by Barrow, the shutter-telegraph has the power of making a greater number of combinations without the use of the stop-signal (or signal which separates one word or one sentence from another) than either of the others, and Pasley's universal telegraph has the least power; but this is of little consequence, if the lowest power prove sufficient. Although the primary signals of the universal telegraph are only 28 in number, they may be increased to 784 by the use of two changes with one stop-signal between them (making three signals in the whole), or, by making three changes (four signals, with the stop), to 21,952; a number considerably exceeding the words and sentences in Sir Home Popham's telegraphic dictionary, which do not exceed 13,000. As this dictionary has never, it is affirmed, been found materially deficient in any of its divisions of subjects, it is evident that even when applied to communication by words and sentences instead of by letters, Pasley's simple telegraph affords sufficient power for all useful purposes; and further, that those who have extended their telegraphic dictionaries to very high numbers (Pasley mentions one extended to 140,000), have impaired their usefulness, owing to the difficulty and loss of time in finding the required sentence among so many. 'We have actually seen in one telegraphic dictionary,' observes Sir John Barrow, '120 pages, of three columns in each page, and sixty sentences in each column, containing upwards of 20,000 sentences (about one-third of the number of words in Johnson's dictionary), and each of these sentences beginning with the personal pronoun "He;" 20 pages with "If," &c.' 'Compared with the use of such a dictionary,' he proceeds to say, 'spelling the sentences is infinitely preferable as to certainty, and in many cases as to celerity. Indeed we should say that the abbreviated nature of communications made by telegraphs renders spelling by far the most eligible mode. In clear weather the rapidity of working single signals, the short compass within which any message may be condensed, the impossibility of committing any mistake that cannot be immediately rectified, more than compensate for the difference of a few minutes which the use of sentences may probably save. In cloudy or foggy weather, the latter method will always be liable to mistake. If experience may be assumed as a guide, the practice at the Admiralty of spelling all sentences, for the last thirty years, must decide in favour of that system.' In making communications alphabetically, much time may be saved by omitting non-essential words and letters, especially vowels. For example, the meaning of the sentence 'Order the Agamemnon out of harbour, and direct her to proceed to Spithead,' may be sufficiently expressed by 'Agmemn. to Spthed.' It is also important to condense the substance of the communication as much as possible into the former part of the message, so that no serious mistake may arise if the communication should be interrupted by foggy weather. Barrow relates a circumstance which occurred during the Peninsular war, in which some anxiety was occasioned by the non-observance of this principle: a despatch from Plymouth to convey intelligence of a British victory having been commenced by the words 'Wellington defeated,' and then broken off by fog, which prevented the whole meaning, 'Wellington defeated the French at,' &c., from being transmitted. Had the message run thus, 'French defeated at,' &c., the interruption of the despatch would have been of far less consequence.

Any means of telegraphic communication which depends upon the deciphering of signals exhibited at a distant station is necessarily dependent upon contingencies of weather; but many plans have been contrived for effecting the object in such a manner as to be independent both of light and of the state of the atmosphere. For communication between the different parts of a house this object may be effected by a mechanical connection, by chains or wires, between two dials with revolving indexes or pointers, in such a way that when one pointer is directed to a particular letter or word inscribed upon the dial to which it is attached, the other may exhibit a similar movement. The attention of the servant is engaged previously by ringing a bell; and when the required signal has been made, a spring returns both indexes to their original position. Such a plan, though very useful for domestic purposes, is not adapted for distant communication. Speaking-pipes, or tubes to convey the voice from one place to another, are also available for short distances, but their range is too limited for application on an extended scale. One of the early schemes of this character depends upon the principle of water always finding its level; but, independent of the difficulty which might arise from the friction of water in a very long pipe of small diameter, such as would be required to connect the vertical tubes in which the observations would be made, such a plan involves the necessity of having all the communicating stations at or near the same level. Other hydraulic telegraphs depend upon the incompressibility of water or other liquids; it being proposed to lay down small pipes of any required length, and to indicate different signals by pressing more or less upon the surface of the fluid contained in them, which would, it is supposed, transmit the motion to the opposite end of the pipe, where it might be pointed out upon a dial, or in any other convenient manner. Mr. Vallance described such a method of telegraphic communication in a pamphlet, published in 1825, of which Hebert gives some account (*Engineer's and Mechanic's Encyclopædia*, vol. ii., pp. 767-8); and some similar schemes have been more recently propounded. Air confined in small pipes has also been tried to a limited extent as a pneumatic telegraph; but in this, as well as in the hydraulic system, the risk of leakage is a serious disadvantage. The application of electricity to telegraphic communication is attended with fewer difficulties, and has recently been carried into effect on an important scale by Messrs. Wheatstone and Cooke. The possibility of so applying it was conceived by several persons long before it was attempted on a practical scale. Arthur Young, who visited France in 1787, 1788, and 1789, mentions, in his travels, the experiments of M. Lomond, who was able by means of electricity to convey messages from one room to another; and the Rev. Mr. Gamble, in his description of his original shutter-telegraph, alludes to the project of electrical communication. Mr. Francis Ronalds, in a pamphlet on this subject, published in 1823, states that Cavallo proposed to convey intelligence by passing given numbers of sparks through an insulated wire; and that, in 1816, he had himself tried experiments upon this principle, which he deemed more promising than the application of galvanic or voltaic electricity, which had been projected by some Germans and Americans. He succeeded perfectly in transmitting signals through a length of eight miles of insulated wire; and he describes minutely the contrivances necessary for adapting the principle to telegraphic communication.

It is however to the joint labours of Messrs. W. F. Cooke and Professor Wheatstone that electric telegraphs owe their practical application; and in a statement of the facts respecting their relative positions in connection with the invention, drawn up at their request by Sir M. I. Brunel and Professor Daniell, it is observed that 'Mr. Cooke is entitled to stand alone, as the gentleman to whom this country is indebted for having practically introduced and carried out the electric telegraph as a useful undertaking, promising to be a work of national importance; and Professor Wheatstone is acknowledged as the scientific man whose profound and successful researches had already prepared the public to receive it as a project capable of practical application.' Their telegraph, which was patented in 1837, acts upon principles founded on Oërsted's celebrated discovery, that a magnetic or compass needle may, through the agency of a voltaic current, be invested with an artificial polarity. [Electro-Magnetism, vol. ix., p. 342.] 'Thus,' explains Mr. Cooke (*Telegraphic Railways*, p. 14), 'as a natural stream of electricity passing round the circumference of the earth causes magnetic needles in general to be deflected at right angles to its course, or towards the north and south poles, so an artificial stream of electricity of adequate strength will cause magnetic needles placed within its influence to be similarly deflected at right angles to *its* course, whatever that may be. If then a magnetic needle were placed parallel and near to any part of a conducting wire, which we will suppose to be laid down between London and Blackwall, the transmission of an electric current from a voltaic battery would cause the needle to change its position, so as to stand during the continuance of the current at right angles to the wire, being turned in one direction or the other according to the course of the current. If this deflexion of the needle were limited by two fixed stops placed respectively at the two sides of one of its poles, the motion of that pole to one stop might evidently constitute one signal, and its motion to the other stop another signal.' Such an apparatus is shown in *Fig.* 11, the dial upon which the signals are represented being removed. In this cut *a* may be supposed to represent the battery, and *b b* the conducting wire, which is formed behind the dial into a coil *c*: *d d* is the magnet, which is mounted upon an axis passing through the coil, and carrying upon its extremity, which comes through the dial, an index or pointer *e*. The arrows indicate the direction of the current required to deflect the magnet to the position indicated in the figure; and a current in the opposite direction would produce a deflexion towards the opposite side. While no current passes through the wire, the magnet and pointer remain vertical. The next cut (*Fig.* 12) represents three such instruments complete, and connected together by wires enclosed in tubes, which may be of any required length. One of these may be supposed to be at the Minories, the next at an intermediate station, and the third at Blackwall; and as each is provided with a battery, and a handle (beneath the dial) by which the conducting wire may be connected with it at pleasure, the attendant at every station at which such an instrument is placed can instantaneously communicate the signal to 'stop' or to 'go on' to all the other stations; attention being previously engaged by ringing a bell, placed above the dial, by an ingenious application of the voltaic current. By this beautifully simple apparatus the peculiar method of working the trains upon the Blackwall railway [Railway, vol. xix.,

Fig. 11.

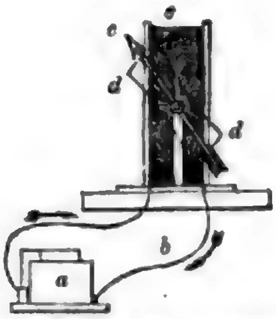
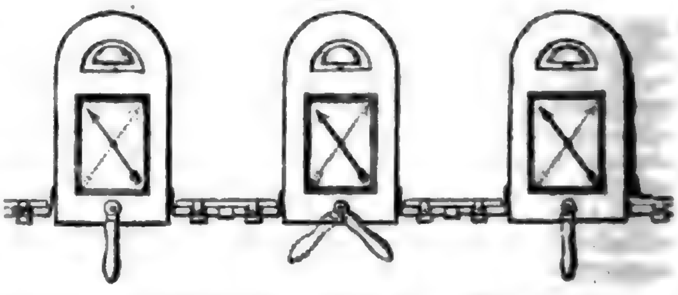
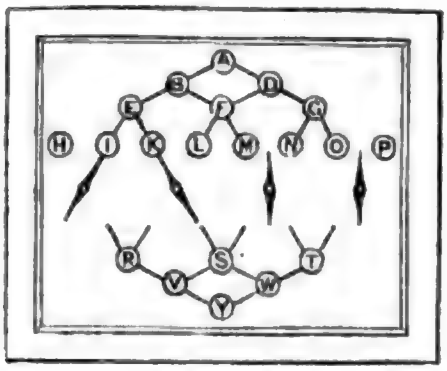


Fig. 12.



p. 260] is effected with the greatest ease, although it is essential that the attendants at each terminus should know not only when the train is ready to start from the opposite end of the line, but also when the carriages at the five intermediate stations are ready. In stopping the trains the same precise information is required, and it is of vital importance in case of any casualty to the rope or to any of the carriages. It is perhaps not too much to say that the mode of working adopted on this railway would be impracticable without the aid of the electric telegraph. Some telegraphs of more extensive powers than the above are in use on the Blackwall railway, as well as on the Great Western and Edinburgh and Glasgow lines. *Fig.* 13, which represents a dial like that on the Great Western Railway, shows how, by the combination of four such magnets and pointers as are described above, all the letters of the alphabet may be expressed, by pointing one or two needles towards them; and of course a larger or smaller number of signals might be made on the same principle if necessary. A telegraph with two pointers, showing eight signals, is considered by Mr. Cooke to be sufficient for all ordinary purposes. The wires, where several are used, are combined into a rope and enclosed in an iron tube, which may be either buried beneath the surface of the earth or supported above it; and they are insulated from each other by wrapping them round separately with a mixture of cotton and caoutchouc. For details of construction as applied to various purposes, and for an exposition of the great advantages derivable from the use of the electro-magnetic telegraph, especially in connection with railways, we must refer to the publications of Mr. Cooke, the 'Reports of the Select Committee of the House of Commons on Railway Communication' in 1840; and the 'Railway Times' for June 12, 1841. The longest continuous line yet completed is that from Paddington to West Drayton, about thirteen miles; but this has been so arranged for the purpose of experiment as to be equal to a stage of thirty-nine miles. It is reported (July, 1842) that an electric telegraph is about to be laid down along the South-Western Railway, from London to Gosport.

Fig. 13.



(Hampton's *Polybius*; Bishop Wilkins's *Secret and Swift Messenger*; Derham's *Philosophical Experiments*; Macdonald's *Treatise on Telegraphic Communication*, 1817; Pasley's *Description of the Universal Telegraph*, 1823; Ronalds's *Descriptions of an Electrical Telegraph, &c.*, 1823; Cooke's *Telegraphic Railways*, 1842; *Transactions of the Society of Arts*; *Encyclopædia Britannica*.)

TELE'MACHUS (Τηλέμαχος), the son of Odysseus (Ulysses) and Penelope. When his father joined the Greeks in their expedition against Troy, Telemachus was very young, but during his father's absence he grew up to manhood. When the gods had decreed that Odysseus should return home from the island of Ogygia, Athena (Minerva), assuming the appearance of Mentes, king of the Taphians, appeared to Telemachus, and advised him to get rid of the suitors of his mother; but if Penelope should wish to marry again, to send her to her father's house, that she might celebrate her nuptials there. She also advised him to sail to Pylos and Sparta, to see whether he could learn anything concerning his father, who, as she said, was probably still living in some island where he was forcibly detained; but if he should be dead, she enjoined Telemachus to raise a monument to his memory, and to rid himself of the suitors of his mother either by stratagem or by force. Telemachus obeyed the commands of the goddess, and visited Nestor at Pylos and Menelaus at Sparta. Both of them received him hospitably, and Menelaus communicated to him the prophecy of Proteus about his father. In the meantime Odysseus arrived in Ithaca, and lodged with Eumaeus, the swineherd, in the disguise of a beggar. In this condition he was found by Telemachus, who, by the advice of Athena, had also returned to Ithaca. The father made himself known to his son, and the two devised a plan for getting rid of the suitors. They went to the town, and Odysseus was admitted as a beggar to a feast of Telemachus and the suitors. When the suitors began to insult the poor man, a fight ensued, in which Odysseus and Telemachus killed the suitors. Telemachus then accompanied his father to the aged Laertius. Thus far the story is described in the Odyssey. Later writers mention other incidents connected with the story of Telemachus, especially relating to his marriage, which however is told in different ways. According to one tradition, he married Circe or her daughter Cassiphone, and he had a daughter Roma, whom he gave in marriage to Aeneas. Servius (*ad Aeneid.*, x. 167) calls him the founder of the town of Clusium in Etruria.

In modern times the name of Telemachus has acquired celebrity from the moral romance of Fénélon, which is based upon the story in the Odyssey. [FENELON.]

TELEMANN, GEORG PHILIPP, a name of no mean rank in musical history, therefore entitled to some notice here, was son of the minister of the Lutheran church at Magdeburg, and there had his birth, in 1681. Though educated with other views, his predilection for music was too strong to be combated, and it became his profession. He successively held many appointments in Germany, the chief of which was that of composer to the Lyric theatre at Hamburg, for which he produced no less than thirty-five operas. But these were only a small part of his labours: he is said to have exceeded the prolific Alessandro Scarlatti in the number of his works for the church and the chamber; and, in 1740, his overtures on the model of Lulli amounted, Doctor Burney tells us, to six hundred! Strange however as it may appear, yet it is most true that of this almost incredible number of compositions, only two or three fugues are now known, at least in England, and these only to a very few organists of patient and deep research.

Telemann was a fellow student of Handel, and attained considerable longevity, having died in 1767, at the age of 86. He was twice married, and each wife had ten children; and it is remarkable that not one of them manifested the slightest inclination for the art to which their father owed his fortune and repute

TELEOSA'URUS. Since the article CROCODILE was written, Professor Owen has published his valuable *Report on British Fossil Reptiles*, in which he notices, among others, a family of extinct crocodilians characterized by a combination of a bi-concave structure of the vertebræ with long, narrow jaws, armed with slender, conical, sharp-pointed, and equal teeth, adapted, like those of the existing Gavials, for the seizure and destruction of fishes. Professor Owen makes this family consist of two genera, whose characters mainly rest on the difference of position in the external nostril. In the first of these, *Teleosaurus*, the external nostril is terminal and placed at the extremity of the upper jaw; in the other, *Steneosaurus*, this aperture is a little behind and above the termination of the upper jaw.

Geological Distribution and Habits of the Family.—The *Teleosauri* and *Steneosauri* are confined to the oolitic division of the secondary rocks. At this period there were scarcely any mammals, but fishes were abundant, and Professor Owen refers to the just observation of Dr. Buckland in his *Bridgewater Treatise*, that it might, *à priori*, have been expected that if any crocodilian forms had then existed, they would most nearly have resembled the modern Gavial. Professor Owen goes on to remark that the modification in the structure of the vertebral column, and the complete mail of imbricated bony scutes, characteristic of the species, indicate that the habits of the antient *Teleosauri* and *Steneosauri* were more strictly marine than those of the modern Gavials, and that their powers of swimming, of pursuing and overtaking their aquatic prey, were greater.

After noticing the papers of Messrs. Wooller and Chapman, in two separate communications in *Phil. Trans.*, vol. 50, 1758, and the figures of an incomplete skeleton here given, as one of the earliest evidences of antient reptiles which is recorded in a scientific publication, and observing that, notwithstanding the remark of Captain Chapman, that 'it seems to have been an alligator,' and of Mr. Wooller, that 'it resembles in every respect the Gangetic Gavial,' Camper pronounced it to be a whale, meaning perhaps a dolphin; an opinion adopted by Faujas, who went a step further, and referred it to the genus *Physeter*, Professor Owen points out Cuvier's refutation of Faujas in the first edition of the *Ossemens Fossiles*, and his declaration in the same work that it was in truth a crocodile. The Professor adds, that Cuvier's subsequent analysis led him (in 1812) to the conclusion that it belonged to the genus of Crocodiles, and was most probably identical in species with the crocodile of Honfleur.

But although the opinions of Messrs. Wooller and Chapman came much nearer to the truth than those of Camper and Faujas, they were still distant from it; and Professor Owen proceeds to show that the fossil really differs more from the Gavial than the Gavial does from any other existing Crocodilian.

Pursuing his inquiry, Professor Owen remarks, that in 1836, when so many new and singular genera, allied to the Crocodilian family, had been added to the catalogues of palæontology, by the labours of English anatomists and geologists principally, Cuvier expresses his opinion with more caution. Cuvier *then* says, 'It now remains to be known whether it is a crocodile, or one of those new genera discovered in the same beds. The bones of the extremities are too incomplete, and the head is not represented with sufficient details, to decide the question; but the vertebræ appear to me to be longer, in relation to their diameter, than in the new genera, and, in this character, more like those of Crocodiles. Those alone who shall rediscover the original, if it still exists, will be able to inform us whether the other characters respond to those referred to.'

Professor Owen inquired at the British Museum, to which the collections formerly belonging to the Royal Society of London were transferred, but he states that no specimen corresponding with the account and figures given by Messrs. Wooller and Chapman exists in that museum.

But a second specimen of a Crocodilian with a long and slender nose was procured from the lias near Whitby (between Staiths and Runswick) in 1791, and a more perfect skeleton was obtained from the alum-shale of the lias formation at Saltwick, near Whitby, in 1824. Professor Owen states that both these specimens so closely resemble the older fossil in all the points in which a comparison can be established, as to dissipate the remaining doubts as to the nature and affinities of the specimen from the same locality described in *Phil. Trans.*, 1758. He then refers to the figures of the skeleton discovered in 1824, in Young and Bird's *Geological Survey of the Yorkshire Coast*, and in Dr. Buckland's *Bridgewater Treatise* [CROCODILE, vol. viii., p. 169], observing that it is now preserved in the museum at Whitby, where he closely examined it. 'In this specimen,' says the Professor, 'are preserved the cranium, wanting the snout, the whole vertebral column, the ribs, and the principal parts of the four extremities, together with the dorsal and part of the ventral series of dermal bones. The entire length of the skeleton, following the curvature of the spine, is fifteen feet six inches, to which may be added two feet six inches for the lost snout. The cranium posteriorly is broad, depressed, and square-shaped: it begins to contract anterior to the orbits, and gradually assumes the form of the narrow depressed snout; the converging sides of the maxillæ are concave outwardly. The zygomatic spaces are quadrilateral, longer in the axis of the skull than transversely; the orbits are subcircular; they look upwards and slightly outwards; their margins are not raised, and their interspace is slightly concave. The parietal bone is relatively longer than in the Gavial, and sends up a longitudinal median crest, from the posterior part of which a strong process extends on each side outwards, and curves slightly backwards parallel with the ex-occipitals, to join the mastoid and tympanic bones, the latter of which expands as it descends to form the joint for the lower jaw.'

Professor Owen then gives details of the dimensions, from which he calculates that the entire length of the skull must have exceeded 4 feet 6 inches. He states that the cranium of one of the Caen Teleosauri measures 3 feet 4 inches, whence Cuvier calculates the entire length of the animal at near 15 feet. Professor Owen remarks that the Whitby Teleosaur agrees with the Caen species, and differs from the Gavial in the following particulars:—the anterior frontal bone is less extended upon the cheek; the lacrymal is much more extended, and is larger at its base; and the jugal bone is more slender. The posterior frontal bone, which separates the temporal from the orbital cavities, is much longer and narrower. 'The parietal and occipital crests each form a thin trenchant plate, and are not flattened above. The mastoidean angle is not uninterruptedly united with the back part of the articular process of the tympanic; it is separated from it by a large depression, which is overarched by a trenchant crest belonging to the ex-occipital. The mastoidean bone has a concavity at its descending part, of which there is no trace in the Gavial. The indentation between the articular process of the tympanic and the tuberosity of the basi-occipital is much smaller than in the Gavial, and the basilar tuberosity projects downwards in a less degree. The pterygoid ala is not expanded externally, as in all crocodiles, but is contracted by a large fissure at the part where it is going to unite itself to the bone; the orbital margin of the malar is not raised, and does not leave behind it a deep fissure, as in the Gavial. The malar does not rise to join the posterior frontal bone; but, on the contrary, the frontal descends to join the malar at the external margin of the orbit. The vacuity between the orbit and the anterior part of the tympanum is much elongated in the fossil, and occupies four-fifths of the temporal fossa; the anterior part of this fossa is narrow and acute. The columella, or ossicle of the ear, is cylindrical, and much larger in proportion than in any known crocodile or other reptile.

'Cuvier calculates the number of teeth in the *Teleosaurus Cadomensis* to be 180, viz. $\frac{45-45}{45-45}$. The *Teleosaurus Chapmanni* has at least 140 teeth. The Gavial has 112, or $\frac{28-28}{28-28}$. The teeth of the Whitby Teleosaur are as slender and sharp-pointed, but not so compressed as in the Gavial; they correspond with those of the Caen Teleosaur, and equally illustrate the dental characters usually attributed to the present extinct genus.'

Professor Owen then shows that the Whitby Teleosaur differs from the Caen Teleosaur, as does the Monheim Teleosaur (*Crocodilus priscus*, Soemmering), in having the upper temporal fossa longer in proportion to their breadth, and that it also differs from the Teleosaurs of both Caen and Monheim in the more equal size of the teeth, and from that of Monheim in the greater number of teeth, the *Teleosaurus priscus* having at most $\frac{27-27}{26-26}=106$. He also points out other differences.

In treating of the *vertebral column*, the author states that the number of vertebræ in the true crocodiles of the present period rarely exceeds sixty, the number assigned by Ælian to the crocodile of the Nile. Cuvier, he observes, generally found 7 cervical, 12 dorsal, 5 lumbar, 2 sacral, and 34 caudal vertebræ. In the *Crocodilus acutus*, he remarks, a thirteenth pair of ribs is occasionally developed, and, according to Plumier, the last-mentioned species has two additional caudal vertebræ; the alligator (*Alligator Lucius*) [CROCODILE, vol viii., p. 163] has 68, the additional ones being in the caudal region; the Gavial has 67 vertebræ, viz. 7 cervical, 13 dorsal, 4 lumbar, 2 sacral, and 41 caudal.

'The very perfect specimen in the Whitby Museum,' says Professor Owen, 'displays the number of the vertebræ through the whole spinal column, and establishes another difference between the Teleosaur and the Gavial, the former having a number of vertebræ intermediate between the Crocodiles and Gavials, viz. 64, with a special peculiarity in the excess of costal vertebræ, as the following formula indicates, viz., 7 cervical, 16 dorsal, 3 lumbar, 2 sacral, 36 caudal. In all subgenera of existing crocodiles, as in the extinct tertiary species, the hind surface of the vertebra is convex, the fore surface concave, except in the atlas and two sacral vertebræ. Cuvier, who had the opportunity of seeing only the annular part (neurapophyses) of the cervical vertebræ of the Caen

Teleosaur, regrets his inability to state whether either of the articular extremities of the centrum were convex, or which of them. The Whitby Teleosaur decides this question, and shows that both articular extremities of the vertebræ are slightly concave in the cervical as in the rest of the vertebral series. The atlas in the Teleosaur corresponds essentially with that of the crocodiles, as is shown by the three main component parts of this bone, from a Whitby Teleosaur in Lord Enniskillen's collection. The body or centrum is a transverse quadrilateral piece, smooth and convex below, narrowing like an inverted wedge above, with articular facets, viz.: a concavity in front for the occipital condyle; a flat rougher surface on each side of the upper part for the attachment of the neurapophyses; a posterior facet for the anterior part of the detached odontoid element of the axis; and the small surface on each lateral posterior and inferior angle, for the atlantal ribs. The neurapophyses are pyramidal processes, with their apices curved towards each other; they are relatively smaller in proportion to the centrum than in the crocodile. The general anterior concavity for the reception of the occipital tubercle is formed at its circumference by the centrum and neurapophyses of the atlas, and at its middle by the anterior detached odontoid epiphysis of the axis, which is here evidently the analogue of the so-called atlas in the *Ichthyosaurus*, the true body of the atlas in the Teleosaur representing the first inverted wedge-shaped bone in the Ichthyosaur. The spine of the atlas is a large oblong piece articulated with the neurapophyses of the atlas, and partly overlapping those of the axis.'

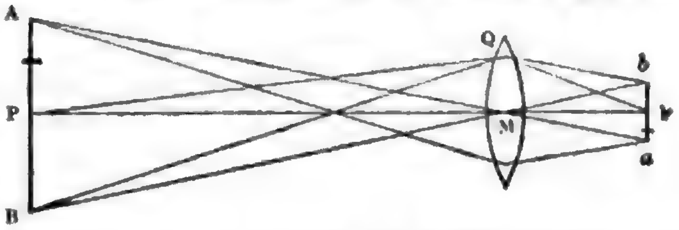
The Professor then describes in detail the cervical vertebræ, from which it appears that the same mechanism for fixing and strengthening the neck, as is found in existing species, exists in the ancient marine crocodiles; the vertebræ of the dorsal region, with 16 pairs of ribs, a greater number than occurs in any existing Crocodilian; a posterior dorsal or lumbar vertebra, which faintly indicates one of the most striking characters of the vertebræ of STREPTOSPONDYLUS; and the caudal vertebræ, which progressively diminish in every diameter, save length, from the middle to near the end of the tail, the terminal vertebræ being shorter than the rest. The sternum and sternal ribs, he remarks, closely agree with the ordinary Crocodilian type. He had not seen a specimen of the abdominal sternal ribs.

Professor Owen then notices the structure of the *Pectoral and Pelvic Extremities*, as compared with those of existing Crocodiles, and the *Dermal armour*, the bony dermal scutes of which are regularly disposed in the Teleosaur, as in them; but the scutes of *Teleosaurus Chapmanni*, he observes, differ as much from those of the existing Gavials and Crocodiles, as those of *Teleosaurus Cadomensis* do. The following are the species recorded by the Professor:—*Teleosaurus Chapmanni; Teleosaurus Cadomensis; Teleosaurus Cadomensis*, var.; and *Teleosaurus asthenodeirus*, Owen. [STENEOSAURUS; CROCODILE, vol. viii., p. 168.]

TELESCOPE (from the Greek *teléscopos*, τηλεσκόπος, 'far-seeing'), an optical instrument consisting of a tube which contains a system of glass lenses having all their centres in one common axis, or a tube containing a metallic speculum in combination with such lenses: by either kind of instrument distant objects are caused to appear magnified, and more distinct than when viewed by the naked eye. Those which are constructed with glass lenses only are called dioptric, or refracting, and the others catoptric, or reflecting telescopes. In the former kind the rays in the pencils of light which come from every part of the object viewed are, by the first lens on which they are incident, made to converge so as to form an image at the focus of the lens. In some cases the rays in each pencil are intercepted by a second lens, and, by its refractive power, are made to enter the eye in parallel directions: in other cases, the rays, after having crossed each other at the place where the image is formed, fall in a divergent state upon a second lens, and by it are refracted so as to emerge from it in parallel directions. Frequently however the parallelism of the rays is effected by two or more lenses in addition to that, called the object-glass, by which the image was formed. In reflecting telescopes an image is formed by the reflection of the rays in the pencils of light coming from the object, after having impinged upon the concave surface of the speculum: in some cases this image is viewed through one glass lens or more, but frequently the rays, before or after forming the image, are reflected from a second mirror, and are subsequently transmitted to the eye through lenses.

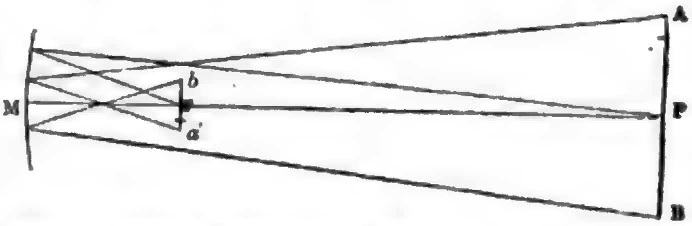
By these instruments objects even in the remotest depths of space are rendered accessible to human vision; and terrestrial objects faintly visible in the distance are brought, as it were, close to the eye. In the hands of astronomers they were the means, almost immediately on being invented, of making more discoveries in the heavens than had been made during 5000 years previously; they form a valuable addition to the instruments employed by the mariner and the surveyor, and they will ever constitute the most agreeable companion of the traveller, by enabling him to distinguish, in every direction from him, objects which it might be difficult or impossible for him to approach.

In exhibiting the principles on which a telescope is constructed, it will be proper to commence with an explanation of the means by which the image of an object is formed at the focus of a lens or of a reflecting mirror. With respect to a lens, if it be of the kind called convex [LENS], the rays in the pencils of light which proceed from every part of an object, as APB, in passing through the lens, supposing the latter to have a proper degree of curvature, are made to converge by the refracting power of the glass at points, as *a*, F, and *b*, and the assemblage of such points constitutes an image of the object: if a screen were placed at F perpendicularly to the axis PF, the object would be represented on it, in an inverted position.



If the lens were of a concave form, the rays in the several pencils, after passing through it, would be made to diverge from one another, and consequently no image could be formed: yet if the directions of the rays, after refraction, were produced backwards, they would unite between the lens and the object, in points corresponding to those which constitute the image formed by the convex lens.

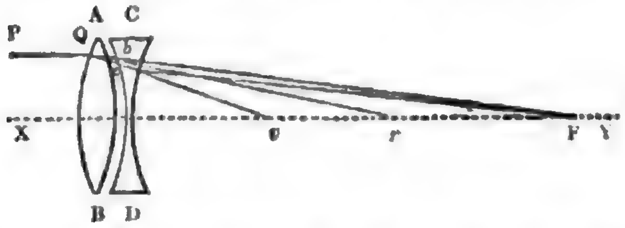
If the rays in the pencils of light proceeding from different points, A, P, B, in an object are reflected from the surface of a concave mirror, supposing the latter to have a certain degree of curvature, those rays will unite in as many points, *a*, F, and *b*, and form an image of the object. If a screen were placed at F the object would be represented on it, in an inverted position. The rays in each pencil reflected from the surface of a convex mirror are made to diverge from each other; and in that case no image is formed.



Now, if the object AB be so remote that, in each pencil, the rays incident upon a lens may be considered as parallel to one another, the point F is called the principal focus; and in the article LENS (p. 421, col. 2) there will be found a collection of formulæ for the reciprocals of the focal lengths of lenses of all the different kinds; it being understood that the diameter of the lens is small, which is generally the case with telescopes, and that the light is homogeneous. But, since all light is not of one kind, and a lens acts like a prism in causing, in each pencil, the rays of the differently coloured light to diverge from one another: it follows that each of the coloured lights will form its own image at its proper focus; and the image formed by light of one kind being seen by the eye along with the images formed by light of the other kinds, the representation of an object when formed by a single lens appears to be indistinct and surrounded by a coloured fringe. [ACHROMATICS; DISPERSION.] It may be observed that the principal focus of any lens, with respect to each colour, may be obtained from the formulæ in LENS by substituting in them the value of μ (the index of refraction) for the given kind of light.

Thus, in an optical instrument, in addition to the distortion of the image arising from the sphericity of the lens, there is an indistinctness caused by the dispersion of the different colour-making rays; and, in a good telescope, it is requisite that both of these imperfections should as far as possible be removed. The chromatic aberration, as the dispersion of the colour is called, constitutes by far the greater evil of the two, for Newton has shown that it exceeds the former nearly in the ratio of 5449 to 1; but fortunately it is that which, to an extent sufficient for practical purposes, admits of being easily corrected.

Since different kinds of glass have different degrees of dispersive power, it is evident that the chromatic aberration may be diminished, if not wholly removed, by causing the light to pass through two lenses of different kinds of glass, and of such forms that they may refract the rays in each pencil in opposite directions. The object-glass of a telescope when so formed is said to be *achromatic*, and the manner in which the effect is produced may be understood from the following description. Let PQ be the direction of a pencil of compound light incident on the first surface of the convex lens AB, in a direction parallel to the common axis, XY, of the two lenses. By the refractive power of this lens (crown glass) the red rays in the pencil would, if no object were interposed, proceed in the direction Q*b*, meeting XY in *r*, and the violet ray in the pencil would proceed in the direction Q*c*, meeting the axis in *v*. But the refractive power of the concave lens CD (flint glass) acts, from its form, in a direction contrary to that of the convex lens, causing the rays either to diverge from the axis XY, or to meet it in points beyond *v* and *r*, towards Y: suppose the curvature of this lens to be such that the red rays in the pencil PQ would, after refraction in both lenses, meet the axis in F (the ray Q*br* taking the direction *b*F); then the dispersive power of this kind of glass exceeding that of the other kind, the violet rays in the refracted pencil will tend farther away from the axis than the red rays do, and thus will tend towards the latter; the ray Q*cv*, for example, taking the direction *c*F. It is conceivable, therefore, that the curvatures of the surfaces of the lenses may be such that, in each incident pencil, the red and violet rays (the extreme rays of the spectrum) shall after refraction unite at the place of the image; and thus the fringe due to these two colours may be destroyed.



If the two kinds of glass dispersed the different colour-making rays in the same proportions, their contrary refractions would cause all the colours to be united on the image formed at F: no two kinds of glass have however been as yet discovered which possess this property; and therefore the red and violet images only are united: fortunately in uniting the extreme rays of the spectrum, the others are brought so near together, that for ordinary purposes the image is as free from colour as can be desired.

From the description just given it will be evident that the place F, of an image in which the dispersion of the red and violet rays is corrected, may be determined on obtaining, from the common theorems of optics, algebraic expressions for the focal lengths of the compound lens for each of those kinds of light, and making the expressions equal to one another. Thus, supposing R and S to be the radii of the curve surfaces of a double convex lens of crown glass, and μ the index of refraction for light of one kind (red, for example); supposing again that the rays in the pencils of incident light are parallel to one another and pass through the lens very near the axis; then, by a fundamental theorem in optics we have, F being the distance from the focus to the lens, which is moreover without thickness,

$$F = \frac{R.S}{R+S} \cdot \frac{1}{\mu - 1}:$$

but since, in the present case, the lens may be supposed to be isosceles (R=S), we have $F = \frac{R}{2(\mu - 1)}$.

In like manner the focal length F′, of a double concave lens of flint glass, R′ being the radius of each surface, and μ' the index of refraction for red rays, is equal to $-\frac{R'}{2(\mu' - 1)}$, the rays being incident near the axis.

Hence, by a fundamental theorem in optics,

$$\frac{R'}{\mu'-1} - \frac{R}{\mu-1} : \frac{R'}{\mu'-1} :: \frac{R}{2(\mu-1)} : \frac{RR'}{2\{R'(\mu-1)-R(\mu'-1)\}}$$

and this last term is the focal length of the compound lens for red rays. Its reciprocal is equal to $\frac{2(\mu-1)}{R} - \frac{2(\mu'-1)}{R'}$, which, in the algebraic sense, is the sum of the reciprocals of the focal lengths of the separate lenses.

On writing $\mu + \delta\mu$, and $\mu' + \delta\mu'$ in place of μ and μ' in the last expression, we have for the reciprocal of the focal length of the compound lens for violet rays,

$$\frac{2(\mu+\delta\mu-1)}{R} - \frac{2(\mu'+\delta\mu'-1)}{R'}.$$

In an achromatic telescope the focal lengths of the compound lens for red and violet rays are to be equal to one another; and it is evident that this condition will be fulfilled when $\frac{\delta\mu}{R} - \frac{\delta\mu'}{R'} = 0$. From this equation we have $R : R' :: \delta\mu : \delta\mu'$: then, dividing the antecedents by $\mu - 1$ and the consequents by $\mu' - 1$, we have [DISPERSION] the ratio of the focal lengths of the two lenses equal to that of the dispersive powers of the two kinds of glass; and hence, the focal length of the compound lens being assumed at pleasure, those of the separate lenses, consequently the radii of their surfaces, may be obtained.

In order to diminish the spherical aberration, the object glasses of achromatic telescopes frequently consist of three lenses, of which the first and third are of the kind called double convex, and are formed of crown glass, while the second is double concave, and made of flint glass. In this case, since the index of refraction is the same for the third lens as for the first, if the radius of each surface of the third lens be R″, the reciprocal of the principal focal lengths of the separate lenses for red rays will be

$$\frac{2(\mu-1)}{R}, -\frac{2(\mu'-1)}{R'}, \text{ and } \frac{2(\mu-1)}{R''};$$

these being added together, their sum will be the reciprocal of the focal length of the compound lens for one kind of light. On substituting in the above terms, $\mu + \delta\mu$ for μ, and $\mu' + \delta\mu'$ for μ', in order to obtain the reciprocals of the focal length for violet rays, we shall have, when the chromatic aberration is corrected,

$$\frac{\delta\mu}{R} - \frac{\delta\mu'}{R'} + \frac{\delta\mu}{R''} = 0, \text{ or } R'\left(\frac{1}{R} + \frac{1}{R''}\right) = \frac{\delta\mu'}{\delta\mu}.$$

But $\frac{\delta\mu'}{\delta\mu}$ is known from tables of the refractive indices for different kinds of glass: therefore if any convenient relation between the radii of two of the lenses be assumed, the values of all the radii, and consequently the focal lengths of the several lenses, may be found.

The investigation of formulæ for the correction of the spherical aberration is a process of some labour, and is scarcely a fit subject except for a mathematical work: it is treated with great perspicuity in Robison's 'Mechanical Philosophy,' vol. iii., from which the subjoined theorem is borrowed, the notation only being changed for that which has been adopted above; and also in the articles LENS and SPECULUM. If a compound object-glass consists of one double convex lens of crown glass and a double concave lens of flint glass, and a ray of light be incident upon the anterior surface of the former in a direction parallel to the axis, at a distance from thence, which is expressed by e; the distance from the lens, of the point at which the ray after refraction will meet the axis, is $f-f^2(q+q')$, where f is the focus for parallel rays infinitely near the axis, and may be found as above, and $f^2(q+q')$ is the aberration. Here, neglecting the thickness of the lenses and the interval between them,

$$q=\frac{\mu-1}{\mu}\left\{\frac{\mu^3}{n^3}-\frac{2\mu^2+\mu}{Rn^2}+\frac{\mu+2}{R^2n}\right\}\frac{e^2}{2},\quad \text{and } n=\frac{RS}{R+S};$$

(R and S being the radii of the two surfaces of the convex lens,) and

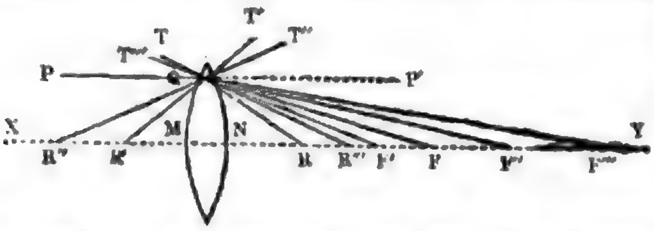
$$q'=\frac{\mu'-1}{\mu'}\left\{\frac{\mu'^3}{n'^3}-\frac{2\mu'^2+\mu'}{R'n'^2}+\frac{\mu'+2}{R'^2n'^2}+\frac{3\mu'^2+\mu'}{F.n'^2}-\frac{4(\mu'+1)}{F.R'n'}\right\}\frac{e^2}{2}:$$

where F is the principal focus of the convex lens, and $n'=-\frac{R'S'}{R'+S'}$; (R′ and S′ being the radii of the surfaces of the concave lens.)

It is evident that, in order to correct the spherical aberration, the values of the radii of the surfaces must be determined from the equation $q+q'=0$. This equation is however indeterminate, because it contains several unknown quantities; but it may be made subject to certain conditions by which there will remain only one: for example, the different radii of the lenses may be made to have any given relation to one another, so that the values of all, in terms of any one, may be substituted for them. In the values of q and q' the terms represented by n and n' are respectively equal to half the radii of equivalent isosceles lenses; and it has been shown, in the investigation concerning the chromatic aberration, that these are to one another as $\delta\mu$ to $\delta\mu'$; consequently $n'=n\frac{\delta\mu'}{\delta\mu}$, and therefore n' is known in terms of n. If again it be supposed that $R'=S$, or that the nearest surfaces of the convex and concave lenses have equal curvatures, the value of R may be found from the equation $q+q'=0$, in terms of n, by a quadratic equation.

Sir John Herschel, in a paper on the aberration of compound lenses and object-glasses (*Phil. Trans.*, 1821), has also investigated formulæ for the values of the chromatic and spherical aberrations; and M. Littrow, of Vienna, setting out with Euler's formula for spherical aberration (*Dioptrica*, tom. iii., 1769), and introducing in it the values of the focal lengths of two lenses so that the former aberration may be corrected, has obtained two equations from which the radii of the four surfaces may be determined by such conditions as may be thought convenient. (*Memoirs of the Astron. Soc.*, vol. iii., part 2.) In solving the problem relating to the determination of the four radii, Professor Littrow uses a method which possesses some facilities for computation, and on that account it has been adopted in the following process.

The radii of the surfaces of the first lens may be determined on the supposition that the whole refraction of light in passing through the lens is a minimum; that is, that the incident and emergent rays make equal angles with the surfaces, or with those radii. Thus let a ray PQ be incident on the first surface in a direction parallel to the axis XY of the lens, and infinitely near it; and RQT being the radius (=R) produced, of that surface let the angle PQT of incidence be represented by a; then $\mu : 1 :: a : \frac{a}{\mu}$ (=RQF, the angle of refraction at that surface). But if R′QT′ be the radius (=S) produced, of the second surface; then, in the triangle R′QR, neglecting the thickness of the lens and substituting arcs for their sines, $S : R :: a : \frac{R}{S}a$;



and $\frac{R}{S}a+a-\frac{a}{\mu}$ (=T′QF) is the angle of incidence on the second surface: and, by optics, 1 is to μ as this last angle is to $\frac{a\mu R}{S}+a(\mu-1)$, the angle of refraction (=T′QF′) at the second surface. But by hypothesis, this angle is to be equal to a; therefore $\frac{R}{S}=\frac{2-\mu}{\mu}$. Again, by optics, $\frac{RS}{R+S}\cdot\frac{1}{\mu-1}$ is equal to the focal length of the lens; and supposing this to be equal to unity, we obtain $\frac{R}{S}=\frac{R-\mu+1}{\mu-1}$: equating this last term with $\frac{2-\mu}{\mu}$ above, we get $R=\frac{2(\mu-1)}{\mu}$; whence $S=\frac{2(\mu-1)}{2-\mu}$. Therefore the two radii are found on the supposition that the focal distance of the lens is unity.

Now PQT being the angle of incidence as above, and QF the direction of the ray after one refraction, we have by optics, $\sin. RQF=\frac{\sin. PQT}{\mu}$; and by trigonometry, in the triangle RQF,

$$RF=R\frac{\sin. RQF}{\sin. P'QF} \text{ and } MF=R\left(\frac{\sin. RQF}{\sin. P'QF}+1\right);$$

also, respresenting the thickness MN of the lens by t,

$$R'F=R\left(\frac{\sin. RQF}{\sin. P'QF}+1\right)+S-t.$$

Then, by trigonometry, in the triangle R′QF,

$$\text{we get } \frac{SF+S-t}{S}\sin. P'QF=\sin. T'QF;$$

consequently by optics, $\frac{SF+S-t}{S}\mu\sin. P'QF=\sin. T'QF'$, or the sine of the angle of refraction at the second surface

Now $T'QF'-T'QF+P'QF=QF'M$, or the angle which the second refracted ray makes with the axis of the lens: but by trigonometry, in the triangle R′QF′, we have

$$R'F'=S\frac{\sin. T'QF}{\sin. P'QF};\ \text{whence } NF'=S\left(\frac{\sin. T'QF}{\sin. P'QF}-1\right).$$

Suppose next a double concave lens, the centres of whose surfaces are at R″ and R‴, and whose radii are R and S′, to be applied to the convex lens on the side N: then, neglecting the thickness of the concave lens and the distance between the two, and supposing QF″, QF‴ to be the directions of the ray of light after the third and fourth refractions respectively, we have in the triangle R″QF′, by trigonometry,

$$\frac{R'+S'F'}{R'}\sin. P'QF'=\sin. T''QF',$$

or the sine of incidence on the first surface of the second lens; and by optics,

$$\frac{R'+S'F'}{R'\mu'}\sin. P'QF'=\sin. T''QF''.$$

But $P'QF'-(T''QF'-T''QF'')=P'QF''$; and in the triangle R″QF″, by trigonometry, we have

$$R''F''=R'\frac{\sin. T''QF''}{\sin. P'QF''};$$

wherefore $NF''=R'\left(\frac{\sin. T''QF''}{\sin. P'QF''}-1\right)$; and considering NR‴ to be equal to S′, R‴F″ will be equal to NF″−S′.

Again, in the triangle R‴QF″, we have by trigonometry,

$$\sin. R'''QF''=\frac{NF''-S'}{S'}\sin. QF''N$$

for the sine of incidence on the fourth surface; therefore, by optics,

$$\frac{NF''-S'}{S'}\mu'\sin. QF''N=\sin. R'''QF''',$$

the sine of refraction at the fourth surface: then

$$QF''N-(T'''QF''-T'''QF''')=P'QF''', \text{ or } =QF'''N:$$

and by trigonometry, in the triangle QF‴R‴, we have

$$R'''F''' = S'\frac{\sin.\ R'''QF'''}{\sin.\ QF'''N},\text{ and }NF''' = S'\left(\frac{\sin.\ R'''QF'''}{\sin.\ QF'''N}+1\right),$$

the focal distance of the compound lens.

These values being reduced to what they become when the incident ray PQ is infinitely near the axis of the lenses; that is, when the angles are substituted for their sines, there may be obtained

$$\frac{R}{MF} = \frac{\mu-1}{\mu},\quad \frac{S}{NF'} = \frac{\mu S}{MF-t} + \mu-1,$$

$$\frac{R'}{NF''} = \frac{R'}{NF'\mu'} + \frac{\mu'-1}{\mu'},\text{ and }\frac{S'}{NF'''} = \frac{S'\mu'}{NF''} + \mu'-1.$$

By means of these equations, eliminating the quantities MF, NF′, and NF″, and neglecting powers of t above the first, there may be obtained a value of $\frac{1}{NF'''}$: then differentiating this value with respect to μ, μ', and NF‴, and making the resulting value of the differential of NF‴ equal to zero (which is a condition necessary in order that the chromatic dispersion may be corrected for rays near the axis), there may be obtained a value of $\frac{1}{R'}+\frac{1}{S'}$. Again on substituting $\frac{2(\mu-1)}{\mu}$ for R, and $\frac{2(\mu-1)}{2-\mu}$ for S, as above found, there will result

$$\frac{1}{NF'''} = 1 - \frac{\mu'-1}{\mu-1}\left\{1+\tfrac{1}{2}(\mu+1)t\right\}\frac{d\mu}{d\mu'} + \tfrac{1}{2}\mu t,\text{ and}$$

$$\frac{1}{R'}+\frac{1}{S'} = -\frac{1}{\mu-1}\left\{1+\tfrac{1}{2}(\mu+1)t\right\}\frac{d\mu}{d\mu'}.$$

Now the value of NF‴ may be directly computed from the formulæ first investigated; afterwards assuming different values of R′, and substituting them in the last equation, let the corresponding values of S′ be found. With these values of S′ find corresponding values of $S'\left(\frac{\sin.\ R'''QF'''}{\sin.\ QF'''N}+1\right)$; that is, of NF‴, and proceeding according to the usual methods of trial and error, there will at length be found a value of NF‴ agreeing with that which was computed by the direct process: the four radii will then, consequently, be determined.

Investigations relating to the dispersion of light, and rules for computing the radii of curvature for achromatic object-glasses, will also be found in an essay by Mr. P. Barlow of Woolwich, printed in the 'Philosophical Transactions' for 1827.

Though on thus uniting the red and violet light by lenses of crown and flint glass the chromatic dispersion is in a great measure corrected, yet when the image is examined, it is found to be surrounded by a green-coloured fringe. The difficulty of procuring flint glass of sufficient purity is also a serious impediment to the perfection of achromatic lenses for telescopes; and though great rewards have been offered for glass which shall be free from defects, the exertions of artists have hitherto been almost without success. Occasionally however flint glass is obtained nearly homogeneous, and the opticians of Germany appear, in this respect, to have been more fortunate than those of England.

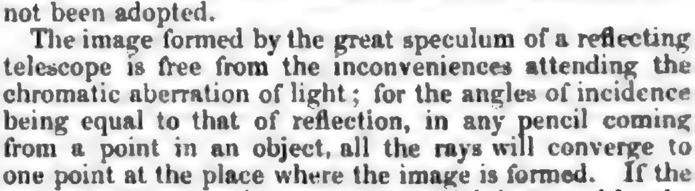
The late Dr. Ritchie obtained a disc of flint glass which was, by Mr. Dollond, formed into an object-glass nearly 7¼ inches in diameter. It was applied to a telescope 12 feet long, and bore a magnifying power equal to 700 times: it is said to have had scarcely any spherical aberration, and to have been very free from colour. (*Mem. Astr. Soc.*, 1840.)

In the 'Transactions' of the Royal Society of Edinburgh, 1791, there is given an account of some experiments made by Dr. Blair, from which he was led to the discovery of a fluid medium, which, being applied between lenses of crown glass, renders the compound lens completely achromatic. By adding liquid muriatic acid to chloride of antimony, or sal ammoniac to chloride of mercury, he succeeded in obtaining a spectrum in which the coloured rays in each pencil followed the same law of dispersion as takes place in crown glass. Therefore, confining a small quantity of either of these liquids between the convex surfaces of two plano-convex lenses, or between those of a plano and a convex meniscus lens, of crown glass, Dr. Blair obtained an object-glass in which the chromatic aberration was entirely destroyed; and he is said to have thus constructed one of 9 inches focal length, and as much as 3 inches in diameter or aperture. Object-glasses so made were for some years on sale in London; but either from the crystallization of the fluids, or the negligence of the artists in compounding them, the telescopes became imperfect, and gradually fell into disuse.

Dr. (Sir David) Brewster, in his 'Treatise on New Philosophical Instruments,' recommends the employment of sulphuric acid and oil of cassia for the composition of fluid lenses, by which the secondary spectrum may be destroyed; the acid being, of all known substances, that which exerts the greatest, and the oil that which exerts the least action on the green coloured rays. The correction of the chromatic dispersion by means of fluids has also recently been attempted by Mr. Barlow, who, in combination with a convex lens of crown glass, used a concave lens, consisting of sulphuret of carbon between two glasses (like that of a watch), of each of which the two faces were of equal curvature: this fluid has nearly the same refractive index as flint glass, and its dispersive power is more than double that of the latter material. The crown glass lens and the fluid lens, instead of being close together, were placed at a considerable distance from one another, by which disposition an increased magnifying power might have been obtained without increasing the length of the telescope. Probably from imperfections in the forms of the glasses, the images of objects were found to be not well defined; and the construction, in consequence, has not been adopted.

The image formed by the great speculum of a reflecting telescope is free from the inconveniences attending the chromatic aberration of light; for the angles of incidence being equal to that of reflection, in any pencil coming from a point in an object, all the rays will converge to one point at the place where the image is formed. If the surface of the speculum were that which is formed by the revolution of a parabola about its axis, then all the rays in any pencil proceeding from a very remote object, as one of the celestial bodies, and being incident on the speculum in a direction parallel to the axis, would, by the nature of the parabola, converge accurately in the focus of the curve; and on this account, an effort is always made to give to the reflecting surface of the speculum a paraboloidal figure. The advantage does not however hold good with the pencils which fall on the mirror in directions oblique to the axis; and therefore that figure is of less importance, when the telescope is to be used for viewing terrestrial objects, than when it is to be employed for astronomical purposes; for then, on account of the great distance of the objects, the several pencils of light fall on the mirror with a very small obliquity to its axis.

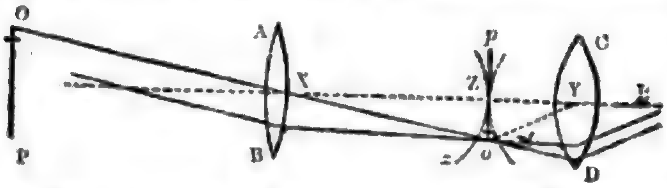
The telescope invented by Galileo consisted of one convex lens AB, and of a concave lens CD; the distance between them being equal to the difference between the focal lengths of the two lenses. In this instrument, if the object OP were so remote that the rays in each pencil of light might be considered as parallel to one another, there would be formed at its principal focus an inverted image *op*, of that object by the union of the rays in each pencil in one point; then the concave lens being placed between AB and that image, in such a situation that its principal focus may coincide with the place of that image, the rays in each pencil will, by the refracting power of the lens, be made to emerge parallel to one another; and in this case, by the optical properties of the eye, distinct vision is obtained.



The line OX*o* is the axis of the pencil of light from O; and, as this passes through the centre X of the lens AB without refraction, the angle ZX*o* is equal to half the angle under which OP would be observed by an eye at X when no telescope is interposed, while (*mn* parallel to Y*o* being the direction of a ray in that axis after refraction in CD) ZY*o* is half the angle under which OP is seen in the telescope: the ratio between these angles is therefore the measure of the magnifying power of the telescope; and since the angles are to one another as YZ is to XZ, nearly, it follows that $\frac{XZ}{YZ}$ nearly expresses the magnifying power.

This is the construction of what is called an *opera glass*; and the Galilean telescope is now used chiefly for viewing objects within a theatre, or an apartment, since if considerable magnifying power were given to it the extent of the field of view would be very small.

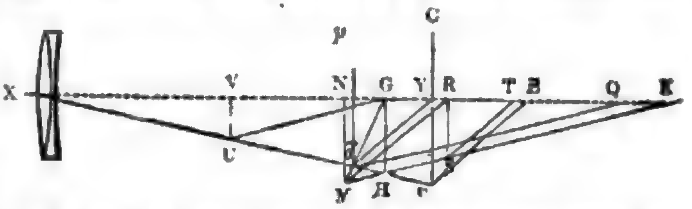
A simple telescope may also be constructed by means of two convex lenses, which are placed at a distance from one another equal to the sum of their focal lengths. For the image being formed at the focus Z, of the lens AB, which is nearest to the object, as in the Galilean telescope, and being supposed to be a plane surface, the light also being supposed to be homogeneous; the rays of each pencil, after crossing at the focus and proceeding from thence in a divergent state, on being allowed to fall upon the surface of the second lens CD, may be refracted in the latter so as to pass out from thence in parallel directions; and consequently distinct vision of the object may be obtained by an eye situated so as to receive the pencils.



If X*o* be the direction of the axis of a pencil of light coming from O, one extremity of the object OP, which is supposed to be so remote that all the rays in each pencil may be considered as parallel to one another; then the angle ZX*o* is half the angle under which the object OP would be seen by an eye at X without a telescope, while the rays of that pencil entering the eye at E in the direction DE, which is parallel to *o*Y, the angle ZY*o* is half the angle under which the same object is seen when viewed through the telescope. Now these angles are to one another nearly as ZY to ZX; therefore $\frac{ZX}{ZY}$ will express nearly the magnifying power of the instrument. As the pencils of light from O and P cross the axis of the eye at E before they are united on the retina, the image of the object OP is formed in the eye in a position contrary to that which is formed when the object is viewed without the telescope; therefore, on looking through the latter, the object OP appears to be inverted.

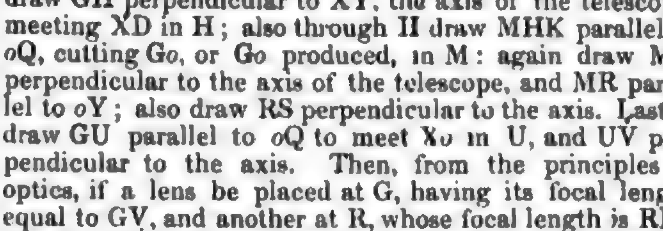
But the image formed at *op*, instead of being a plane, is nearly on a portion of a spherical surface whose centre is at X; and, on the other hand, in order that the rays in each pencil may after refraction in CD be parallel to one another, they ought to diverge from a point nearly in the surface of a sphere whose centre is at Y, the two spherical surfaces being in contact at Z: consequently when the distance between the lenses is such that the crossing of the rays in a pencil parallel to the axis takes place exactly at Z, the crossing *z* in one of the oblique pencils will be at a certain distance from the point *z'*, at which it ought to be to permit the rays in it to go out of CD parallel to one another; the rays of the pencils which proceed from the margin of the object will not then emerge parallel to one another, and consequently that margin will not be distinctly seen. Moreover from the unequal refrangibility of the different kinds of light, the rays in each pencil will be decomposed in passing through the lens CD, so that though the chromatic aberration were perfectly corrected in the image at *po*, it would exist in the image which is formed in the eye by the rays emerging from CD.

The spherical aberration can only be diminished by diminishing the inclination at which the rays in the marginal pencils fall upon the surface of the lens after having crossed at the focus of the object-glass; that is, by using a lens of less convexity or of greater focal length; adding a second eye-glass in order finally to render the rays in each pencil parallel to one another. Thus, if it be required to preserve the same magnifying power and field of view as might be obtained with any single eye-glass; let, as before, X be the place of the object-glass, *op* the image formed by it, and let CD be the place of the single eye-glass: then draw a line *o*Q so as to bisect the angle D*o*Y which may be considered as the whole refraction produced by the lens CD: let G, on the right or left of *op*, be the assumed place of what is called the field-glass, and draw GH perpendicular to XY, the axis of the telescope, meeting XD in H; also through H draw MHK parallel to *o*Q, cutting G*o*, or G*o* produced, in M: again draw MN perpendicular to the axis of the telescope, and MR parallel to *o*Y; also draw RS perpendicular to the axis. Lastly, draw GU parallel to *o*Q to meet X*o* in U, and UV perpendicular to the axis. Then, from the principles of optics, if a lens be placed at G, having its focal length equal to GV, and another at R, whose focal length is RN; the ray X*o*H will by refraction in the first lens take the direction HS, and by refraction in the second lens it will take the direction ST parallel to *o*Y or DE: thus the present visual angle STR will be equal to DEY, which was obtained with the single eye-glass.



This is called the Huygenian eye-piece, and it is that which is generally used for astronomical telescopes: the object seen through it is inverted, as in the last-mentioned telescope.

If the places G and R of the two eye-glasses are given (GH being very near *op*; its focal length being also known), and it be required to find the focal length of RS so that the red and violet rays in each pencil may emerge from it parallel to one another, that length might be determined in the following manner. In a pencil of rays crossing each other at H, let H*m* be the direction of a mean ray, and H*r*, H*v* those of a red and a violet ray; these last will make with one another an angle equal to about $\frac{1}{27}$ of the angle DH*m*, which may be supposed to be known. Now, by optical principles, if these rays are to emerge from RS in directions parallel to one another, the focal lengths of the lens for red and violet rays, viz. RF and R*f* must be to one another as 28 to 27, and the foci F and *f* must be in places determined by perpendiculars drawn to the axis from points W and *w*, in which the line RW supposed to be drawn parallel to *rr'* or *vv'*, meets H*r* and H*v*; that is, by finding the position of a line to be drawn from R to cut the given lines H*r*, H*v*, so that RW may be to R*w* as 28 to 27. For this purpose, having drawn the straight line HR, the angles RHW, RH*w* will be known; let them be represented by *a* and *b*; also let the angle HRW be represented by θ: then by trigonometry we shall have, after a few reductions, 27 cotan. $a -$ 28 cotan. $b =$ cotan. θ.



In order to afford a view of objects in the same position as they appear to have when seen by the naked eye, a telescope may be formed with three lenses besides the object-glass. In the construction of this instrument, if attention is paid only to the rays which suffer a mean refraction, the first eye-glass, or that which is nearest to the object-end of the telescope, may be placed between the image formed by the object lens and the eye, with the foci of the two lenses in coincidence; by this means the rays in each pencil will emerge from the first eye-glass in directions parallel to one another, those of the pencils which are oblique to the axis of the telescope crossing each other at some point in the latter axis. A second eye-glass is then placed at any convenient distance from the former, beyond the place where the oblique pencils cross each other; and by this lens a second image is formed in a position contrary to that which is formed by the object lens. Lastly, the third lens being placed between this image and the eye at a distance from the former equal to its focal length, the rays in the several pencils will emerge parallel to one another, and an erect image of the object will thus be formed in the eye.

The ratio between the angles under which an object would be seen by the naked eye, and that by which it is seen in the telescope, is compounded of the ratios of the focal lengths of the several lenses: thus, if F be the focal length of the object-lens, f', f'', f''' those of the eye-lenses, reckoned in order towards the eye, the expression $\frac{F . f''}{f' . f'''}$ will denote the magnifying power.

But both the spherical aberration and the chromatic dispersion in such a telescope are very considerable; and before the invention of the achromatic object-glass, Mr. Dollond endeavoured to diminish the former by an eye-tube consisting of five lenses disposed so as to divide the bendings of the pencils nearly equally between them. Such telescopes are not now used; and Mr. Dollond succeeded at length in constructing telescopes with four eye-glasses, from which both distortion and colour are removed as much perhaps as a removal is possible.

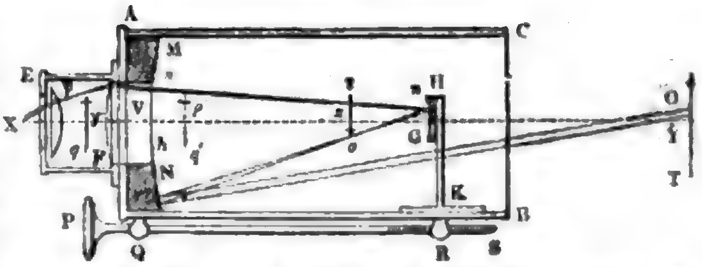
This is accomplished by placing the first eye-glass beyond the image formed by the object-glass, and at a distance from it less than the focal length of that eye-glass; by this disposition the rays of mean refrangibility in each pencil which diverges from the image are not, after refraction, parallel to one another, but go on with diminished divergency. A little way beyond the place where the axes of the oblique pencils cross the axis of the telescope there is placed the second eye-glass, which is of such focal length that the mean refrangible rays in each pencil, after passing through it, meet in a point, and thus a second image of the object is formed near the eye: the use of these two lenses, therefore, is to cause the second image to be formed by a gradual convergence of the rays in each pencil. But the several pencils of rays are intercepted by the third eye-glass (commonly called the field-glass), and the second image is thereby formed rather nearer to the first than it would be without such field-lens: from this image the rays in each pencil diverge, and by the refractive power of the fourth eye-glass they are made to enter the eye in parallel directions: thus distinct vision of the external object is obtained. The field-glass might have been placed between the eye and the second image, as in the Huygenian eye-piece before described; but the aberration arising from the spherical form of the glasses is a little less by the construction just mentioned.

Now, in each pencil, the red and violet rays which had been united at the image formed by the object-glass, and which there crossed each other, go on from thence diverging from each other till, on the opposite side of the axis of the telescope, they fall upon the surface of the second eye-glass: after passing through this lens, the violet ray, which is always more refracted than the red ray, gradually converges towards the latter, and at length meets it in some place short of that at which the rays of mean refraction unite to form the second image. The practice is to fix the third or field-glass exactly or nearly at the place where the red and violet rays so unite in all the pencils; for the different coloured rays crossing each other in that place, they are finally, by the refractive power of the fourth eye-glass, made to enter the eye in parallel directions, and thus afford a view of the object nearly or wholly free from colour.

In forming the eye-glasses of telescopes it may be observed that they should be such as will allow the incident and emergent pencils of rays to be nearly equally inclined to their surfaces: on this account the first and fourth eye-glasses are of the plano-convex form; the flat side of that which is nearest to the object-glass being towards the latter, and that of the other towards the eye.

It has been said above that, in reflecting telescopes, a speculum at one extremity of the tube serves the purpose of the object-glass in refracting telescopes by forming an image at its focus; and the manner in which, in the former instruments, the image is transmitted to the eye remains now to be explained.

The following diagram represents a longitudinal section through the axis XY of the instrument, which is supposed to be of the Gregorian kind. AB is the tube which contains the specula, and is open at the end CB; and at the extremity nearest to the eye of the observer is a tube EF containing two lenses. MN is the anterior surface of the great speculum, which has a circular perforation, *mh*, at its centre: G is a small speculum, concave like the former, its surface being either spherical or parabolical. It is connected with the side of the tube AB by the arm HK, and is capable of being moved in the direction of the axis XY by means of the rod PS: the latter passes through a knob Q, which is fixed to the side of the tube, and works in the knob R, which passes through an oblong perforation in the side of the tube, and is attached to the part K of the arm HK. This movement is given to the small mirror in order that its focus may be made to coincide with the place of the image formed by the great speculum; that image being at different distances from the latter according to the distance of the object from the observer.



Let O be the upper part of an object, and let ON be the direction of the rays in a pencil of light diverging from O: the rays of this pencil will, after being reflected at N, converge to *o*, which will be the lower part of the image *ot*. From *o* the rays in the pencil diverge, and having fallen upon the small mirror at *n*, they are reflected from thence towards the eye-piece EF: having passed through the orifice *mh*, they fall on the lens at F, by which they are made to unite at *p*, where an image, *pq*, of the object is formed. From *p* the rays in the same pencil again diverge, and, falling on the lens at E, they are made to emerge in parallel directions, so that the eye is enabled to obtain distinct vision of the object in the same position as if the latter were viewed by the naked eye. The rays, after being reflected at *n*, might with a due concavity of the smaller mirror have united, as at *p'*, in front of the great mirror, and the second image might have been formed at *p'q'*: in this case the rays in each pencil, after crossing one another, would have fallen in a divergent state on the lens at F, and then, by the refractive powers of both lenses, they would have entered the eye in parallel directions as before. The positions of the lenses at E and F, and the curvatures of their surfaces, are determined according to the method of Huygens; and the construction differs in no respect from that which has been described in speaking of the eye-pieces of dioptric telescopes.

The magnifying power of a reflecting telescope of this kind is expressed by the formula $\frac{Vz . Gy}{Xy . Gz}$; in which V*z* is the focal length of the great speculum, G*y* is the distance of the small speculum from the image *pq*, X*y* is the focal length of the second eye-glass, and G*z* is the focal length of the small speculum for parallel rays.

In the Cassegrainian telescope the small mirror G is made convex, and it is placed so as to intercept the rays from the great speculum MN before the image *ot* is formed; the rays of each pencil consequently fall in a convergent state on the small mirror, and, after reflection from thence, unite to form the image either at *p'q'* or after refraction in the first eye-glass F. It is obvious that these telescopes, with equal magnifying power, will be shorter than the Gregorian telescopes by more than twice the focal length of the small speculum; and it may added that, in some degree, the spherical aberration is corrected by the contrary curvatures of the two mirrors.

The Newtonian reflecting telescopes have one concave speculum at the bottom of the tube; and, in each pencil of light, the rays reflected from it fall in a convergent state upon a small plane mirror placed so as to make an angle of 45° with the axis XY of the telescope: after the second reflection the rays unite and form an image which is viewed through a Huygenian eye-piece fixed in the side of the tube AB, opposite the plane mirror; that is near the open end of the tube.

The great telescope constructed by Herschel differs from the Newtonian telescope only in having no small mirror. The surface of the great speculum, which is 4 feet in diameter, has a small obliquity to the axis XY, so that the image formed by reflection from it falls near the lower side of the tube at its open end: at this place there is a sliding apparatus which carries a tube containing the eye-glasses. The observer in viewing, is situated at the open end of the tube, with his back to the object, and he looks directly towards the centre of the speculum, the magnitude of which is such that the rays intercepted by his head, in coming from the object, do not in any sensible degree diminish the brightness of the image.

Formerly the great speculum of a reflecting telescope was pressed into its cell by means of springs attached to the interior side of the brass plate at A; but the vibrations of the springs were found to cause tremulous motions in the image at the focus of the mirror; and this effect was so great as to render reflecting telescopes inferior to those of the dioptric kind. The Reverend Mr. Edwards, who detected the cause of the tremors, at once removed it by taking away the springs (*Naut. Alm.*, 1787); and the same gentleman further improved the distinctness of the image by enlarging the aperture to which the eye is applied. It has been observed also that when the great speculum is nearly in a vertical position, and consequently rests on its lower extremity, its weight bends it, and thus causes a change in the figure of its polished surface: on this account it is recommended that the speculum should be made to rest on two small wedges, placed one on each side, at about 45 degrees from the lowest point.

Besides the power of magnifying objects, that of affording distinct vision with given quantities of light is often an essential requisite in a telescope, particularly to naval men, who have occasion during the obscurity of the night to keep in view a ship of which they may be in chase. This subject was investigated by the late Sir William Herschel, and an account of his researches on what he calls the 'space-penetrating power of telescopes' was printed in the *Philosophical Transactions for* 1800.

Herschel states that he was aware of this property of telescopes as early as the year 1777, when he had constructed a Newtonian telescope with a speculum whose focal length was 20 feet: for, on directing the instrument to a church-steeple at a considerable distance, he could distinguish the hour by the clock, though with the naked eye he could not see the steeple itself. In order to obtain a formula for the space-penetrating power, he observes that the quantity of light received by the natural eye varies directly with the aperture of the *pupil*, or with the square of its radius, and inversely with the square of the distance of the object: also that the quantity of light transmitted by a telescope, supposing none to be lost in the reflections from the mirrors, or in refraction through the lenses, will vary directly with the square of the radius of the aperture and inversely with the square of the distance of the object. But, from experiments on the measure of light, it appears that the whole quantity incident upon a plate of glass is to the quantity transmitted through it as 1 is to ·9381, or to the quantity lost as 1 is to ·0619; and from this, the whole quantity of incident light being unity, an estimate may be made of the quantity of light transmitted through all the lenses of a telescope: with respect to the quantity lost in reflection from mirrors Sir W. Herschel found that out of 100,000 incident rays, only 45,242 reached the eye after two reflections.

Let the quantity of incident light be to that which arrives at the eye as 1 to m; then r being the radius of the pupil, and R that of the aperture of a telescope, $\frac{R^2m}{r^2}$ will express the ratio between the quantity of light transmitted to the naked eye, and through a dioptric telescope: therefore the space-penetrating power varying with the square root of the quantity of light, $\frac{R}{r}\sqrt{m}$ expresses the penetrating power. With respect to reflecting telescopes, if R′ be the radius of the small speculum, the penetrating power will be expressed by $\frac{1}{r}\sqrt{\{m(R^2-R'^2)\}}$. It is necessary to observe that, in these expressions, it is supposed that the pencil of light transmitted by the telescope is not greater than the pupil of the eye.

TELESCOPE, HISTORY OF THE. It has been the fate of almost every instrument by which science has been extended, or the well-being of man promoted, that the precise epoch of its invention, and even the name of the individual to whom the world is indebted for it, are alike unknown. This is particularly the case with the telescope, of which the earliest notices are that it existed in England and in Holland near the end of the sixteenth or in the beginning of the seventeenth century.

There is in Strabo a passage (iii., p. 180, Falconer's ed.; p. 138, Casaub.) in which, speaking of the enlargement of the sun's disk at his rising and setting in the sea, it is stated that the rays (of light) in passing through the vapours which rise from the water, as through tubes, are dilated, and thus cause the apparent to be greater than the real magnitude (of the object); and from this it has been inferred (Dutens, *Recherches*, &c.), though the inference is probably without foundation, that there then existed tubes furnished with lenses for magnifying objects by refracting the light. It would be needless to make any observations on an inference founded upon an hypothesis so obscurely expressed: the words in Strabo probably signify only that the rays of light might become divergent in passing along the intervals between the particles of vapour.

Omitting then all notice of this, and of the ill understood passages in Aristophanes ('Clouds') and Pliny (lib. xxxvi., c. 67) concerning transparent spheres, or lenses for concentrating the rays of light, it must be acknowledged that before the end of the thirteenth century lenses of glass were in constant use for the purpose of assisting the eye in obtaining distinctness of vision. Vitello, a native of Poland, in that century, gave some obscure indications of the apparent magnitudes of objects when viewed through a segment of a sphere of glass; and Roger Bacon, in his 'Opus Majus,' both mentions the like fact, and expresses himself in such a manner as to indicate that in his time (he died in 1292) spectacles were already in use. He may not have actually made combinations of lenses in one instrument, but there is no doubt of his being aware of the fact that lenses might be arranged so that objects seen through them would appear to be magnified. [Bacon, Roger; Spectacles.]

The idea being known to the learned, it is scarcely possible to doubt that the combination of two lenses, or of a concave or convex mirror and a lens, must have been often made during the three centuries which elapsed between the time of Bacon and that which is generally considered as the epoch of the invention of telescopes. Dr. Dee, in his preface to Euclid's 'Elements' (1570), having mentioned that some skill is required to ascertain the numerical strength of an enemy's force when at a distance, observes that the 'captain, or whosoever is careful to come near the truth herein, besides the judgment of his eye, the help of his geometrical instrument, ring, or staffe astronomical (probably for determining the measure of distances), may wonderfully help himself by perspective glasses:' these last can only signify some kind of telescope, which therefore must have been then in general use. And in the 'Pantometria' of Digges (1571) it is stated that 'by concave and convex mirrors of circular (spherical) and parabolic forms, or by frames of them placed at due angles, and using the aid of transparent glasses which may break, or unite, the images produced by the reflections of the mirrors, there may be represented a whole region: also any part of it may be augmented, so that a small object may be discerned as plainly as if it were close to the observer, though it may be as far distant as the eye can descrie.' In the preface to the second edition (1591) the editor, who was the author's son, affirms that 'by porportional mirrors placed at convenient angles, his father could discover things far off, that he could know a man at the distance of three miles, and could read the superscriptions on coins deposited in the open fields.' There is probably some exaggeration in this account, but it is sufficiently manifest from it that reflecting telescopes, or optical instruments containing combinations of mirrors and lenses, were known in England before the end of the sixteenth century. The claim of Baptista Porta (between 1545 and 1615) to the invention of the telescope appears to have no other foundation than the circumstance that

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he perceived a small object to be magnified when viewed through a convex lens.

It is highly probable that the telescope had been invented long before the value of such an instrument was duly appreciated; and it may have been owing to the very gradual discovery of its importance that the name of the inventor sunk into oblivion: about the middle of the seventeenth century, however, an effort was made to discover the traces of the invention, and Peter Borellus, in his work entitled 'De vero Telescopii Inventore,' which was published in 1655 at the Hague, has given testimonials in favour of two persons; the first of these is Zachariah Jans, or Jansen, and the other, Hans Lapprey, or Lippersheim, both of whom are said to have been opticians, or spectacle-makers, residing at Middleburgh: in a letter written by a son of Jans, it is stated that the epoch of the discovery is the year 1590; but by another account, the year 1610. The same author has also given a letter from M. William Boreel (envoy from the States of Holland to the British Court) which seems to throw some light on the facts. The writer of the letter asserts that he was acquainted with the younger Zachariah Jans, when both of them were children, and had often heard that the elder was the inventor of the *microscope:* he adds that, about the year 1610, the two opticians Jans and Lapprey first constructed telescopes, and that they presented one to Prince Maurice of Nassau, who desired that the invention might be kept secret as (the United Provinces being then at war with France) he expected to obtain in the field, by means of the instrument, some advantages over the enemy. The writer further states that the invention became known, and that soon afterwards Adrian Metius and Cornelius Drebbel went to Middleburgh and purchased telescopes at the house of Jans. This account differs from that which is given by Descartes ('Dioptrics,' cap. 1), who, writing in Holland, states that about thirty years previously, Metius (who was, he observes, a native of Alckmaer), having always taken pleasure in forming burning-mirrors and lenses of glass and of ice, by chance placed at the extremities of a tube two lenses, one thicker in the middle, and the other thinner, than about the edge (convex and concave); and thus, he adds, was formed the instrument which is called a telescope. The 'Dioptrics' was published at Leyden in 1637, and therefore the time of the supposed invention by Metius is nearly coincident with that at which, according to Borellus, it was made by Jans. From the papers of Harriot, it appears that this mathematician observed spots on the sun, in 1610, with telescopes magnifying from 10 to 30 times; but it is uncertain whether he got them from Holland, or whether they were made in this country; and the only conclusions at which it is possible now to arrive, are, that telescopes were known in England and Holland about the end of the sixteenth century, and that in both countries they were then in a form which rendered them practically useful.

The two Jansens, father and son, appear to have used their telescopes in observing the heavens; and the latter is said to have remarked four small stars near Jupiter: it has been concluded from thence, that he was the first discoverer of the satellites of that planet; but though this may be, he probably did not continue his observations long enough to enable him to determine their distances from it, or the times of their revolutions.

The use of the telescope, and, probably, even the knowledge of the fact that it had been invented, must have been for many years confined to the north of Europe; for it appears that it was not till the year 1609 that Galileo, who then happened to be at Venice, heard from a German a rumour of the discovery which was said to have been made in Holland. The Italian philosopher states, in the 'Sidereus Nuncius,' that he had then no knowledge of the nature of the instrument, and that he requested a friend at Paris to send him some information concerning it. On being informed, merely, that it was a tube containing glass lenses, his acquaintance with the nature of the refraction of light enabled him, it is said, to discover that one of the lenses must have been convex and the other concave, and also to determine the distance at which they should be placed from one another in order that the objects seen through them might appear magnified and distinct. Without however supposing that Galileo was here guided by theoretical considerations merely, it is easy to conceive that, as lenses of different forms were then in use for spectacles, he might have obtained from an optician some which were of different degrees of convexity and concavity; and after a few trials he must have found such as would constitute an instrument possessing magnifying power.

The telescopes which he constructed consisted of one convex object-glass and one concave eye-glass, which were placed at the extremities of a leaden tube; and the first of them magnified the heights and breadths of objects three times only. Soon afterwards he made one which magnified eight times; and subsequently he succeeded in forming a telescope with a magnifying power which caused objects to appear about thirty times as great as they are to the unassisted eye.

The knowledge which man had acquired of the visible heavens received many important accessions from the discoveries which Galileo was enabled to make by means of the telescope. Except the sun and moon, not one of the celestial bodies had hitherto been observed to have any visible form or magnitude, and it was to the eye of reason alone that those appeared to be anything but plane surfaces: the fixed stars and the planets were alike known only as luminous and ill-defined points; but when seen through a telescope, the planets were found to have certain magnitudes, and some of them to undergo variations of form; while the fixed stars appeared unchanged, or only divested of the radiance with which they seem to be surrounded when seen by the naked eye; and hence it became obvious that the former must constitute a distinct group of bodies infinitely nearer the earth than the others. The sun, from the spots observed on his surface, was found to revolve on its axis, and consequently was ascertained to be globular; and the light and dark spaces on the moon were distinctly perceived to be mountains and valleys, nearly resembling those features on the surface of the earth. Galileo relates, in the work above mentioned, that in the year 1610 he discovered the four satellites of Jupiter, and observed that they revolved about that planet as our moon revolves about the earth. Nearly at the same time he observed that Saturn presented a remarkable appearance: at first he thought it was accompanied by two smaller planets; but on using a telescope of superior magnifying power, these were found to be portions of a vast annulus which surrounds Saturn without touching his surface; and soon afterwards he ascertained the fact that Venus exhibited phases similar to those of the moon.

The species of telescope which was used by Galileo continued for several years unchanged; yet it is extremely defective, on account of the small extent of the field of view which it affords when its magnifying power is considerable; and the Batavian or Galilean telescope, as it was called, is now chiefly used to distinguish objects in a theatre. It is due to the memory of Kepler to state that he pointed out (in his 'Dioptrics') the possibility of forming telescopes with two lenses, both of which are convex; but he did not reduce his ideas to practice by the construction of such an instrument, and the honour of having been the first to do so is to be attributed to the Jesuit Scheiner, who, in his 'Rosa Ursina' (1650), gives a description of telescopes with one convex eye-glass. He observes that they cause the images of objects to appear in inverted positions; and adds, that thirteen years previously he had used such a telescope in presence of the Archduke Maximilian.

Telescopes with a single convex eye-glass have been since designated astronomical, from the circumstance that they were long employed for celestial observations; the greater extent of their field of view having caused them, notwithstanding the inversion of the image, to supersede for that purpose the telescopes of Galileo. It ought to be remarked however that telescopes with two eye-glasses, by which the object might be seen in a direct position, as it appears to the naked eye, were described by Kepler, and constructed by Scheiner; but as they caused the object to appear much distorted and coloured about the margin of the field, they were not esteemed. Père de Rheita, about the same time, constructed for telescopes eye-tubes containing three lenses, which, he observes, afford a better image than those with two: the same person was the inventor of what is called a binocular telescope, that is, an instrument which consists of two telescopes having equal magnifying powers, and placed near each other in such positions that an object might be observed with both eyes at the same time. Attempts have been since made to revive this invention; but the advantages, if any there be, are more than compensated by the trouble of directing the two tubes to the object.

The magnifying power of a dioptrical telescope increasing with the ratio which the focal length of the object-glass bears to that of the eye-glass, and since, by increasing the focal length of the former without increasing its diameter, the coloured border round the image is diminished so that vision is rendered more distinct, the opticians of the seventeenth century were induced to form, for object-glasses, lenses which were segments of very great spheres, that is, lenses of great focal lengths. Campani at Bologna, by order of Louis XIV., made telescopes having object-glasses whose focal lengths were as great as 136 feet, and with such, Cassini, in 1671, discovered the satellites of Saturn. [CAMPANI.] M. Auzout is said to have made a lens of 600 feet focal length, but it does not appear that he was able to use it as a telescope.

Huygens, who was an ingenious mechanic as well as a good philosopher, contrived to use an object-glass of long focus for astronomical purposes without placing the system of lenses in a tube. On the top of a long pole which was planted vertically in the ground, he mounted the object-glass, having fixed it in a frame with joints so that its axis could be moved in any direction by means of a string which was held in the hand of the observer; and the axis being in a line passing through the celestial body, a short tube containing the eye-glasses was fixed to a stand near the ground with its axis in the same direction. An instrument of this kind having an object-glass of 123 feet focal length, was made by Huygens and presented to the Royal Society; and with it Dr. Bradley made some of his astronomical observations. It is described by Huygens in his 'Astroscopia Compendiaria,' which was printed at the Hague in 1684. But the chief merit of Huygens as an improver of astronomical telescopes consists in his construction of an eye-piece with two lenses so combined as both to enlarge the field of view and diminish the aberrations produced by their spherical forms.

There is some probability that the elder Digges had contrived an instrument which constituted a species of catoptric, or reflecting, telescope; but, on account of the obscure manner in which the instrument is described, it will be scarcely necessary to notice further his claim to the honour of the invention. It appears that Père Mersenne, in his correspondence with Descartes, and in his 'Catoptrics' (1651), suggested the idea of a concave spherical mirror to be used, like the principal lens of a dioptric telescope, for forming in its focus an image of an object; and that this image being viewed through a convex eye-glass of proper curvature, the original object would appear to be magnified. Descartes, in his reply to Mersenne, which is said to have been written in 1639, makes several objections to the scheme, and no effort was then made to put it in practice. But the great length of the dioptric telescopes which were then in use rendering the management of them very inconvenient, ingenious men were induced to attempt a construction in which with equal magnifying power much smaller dimensions might be employed. Mr. James Gregory of Edinburgh, in his 'Optica Promota' (1663) published a suggestion for forming a telescope by means of the image at the focus of a concave speculum. The mirror was to be of polished metal with a paraboloidal surface, which by the properties of that curve would cause all rays incident upon it in directions parallel to the axis to converge accurately at one point. It is uncertain whether Gregory had any knowledge of Mersenne's treatise, or whether the idea originated with himself; but this is of little consequence, for not being able to find an artist who could execute such a speculum, though he came to London for the purpose, the suggestion was abandoned, and men of science continued to direct their inquiries to the means of improving dioptric telescopes.

When, however, Newton had discovered the unequal refrangibility of light, and had ascertained that the aberration produced by this cause about the focus of a lens was many hundred times greater than that which was caused by the spherical form of the glass, he gave up the hope of being able to construct refracting telescopes which should be free from this defect, and applied himself to the formation of specula for those of the catoptric kind: the image formed by reflection from a mirror being free from what is called the chromatic aberration, and consequently incomparably more distinct than one which is formed by the refraction of light in a lens of any transparent medium.

In the beginning of 1669, Newton having obtained a composition of metals which appeared likely to serve for a mirror, began with his own hands, to grind its surface to a spherical form; and early in the year 1672 he completed two telescopes: of the construction and performance of these instruments he sent to the Royal Society an account which was read in the January of that year. The radius of the concave metal in one of them was 13 inches, and the telescope magnified about 38 times. The rays, before forming an image in the focus of the speculum, were intercepted by a glass prism, or a plane mirror, and the image formed after this second reflection was viewed by a convex eye-glass which was fixed for the purpose in the side of the tube. In the telescope proposed by Gregory, the rays in each pencil of light, after crossing at the focus of the great speculum, were to fall upon the surface of a small concave mirror; and by this being again reflected, they were to form a second image near the anterior surface of the first speculum: through a perforation in the latter the image was to be viewed; a convex lens being interposed between the image and the eye of the observer. This has been always called the Gregorian telescope; and in 1672, the year in which Newton completed his reflecting telescopes, M. Cassegrain, in France, proposed one which differed from that of Gregory only in the rays reflected from the great speculum being intercepted by a small convex mirror: from this the rays of each pencil were again reflected, and they were made to form an image near the anterior surface of the great speculum: this image was to be viewed through a convex lens behind an aperture in the latter speculum, as in the telescope of Gregory. It does not appear that M. Cassegrain constructed such a telescope, but it may be observed that the image formed after reflection from the convex speculum would be more free from the aberration caused by the surfaces of the mirrors, and would also be rather greater, than that which is obtained from the concave speculum of Gregory or the plane one which was used by Newton.

The first reflecting telescope, in which the great speculum was perforated so that objects could be viewed by looking directly at them, was executed by Dr. Hooke, and produced before the Royal Society in February, 1674. But the difficulty of obtaining metal proper for the purpose, and of giving it a perfectly spherical form, for a long time prevented reflecting telescopes from attaining the desired degree of perfection. In 1718 Mr. Hadley succeeded in executing two telescopes, each about five feet long, which were considered good; and he gave, in the 'Philosophical Transactions' (1723), a description of the methods employed in their construction. By his advice Dr. Bradley, who was then professor of astronomy at Oxford, in conjunction with Mr. Molyneux at Kew, applied themselves to the construction of these instruments: having executed one which was satisfactory, they in 1738 instructed Scarlet and Hearne, two London opticians, in the processes which they used, and these artists presently succeeded in making good reflecting telescopes for general sale. Mr. James Short, of Edinburgh, also soon afterwards distinguished himself by his skill in forming such telescopes: he attempted at first to make the principal speculum of glass, but finding that this material had not sufficient steadiness to preserve the form of its surface, he devoted himself to the improvement of metallic specula, and succeeded in giving them, it is supposed, a correct parabolic figure, by which means his telescopes admitted of larger apertures than any that had before been made.

The processes adopted by Mr. Mudge in grinding and polishing the mirrors for reflecting telescopes, and in giving them the parabolic figure, may be seen in the 'Philosophical Transactions' for 1777. See also SPECULUM METAL.

But the reflecting telescope was destined to receive the highest power of which perhaps it is susceptible from the hands of Dr. (afterwards Sir William) Herschel: this distinguished astronomer, while residing at Bath, employed his leisure hours in grinding and polishing specula, with which he formed telescopes, both of the Newtonian and Gregorian kinds; and about the end of 1783, that is, subsequently to the discovery of the planet which is called by his name, being aided by the liberality of the king (George III.), he began the formation of a speculum four feet in diameter and forty feet in focal length: the telescope to which it appertains is of the Newtonian kind, the observer being placed in a seat near the open end of the tube, and viewing the image through a system of eye-glasses. With this telescope, which was completed in 1789, objects are magnified about 6500 times; and on the night after it was finished, Dr. Herschel discovered the sixth satellite of Saturn. An attempt is even now being made to form a reflecting telescope possessing a higher degree of perfection than that of Herschel; but though the expectation should be fulfilled, telescopes of great magnitude must always be inconvenient in the management; and, from the expense of their construction, they will ever be confined to a few persons. It is right to observe moreover that the greatest discoveries of which astronomy can boast have been made with telescopes whose magnifying power did not exceed 700 times.

While the improvement of reflecting telescopes was in progress, the efforts to combine glass lenses in order to diminish the coloured fringes by which the images in dioptrical telescopes are surrounded were not entirely neglected; and as early as 1729, a private gentleman, Mr. Chester More Hall, of Essex, influenced, it appears, by an opinion that the humours of the eye are combined so as to correct the dispersions which each alone would produce in the different kinds of light, contrived to combine two lenses of different kinds of glass in such a way as to form an image which was free from colours: it is added that telescopes with such object-glasses were in the possession of several individuals many years afterwards. (*Gent. Mag.*, October, 1790; *Phil. Mag.*, November, 1798.)

In 1747 Euler, guided also by the constitution of the eye, conceived the possibility of forming a lens compounded of two hollow spherical segments of glass, inclosing water between their concave sides, which should be free from the chromatical and spherical aberrations; and in investigating the curvatures he assumed that the logarithms of the terms expressing the ratio of the refraction of a mean ray in passing from air into glass, and from air into water, were proportional to the logarithms of the terms expressing the ratio of the refractions of red rays in the same media. He was not able to obtain from any artist a lens of this nature, in which the proposed end was accomplished, and Mr. Dollond [Dollond], in a short paper which is printed in the 'Philosophical Transactions' (1752), contested the justness of Euler's principle on the ground that it was contrary to one which he conceived to be founded on the experiments of Newton.

But M. Klingenstierna, a Swedish mathematician, having soon afterwards, in a Mémoire which was sent to the Académie des Sciences, pointed out that the principle which had been adopted by Dollond was not conformable to the acknowledged laws of refraction, the latter determined immediately on having recourse to experiment. Either guided by the object-glasses constructed under the direction of Mr. Hall, or from a series of experiments made by himself on the refraction of light in wedges of crown and flint glass, he discovered that by employing a convex lens of the former, in combination with a concave lens of the latter kind, the rays of the different colours in each pencil of light, after refraction through both, might be made to unite at the focus, and thus produce an image of the object nearly free from colour. For this important discovery Mr. Dollond received from the Royal Society the Copleian medal. In 1765 his son, Mr. Peter Dollond, diminished the aberration of light on account of the spherical forms of the lenses by combining together two convex lenses of crown glass with a concave lens of flint glass between them: this construction is particularly advantageous, by the increased aperture which it allows when the focal length of the compound lens is short.

For several years after the telescopes thus improved by Dollond had been in general use, Euler continued to believe that all kinds of glass differed but little from each other with respect to their dispersive power, and he ascribed the success of the English artist merely to a fortunate determination of the curvature of his lenses; but having, in the year 1764, received information that, by the addition of lead, glass had been obtained whose dispersive power was four times as great as that of the common kind, he immediately renounced his former opinion; and from that time the merit of the achromatic object-glasses, as they were called, has been firmly established. The most eminent mathematicians, both on the Continent and in this country, have subsequently investigated, on scientific principles, the curvatures which should be given to the surfaces of lenses, so that, the focal length of the compound lens being assumed, the chromatical and spherical aberrations may be corrected.

The arrangement of lenses for the eye-pieces of telescopes is of no less importance than the formation of the object-glass; and Huygens proposed (*Dioptrics*, prop. 51), in order to diminish the refraction of light at the surfaces, to substitute for the single eye-glass of the common astronomical telescope two convex lenses, of such curvatures that the whole refraction, or the angle between the incident and emergent ray in the former construction, should be divided between the two lenses.

One mode of effecting this purpose is to place the first eye-glass, or that which is nearest to the object, so as to intercept the pencils coming from the object-glass before the rays are united, and thus the image is formed after the refraction of the light in this lens: the second eye-glass is then placed so that the rays falling on it, after having crossed at the place of the image, are made to enter the eye parallel to one another. A micrometer cannot be applied to such an eye-piece, since any change in the place of the lens which is nearest to the eye would derange its adjustment: these eye-pieces can however be rendered achromatic, and they have the greatest possible field of view; they have therefore been constructed for the purpose of merely viewing the celestial bodies by Dollond, Ramsden, and Frauenhofer. Mr. Ramsden was the first who constructed eye-pieces with two lenses which were capable of being used with a micrometer: this he accomplished by placing the tube containing those lenses so that the rays in the pencils, after crossing at the focus of the object-glass, fell in a diverging state upon the first eye-glass, and, after refraction in both, entered the eye in parallel directions.

With both these kinds of eye-pieces the object appears to be inverted; but eye-pieces with three lenses, by which the object is made to appear in the erect position, had been proposed by Rheita: these being found defective, Mr. Dollond endeavoured to improve upon the construction by dividing the refraction at the first and third eye-glasses between two lenses, according to the method recommended by Huygens, and thus he formed eye-tubes with five lenses. But some light is always lost by reflection when it falls upon glass; and, in order to diminish this evil, Dollond subsequently, retaining the Huygenian construction in the two lenses nearest to the eye, used but one lens to perform the office of the second and third (in the eye-piece with five glasses), in rendering the rays of each pencil convergent after the first had diminished the divergency caused by the crossing at the focus of the object-glass: he thus succeeded in producing an eye-piece of four lenses which was nearly *aplanatic*, or free both from the chromatical and spherical aberrations; and such are the telescopes now in common use for viewing terrestrial objects.

The chief improvements, if they may be so called, which have since been made in dioptric telescopes, consist in the means which have been adopted to remove those aberrations more completely; and the natures of the different media which have been used for this purpose by Dr. Blair, Sir David Brewster, and Mr. Barlow, have been mentioned in the article Telescope.

Attempts have been made by M. Chevalier to diminish the aberrations by means of two achromatic object-glasses placed at a certain distance from each other in the tube; and by Mr. Rogers of Leith, by a single convex lens of plate glass, in combination with a double achromatic lens, the convex lens being of plate-glass, and the concave lens of flint-glass. This last gentleman proposes to unite the red and violet rays at the image of the object by a proper distance between the single and the double lens, and to correct the spherical aberration either by giving proper curvatures to the surfaces of the compound lens, or by placing the two lenses at a small distance from each other. (*Memoirs of the Astron. Soc.*, vol. iii., part 2.) Dr.

Brewster has suggested (*Treatise on New Phil. Inst.*, p. 400) that it may be possible to remove, or at least very much diminish, the uncorrected colour in the image by the use of two lenses of the same kind of glass with the same or different dispersive powers. He proposes that the exterior lens should have the meniscus form, the convex side being outwards; in order, from the obliquity of the incident rays to the surface, that the dispersion produced by that lens may increase in a higher ratio than its refraction, so that the dispersion produced by the other lens may be corrected; while in each pencil the rays, after refraction through both, may be convergent.

It would be improper to omit here to mention that M. Amici at Modena, some years since, invented a species of achromatic telescope by a combination of four prisms, all of the same kind of glass: the refracting edges of one pair of the prisms were parallel to one another, and those of the other pair were also parallel to one another, but perpendicular to the edges of the first pair; and each pair formed an achromatic combination. By the refraction in the first pair the breadth of the object is magnified, and by that in the second pair the length is magnified in the same ratio: thus the result is an image undistorted and magnified. Sir John Herschel states that, in 1826, he saw in the hands of its inventor one of these telescopes, which magnified about four times.

TELESCO'PIUM (the Telescope), a constellation of Lacaille, in the southern hemisphere, surrounded by Ara, Pavo, Sagittarius, and Ophiuchus. Its principal stars are as follows:—

Character.	No. in Catalogue of		Magnitude.
	(Piazzi.) Lacaille, C.	Astron. Soc.	
β	(17)	2101	4
α	(50)	2115	4½
γ	(229)	2043	4
ι	(361)	2086	5
ζ	1517 C	2120	5

TELESCO'PIUM, De Montfort's name for the *Cerithium Telescopium* of authors. [ENTOMOSTOMATA, vol. ix., p. 451.]

TELFORD, THOMAS. In the life of this eminent man, as has been observed in a brief notice of the fathers of that science of which he was so distinguished an ornament, in the preface to the 'Transactions' of the Institution of Civil Engineers, 'another striking instance is added to those on record of men who have, by the force of natural talent, unaided save by uprightness and persevering industry, raised themselves from the low estate in which they were born, to take their stand among the master-spirits of their age.' Telford's father was a shepherd in the pastoral district of Eskdale in Dumfriesshire, where, in the parish of Westerkirk, his only son was born, on the 9th of August, 1757. His father dying while he was yet an infant, the care of Telford's early years devolved upon his mother, Janet Jackson, for whom he cherished an affectionate regard until her death in 1794; he having been in the habit, according to Mr. Rickman, of writing letters to her in *printed* characters, that she might be able to read them without assistance. He received the rudiments of education in the parish school of Westerkirk; and, while engaged during the summer season as a shepherd boy in assisting his uncle, he made diligent use of his leisure in studying the books furnished by his village friends. At the age of fourteen he was apprenticed to a stone-mason in the neighbouring town of Langholm; and for several years he was employed, chiefly in his native district, in the various operations usually performed by a country mason in a district where there is little occasion for the higher departments of his art. The construction of plain bridges, of farm buildings, and of simple village churches and manses, afforded however good opportunities for obtaining practical knowledge. Telford himself has expressed his sense of the value of this humble training, observing, that although convenience and usefulness only are studied in such erections, yet peculiar advantages are offered to the young practitioner; 'for,' to adopt his own words, 'as there is not sufficient employment to produce a division of labour in building, he is under the necessity of making himself acquainted with every detail in procuring, preparing, and employing every kind of material, whether it be the produce of the forest, the quarry, or the forge; and this necessity, although unfavourable to the dexterity of the individual workman who earns his livelihood by expertness in one operation, is of singular advantage to the future architect or engineer, whose professional excellence must rest on the adaptation of materials and a confirmed habit of discrimination and judicious superintendence.' Chambers states that during this period of his life Telford was remarkable for the neatness with which he cut letters upon gravestones. In 1780, being then about twenty-three, and considering himself master of his art, he visited Edinburgh, apparently with a view to obtaining employment. The splendid improvements then in progress in that city enlarged his field of observation, and enabled him to contemplate architecture as applied to the object of magnificence as well as utility; and he seems at this time to have devoted much attention both to architecture and drawing. After remaining there about two years, he removed to London, where he obtained employment upon the quadrangle of Somerset House, then erecting by Sir William Chambers, an engagement in which, according to his own account, he obtained much practical information. About 1784 he was engaged to superintend the erection of a house for the resident commissioner in Portsmouth dockyard, from the design of Mr. S. Wyat. Telford's good character and promising talent had secured for him the friendship of two families resident in his native district, the Pasleys and the Johnstones, and to their influence his early employment on important works is, in some measure, to be attributed. He was engaged upon various buildings at the Portsmouth dockyard for three years, during which time he became well acquainted with the construction of graving-docks, wharf-walls, and similar engineering works; and in 1787, having completed his engagements there, he was invited by the late Sir William Pulteney (a member of the Johnstone family) to take the superintendence of some alterations at Shrewsbury Castle. He therefore removed to Shrewsbury, where he was also employed to erect a new gaol, which was completed in 1793, and was subsequently appointed county surveyor, in which office (retained by him until death) he had to furnish plans for, and oversee the construction of, bridges and similar works. The first bridge which he designed and built was that over the Severn, at Montford, about four miles west of Shrewsbury, consisting of three elliptical stone arches, one of fifty-eight, and the others of fifty-five feet span. His next was the iron bridge over the Severn, at Buildwas, consisting of a very flat iron arch of a hundred and thirty feet span, constructed upon very superior principles to that erected a few years previously at Coalbrook Dale: Telford's object was rather to introduce the trussing principle of a timber construction than that of a stone arch. This bridge was built in the years 1795 and 1796. Forty smaller bridges were erected in Shropshire under Telford's direction.

The Ellesmere Canal, a series of navigations intended to unite the Severn, the Dee, and the Mersey, and extending altogether to a length of about one hundred and three miles, was the first great work upon which Telford was engaged, his satisfactory execution of the county works intrusted to him having led its projectors to select him as their engineer; and from this engagement, which commenced about 1793, in which year the act of parliament was obtained for the scheme, his attention was directed almost solely to civil engineering. The uneven character of the country occasioned many serious difficulties in the construction of this canal, and rendered necessary the execution of some works of astonishing magnitude, especially in crossing the valleys of the Ceriog, or Chirk, and of the Dee. In the former the canal crosses the river at an elevation of seventy feet by an aqueduct-bridge of ten arches, each of which is of forty feet span, in the construction of which some important deviations were made from the previous practice of engineers. It had been usual in such structures to form the bed for the canal of puddled clay confined in masonry, a practice which involved great expense, and some danger in time of frost, from the expansion of the moist puddle. The great elevation of the Chirk aqueduct would have increased the difficulty, but Telford abandoned the puddling system, and formed the bed of the canal of flanged cast-iron plates resting upon walls built on the piers, and constructed the sides of masonry. This work was executed between 1796 and 1801, at a cost of 20,898*l*. The aqueduct-bridge over the valley of the Dee, called the Pont-y-Cysylte, is still more remarkable: it consists simply of a trough of cast-iron plates, securely flanged together, and supported by eighteen piers or pillars of masonry, the elevation of which is a hundred and twenty-one feet above low-water. These piers are solid to the height of seventy feet, above which they are hollow, with interior walls. The water-way in the cast-iron trough is eleven feet ten inches wide, of which four feet eight inches is covered by the towing-path, supported upon cast-iron pillars, so as to allow the water free play beneath it. The length of the aqueduct is about one thousand feet, and the height of the canal one hundred and twenty-seven feet above the Dee; and at one end of the aqueduct-bridge is a great embankment, fifteen hundred feet long, rising in parts to a height of seventy-five feet above the natural surface. These gigantic works were executed between 1795 and 1805, at a cost of 47,018*l*. In the locks of this canal Telford introduced cast-iron framing in lieu of timber; and in one instance, where the lock was formed in a quicksand, he made every part of that material.

The Caledonian Canal is another of Telford's principal works. In 1773 the commissioners of the forfeited estates in Scotland had engaged Watt to report on the practicability of a ship-canal along the valley called the Glen of Scotland, to be formed by connecting the lakes which form a series of navigable waters extending a great part of the distance; but although the report was favourable, it was not acted upon, and the scheme was deferred for some years by the restoration of the forfeited estates, through which the line would pass, in 1784. In 1801 however Telford was deputed by government to make a survey of the coasts and of the interior of Scotland, and to report generally upon desirable public works for the improvement of the country. In consequence of his reports Commissions were formed to carry out the proposed canal, and other improvements classed under the general title of Highland Roads and Bridges; and the services of Telford were engaged by both boards. The Caledonian Canal was opened throughout in 1823. Its construction was delayed by many untoward circumstances; and unfortunately its utility has not hitherto answered the expectations of its projectors. It forms however a noble monument of the skill of the engineer. The locks are stated by Telford to be the largest ever constructed at that time, being forty feet wide, and from one hundred and seventy to one hundred and eighty feet long; and one of them, at Clachnacarry, near Inverness, was made under circumstances of especial difficulty, the earth being a soft mud, into which an iron rod might easily be thrust to a depth of fifty-five feet. The means adopted for conquering this difficulty are fully detailed in the engineer's own narrative.

Of other canals constructed wholly or partially under Telford's superintendence it is sufficient to mention the Glasgow, Paisley, and Ardrossan (which was never completed to the length originally intended); the Macclesfield; the Birmingham and Liverpool Junction; the Gloucester and Berkeley (completed under his direction); the Birmingham, which was completely remodelled and adapted to the conduct of a very extensive traffic, by him; and the Weaver navigation, in Cheshire. He also constructed a new tunnel, 2926 yards long, 16 feet high, and 14 feet wide, at Harecastle, on the Trent and Mersey Canal, the original tunnel of Brindley having been found too small [TUNNEL]; and he executed many important works connected with the drainage of the fen country, especially of Bedford Level. On the Continent likewise he superintended the construction of the Gotha canal, in Sweden, a navigation of about one hundred and twenty English miles, of which fifty-five are artificial canal. This navigation rises one hundred and sixty-two feet from the Lake Wenern, at one extremity, to the summit-level, and falls three hundred and seven feet to the Baltic, at the other: the rise and fall are effected by fifty-six locks. The canal is forty-two feet wide at the bottom, and ten feet deep. Telford visited Sweden in 1808 to make the surveys and preliminary arrangements, and again in 1813, taking with him, under the sanction of the British government, several experienced workmen to instruct the natives in the works then in progress. Upon the completion of the canal a Swedish order of knighthood and other honours were conferred upon Telford.

The works executed by Telford under the Commissioners of Highland Roads and Bridges are of great importance. His survey was delivered to the Lords of the Treasury in 1802, and in the following year the Commission was appointed. Of the works committed to their superintendence Telford observes that 'the whole of Scotland, from its southern boundary, near Carlisle, to the northern extremity of Caithness, and from Aberdeenshire on the east to the Argyleshire islands on the west, has been intersected by roads; its largest rivers, and even inferior streams, crossed by bridges; and all this in the space of twenty-five years, under the same board, and (with some few exceptions) by the same individual Commissioners;' and all this was done under the direction of Telford alone. The practical operations under this Commission embraced about a thousand miles of new road, with twelve hundred bridges, in a mountainous and stormy region, of which five only, according to Telford's narrative, have required to be renewed. It should be explained that the operations of the Commission were not confined to the objects defined in its title, but embraced also the Glasgow and Carlisle road; the Lanarkshire roads; the improvement of several harbours, of which the principal are those of Peterhead, Banff, Frazerburgh, Fortrose, Cullen, and Kirkwall; and the erection of several Highland churches and manses under a parliamentary grant of 1823. Nor were these Highland churches and manses the only buildings in which Telford acted as an architect; he had, many years previously, erected a church at Bridgenorth, from his own design.

In the improvements of the great road from London to Holyhead, under another parliamentary Commission, appointed in 1815, Telford had a further opportunity of carrying into effect his system of road-making, of which an account is given under ROAD, vol. xx., p. 29, &c. This road, and the works connected with it, is probably the most perfect specimen of Telford's skill as an engineer, and appears to have been regarded by him with much satisfaction. The Menai suspension-bridge, especially, is a noble example of his boldness in designing and practical skill in executing a work of novel and difficult character: it is described under MENAI BRIDGE, vol. xv., p. 91, and SUSPENSION-BRIDGE, vol. xxiii., pp. 334-5.

Among the other works of Telford are many bridges of considerable size, in which he adopted the important principle of making the spandrils hollow, and supporting the roadway upon slabs laid upon longitudinal walls, instead of filling up the haunches with a mass of loose rubbish, which may press very injuriously upon the arch, and often proves of serious inconvenience when the masonry of the bridge needs any repair. He employed this mode of construction in a large arch, of 112 feet span, erected over the Dee, near Kirkcudbright, in 1805 and 1806, and in many subsequent bridges. In his 'Life' will be found particulars of the ingenious alteration of Glasgow old bridge, by the addition of a projecting footpath of cast-iron on each side, so as to leave the whole width of the stone structure for carriages; and of the new bridge designed by him for crossing the Clyde at Glasgow, and commenced in 1833; of the light and elegant Dean bridge, at Edinburgh; Path-head bridge, of five arches of 50 feet span, over a ravine about eleven miles south of Edinburgh; Morpeth bridge; Tewkesbury bridge, erected between 1823 and 1826, with a light iron arch of 170 feet span and only 17 feet rise; the Over bridge at Gloucester, and many others. The last-mentioned bridge has an arch of peculiar form, previously employed by Perronet in the Neuilly bridge. The general body of the arch is an elliptical curve of 150 feet span and 35 feet rise, but the external arch stones at the sides of the bridge form segmental curves of the same span, but of only 13 feet rise: the two arches are coincident at the crown, and are connected by a vaulted form on the haunches of the bridge. 'This complex form,' observes Telford, 'converts each side of the vault of the arch into the shape of the entrance of a pipe, to suit the contracted passage of a fluid; thus lessening the flat surface opposed to the current of the river whenever the tide or upland flood rises above the springing of the middle of the ellipse, that being at four feet above low-water; a precaution rendered necessary in this instance owing to the liability of the bridge to very trying floods.'

Telford executed some important harbour-works at Aberdeen and Dundee; but his most striking performance of this class is the St. Katherine Docks, London. Owing to the very limited space which could be obtained, it was necessary to construct these docks of irregular forms, and to adopt unusual arrangements respecting the warehouses; and these arrangements, combined with the admirable machinery employed, have reduced the time requisite for unloading a vessel in an astonishing degree.[*] There are two docks, communicating with the river by a tide-lock 180 feet long and 45 feet wide, with three pair of gates, so that either one very large or two smaller vessels may pass the lock at one time; and steam-engines are provided, capable of filling the locks in a few minutes by pumping water from the middle of the river, so that vessels are enabled to pass in and out of the docks with great rapidity so long as there is a sufficient depth of water to receive them outside the lock. The cast-iron turn-bridge over this lock is an excellent specimen of that kind of machinery, being easily worked by two persons at each end, although it supports a carriage-way 24 feet wide. These docks were constructed much more quickly than is usual for works of such magnitude, and more quickly than the engineer could fully approve, although he admitted the urgency of the case as a justification of a course against which he could not but enter his protest. One of the very latest engagements of Telford was the survey of Dover harbour, undertaken, in January, 1834, at the request of the duke of Wellington, as warden of the Cinque Ports, with a view to the adoption of measures to check the accumulation of shingle at the entrance.

In addition to the works which he executed himself, Telford was frequently applied to for his judgment upon important schemes, and in this way he made many reports to parliament. For many years he was employed to report upon all public works of engineering character for which loans were required of the Exchequer Loan Commissioners. Among his reports are several of considerable interest, especially upon proposed canals between London and Birmingham, and between the English and Bristol Channels, and on the supply of water to the metropolis, one of the last objects to which he devoted his attention. For some years before his death he had gradually declined as much as possible forming new engagements, and had made preparations for the publication of such a selection from his papers as might leave on record an authentic account of the important works in which for more than half a century he had been engaged. Having made arrangements with his executors for the completion of his work in case he should not live to finish it, he set about it with ardour, and had many of the plates completed, the manuscript in a very forward state, and arrangements made respecting the paper, type, &c. before his death. The book was not published until 1838, chiefly owing to the illness and death of Mr. Turrell, the engraver, and the difficulty of getting the plates completed. It forms a thick 4to. volume, entitled 'Life of Thomas Telford, civil engineer, written by himself; containing a descriptive Narrative of his Professional Labours;' and it contains a preface and supplement, by the editor, Mr. Rickman, and a very copious appendix of illustrative reports and other documents. The plates, eighty-three in number, constitute a companion volume, in large folio, to which is prefixed a fine portrait of Telford, engraved by W. Raddon, from a picture by S. Lane. From this work the materials of the preceding notice of his principal works are chiefly derived; and from the supplementary notice, by Mr. Rickman, and some other sources, are collected the following additional biographical particulars.

Before leaving his native district, Telford acquired some distinction as a poet. He wrote in the homely style of Ramsay and Fergusson, and contributed small pieces to Ruddiman's 'Weekly Magazine,' under the signature of 'Eskdale Tam.' He wrote a short poem, entitled 'Eskdale,' descriptive of the scenes of his early years, which was originally published in a provincial miscellany, subsequently reprinted at Shrewsbury, at the request of his friends, and afterwards inserted in the appendix to his Life. Another pleasing fragment of his composition is given at the end of the first volume of Dr. Currie's 'Life and Works of Burns,' published at Liverpool in 1800: it is an extract from a poetical epistle sent by Telford, when at Shrewsbury, to the Ayrshire poet, recommending him to take up other subjects of a serious nature, similar to the 'Cottar's Saturday Night.' He taught himself Latin, French, Italian, and German, so as to read them all with facility, and to converse readily in French; and he has left valuable contributions to engineering literature, in the articles Architecture, Bridge, Civil Architecture, and Inland Navigation, in Brewster's 'Edinburgh Encyclopædia,' in which work Mr. Rickman says he was a shareholder. He was well acquainted with algebra, but he held mathematical investigation in rather low estimation. In his early years he appears to have been tinctured with democratic opinions; but after seeing the excesses of the French revolution, he always studiously avoided conversing on political subjects. In all the relations of life he commanded respect and esteem; and he was particularly remarkable for his facility of access to the deserving, and especially for his ready communication of professional information to foreigners; a circumstance which, added to his connection with the Gotha canal and some other continental works, procured for him the highest respect on the continent of Europe. The Russian government frequently applied to him for advice respecting the construction of roads and canals; and the sixty-seventh plate in his atlas represents the details of a road designed by him from Warsaw to the Russian frontier. The emperor Alexander of Russia acknowledged his sense of his services on one occasion, in 1808, by sending him a diamond ring with a suitable inscription. Although he was not connected with the Institution of Civil Engineers at its formation, he accepted their invitation in 1820, and became their president; and from that time he was unremitting in his attention to the duties of the office, having become, by his partial retirement from business, a pretty regular resident in the metropolis. He ardently loved his profession, and was, observes Mr. Rickman, so energetic in any task before him, that all other motives became subordinate to it. He never married, and hardly had a fixed habitation until a late period of life. He was of athletic form, and reached the age of seventy without any serious illness; but in 1827 he was afflicted with a severe and painful disorder, after which he became subject to bilious attacks, under one of which he died, on the 2nd of September, 1834, at his residence in Abingdon Street, Westminster, at the age of seventy-seven. He was buried in Westminster Abbey. The acquisition of property was always a secondary consideration with Telford; and in certain cases, especially of abortive speculations, he was ingenious in finding arguments for giving his assistance gratuitously. Even in increasing his charges as his reputation and experience increased the value of his services, he seems to have been actuated chiefly by a sense of what was due to others in his profession, whose remuneration was in some degree dependent upon his own. After his mother's death he had few family connections to provide for, and he had a great objection to raising any individual above his station in life, which is stated by his biographer as his reason for not leaving his property to relations. His will, printed in the appendix to his 'Life,' provides for the payment of handsome legacies to many personal friends; of 2000*l.* to provide annual premiums to be given by the Institution of Civil Engineers; and of 1000*l.* each in trust to the ministers of Westerkirk and Langholm, for the purchase of books for the parish libraries. His scientific books, prints, drawings, &c. are bequeathed to the Institution of Civil Engineers. Telford became a fellow of the Royal Society of Edinburgh in 1803, and of that of England in 1827.

(*Life*, edited by Rickman; Chambers's *Scottish Biographical Dictionary*; *Annual Biography*, vol. xix.)

TELINGA or TELUGU LANGUAGE. [HINDUSTAN, p. 229.]

TELL, WILLIAM, a simple countryman of the village of Bürglen near Altorf in Switzerland, who lived towards the end of the thirteenth and during the first half of the fourteenth century. His early life is unknown, and his name would probably never have been heard of in history, if the tyranny of the Austrians had not called him from his obscurity. At the beginning of the fourteenth century, when Albert I. of Austria was endeavouring to suppress the spirit of freedom and independence in the three Waldstädte, Uri, Schwyz, and Unterwalden, and was using every means to add them to his family estates, he sent bailiffs (Landvögte) into these cantons, who perpetrated the most flagrant acts of tyranny, and treated the people like a conquered nation. The principal men of the three Waldstädte, in 1307, formed a league, which was headed by Walter Fürst, Arnold von Melchthal, and Werner Stauffacher. William Tell, who had married a daughter of Walter Fürst, also belonged to the league, though without taking any prominent part in it. The object of these men was gradually and secretly to increase their numbers, and to seize on any favourable opportunity for delivering their country from its oppressors, and if possible without bloodshed. While the confederates were daily gaining new strength, Hermann Gessler of Brunegg, one of the bailiffs of Albert I., who had taken up his residence in the canton of Uri, after various other vexatious acts, caused the ducal hat of Austria to be raised on a pole in the market-place of Altorf, and commanded that every one who passed the pole should uncover his head as a token of respect for the house of Austria. William Tell with his little boy happened one day to pass the pole without paying any regard to the orders of the bailiff; and he was immediately seized and taken before Gessler. Tell had the reputation of being an excellent bowman, and Gessler devised a mode of punishment which should put his skill to a severe test. He ordered Tell's boy to be placed at a considerable distance from his father, and an apple to be fixed on his head. A crossbow and arrows were handed to Tell, who, without being observed, contrived to get two arrows, and he was ordered to shoot the apple from his own child's head. The tyrant added, that if he missed the apple, he should die. Tell succeeded in hitting the apple. Gessler had expected that Tell would kill or hurt his child, and in his disappointment he tried to find out some pretext for punishing the presumptuous peasant: he asked him why he had taken a second arrow? Tell boldly replied: 'It was intended for thee, if the first had hit my child.' The bailiff, delighted with this opportunity of satisfying his vengeance, ordered Tell to be bound and to be conveyed in a boat across the lake of Waldstädten to the castle at Küssnacht, the residence of Gessler, who himself accompanied his prisoner. When the boat was on the lake, a storm arose, which became so violent, that the rowers were unable to manage the boat, and proposed to Gessler to unfetter Tell and allow him to assist them, as he was known to be an experienced boatman and well acquainted with every part of the lake. Tell was freed from his fetters, and taking the rudder in his hand, he steered the boat towards a part of the rocky shore, where a flat shelf jutted out into the lake. When he was near this spot, he seized his bow, jumped upon the projecting rock, and with his foot pushed the boat back into the waters. The storm however was abating, and Gessler and his men were safely landed. Tell knew the road by which the bailiff had to pass to Küssnacht, and lay in wait for him in a narrow defile. When Gessler came, Tell shot him through the heart. This happened towards the end of the year 1307. The event was followed by a series of wars between the Swiss and the Austrians, which did not terminate till the year 1499.

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[*] See, for an illustration of this point, a paper on 'The Docks,' forming No. IV. of 'London,' vol. iii., pp. 74-76.

The conduct of Tell was highly disapproved of by his friends, as they wished to avoid bloodshed, and were not yet prepared to carry their plans into execution. After this adventure Tell sinks again into his former obscurity, though he is said to have taken part in the battle of Morgarten, and to have perished, in 1350, in the river Schächen during a great flood.

Tell has been represented as a hero and a champion of liberty, by historians as well as by poets, but his conduct, if looked into more closely, will appear in a different light. His refusal to pay homage to the ducal hat of Austria was indeed owing to a noble independence of spirit; but his obeying the inhuman command of Gessler to shoot the apple from his child's head is repugnant to all paternal feelings, and a true hero would have aimed at the tyrant himself. He shot his enemy from an ambush, which, although in a measure an act of self-defence under the circumstances, yet in the manner of the execution was little better than murder.

But the truth of the story of Tell, notwithstanding its being commemorated down to this day by chapels and other public monuments, has been doubted by several modern historians; while others, and among them Johann von Müller, regard it as a genuine history. The doubts about its truth have arisen from the fact that a similar story is told in the Wilkina Saga, and by Saxo Grammaticus, of a Danish king Harold and one Toko. The same story is also told of one William Tell and a count of Seedorf who had extensive possessions in Uri, but must have lived early in the twelfth century. Another singular circumstance is that in the documents relating to the antient Swiss confederacies, and published by Kopp at Luzern in 1835 ('Urkunden zur Geschichte der eidgenössischen Bünde') there is no mention of a Gessler among the bailiffs who resided in the castle of Küssnacht. For these and other reasons, Grimm and Ideler (*Die Sage vom Schusse des Tell*, Berlin, 1826) consider the whole story of Tell as fabulous. There are however facts which seem to confirm the historical truth of at least the groundwork of the story. It was not many years after the death of Tell that it became customary for annual processions to visit the spot where Tell had escaped from the boat, and in 1388 the canton of Uri built the celebrated chapel of Tell near the same spot, and it is stated that among the visitors of that year there were one hundred and fourteen who had known Tell himself. His adventure is moreover told to the same effect by all the chroniclers who wrote at or soon after the alleged time of the occurrence.

TELLER, WILHELM ABRAHAM, son of Romanus Teller, minister of St. Thomas's church at Leipzig, was born in that city, 9th January, 1734. So early as at the age of twenty-two he attracted the attention of the theological world by a Latin translation of Kennicott on the Hebrew Text; and after being for a year or two preacher at the Nicolai church, very unexpectedly received the appointment of professor of theology at Helmstädt, from the Duke of Brunswick, in 1761. On entering upon his new office, he published as an inaugural disputation his 'Topice Scripturæ,' which was considered by Superintendant Bahrdt so heterodox in its opinions, that it was with difficulty he could be prevailed upon not to protest against Teller's appointment. Not deterred by this circumstance from expressing his own convictions, Teller published not long afterwards his 'Lehrbuch des Christlichen Glaubens' a production that caused no little noise at the time, exciting violent disapprobation in some quarters, and obtaining him friends in others. Just before this work appeared he had been invited to accept the professorship of theology at Halle, then vacant by the death of Baumgarten, and he declined it out of regard towards his patron the Duke. But the persecution he continued to experience from those to whom his opinions had rendered him obnoxious made his residence at Helmstädt so disagreeable, that it was without the least reluctance he exchanged it, about three years afterwards, 1767, for Berlin, with the appointment of 'Oberconsistorial-Rath' and Dean of Cologne. While it removed him from their immediate attacks, the distinction thus conferred upon him also in some measure awed his opponents; and at the same time he himself was brought into intercourse with some of the most learned and distinguished characters belonging to the reign of Frederick the Great. He was so far however from neglecting his professional duties or relaxing his zeal, that he continued to apply to his theological studies with the same ardour as before, and was instrumental in promoting many beneficial plans connected with church matters and education in public schools. The vast number of sermons and various theological writings published by him, attest not only his industry, but his earnestness in the cause of genuine religion, although his rejection of the dogmas ingrafted upon Scripture afforded his enemies and those who lay greater stress upon speculative points than upon religious conduct and feeling an opportunity to decry him as very dangerous, heterodox, and unsound. 'Equally remote from all mysticism on the one hand, and from dry metaphysical philosophizing on the other, Teller,' says Küttner, 'addresses himself both to the reason and the heart, and while he touches the latter, carries conviction to the former.' Others have also spoken of him in very high terms, not only as a writer and teacher of religion, but as a man—one no less estimable in private life than in his public capacity, and as exemplifying in himself that conduct which he sought to enforce upon others.

Besides his German writings, Teller published not a few theological and critical dissertations in Latin, and continued to employ his pen almost up to the time of his death; for though he was greatly worn out in body, his faculties continued active to the last. He died at Berlin, December 8, 1804. (Jörden's *Lexicon*.)

TELLERS OF THE EXCHEQUER were the holders of an antient office in the Exchequer. They were four in number: their duties were to receive money payable into the Exchequer on behalf of the king, to give the clerk of the pells (skins or rolls of parchment) a bill of receipt for the money, to pay all money according to the warrant of the auditor of receipts, and to make weekly and yearly books of receipts and payments for the lord treasurer. (4 *Inst.*, 108; *Com. Dig.*, tit. 'Court,' D. 4, 14, 15.) The office was abolished by act of parliament (4 & 5 Wm. IV., c. 15), together with that of the clerk of the pells and the several offices subordinate thereto, and a new constitution established, a comptroller-general of the receipt and issue of his Majesty's Exchequer being appointed to perform the duties of the four tellers. (4 & 5 Wm. IV., c. 15.)

TELLEZ, BALTHEZAR, a native of Lisbon, was born, according to the statement of M. Weiss, in the 'Biographie Universelle,' in the year 1595. Moreri states that he joined the Society of Jesus in the year 1610. In the eulogistic letter of Dom Francisco Manoel, prefixed to Tellez's 'History of Ethiopia,' he is said (at least this seems to be the writer's meaning, which his affected style renders rather obscure) to have studied ten years, and taught forty; to have paid attention to literature during the whole ten years of his career as student, but devoted two of them more especially to philosophy, and four of them to theology. He lectured upon *belles lettres* for twenty years, teaching in succession the most advanced literary classes in the Society's colleges at Braga, Evora, Lisbon, and Coimbra. He lectured two years on philosophy, but Manoel does not mention in what seminary. Lastly, Tellez was eight years professor of theology in the college of St. Antonio at Lisbon. At a later period he was appointed master of the house of the professed Jesuits in Lisbon, and ultimately provincial of the order in Portugal. He died in his eightieth year, on the 19th of April, 1675. The published works of Tellez are:—1, A compendium of philosophy, entitled 'Summa Universae Philosophiae, cum Quaestionibus quae inter Philosophos agitantur,' published at Lisbon, in folio, in 1642; at Paris, in two quarto volumes, in 1644; and at Lisbon, in four octavo volumes, in 1652: 2, 'Chronica da Companhia de Jesus da Provincia da Portugal,' in two volumes, the first published in 1645, the second in 1648, both at Lisbon: 3, 'Historia geral de Ethiopia a alta,' in one folio volume, at Coimbra, in 1660. He is also said to have left in MS. a history of the Society's labours in the East. The historical works of Tellez are of more value than his philosophical treatise. The History of the Jesuits in Portugal is a valuable contribution to the history of that accomplished and energetic order. The 'History of Ethiopia,' or, more properly, the history of the Jesuit-Missions in Ethiopia, is indispensable to any one who wishes to study the history or comparative geography of Abyssinia. The first book contains an outline of the geography of Abyssinia, of its political divisions, government, and statistics, as they existed from the time that the Jesuit missionaries first entered the kingdom till their expulsion under Facilidas. The remaining five books are chiefly occupied with the narrative of missionary enterprise, but contain important contributions to geography, the general accuracy of which has, on the whole, been confirmed by the testimony of later travellers. In the preface Tellez gives an account of the authorities from whom he has compiled his book, Manoel d'Almeyda, Affonso Mendes, Jeronymo Lobo, and Pero Pays; and he has availed himself of their information both with taste and judgment.

(The authorities for the statements in this sketch are the 'History of Ethiopia,' with the preface by Tellez himself, and the letter of Francisco Manoel prefixed to it; the articles on Balthezar Tellez, in the 'Bibliotheca Scriptorum Hispaniae' of Nicolao Antonio, in the 'Dictionnaire Historique' of Louis Moreri, and in the 'Biographie Universelle.')

TELLICHERRY. [HINDUSTAN, p. 207; MALABAR, p. 312.]

TELLI'NA. [CONCHACEA, vol. vii., pp. 428, 429.]

TELLI'NIDES. [CONCHACEA, vol. vii., p. 428.]

TELLU'RIUM, a metal which was discovered in 1782 by Müller of Reichenstein, but its properties were more minutely examined by Klaproth sixteen years afterwards, and he gave it the name it now bears. It is a scarce metal. Its properties are the following:—its colour is silver-white, and it is very brilliant: it is crystalline and brittle, of a lamellar fracture, easily pulverized, and a worse conductor of electricity than antimony or bismuth. Its specific gravity, according to Klaproth, is 6·115, while Magnus makes it 6·1379. It is nearly as fusible as antimony, and at a high temperature it boils, and may be distilled. When strongly heated in contact with air, it burns with a lively blue flame, green at the borders, and forms a white vapour, which has an acid odour.

The principal ores of tellurium are the following:—

Native Tellurium.—It is found crystallized and massive. Primary form a rhomboid; occurs in minute six-sided prisms, the terminal edges of which are usually replaced. Cleavage parallel to the faces of the prism. Fracture indistinct. Hardness: scratches sulphate of lime, and is scratched by the carbonate. Easily frangible. Colour tin-white or steel-grey. Lustre metallic. Specific gravity 5·7 to 6·115.

Before the blowpipe very fusible, burns with a greenish flame, and is volatilized in a white vapour. It is soluble in hydrochloric acid.

Massive Variety.—Granular. Colour splendent tin-white. Lustre metallic. Opaque. Specific gravity 6·115.

It occurs in Transylvania.

Klaproth's analysis gives,—

Tellurium . .	92·55
Iron . . .	7·20
Gold . . .	0·25
	100·

Graphic Tellurium. Auro-argentiferous Tellurium.—Occurs crystallized. Primary form a right rhombic prism; occurs in attached flattened crystals, which are generally minute. Fracture uneven. Hardness: scratches talc, and is scratched by calcareous spar. It is brittle. Colour steel-grey. Lustre metallic. Opaque. Specific gravity 5·723.

Before the blowpipe it readily fuses into a globule, and is reduced to a metallic button of a bright yellow colour. Soluble in nitric acid, except a yellow metallic residue.

It occurs accompanying gold in narrow veins traversing porphyry at Offenbanya, and also at Nagyag, in Transylvania.

Analysis by

	Klaproth.	Berzelius.
Tellurium	60	62·
Gold	30	24·
Silver	10	11·3
Lead	..	1·5
	100	98·8

Berzelius found also a little sulphur, arsenic, antimony, iron, and copper.

Yellow Tellurium.—Occurs in imbedded crystalline laminæ. Primary form a right rhombic prism. Traces of cleavage. Fracture uneven. Hardness: scratches gypsum, and is scratched by calcareous spar. Rather brittle. Colour silvery-white, inclining to brass-yellow. Lustre metallic. Opaque. Specific gravity 10·678.

By the blowpipe melts into a metallic globule. Partly soluble in nitric acid.

It occurs at Nagyag in Transylvania, and in the Altai Mountains in Siberia.

Analysis by Klaproth:—

Tellurium . .	44·75
Gold . . .	26·75
Lead . . .	19·50
Silver . . .	8·50
Sulphur . .	0·50
	100·

Black Tellurium.—Occurs crystallized, and in imbedded foliated masses. Primary form a square prism. Cleavage parallel to the terminal plane, in thin flexible laminæ. Fracture indistinct. Hardness: scratches talc, and is scratched by gypsum. Colour dark lead-grey. Lustre metallic. Opaque. Specific gravity 7·085.

Before the blowpipe is fusible on charcoal, and covers it with oxide of lead; reducible into a grey metallic globule, which eventually leaves a button of gold.

It is found at Nagyag and Offenbanya in Transylvania.

Analysis of the ore from Nagyag, by Klaproth:—

Tellurium . . .	32·2
Lead . . .	54·0
Gold . . .	9·0
Silver . . .	0·5
Copper . . .	1·3
Sulphur . . .	3·0
	100·

Brandes and Berthier have also analyzed this ore from Nagyag: their results differ considerably from the above, and also from each other.

Bismuthic Tellurium. Telluret of Bismuth.—Occurs crystallized in small six-sided prisms. Cleavage parallel to the base of the prism. Fracture indistinct. Hardness: scratches calcareous spar, and is scratched by fluor-spar. Colour steel-grey or zinc-white. Lustre metallic. Specific gravity 7·82.

Fusible by the blowpipe, and disengages the odour of selenium. Acted on by nitric acid, and the solution is precipitated by water.

It is found in Norway.

Analysis of Wehrle:—

Tellurium	34·6
Bismuth	60·0
Sulphur and traces of selenium .	4·8
	99·4

We shall now describe the more important binary compounds of tellurium, beginning with

Oxygen and Tellurium.—It has been already mentioned that when tellurium is heated in contact with air, it burns, and a white vapour is formed: this is oxide of tellurium, or tellurous acid. It may also be obtained by the action of nitric acid on the metal; by adding water to the solution, part of the oxide is precipitated, and the remainder is obtained by evaporation to dryness. The properties of this substance are, that it is a white granular anhydrous powder, which slowly reddens moist litmus-paper, and is insoluble in water and acids. It is dissolved by a solution of potash or soda, and by fusing with their carbonates crystallizable salts are formed: when these are decomposed by acids, hydrated tellurous acid is precipitated, which, if washed with very cold water, and dried at a temperature not above 53°, may be preserved without suffering change, and is soluble in water, acids, ammonia, and the alkaline carbonates, which last it decomposes: the aqueous solution reddens litmus-paper: when zinc, tin, and some other metals are left in a solution of this acid, they deoxidize it, and metallic tellurium is precipitated in the state of a black powder. Its salts are called tellurites.

It is composed of—

One equivalent of oxygen . .	8
One equivalent of tellurium . .	32
Equivalent . .	40

Sesquioxide of Tellurium, or *Telluric Acid.*—This is obtained by fusing tellurous acid with nitrate of potash: by this it is oxidized completely, and the result is tellurate of potash: when chloride of barium is added to it, tellurate of barytes is precipitated, which, being decomposed by sulphuric acid, yields a solution of telluric acid: this yields hexagonal crystals of the acid: it acts but feebly as an acid, the dilute solution reddening litmus-paper with difficulty, and its taste is rather metallic than sour: the crystals contain water, two-thirds of which they lose at about 212°, and the remainder below a red heat becomes a mass of a fine orange colour, which is completely insoluble in water, either cold or boiling, or hot hydrochloric or nitric acids, or solution of potash. It is decomposed at a high temperature, and converted into a white powder, which is tellurous acid. Its salts are called tellurates.

It consists of

One and a half equivalent of oxygen .	12
One equivalent of tellurium	32
Equivalent . . .	44

Hydrogen and Tellurium.—When tellurium is alloyed by fusion with tin or zinc, and the compound is acted upon by hydrochloric acid, the hydrogen of the decomposed acid dissolves tellurium, and telluretted hydrogen gas is obtained. This gas has a smell somewhat resembling that of hydrosulphuric acid: it is soluble in water, forming a claret-coloured solution; and, as it possesses acid properties, though feebly, it has been called hydrotelluric acid. It decomposes many metallic salts, yielding an alloy of tellurium with the other metal. Chlorine, nitric acid, and the oxygen of the air, all take the hydrogen from the tellurium.

It consists of

One equivalent of hydrogen . .	1
One equivalent of tellurium . .	32
Equivalent . .	33

Chlorine and Tellurium form two compounds. When a feeble current of chlorine gas is passed over tellurium at a high temperature, the dichloride formed passes over as a violet-coloured vapour, which condenses at first into a black liquid, and eventually into a solid of the same colour. It is decomposed by the action of water into metallic tellurium, which is precipitated, and chloride of tellurium remains in solution.

It is comprised of

One equivalent of chlorine . .	36
Two equivalents of tellurium . .	64
Equivalent . .	100

The *Chloride of Tellurium* is obtained, as above stated, by the action of water on the dichloride, but is better procured by passing a larger quantity of chlorine over tellurium at a lower temperature than in forming the dichloride. It is volatile, and any excess of chlorine being separated by agitation with mercury and rectification, a white crystalline solid is obtained, which is composed of

One equivalent of chlorine . .	36
One equivalent of tellurium . .	32
Equivalent . .	68

Sulphur and Tellurium combine in two proportions: the sulphuret is obtained when hydrosulphuric acid gas is passed through a solution of chloride of tellurium, tellurous acid, or of a soluble tellurite. It is of a dark brown colour, and is soluble in a solution of potash. It is formed of

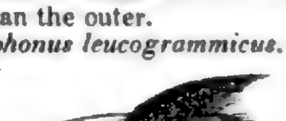
One equivalent of sulphur . .	16
One equivalent of tellurium . .	32
Equivalent . .	48

Persulphuret of Tellurium is obtained by mixing a solution of persulphuret of potassium with one of a salt of telluric acid. It is of a deep yellow colour; but it is a very unstable compound, for it speedily becomes black and is converted into protosulphuret.

TELOPHO'NUS, Mr. Swainson's name for a genus of *Lanianæ* [SHRIKES, vol. xxi., p. 416], which he thus characterises:—

Bill more lengthened (than in *Lanius*), slightly hooked; the tooth smaller. Wings very short and rounded. Tail lengthened, graduated. Lateral toes free; the inner very slightly shorter than the outer.

Example, *Telophonus leucogrammicus*.



Bill of Telophonus leucogrammicus. (Sw., *Classification of Birds*, vol. ii.)

TELUGU or TELINGA LANGUAGE. [HINDUSTAN, p. 229.]

TEMANZA, TOMMASO, an architect who is better known by his writings relative to his art than by the buildings which he executed, was the son of an architect, and the nephew of another architect (Giovanni Scalfarotti), and was born at Venice in 1705. Having finished his mathematical studies in the school of Padre Niccolo Comini and the eminent Marchese Poleni, he was appointed—although then only twenty-two—one of the assistants in the Commission of Engineers, and in 1742 became the chief of that body on the resignation of Bernardino Zendrini, a few years before the latter's death (1747). His share in the hydraulic commission caused him for awhile to be involved in literary disputes, he having offended the people of Padua by a publication entitled 'Dell antico Corso de' Fiumi in Padova e suoi Contorni;' wherein he asserts that their ancestors had attempted to turn the source of the Brenta. As an architect he had not many opportunities afforded him, for the period of Venetian grandeur and enterprise in art had passed away. He was however employed to execute one of the very few public edifices of any kind erected at Venice in the last century, namely the church of La Maddelena, a structure of the Ionic order, and which, though it may be said to be comparatively pure, is also somewhat feeble and insipid in design. His other principal architectural works are—the façade of Santa Margherita, at Padua; the Rotunda at Piazzolo, built at the expense of the Contarini family; and the bridge over the Brenta at Dolo. It is as a writer that Temanza is chiefly known, more especially by his 'Vite de' più Eccellenti Architetti e Scultori Veneziani,' 4to., Ven., 1778; which is one of the most copious as well as best-written works of the kind, not on account of the number of lives it contains, it being in that respect scanty, but for the unusual extent at which they are given. In fact several of them, Palladio, Sansovino, &c., had previously been published separately. Besides this literary production—an important contribution to architectural biography,—he published the 'Antichità di Rimini,' folio, 1741; and left behind him another work, 'Degli Archi e delle Volte, e delle Regole generali dell' Architettura Civile,' which was first edited in 1811. There are likewise a great many letters by him on architectural topics in Ticozzi's edition of Bottari's 'Raccolta di Lettere sulla Pittura,' &c.

Temanza died at Venice, June 14, 1789, and was buried in his own church of La Maddelena. There is a portrait of him in Gamba's 'Galleria d'Uomini Illustri,' to which work, and to Comolli's 'Bibliografia Storia Critica dell' Architettura Civile,' we are indebted for some of the particulars here given.

TEME. [SHROPSHIRE.]

TEMESWAR, THE BANAT OF, is one of the finest and most remarkable portions of Hungary, comprehending the counties of Torontal, Temes, and Krassova, and the German and Wallacho-Illyrian districts. These two districts are sometimes not considered as part of the Banat. The area of the whole is 11,340 square miles, and the population is said to be above a million; but there is no part of the Austrian empire the population of which it is so difficult to ascertain as that of Hungary. It is bounded on the north by the Maros, separating it from the counties of Arad, Csongrad, and Csanad; on the west it is separated by the river Theiss from the counties of Csongrad and Bacs, and the Czaisk district, and by the Danube from Slavonia; on the south by the Danube from Servia; and on the east by the Cserna, and the offsets of the Carpathians, extending from Transylvania, from Little Wallachia, and Transylvania. The Magyars comprehended it in the military district of Kant. It was a frontier province against the Wallachians, the Bulgarians, and the Turks. The latter however got possession of it in 1552, and retained it till 1716; when, in consequence of the victories of Prince Eugene, it was restored to Austria by the treaty of Passarowitz in 1718. Under the disorderly rule of the Turks, the country was overrun with banditti, so that many parts were nearly uninhabited and desert. Field-Marshal Count Francis Mercy d'Argenteau, who was appointed governor, and died in 1734, and Baron Engelshofen, his successor, exerted themselves to improve it by inviting numerous colonists from Germany, Italy, and France, building towns and villages, establishing manufactories, and erecting forts. But the Turkish war being renewed in 1737, many of these establishments were ruined, and a great number of the foreign colonists quitted the country. When peace was restored, numbers of Servians, Rascians, Macedonians, and Bulgarians, came from the Turkish provinces, bringing their property with them. In 1752 the government was changed from the military to the civil form, and, with the exception of a temporary check during the Seven Years' war, the progress of improvement in this province has been constant.

The Banat is remarkable for the great varieties of climate: in many parts the snow on the high mountains and in the deep ravines never melts, and in other parts it falls only in severe winters. A third part of the country is mountainous, and almost everywhere well watered. The ground which has been gained by draining the morasses on the banks of the Theiss and the Danube, and in the more elevated tracts by clearing the old forests, is extremely fruitful. In the middle of the two military frontier districts lies the most extensive sandy tract in the whole Austrian empire, in which there are however many oases. The principal points of the high mountains are Sarko, Gugu, Muraru, and Godjan; on the lower mountains there are vast forests and fine pastures. The principal rivers are the Danube, Theiss, Maros, Körös, Neray, Temes, and Bega. In 1748 and the following years canals were made in order to drain the marshes: the principal of these is the Bega canal, 75 miles in length, which traverses the whole of the counties of Temes and Torental, and is conducted into the Theiss. By the draining of the marshes, tracts which in the latter half of the last century were stagnant pools, the source of pestilential exhalations, are now covered with the finest corn-fields, or, where they have been imperfectly reclaimed, with crops of rice, and the salubrity of the country has been greatly improved. The protection which the mountains give against the east and north-east winds, and the mitigation which the north winds experience in traversing the great plain, raise the temperature to that of a southern country, and the rich soil yields abundant crops. The wheat and maize of the Banat are of the finest quality. Rice is extensively cultivated. Successful attempts have been made to cultivate cotton and silk, and in some parts a sweet wine is produced. There is no part of Hungary in which colonization has been attended with such favourable results by the settlement of industrious foreigners as the Banat, where there is still so much uncultivated land, and where, with the exception of some marshy tracts, the climate is very healthy. Mineral springs are frequent, but little use is made of them. Only those of Mehadia, which were known to the Romans by the name of *Thermæ Herculis*, are still much resorted to, especially by the Wallachian and Moldavian nobles. About this place, as well as in other parts of the Banat, Roman antiquities are frequently found. The population of the Banat, which is continually increasing by the accession of foreign settlers, consists chiefly of Wallachians, Rascians, Bulgarians, gypsies, Germans, Jews, French, Italians, and other foreign settlers: among whom, in the mountainous districts, the Wallachian language is prevalent; in the towns and colonised plains, the German; and in the districts of the military frontier, the Illyrian. The natural productions are horses, horned cattle, swine, wheat, maize, rice, flax, hemp, tobacco, fruit, wine, woad, madder, saffron, silk, timber, honey: game of all kinds and fish abound. The minerals are gold, silver, copper, zinc, and some iron. The gold is obtained by the gypsies, by washing the sand of the rivers. Between 4000 and 5000 workmen, chiefly Wallachians, are employed in the mines. The chief occupations of the inhabitants are agriculture and the breeding of cattle. There are no manufactures. The county of Temeswar, as has been stated, is one of the three included in the Banat, and needs no separate description. A circle of the county bears the same name.

TEMESWAR, the capital of the Banat and of the county, is a royal free city, situated in 45° 45′ N. lat. and 21° 10′ E. long., at the confluence of the Temes and the Bega, and on the Bega canal, in a part of the country which is rendered unhealthy by the stagnant waters in the vicinity. It is one of the strongest fortresses and one of the handsomest and most regular towns in the whole Austrian empire. While the town was in the possession of the Turks it consisted of only a few houses and an old castle, which is still habitable. When Prince Eugene made himself master of it in 1718, the strong fortifications were erected as a bulwark against the Turks, and the town was built in the modern style. The inner town, or fortress, is surrounded with triple walls and moats, and consists of large uniform stone houses, in straight, broad, well-paved streets. There are three gates, the Vienna, Peterwardien, and Transylvania gates, which are defended by strong blockhouses. The casemates are capable of containing 3000 men. Temeswar is the seat of the Roman Catholic bishop of Csanad, with his chapter and seminary, and of the schismatic Greek bishop of Temeswar: here too are the court of justice for the three counties, the offices of the governor of the fortress and of the commander of the Banat military frontier, a military academy, a great arsenal, and many other offices connected with the military and civil administration. The most remarkable buildings are—1, the old strong castle of John Hunyady, built of freestone, the only relic of the antient Temes; 2, the churches, viz. the fine Gothic cathedral of St. George, belonging to the bishopric of Csanad, the cathedral of the schismatic Greeks, the Roman Catholic parish church, the churches of the Piarists, and of the seminary; 3, the elegant residence of the bishop of Csanad, the remarkably fine building in which the chapter resides, the house of the commander of the military frontier on the parade, the large and handsome county hall in the great square, the barracks, the military and civil hospitals, the synagogue, the Rascian town-hall, which contains the theatre and the assembly-rooms. Some of the churches were formerly Turkish mosques.

Temeswar has three suburbs, one before each gate, at the distance of 300 paces, with fine avenues of trees leading to them. Before the Vienna gate is the suburb Michala, inhabited by Wallachians, who have their own churches, and whose occupations are agriculture and the breeding of cattle. Before the Peterwardien gate is Josephstadt, an extremely pleasant suburb, with very broad straight streets, and trees planted in front of the houses. Many wealthy families reside here in the summer to enjoy the country, and formerly to avoid the fevers that usually prevailed in the town, but which have greatly abated since the surrounding marshes have been drained. The inhabitants of this suburb are Germans. The fine Bega canal passes through the middle of this suburb, and communicates with the Danube. Before the Transylvania gate lies the manufacturing suburb (*Fabriken Vorstadt*), so called from the great manufactories that were formerly established here, but most of which were broken up in 1738, when a Turkish war was apprehended; the suburb however retains its name. The Turkish merchants have their warehouses here. In this suburb there is a curious hydraulic engine, by means of which water is conveyed in iron pipes underground into the fortress: the inhabitants are chiefly Rascians. There is a considerable trade at Temeswar in the productions of the country, and some manufactures of cloth, paper, iron-wire, and silk. The population of the fortress is about 3000; and that of the whole town, including the suburbs, 13,000, besides the garrison.

(Brockhaus, *Conversations Lexicon*; Jenny, *Handbuch für Reisende in dem Oesterreichischen Kaiserstaate*; Thiele, *Das Königreich Ungarn*; *Die Oesterreichische National Encyclopädie*; Rohrer, *Statistik des Oesterreichischen Kaiserthums*; *Neueste Beschreibung von Ungarn, &c.*; Joseph von Hammer, *Geschichte des Osmanischen Reiches*; *Historisch-Statistischer Umriss von der Oesterreichischen Monarchie*. These two last works are anonymous. Hassel; Stein; Blumenbach; Hörschelmann; and Cannabich.)

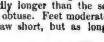
TE'MIA, Le Vaillant's name for a genus of INSESSORES, or perching birds, which, Cuvier observes, M. Vieillot has changed into *Crypsirina*, and Dr. Horsfield into *Phrenotrix*, whilst M. Temminck arranges them under *Glaucopis*.

Cuvier remarks, that these birds have the carriage and tail of the magpies, an elevated bill with the upper mandible convex, and the base furnished with velvety feathers, nearly as in the BIRDS OF PARADISE. The species most antiently known is, he observes, the *Corvus varians* of Latham, which is of a bronzed green colour, and found in India and Africa. Cuvier places the genus between *Caryocatactes* [NUTCRACKER] and *Glaucopis*.

Mr. Swainson arranges *Crypsirina* in the subfamily *Glaucopinæ*, or Wattle-Crows, in his *Classification of Birds*; but in *Fauna Boreali Americana* he had made *Crypsirinæ* a subfamily. In the *Classification*, the genus is situated at the head of the *Glaucopinæ*, and is immediately succeeded by *Ptilostomus*, Sw.

Mr. Swainson thus characterises *Crypsirina*:—

Bill shorter than the head, much compressed; the culmen considerably arched, and curved from the base. Nostrils small, basal, concealed by incumbent feathers, which are either soft or setaceous. Wings short, much rounded; the primaries hardly longer than the secondaries. Tail feathers broad and obtuse. Feet moderate, arboreal. The middle toe and claw short, but as long as the tarsus; lateral toes unequal; hind toe and claw shorter than the tarsus. India.'

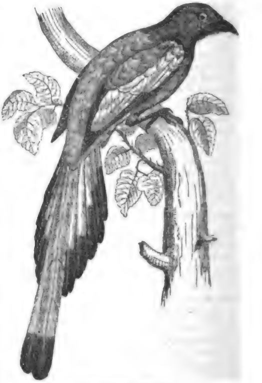

Bill of Crypsirina. (Sw.)

Crypsirina vagabonda (vagabunda) and *Temia* are among the species given as examples.

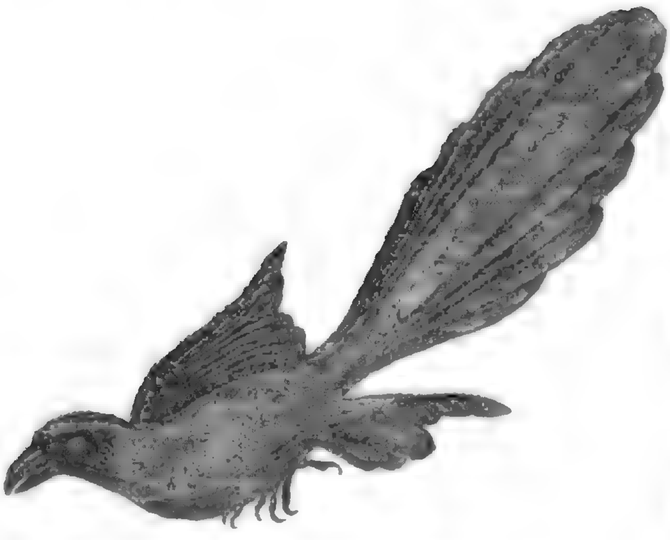
The first of these is the *Pica vagabunda* of Gould (*Century of Birds from the Himalaya Mountains*), and thus described by him:—

'The specific denomination of this bird is bestowed upon it in consequence of its peculiar habit of life. The *Pica vagabunda*, or Wandering Pie, unlike the typical pies, who remain constantly stationary in one neighbourhood, seeking for their food in its vicinity, wanders from place to place, travelling over a large space of ground, and not evincing a partiality for any particular situation. The shorter tarsus of this bird, indeed, and its more elongated tail, are indicative of trees being its most usual resort, where fruits and berries offer a supply of its natural food; whereas in the more typical *Picæ* the longer tarsus and more elongated beak fit them for digging in the ground, in which they almost solely seek for subsistence. This species is more widely distributed than any of its congeners, being found in considerable abundance all over India.

'The head, neck, and crest are of a smoke colour or a blackish-grey; the back light cinnamon; the centre of the wings grey; the quills black; tail grey; each feather being tipped largely with black; the under surface is pale-tawny; the beak and tarsi black. Length 16¾ inches; beak 1½; tarsi 1½; tail 10 inches.'


Pica Vagabunda. (Gould.)

Dr. Horsfield, who gives *Corvus varians* as the synonym of his *Phrenotrix Temia* (the *Chekitut* or *Benteot* of the Javanese), states that although not a rare bird in Java, his *Phrenotrix* is by no means familiar, and never approaches the villages and habitations like many others. 'It can only be observed near solitary hamlets situated in tracts recently cleared for cultivation, where its food is abundantly supplied by the insects contained in the rich mould, and by the wild fruit-trees about the skirts. In consequence of the shortness of the wings, its motions are slow: it is chiefly seen about noon sailing heavily through the air in a right line towards the trees surrounding the openings in the forest. The strength of the bill and of the claws shows its adaptation to feed both on fruits and insects.' (*Zoological Researches in Java.*)



Phrenotrix Temia. (Horsf.)

TEMNU'RUS. [Trogonidæ.]

TEMPE (Τέμπη, called also Thessala or Thessalica or Phthiotica Tempe) was the antient name of a beautiful valley in Thessaly, lying between Mount Olympus on the north and Mount Ossa on the south, near the mouth of the river Peneus, which runs through it. It is a narrow glen, not quite five miles long, opening on the east into a wide plain which extends to the Thermaic gulf. It forms the only break in the great chain of mountains by which Thessaly is enclosed on all sides. Antient traditions asserted that the great plain of Thessaly was at one time covered with water, which was at length discharged by the vale of Tempe, which was opened by a stroke of Neptune's trident, or (according to another legend) by the strength of Hercules. The appearance of the country has led modern travellers to accept the mythical story as meaning that the pass was opened at some period by a great convulsion of nature. The rocks which enclose it rise in precipices from the bed of the Peneus, and at the narrowest point these precipices approach so near each other that the road is cut in the face of them.

The Greeks reverenced Tempe as the place from which Apollo transplanted to Delphi his sacred laurel, and admired it as the most beautiful spot in their country. The most vivid description of it is that of Aelian (*Var. Hist.*, iii. 1). See also Ovid, *Metamorph.*, i. 569, &c.; Livius, xliv. 6; Plin., *Hist. Nat.*, iv. 8; Cramer's *Greece*, i., p. 379; the Tours of Clarke, Holland, Dodwell, and Gell; and Thirlwall's *Hist. of Greece*, i., p. 5.

TEMPERAMENT (*temperamentum*, κρᾶσις) is a vague and unsatisfactory term, but still it is one which, as Dr. Mayo observes (*Pathology of the Human Mind*, London, 12mo., 1838, Append., p. 162), 'has for many centuries been found a convenient generalization; and, unless we propose to sacrifice knowledge at the altar of logic, we must still be contented to use this or some other equally indefinite term.' The word means literally *a tempering*, or *mixing together*, and may be defined to be a peculiar state of the system common to several individuals, which results from the various proportions in which the elementary parts of the human body are *mixed up together*, and which gives rise to a tendency to certain phenomena. There is besides in each individual a further peculiarity of combination, which serves to distinguish his temperament from that of any other person, to whom however he may in other respects bear a great resemblance. This individual temperament is called an *idiosyncrasy* (i.e. *a peculiar mixing together*), and, as the two words are sometimes confounded, it may be useful to have pointed out the distinction between them. All the different systems of organs in the human frame are accurately adjusted to each other, so as to produce one harmonious whole. If the disproportion be too great, disease ensues; but there are many gradations, compatible with health, where yet this disproportion is very observable. The predominance of any particular system of organs modifies the whole economy, impresses striking differences on the results of the organization, and has perhaps almost as great an influence on the moral and intellectual as on the physical faculties. This predominance establishes the temperament: it is the cause of it, and constitutes its essence. The antients paid considerable attention to the subject of temperaments, and pointed out various peculiarities in the constitution and actions of the human body, which have been seen so far to coincide with general observation, that their nomenclature has continued in very general use even to the present day, although the hypothesis on which it was founded is universally discarded. They described four temperaments corresponding to the four qualities of Hippocrates—hot, cold, moist, and dry. It was supposed that there were four corresponding primary components of the human body, namely, blood (αἷμα), phlegm or pituita (φλέγμα), and the two kinds of bile (αἱ δύο χολαί), yellow bile (ξανθὴ χολή), and black bile or atrabilis (μέλαινα χολή); and the preponderance of one or other of these components in different persons produced the different temperaments. These four primary principles of living bodies were supposed to be compounded of the simple elements or qualities of nature thus: hot and moist produce blood; cold and moist, phlegm or pituita; hot and dry, yellow bile; and cold and dry, black bile. Bodies in which blood superabounds are of the sanguine temperament; if phlegm is in excess, the phlegmatic temperament is developed; if yellow bile, the choleric; and if black bile, the melancholic or atrabilious temperament. The following is the description of the different temperaments given by Paulus Aegineta (*De Re Medica*, lib. i., cap. 61), in Mr. Adam's Translation (London, 1834, 8vo.):—'Those bodies which are of a hotter temperament than the moderate will have their teeth earlier than usual, and will grow in like manner. They feel warmer to the touch, and have less fat; they are of a ruddy colour, and have their hair black and moderately thick, and their veins are large. But if such a one be also fat and brawny, and have large veins, he is fat from habit, and not from nature. The following are the symptoms of a cold temperament: such bodies appear cold to the touch, are without hair, and are fat; their complexion, like their hair, being tawny. But when the coldness is great, they are pale, leaden-coloured, and have small veins; and if lean, this does not proceed from nature, but habit. The dry is harder and more slender than the temperate, the hardness indeed being inseparable from the dry temperament; but leanness not only follows the connate temperaments, but also those which are acquired by long habit. It is peculiar to the humid temperament that the body is oppressed by things of a moist nature. The warm and dry temperament, in other words, the *choleric*, is extremely shaggy, having the hair of the head in early age of rapid growth, black, and thick; but in after-life baldness follows. The veins are large, as are likewise the arteries, which beat strongly. The whole body is firm, well articulated, muscular, and without obesity; and the skin hard and dark. When the temperament is cold and humid, or *phlegmatic*, the chest is narrow, and, like the rest of the body, without hairs; the skin is soft and white, and its hairs somewhat tawny, especially in youth; and such persons do not get bald when they grow old: they are timid, spiritless, and inactive; their veins are invisible; they are gross and fat; their muscles and legs are feeble, and their joints ill-formed; and they are bandy-legged. But should the humidity and coldness increase, the colour of their skin and hair becomes tawny, or, if they increase still more, pale. The hot and humid, or *sanguine*, temperament is softer and more fleshy than the proper, and, when it increases much, is subject to putrid disorders; but if it be only a little more humid and much hotter than the moderate, the bodies of such persons are only a little more soft and fleshy than the moderate, but they are much more hairy and hotter to the touch. But if the cold and dry grow equally together, and form the *melancholic* temperament, such persons have naturally their bodies hard, slender, and white, with fine muscles, small joints, and little hair; and they are cold to the touch. Although slender, fat is mixed with their flesh. The colour of their hair is correspondent to the degree of constitutional coldness. As to disposition of mind, they are spiritless, timid, and desponding. To say all in a word, with regard to the compound temperaments, they are always to be distinguished by the marks of the prevailing quality.'

The due admixture of these different qualities was supposed to constitute the best form of temperament or constitution (εὐκρασία), of which the following is Paulus Aegineta's description (*Ibid.*, i. 60):—'That man is in the best temperament of body when it is in a medium between all extremes, of leanness and obesity, of softness and hardness, of heat and cold, of moisture and dryness; and, in a word, who has all the natural and vital energies in a faultless state. His hair also should be neither thick nor thin, neither black nor white. When a boy, his locks should be rather tawny than black, but when an adult, the contrarywise.'

Further information respecting the opinions of the antients on the subject of the temperaments may be found in the treatise of Hippocrates, *De Natura Hominis*, tom. i., ed. Kühn; in Galen's works, *De Elementis ex Hippocrate*, tom. i., *De Temperamentis*, tom. i., *De Optima Corporis nostri Constitutione*, tom. iv., *De Sanitate Tuenda*, lib. v., tom. vi., and his *Ars Medica*, tom. i.; Oribasius, *Synopsis*, lib. v., cap. 43, sq.; Aëtius, *Libri Medicinales*, lib. iv., cap. 53, sq.; Haly Abbas, *Theor.*, lib. i.; Averroes, *Collig.*, lib. vi.; Alsaharavius, *Theor.*, tract. vi.; and Avicenna, *Cantica*.

After the revival of letters, this fourfold division was adopted in its most essential parts by all the most eminent physiologists. Stahl ingeniously adapted it to the modern doctrines of the humoral pathology; and even Boerhaave, although he increased the number of the temperaments to eight, and relinquished the erroneous opinions of Hippocrates and Galen respecting the constitution of the blood, yet he still derived the characters of his temperaments from the principles of the humoral pathology, and supposed them to be formed merely by different combinations of the four cardinal qualities. Many late physiologists have been inclined to doubt whether the external characters associated with the four temperaments are real and constant signs of diversity in bodily structure, and enable us to distinguish the principal varieties of constitution which exist. Several attempts have accordingly been made to define in a more satisfactory manner the peculiarities of organization and the resulting varieties of predisposition, which are chiefly interesting with regard to pathology. Hoffmann and Cullen have indeed retained the old division, supposing that the theory of the antients as to the peculiarities of constitution was founded originally upon facts, though subsequently combined with an erroneous theory. Haller seems to have been the first who decidedly opposed the antient doctrine, not only by showing that there was no foundation for the varieties of the temperaments in the peculiar nature of the fluids, but by substituting in their place the vital actions of the system. Darwin proceeded upon the principle of Haller; and, in conformity with the hypothesis which he adopted of reducing these actions to the four heads of irritation, sensation, volition, and association, he formed four temperaments in which these qualities were supposed respectively to prevail. The only attempt however to improve upon the Hippocratic theory and division which has been attended with any degree of success is that by Dr. Gregory, who to the four temperaments of the antients added a fifth, which he called the *nervous*, and bestowed upon three of the others the new appellations of the *tonic*, the *relaxed*, and *muscular* temperaments. Dr. Prichard however restricts the number to four, and designates them by their original names; remarking that only four strongly marked diversities of external character present themselves to observation; that the nervous temperament is not so distinguished; and that therefore, as this is an essential part of the original scheme for the distribution of temperaments, the improvement proposed by Dr. Gregory is lame and defective. These four varieties then of external character really indicate, more or less constantly, well marked differences of constitution, and likewise of morbid predisposition. There is no doubt that persons having the complexion and other signs of the sanguine temperament are more liable to certain classes of disorders than the phlegmatic or melancholic, while the latter have their own peculiar tendencies. The sanguine, having a fully developed vascular structure, and therefore a vigorous circulation of blood, a warm skin, and a high degree of organic sensibility, are more liable to sudden and powerful impressions from external agents than those of more languid vital functions. They are subject in a greater degree to severe inflammatory disorders, and disorders of this class are in them more acute: they bear however, better than persons of more languid habit, evacuations of blood and the other measures which are found to be the proper remedies for these diseases. The greater fulness of blood-vessels, of those at least which are near the surface, the greater warmth of the skin, and the florid complexion of the sanguine, afford reason to believe that the designation given to this temperament is not wholly unfounded. We likewise find that sanguine persons are more subject to hemorrhages (to those at least which are termed *active*) as arising from excess in the force of circulation through the arteries. Individuals of the phlegmatic temperament are predisposed to disorders arising from, or connected with, a low degree of vital energy. Local congestions of blood arising independently of general excitement come under this category. Glandular and tubercular diseases take place in bodies weak in the structures connected with the vital functions, and are perhaps more frequent in the phlegmatic than in other temperaments. Inflammatory complaints, when they attack the phlegmatic, are less acute and more disposed to terminate in chronic diseases than are those of the sanguine constitution, when at least the latter have been treated by appropriate remedies. The relations of the choleric to the melancholic temperament are similar to the relations which the phlegmatic bears to the sanguine; the former displays greater vigour, both in health and disease, than the latter. The choleric and sanguine, when affected by diseases of the nervous system, have complaints of greater violence and acuteness; mania or raving madness belongs particularly (according to the observations of M. Esquirol and many others) to these constitutions. The melancholic temperament is most prone to monomania, attended with depression and melancholy illusions. Hypochondriasis much more frequently affects the phlegmatic and melancholic, though it is occasionally observed in persons who have some of the external characters of the sanguine temperament. The most severe cases of hypochondriasis, adds Dr. Prichard, and those which approached most nearly to the character of melancholia, have certainly occurred in individuals of a dark leaden complexion, fixed and sullen aspect, and lank coal-black hair.

But it is not merely on the body, both in its healthy and morbid state, that the temperament exerts an important influence; the relation of the different forms of physical organization to the intellectual, and even to the moral, faculties is equally marked and apparent. The relation of mental peculiarities to the structure of the body has been observed by medical authors of every age, and it has been stated and explained in different ways. Hippocrates said that 'the soul is the same in all men, but that the body is different in different individuals. The soul is ever like itself both in greater and in less, for it undergoes change neither by nature nor by necessity; but the body is subject to continual alterations.—The affections of the mind depend upon the body; there are many states of the latter which sharpen, and many which obtund it.' (Hipp., *De Victûs Ratione*, lib. i., § 21, tom. i., p. 650.) Democritus, in a letter said to have been addressed by him to Hippocrates, asserted that 'the intelligence of the mind depends greatly on the body, the diseases of which obscure the mental faculties, and draw the latter into consent.' (Hipp., *Epist.*, tom. iii., p. 824.) Among the writings of Galen there is a treatise entitled *Quod Animi Mores Corporis Temperamenta sequantur* (tom. iv., ed. Kühn), written expressly to establish the connection between the passions and desires of the mind and the temperaments, wherein he has handled the subject very ingeniously and has delivered many profound views of the animal economy. But it is in the works of modern writers that we find this doctrine most fully developed, and made a foundation for a division of human characters. According to Hoffmann, the choleric temperament by peculiarity of organization disposes men to precipitate and impetuous conduct, to anger, audacity, impatience, temerity, quarrels, sedition, and the like. On the other hand the slow progress of the blood through the vessels of the meninges, which is the result of its crassitude in melancholics, renders such persons timid, slow in business, anxious, suspicious, with difficulty of forming or uttering opinions. The sanguine by a happier temperament are rendered cheerful and free from care. A too abundant serosity causes the phlegmatic to be lazy, somnolent, and torpid. Certain temperaments qualify men for particular situations in life. Melancholic men, says Hoffmann, should be the king's ministers and counsellors; choleric persons should be appointed generals, foreign ambassadors, orators, and conductors of all business requiring energy and dispatch; and it was with some such impression concerning the peculiar qualities of this temperament that Napoleon, after complaining of its inconvenient effects in deranging his temper, is said by M. Ségur to have added, 'Cependant sans cette maudite bile on ne gagne pas de grandes batailles.' Sanguine men, continues the writer above mentioned, are fit for courtiers; but individuals who have the misfortune to be of the phlegmatic temperament, being quite incompetent to any elevated condition, must be made common soldiers or labourers, and condemned to the lowest employments. (*De Temperamento Fundamento Morborum*, § 10, quoted by Dr. Prichard.) It is extremely improbable that an opinion should have held its ground for so many ages among men of observation, especially on a subject requiring no abstruse research, without some foundation at least in fact. The doctrine of temperaments is true to a certain extent, and has ever been confirmed by an appeal to experience. States of the mind are so connected with affections of the body, that it is impossible for any person who considers all the physiological facts that present themselves in connection with this subject to doubt that with each temperament particular mental qualities must be associated, although it is manifest that many writers have indulged their fancy on this subject, and have gone into more full and minute details than experience will establish. The same may be said of phrenology, with which science the doctrine of the temperaments is in this point of view closely connected, as modifying in some degree the intellectual and moral qualities depending on the organization of the brain. This very interesting subject is discussed at some length in Dr. Prichard's article on 'Temperament' in the *Cyclopædia of Practical Medicine*, from which most of the preceding observations are taken. See also Bostock, Richerand, and Müller's works on Physiology, and other writers there quoted.

TEMPERAMENT. [TUNING.]

TEMPERATURE. [ATMOSPHERE; CLIMATE; ISOTHERMAL LINES.]

TEMPERATURE OF THE EARTH. [GEOLOGY, p. 133.]

TEMPERATURE. It is intended under this head to notice the law of the variations of temperature on the earth so far only as to indicate its analogy with that of the variations of terrestrial magnetism; the formulæ expressing the mean temperatures at different places being, as yet, very far from affording satisfactory results, and observations being too few to serve as a basis for correct theory. In CLIMATE there are given some general observations concerning the distribution of heat at the surface of the earth, and under ISOTHERMAL LINES there will be found the estimated values of the mean temperatures at the equator and at the geographical north pole. With respect to the former, it may be said to have been tolerably well determined, and to be nearly uniform quite round the world; but the mean temperature at the pole can only be surmised from the uncertain evidence afforded by an application of the formula of temperature which has been found to hold good in the north of Europe, and a correction founded on an estimated amount of the frigorific influence of ice: even the determination thus obtained is rendered still further uncertain by the fact that the decrease of temperature in proceeding from the equator northwards is different on meridians which differ considerably in longitude.

Before this difference of temperature on the same parallel of latitude in the old and new continents was known or regarded, a simple formula was thought sufficient to express the temperature at any parallel of terrestrial latitude. The celebrated Tobias Mayer, from such mean temperatures as had in his time been observed, found that the temperature t (on Fahrenheit's scale) at any place might be represented by $T-52^\circ \sin.^2 L$, where T is the mean temperature at the equator, and L the geographical latitude of the place; and in 1819 M. Daubuisson ('Traité de Géognosie') proposed the more accurate formula $t=27^\circ \cos.^2 L$ (centigrade scale); which being adapted to Fahrenheit's scale, considering the mean temperature at the equator to be 81°, becomes $32^\circ+49^\circ \cos.^2 L$. This formula has been found to serve for temperatures in Europe as far north as the latitude of 60°; but beyond that parallel it is useless, and it supposes the temperature at the geographical pole to be 32°, which is much too high.

From above 4000 observations which were made by Sir Edward Parry, it is found that in Winter Harbour, in 74° 45′ N. lat., and in long. 250° (110° W. long.), the mean temperature is as low as 1·33°; and from above 600 observations at Spitzbergen (78° N. lat.) Mr. Scoresby found the mean temperature to be 16·99°: a mean temperature of 17° is also found on the American continent, in 65° N. lat.; and hence it may be inferred that, between the parallels of 65° and 78°, and near the meridian of Winter Island, there exists a pole of minimum temperature. The mean temperatures of places in the eastern parts of Asia have not been well ascertained; but since at North Cape in Lapland the mean temperature is that of freezing water, and in Siberia, as low as the parallel of 60° N. lat., the surface of the ground is constantly frozen, it is evident that the isothermal line of 32° must form a curve about some point as a focus in the northern part of the Asiatic continent: hence, for determining the mean temperature of any place, no formula which does not involve the position of the place with respect to the two foci of coldness can be expected to satisfy the phenomena.

This circumstance has suggested to Sir David Brewster the formula $T=(t-\tau)\sin.^n \delta \sin.^n \delta'+\tau$ for the mean temperature at any place: T being that temperature, t the mean temperature at the equator, τ the temperature at each of the foci of coldness, and δ, δ', the distances in degrees between the given place and those foci. A corresponding expression will serve to determine the number of vibrations which would be performed by a magnetized needle in a given time if t and τ be made to represent the numbers performed, in an equal time, at the magnetic equator and at either of the poles of magnetic intensity: the exponent n, both for temperature and intensity, is to be determined by means of observations, and Brewster considers that the fraction $\frac{1}{2}$ may be the value of it in the formula for temperature.

The similarity of character which is presented by the isothermal lines and those of magnetic dip and intensity, with respect to two polar points in one hemisphere of the earth, and the fact that the poles of temperature and magnetism lie nearly in the same parts of the world, cannot fail to suggest the idea that there may be a connection between the temperature and magnetism of the earth. It is generally believed, also, that the temperature of the western parts of Europe is now higher than it was nearly two thousand years since; and it has, hence, been inferred that the poles of minimum temperature perform revolutions about the geographical pole of the earth, so that the terrestrial meridian on which the greatest cold prevails gradually changes its position. If this opinion be well founded, the circumstance will afford another argument in favour of the hypothesis which assigns to the temperature and magnetism of the earth an intimate connection with each other, by its correspondence to those motions of the poles of magnetic dip which have been adduced from observations by M. Hansteen. [TERRESTRIAL MAGNETISM.]

As the mean temperature at the surface of the earth is an element of great importance in the present state of physical science, it has been strongly recommended to travellers and persons making distant voyages, if they are to remain only a few days at any place, that they should, on arriving, lose no time in burying in the earth, to the depth of from three to twelve feet, according to the power of penetrating into the soil, bottles filled with water, or with spirits, if there should be any danger of water freezing. These bottles should be packed in boxes stuffed with woollen cloths, pounded charcoal, or any other non-conducting material, and should be allowed to remain underground till the time of departure, in order that they may acquire, as accurately as possible, the temperature of the ground. On being taken up, the temperature of the liquid should be ascertained by a good thermometer inserted in the bottle.

TEMPERATURE OF PLANTS. The living processes by which heat is so evidently developed in animals go on, though much less actively, in plants, and give to them a peculiar temperature, independent of the air in which they live. The periods at which an increase in the temperature of plants has been most evidently observed are those of germination, flowering, and impregnation; but it is only because those chemical changes which produce heat are more active during the performance of those functions that the heat becomes more evident. The great cause of the development of heat in animals is the union or combustion of carbon with oxygen, which is constantly taking place during the process of nutrition in the various tissues of the animal body. The same thing occurs during the general growth of the plant: a certain quantity of carbonaceous matter is contained in the sap of the plant, which, coming in contact with oxygen in the tissues of the plant, unites with it, forms carbonic acid, and heat is developed.

That a development of heat took place during the growth of plants was proved by Hunter, who placed a thermometer within the stems of several trees, and found that their temperature was always above that of the atmosphere. These experiments were followed up by Salomé, Hermstadt, and others, who confirmed the experiments of Hunter. De Candolle however supposed that this increase of temperature depended on the sap which was pumped up from the soil; but this theory will not explain the phenomena of heat observed during the growth of plants, nor is it at all applicable to its occurrence during germination, which is evidently an analogous process.

Schubler, Neuffer, Nau, and Goeppert have conducted a variety of experiments on the temperature of plants. They found that in winter the parts that were not frozen had a higher temperature than the surrounding air: this was much more remarkably the case in spring; but in summer the temperature of the plant was mostly below that of the surrounding air. These experiments are in accordance with what we know to be the law of the development of heat in more highly organized textures. In winter the vital processes of plants are slow or almost suspended; hence the small increase of temperature at that season. In the spring the process of growth is most rapid, and there is the greatest conversion of nutritive matter into the structure of the plant, and it is at this season of the year that the temperature of the plant is highest above the surrounding air; but in summer the heat of the air becomes greater, and the temperature of the plant is kept under that of the atmosphere by the exhalation which is constantly going on from all parts of its surface.

In the development of heat during germination the changes that take place are more evident. The starch or fecula surrounding the young plant is converted into sugar, and this process takes place through the separation of carbon and oxygen in the form of carbonic acid, which, during their union, give out heat. A familiar instance of this process is seen in the increased heat of the growing barley previous to its being dried to form malt.

The increase of heat is more evident still in the flowering of plants, which, according to Dunal, results from the conversion of a certain portion of starch or fecula in the disk and petals of the plant into sugar, for the nutrition of the anthers and ovules of young plant. The increased heat of the flowers of plants during certain stages of their development was first observed by Madame Hubert in Madagascar, who, being blind, was the more dependent on the organ of touch; and in handling plants she found that the Arum cordifolium was much warmer than others. This led Bory St. Vincent to pursue a series of experiments on this plant, in which he found a very high degree of heat developed during its flowering, which was sometimes 7° higher than the surrounding atmosphere. The flowers of the Arum tribe are very favourably constructed for the development and retention of heat; but all flowers, previous to the full development of their anthers and the function of impregnation, undergo these changes, which produce an increase of temperature.

(Meyen's *Pflanzen Physiologie*, band ii.; and Lindley's *Introduction to Botany*.)

TEMPERING OF STEEL. [STEEL.]

TEMPESTA, ANTONIO, a celebrated Italian battle and animal painter and engraver, was born at Florence in 1555. He became the scholar of John Strada or Stradanus, a Fleming, who was settled at Florence in the employ of the grand-duke, and who assisted him in the battles which he painted in the old ducal palace. Tempesta, after painting some years with Strada, whom he surpassed in many respects, visited Rome, and was employed by Gregory XIII., in the Vatican, where he painted, in small figures in fresco, the Translation of the Body of St. Gregory of Nazianzus, and some other subjects, which acquired him a great reputation among the artists and virtuosi of Rome, and procured him constant occupation from the Roman nobility. He executed several good works for the Cardinal Alessandro Farnese, at his villa at Caprarola, and some at Bassano for the Marquess Giustiniani. Tempesta resided chiefly at Rome, and died there in 1630, aged seventy-five. His reputation rests now almost entirely upon his etchings, although in his time he had a great name also as a painter. Lanzi terms him the first Italian who ever attained distinction in landscape and animal painting, and considers him at this period to have been unrivalled in his own style in Italy; he was however surpassed afterwards by Cerquozzi and Borgognone. Horses were his favourite subjects, and he excelled in battles, processions, cavalcades, hunts, and various field-sports. His designs, particularly his etchings, are remarkable for their spirit and boldness of conception, but they are at the same time coarse and heavy, and careless in their execution. He painted generally small figures; in large ones he was not successful, and he seldom attempted them; he however occasionally prepared large cartoons for tapestries, in the style of his master Strada. Tempesta's chief works in painting, besides those in the Vatican, already noticed, were a Slaughter of the Innocents, in the Church of San Stefano Rotondo, at Rome; and two great cavalcades and state-processions, executed for the Cardinal Scipione Borghese, as friezes around the loggie of his palace on Monte Cavallo (afterwards Palazzo Bentivoglio), which, according to his biographer and contemporary Baglione, were alone sufficient to have ensured him a lasting reputation if he had never painted anything else. One represented a state procession of the Pope; the other, one of the Grand Turk. Tempesta has executed etchings of both these subjects. His invention was amazingly fertile; he has been equalled by few artists in the number of his designs. According to Gandellini, Tempesta etched 1519 plates, and about 500 have been engraved after him by other masters. He also engraved after other masters himself; he executed some battles, and 40 plates of the Spanish story of 'The Seven Twin Sons of Tara,' after Otho Venius: Filibien, in his 'Entretiens sur les Vies des plus célèbres Peintres,' has related the story at length, and has described the subject of each plate.

Tempesta's style of etching is peculiar and not agreeable; and although his designs are bold, and contain many grand parts, they are heavy, his style of design gross, his compositions generally confused, and his light and shade disposed without taste: his most valuable designs are his hunts and field-sports, and his studies of horses. Of his other pieces the following are among the best and the most celebrated:—

A set of 150 illustrations to the Old Testament, known as 'Tempesta's Bible;' 15 large figures of Christ, the Virgin, and the Apostles; a very large plate of the Victory of the Jews over the Amalekites, marked 'Hebraeorum Victoria ab Amalechitis reportata,' the composition of which is spirited, but very confused; the Life of St. Antony, in 24 plates; 150 small plates from Ovid's 'Metamorphoses;' 13 of the Labours of Hercules; and 7 of the Seven Wonders of the Antient World. He etched many cavalcades and processions, and engraved also large plates from the following statues—they are however executed too much in his own style to be faithful representations of the originals:—Castor and Pollux, and the horses on Monte Cavallo, and the equestrian statue of Marcus Aurelius on the Capitol, at Rome; the equestrian statue of Cosmo I., by John of Bologna, at Florence; that of Henry IV. of France, at Paris, which was destroyed in 1792; and one of Henry II. of France. The last statue however never existed, for a figure of Louis XIII. was placed upon the horse which was originally designed for a statue of Henry II., who was killed at a tournament. Tempesta's print bears the following inscription: 'Effigies equi aenei operis Dan. Ricci, Volterrani, fieri jussit Reg. Maria ob memor. Reg. Henrici II. F. M. sui viri, qui obiit in torniamentis.'

A spirited design of the Battle of the Centaurs and the Lapithae, by Tempesta, was cut in a large size in wood, by Jeronime Parabole. As a man Tempesta appears, according to his contemporary Baglione, to have been highly accomplished in every respect, and to have been universally esteemed by his companions. There is a long list of the works of Tempesta in Heineken's 'Dictionnaire des Artistes,' &c., and in the 'Peintre Graveur' of Bartsch.

TEMPE'STA, CAVALIERE, called also in Italy Pietro Mulier or de Mulieribus. This artist, who is sometimes confounded with Antonio Tempesta, was a native of Holland, although better known in Italy, and his real name was Peter Molyn. Fiorillo says he was the son of a landscape-painter of the same name, and was born at Haarlem in 1637. He was called Tempesta through his skill in painting sea-storms and similar subjects, in which he was excellent, and in some respects rivalled Backhuyzen: he was also nearly equally excellent as an animal painter, especially of wild animals, and some have said that had he remained in his own country and pursued entirely such subjects, he would have rivalled Rubens and Snyders in that department. There is yet another comparison to make respecting him; he rivalled, or perhaps surpassed, the infamous Castagno in moral depravity. Pascoli, who has written an account of Tempesta in his 'Lives of the Painters,' &c., says that his father was a merchant, and that he intended to bring up his son to his own business; young Peter was however naturally so fond of drawing, that when a boy, instead of going to school, he used, unknown to his parents, to spend his time in sketching upon the sea-side, sometimes drawing the sea and shipping off the coast, and at others cattle grazing near the shore. He was eventually allowed to take his own course, but nature appears to have been his only or at least chief master. After painting with great success in various cities of the Netherlands, he became acquainted at Antwerp, in about his 30th year, with a monk of the barefooted Carmelites, who converted him from Calvinism, in which he had been brought up, to Popery, and Tempesta was thence strongly induced to make a journey to Rome. At Rome he found a valuable patron in the Duke Bracciano, and his success was beyond his expectations. He received so many orders for pictures, that he was obliged to employ assistants; and the sister of one of these, his favourite, known as Tempestino, became his wife. He however never appears to have lived in great amity with her, but the fault is said to have been Tempesta's. The story of the deep tragedy which followed is told differently by Pascoli, and the writer in the 'Museo Fiorentino,' in which there is a Life of Tempesta, but there is no discrepancy in their statements of the main fact. Tempesta made up his mind to leave Rome, it is said, in order to get rid of his wife, and he requested permission of the Duke Bracciano to depart: the duke consented, but unwillingly, yet he presented Tempesta with a cross and a chain of gold, and knighted him before his departure. Tempesta left Rome, and promised to send for his wife as soon as he was settled; he went round by Venice and Milan, where he made a short stay, to Genoa. In Genoa he was as successful as he had been at Rome; but soon after his arrival he became enamoured of a beautiful Genoese lady, and being unable to obtain possession of her except by marriage, he resolved upon marrying her, and he got over the obstacle of already having one wife in the following infamous manner:—He dispatched a hired assassin to Rome, with a letter to his wife, ordering her to accompany the bearer immediately to Genoa; his wife, who knew her husband's character, and disliked the messenger, delayed going, but on a second summons from her husband she complied, and commenced the fatal journey. The unfortunate woman was murdered by the ruffian, her companion, at Sarzana. The affair was not long a secret, and Tempesta, who must have already married the Genoese lady, according to Pascoli, was arrested upon suspicion, was tried, convicted, and condemned to death. The sentence was however not carried into execution: Tempesta obtained a respite, or, according to the other account, had sufficient interest to obtain a commutation of sentence from that of death to one of perpetual imprisonment.

Pascoli says he was set at liberty again, after remaining five years in prison, through the intercession of the Count di Melgar, governor of Milan; according to the other story, he obtained his liberty during the bombardment of Genoa by Louis XIV., when the prisons were thrown open, having suffered an imprisonment of sixteen years. He was however busily employed with his pencil during the whole time, and he found it difficult to satisfy the demand for his pictures. On recovering his liberty he went to Milan, and there established himself, where, through his unenviable notoriety, his success was even greater than it had been previously either at Rome or at Genoa. He was in the receipt of a great income, lived in splendid style, and even kept a private menagerie, containing many varieties of wild animals, solely for the purpose of painting from them. His conduct at this period of his life was still consistent with his previous immorality, for though enjoying the greatest affluence, he not only deserted his second wife, but left her destitute, according to Pascoli; yet how such conduct could be suffered by the laws is difficult to understand. He had several mistresses, and he acquired the cognomen of Mulier or de Mulieribus by his profligate habits; Peter Mulier is the name by which he is best known in Italy. As he grew old his powers of painting forsook him, and his means accordingly gradually diminished, and as he was too improvident to make any provision for his old age, his affairs became embarrassed at the end of his life. He died of a fever in 1701, aged 64, in a state of poverty when compared with his former affluence. His pictures are numerous in the collections of the north of Italy: those which he painted during his imprisonment are generally accounted his best.

TEMPIO. [SARDEGNA.]

TEMPLARS, KNIGHTS TEMPLARS, or KNIGHTS OF THE TEMPLE, are the popular designations for the Brethren of the Temple of Solomon at Jerusalem, also called the Soldiery of the Temple (Militia Templi) and the Soldiers of Christ. The three great religious military Orders, the Knights of the Hospital of St. John of Jerusalem (commonly called the Knights Hospitallers), the Templars, and the Teutonic Knights of St. Mary of Jerusalem (or German Knights of the Cross), all originated in the twelfth century; the two former towards its commencement, during the first crusade, the last not till near its close. The founders of the Order of the Templars, which is held to date from the year 1118 or 1119, were nine Knights, all French, of whom the two chief were Hugues de Payens or de Paganès) and Geoffroi de St Omer (or St. Ademar). One account makes all the nine to have been previously members of the Order of St. John; but it is at least doubtful if this was the case. At all events, the Hospitallers were not yet a military order; their distinguishing profession was to entertain pilgrims and to attend the sick and wounded; the idea of adding to the three common vows of chastity, poverty, and obedience, an engagement to fight against the infidels, appears to have been first put in practice by De Payens and his brethren. Up to this time, when a knight entered the society of the Hospitallers, he seems to have laid aside his arms. Nor probably did the nine Knights forming the new association at first contemplate either the extensively military character which their order eventually assumed, or even the establishment of an order which should extend and perpetuate itself. Their original vow was simply to maintain free passage for the pilgrims who should visit the Holy Land; nor did they proceed to add to their number till six or seven years after their association. In another respect also their early condition and pretensions were remarkably contrasted with their subsequent state; for at this time they made the greatest show of poverty, even De Payens, who was styled Master, and his friend De St. Omer, keeping only one horse between them, a circumstance commemorated in the seal of the order, which represents two armed knights mounted one behind the other on the same horse. At this their beginning, indeed, the name which they took, and by which they were commonly known, was the Pauper soldiers (*Pauperes Commilitones*) of the Holy City; and they professed to have no source of subsistence but the alms of the faithful. The king of Jerusalem, Baldwin II., gave them their first place of residence, a part of his palace; to which the abbot and canons of the church and convent of the Temple, which stood adjoining, added another building for keeping their arms, whence they acquired the name of Templars.

The new principle of their association, however, immediately drew general attention; so much so, that in 1120 the Hospitallers got their order remodelled by Pope Calixtus II. on the same principle. The first regular embodying of the Templars was by Honorius II., the successor of Calixtus, who in 1128 confirmed a rule for them which had been drawn up and decreed that same year by the Council of Troyes, on the requisition of Hugues de Payens and several of his brethren, who had come to Europe for that purpose with strong recommendations from king Baldwin. Honorius at the same time, to distinguish them from the Hospitallers, who were arrayed in a black mantle, assigned the brethren of the new order a white mantle for their peculiar dress, which they wore plain till Eugenius III., in 1146, appointed them to wear a red cross on the left breast, in imitation of the white cross worn by the Hospitallers. This bloody cross was also borne upon their banner, which was formed of cloth striped black and white; whence it was called *Bauseant*, an old French term applied to a horse marked with these colours. This word consequently became the famous war-cry of the Templar chivalry.

The new order speedily rose into consideration. Members of the noblest families in every nation of Christendom eagerly sought to be joined to it; legacies and donations in lands and money were showered upon it by persons of all ranks; and in course of time it acquired ample possessions in nearly every country of Europe. At the head of the order was the Master, or Grand-master (*Magister*, or *Magnus Magister*), who was however not only elected by the Chapter, or general body of the Knights, but very much controlled by that body: the Grand-Master had immediately under him his Seneschal, or lieutenant; and other high officers were the Marshal, the Treasurer, &c. The several countries in Asia and Europe in which the order had possessions were denominated Provinces; and each of them was presided over by a resident chief, called, indifferently, a Grand Prior, Grand Preceptor, or Provincial Master. Under the provincial masters were the Priors, otherwise called Bailifs, or Masters, who had charge each of one of the districts into which the province was divided; and finally, under the priors were the Preceptors, each of whom presided over a single house of the order (or sometimes over two or three adjoining houses which were considered as one establishment), hence called a Preceptory. The head province was that of Jerusalem; the affairs of the order, in fact, were for the most part directed by the chapter of this province, which was invested by the constitution with all the powers of a general chapter at all times when such a chapter was not assembled. The grand-prior of Jerusalem was ex-officio treasurer of the order; and in this province the grand-master resided so long as the Christians retained any footing in the country: first in the city of Jerusalem, from the origin of the order till 1187, when Jerusalem was taken, and the kingdom founded by Godfrey of Bouillon put an end to, by Saladin; then (after a retirement of four years to Antioch) at Acre, from 1191 till 1217; then at the newly-built fortress of the Pilgrims' Castle, situated on the sea-coast a few miles north of Cæsarea, till the fall of Acre, and the final extinction of the Latin power in Palestine, in 1192. On this the Knights took refuge in the town of Limisso (otherwise called Limasol) in Cyprus. The other provinces in the east were Tripolis and Antioch; to which Cyprus, till then included in one of these, was added after that island became the head-quarters of the order. The western provinces were, Portugal, Castile and Leon, Aragon, France and Auvergne, Normandy, Aquitaine or Poitou, Provence, England (in which Scotland and Ireland were included), Germany, Upper and Central Italy, Apulia, and Sicily.

For some time after its institution the order of the Templars consisted exclusively of laymen. But in the year 1162, the famous bull entitled 'Omne Datum Optimum,' issued by Pope Alexander III., among other important privileges which it bestowed upon the order, permitted it to receive as members any spiritual persons who were not bound by previous vows. These spiritual members were called Chaplains. They did not fight, nor take the military vow; but, in lieu of that duty, they not only celebrated mass and other religious offices in the houses of the order, but usually also acted as secretaries to the chapter. They were not allowed to take any share in the government of the society unless specially invited by their superiors; but they were treated with much ceremonious respect, and they were frequently appointed preceptors. Among the other privileges granted by the bull of 1162, was that of having the offices of religion celebrated once in the year in the houses of the order, even in countries lying under an interdict; a permission well calculated to induce persons to join the society, especially after it came, as is asserted, to be interpreted in practice as entirely exempting the Templars from the effects of interdicts. Alexander's bull also allowed the order to have its own burial-grounds; released it from all spiritual obedience, except only to the holy see; freed it from the payment of tithes, and even authorised it to receive them if the bishop gave his consent; and prohibited any one who had once become a Templar from ever leaving the order unless to enter into a stricter one.

At a date a little later the society still farther extended its scheme and its influence, by admitting as members many persons who were not knights or of noble birth, but who were desirous of participating in the advantages of belonging to so powerful a body, on condition of acting as the squires and servants of the knights. These were styled Serving Brethren; and in this class were sometimes found individuals both of great wealth and eminent station, though not of high birth or knightly rank. The serving-brethren however could not be preceptors, or hold any of the higher offices in the order. Latterly, they were divided into two classes—those of arms and those of trades; the former attending the knights to the field as esquires; the latter exercising various handicrafts in the houses or on the lands belonging to the order. The serving-brethren of arms were considered to form by much the more honourable of the two classes, and were treated with much more consideration than the others; but both appear to have been equally entitled to be present at meetings of the chapter, although it may be presumed that none of the serving-brethren either voted or took part in the deliberations. The order also associated to itself many persons under the name of Affiliated Members, who took no vows, assumed no peculiar dress, nor became subject to any duties or services; but, continuing to pursue their ordinary secular occupations, merely purchased enrolment in the ranks of the powerful and highly privileged soldiery of the Temple for the sake of the protection and other advantages, both temporal and spiritual, which even such a mere nominal membership ensured. The affiliated comprehended women as well as men. Finally, there were the *Donati* and the *Oblati*, consisting of children dedicated to the order by their parents or other relations; and also of persons of all ranks, both laity and clergy, who, without entering the order, pledged themselves to stand by it and to maintain its rights.

The history of the Knights Templars would embrace the history of the wars of the Christians against the Infidels in the East for all the time they lasted after the establishment of the order. For more than a hundred and seventy years the soldiers of the Temple formed the most renowned portion of the Christian troops, and almost every encounter with the enemy bore testimony to their unequalled prowess and daring. But it may nevertheless be questioned whether the establishment of this and the other religious military orders proved advantageous to the attempt so perseveringly made to wrest the Holy Land from the dominion of the Infidels. The Templars and Hospitallers probably damaged and weakened the cause for which they fought, as much by their rivalry, jealousies, and frequently open contention, as they aided it by their valour. On some occasions this opposition between the two orders rose so high as not only to make them desert or withhold assistance from each other in the extremest dangers, but even to throw one of them for the time into concert with the common enemy. No charge (though such charges have been brought) can be substantiated against the bravery of either; but they can hardly be acquitted of treachery in some instances to one another, and the most scandalous abandonment of their duties to the public cause. Then, the immense wealth and worldly power which the Templars in particular speedily acquired altogether changed the original character and spirit of their institution long before it was half a century old. Within thirty or forty years from the origin of the order, two at least of the four vows which the members still continued to take had become a mockery and a profanation; instead of poverty and chastity, they were already distinguished by their pomp and pride, and the general luxury and licentiousness of their lives. But the vast material forces of the association, the extent to which it had projected its ramifications in all directions, and its other elements of strength, might have long withstood the principle of corruption thus at work within it, if it had not drawn upon itself an assault from without by which it could not fail to be overpowered.

The destroyer of the Templars was the resolute and vindictive Philip IV., surnamed Le Bel, or The Fair, of France. Philip, who came to the throne in 1285, at the age of seventeen, was the enemy of the church by education, by temper, and by circumstances. He had already proceeded to extremities in a quarrel with Pope Boniface VIII., which was terminated only with the life of that pontiff. His successor, Benedict XI., is supposed to have been poisoned at the instigation of Philip. Benedict was succeeded by Clement V., who is believed to have purchased his elevation from Philip on condition, among other compliances, of co-operating with him in the destruction of the Templars. This was in 1305. Obnoxious already as the natural allies and defenders of the Holy See, and tempting the attack of the needy and unscrupulous king by their immense possessions, these knights are also said to have further irritated Philip about this time by their suspected share in exciting an insurrection of the Parisians against a debasement of the coinage, a practice which he repeated so often in the course of his reign, that he acquired for himself the name of the money-forger (le faux-monnoyeur).

In 1306 Jacques de Molay, the master of the Temple, was drawn to Europe by a summons from the pope, who professed a desire to consult with him on the expediency of a union of the two orders of the Templars and the Hospitallers. The following year, while Molay was at Paris, the first distinct accusations against the Templars were made by two individuals lying in prison under sentence of death; Squin de Flexian, who had formerly been a member of the order and prior of Montfaucon, but had been ejected for heresy and other offences, and a Florentine called Noffo Dei, also, according to one account, a degraded Templar, by general admission a person of the worst character. They made their revelations to Philip himself, and were immediately liberated from prison. Their charges, imputing to the order the systematic practice and encouragement of all sorts of secret immoralities, as well as the strangest confusion of heresy, idolatry, and infidelity, are far too absurd for examination. Very soon after this, on the 12th of September, 1307, royal letters were issued sealed to all the governors of towns and other officers of the crown in authority throughout the kingdom, and transmitted along with orders to them to arm themselves and the persons under their command on that day month, and then to open the letters in the night, and to act as they should find themselves therein directed. The result was that the next day nearly all the Templars in France, De Molay included, were in custody. Their houses and goods were also everywhere seized; the vast stronghold of the Temple at Paris, the chief seat of the order in that kingdom, was entered and taken possession of by Philip himself; and on the following day, the 15th, the university met there, and examined De Molay and some other knights.

An act of accusation was forthwith published; and Philip at the same time wrote to the pope, and also to the king of England, intimating what he had done, and calling upon them to second him. Edward II. expressed himself at first disinclined to believe what was said against the knights; but on soon after receiving letters from Clement, he yielded, and the English Templars were also all seized and thrown into confinement about the end of December. Meanwhile the examinations had been going on in France under the direction of the king's confessor, Imbert, a Dominican priest, and as such the inveterate enemy of the order of the Templars. Confessions, in many cases incredible from their inherent absurdity, were extracted from many of the knights at Paris and elsewhere by the most savage tortures: the confession was in numerous instances speedily followed by a recantation; but a new application of the wheel, or the fire, to which the accused were exposed in some cases till the roasted flesh dropped from the soles of their feet, generally made them repeat their former testimony. This went on for many months. In August, 1308, Clement, whose very person Philip had now contrived to get completely into his power, issued a bull, calling upon all Christian princes and prelates to aid him in examining into the guilt of the order; and about the same time his holiness appointed a commission, consisting of the archbishop of Narbonne and other prelates and dignitaries of the church, to meet at Paris to try the case. This commission however did not commence its sittings till the 7th of August, 1309. A few months later, examinations under judges, deputed or nominated by the pope, commenced in England and other countries. Altogether many hundreds of knights were examined by these commissions during the years 1309, 1310, and 1311; but it was only in France, where torture was made use of, that any admissions were obtained of the crimes laid to the charge of the order, or any at least that were not manifestly and undeniably unworthy of all regard. Even the Paris commission however did not satisfy the impatience of Philip: on its requisition a great number of knights had stood forward to defend the order, among whom were several of those who had confessed and afterwards retracted. Philip, having forced the pope to nominate Philip de Marigni, bishop of Cambray, the brother of Enguerrand de Marigni, his prime-minister, to the archbishopric of Sens, which had just become vacant, and then included the diocese of Paris, got the new archbishop to convoke his provincial council in the capital, on Sunday, the 10th of May, 1310; and this body, on the Wednesday morning following, had fifty-four of the defenders of the order, who had formerly made confession, brought out as 'relapsed heretics' to a field behind the abbey of St. Antoine, and there committed to the flames. They all died asserting their innocence and that of the order. This terrible example was speedily imitated in the province of Rheims and elsewhere; and some months after, the archbishop of Sens held himself another council, and burned four more knights. These proceedings put a stop to the attempt at defending the order: the rest of the knights who had undertaken this task now all declared their renouncement of it. Meanwhile a general council had been appointed by Clement to meet at Vienne in October, 1311. It assembled on the 13th of that month, but it was not found so compliant as Philip and the pope had expected; and Clement, having put an end to the session, assembled the cardinals and a few other prelates upon whom he could depend in a secret consistory, and abolished the order by his own authority, on the 22nd of March, 1312. When the council reassembled, pursuant to the adjournment, on the 3rd of April, Philip was seated on Clement's right hand, accompanied by his brother and his sons, and attended by an imposing military force; and his holiness read the bull of abolition, the council listening in silence. It was formally published on the 2nd of May following. On the 18th of March, 1314, Molay, the grand-master, and Guy, commander or grand-prior of Normandy, who had all this while remained in prison at Paris, were brought before the archbishop of Sens, condemned to death, and burned on one of the small islands in the Seine, about the spot where the statue of Henri IV. is now erected on the Pont Neuf.

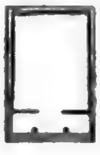
After all, Clement and Philip, the former of whom died suddenly about a month, and the latter, of a fall from his horse, within a year after the martyrdom of De Molay, were able to secure to themselves only a small portion of the plunder which they had probably hoped for. The king of France seized and kept, or divided with his confederate, the moveable property of the Templars in that country; but there, and also in England, and throughout the rest of Europe, with the exception of Spain and Portugal, it was found necessary to transfer their landed possessions to the Hospitallers, or Knights of St. John (at this time commonly known, from the place where they had fixed their head residence, as the Knights of Rhodes). In Spain the lands of the Templars were bestowed upon the Knights of Our Lady of Montesa, a new order, founded in 1317; and in Portugal the society merely took the new name of the Order of Christ, which still subsists. It is affirmed that even in France the order of the Templars has survived to our own day; and it is certain that a society calling itself by that name exists in Paris, which professes to be in possession of the original register and records of the antient Templars, and to have been governed by an unbroken succession of grand-masters, many of them of illustrious rank, ever since the time of Jacques de Molay. It pretends therefore to be the supreme chapter of the order. In England, and we believe also in Germany, the Freemasons are in the habit of holding themselves up as a sort of representatives of the antient Templars.

It is asserted by Matthew Paris, that about the year 1244 the manors or estates in possession of the Templars throughout Christendom already amounted to 9000; and it has been calculated that the entire revenues of the order when it was dissolved did not fall short of six millions sterling, though it seems impossible that this should not be a great exaggeration. Their possessions in England particularly were even at a comparatively early period of great extent and value, as may be seen from an 'inquisitio,' or account of their lands, taken by royal authority in the year 1185, which Dugdale has printed in his 'Monasticon' (vol. vi., pt. ii., pp. 815, &c., edition of 1830). They are supposed to have been settled in the Old Temple, at London, which stood on the south side of Holborn, near the present Southampton Buildings, by the beginning of the reign of Stephen: they removed to their new house at the western extremity of Fleet Street, the site of which still retains the name of the Temple, in 1185. This was the chief seat of the order in England.

The question of the guilt or innocence of the Templars has been much discussed in modern times; and although it may be said to be now almost universally admitted that the particular charges upon which they were condemned were for the most part entirely unfounded, some attempts have been made to show the probability that the order nevertheless was held together by certain secret principles or doctrines which made its existence dangerous to society and called for its suppression. Von Hammer, for instance, in his 'Geschichte der Assassinen' (or 'History of the Assassins'), of which there is an English translation by Dr. G. C. Wood, has endeavoured to establish a similarity and connection between the order of the Templars and that famous association; and in a disquisition, printed in the sixth volume of his 'Mines de l'Orient,' the same writer has attempted to convict the order of a participation in the apostasy, idolatry, and impiety of the Gnostics and Ophianites. Von Hammer's Essay has been answered by M. Raynouard, in a long note printed in the fifth volume of Michaud's 'Histoire des Croisades,' p. 572, &c.; and also in two articles in the 'Journal des Savans' for March and April, 1819; and in two others, published in the 'Bibliothèque Universelle,' tom. x., p. 327, and tom. x., p. 3. The documents relating to the condemnation of the Templars were first published in a work entitled 'Traitez concernant la Condemnation des Templiers,' par M. Du Puy, 8vo., Paris, 1654; reprinted, with additions, under the title of 'Histoire de la Condemnation des Templiers,' &c., par Pierre Du Puy, 2 vols. 8vo., Bruxelles, 1713; and under that of 'Histoire de l'Ordre Militaire des Templiers, avec les Pièces Justificatives,' 4to., Bruxelles, 1751. Other works on the subject are —'Nicolai Gürtleri Historia Templariorum,' 8vo., Amstel., 1691, and, with large additions, 1703; 'Christiani Thomasii Dissertatio de Templariorum Equitum Ordine Sublato,' 4to., Halae, 1705; Raynouard, 'Monumens Historiques relatifs à la Condamnation des Templiers,' 8vo., Paris, 1813; Voltaire, 'Essai sur les Mœurs et l'Esprit des Nations,' chap. 66; Munter, 'Statutenbuch des Ordens der Tempelherren;' Wilike, 'Geschichte des Tempelherrenordens;' 'Secret Societies of the Middle Ages' (in the 'Library of Entertaining Knowledge'), 12mo., Lond., 1837; and 'The History of the Knights Templars, the Temple Church, and the Temple,' by C. G. Addison, Esq., 4to., Lond., 1842. See also Tanner's 'Notitia Monastica,' fol., Lond., 1744, pp. 307-310, for numerous references to printed books and MSS. on the subject of the English Templars.

TEMPLE (the Latin 'Templum'). What is known of the architecture of the nations of antiquity is derived chiefly from their temples; for of all their public edifices those devoted to religion are the most numerous, if we except perhaps those of the Romans, the remains of whose thermæ, aqueducts, theatres, amphitheatres, and other monuments of that class, are as common as their temples, and have been as well preserved. Nearly all of what may, for distinction's sake, be termed the *columnar* architecture of the antients—Egyptians, Greeks, and Romans—is seen in their temples. In those of the Egyptians, it may be said to display itself exclusively, and likewise much more extensively than in the temples of the other two, with this further difference as regards the general design and character, viz. that in the Egyptian edifices the columns are placed *internally*, that is, so as to form colonnades along the sides of an enclosed fore-court, and the portal or frontispiece of the temple itself. Of this disposition of the entire plan, with a walled-in cortile or cloister, an example is shown in Egyptian Architecture (p. 316), where other particulars relative to Egyptian temples and some of the characteristic differences between them and those of the Greeks are mentioned. Instead of being composed of a variety of parts grouped and combined together, these latter consist only of a simple parallelogram, a *cella*, or body of the temple itself, either *in antis*, or else *peripteral*, that is, entirely surrounded with an external colonnade; for to these two distinctions may be reduced all those subordinate ones for which separate technical terms have been invented, yet they do not at all affect the general shape and outline, which still remains a simple unbroken parallelogram, either with or without external colonnades along its sides.

An explanation of those terms having been given in Civil Architecture, page 221, col. 1, we refer to what is there said for the respective definitions, and instead of repeating them, now introduce here what will render them more intelligible, and be of assistance in the present article, viz. examples of the different forms of plan as regards *columniation*, or the arrangement of the columns.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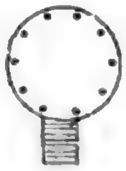
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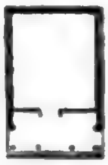
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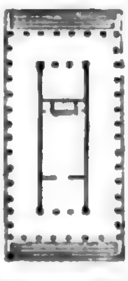
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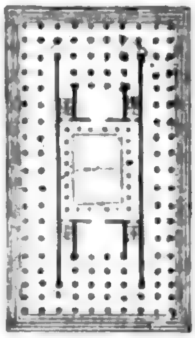
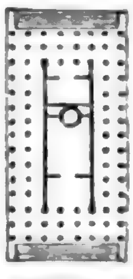

HYPÆTHRAL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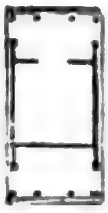
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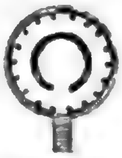
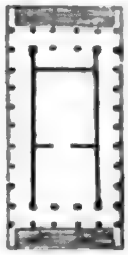

PERIPTERAL


PERIPTERAL

Though so exceedingly small as to show little more than the position of the columns, without any regard to exactness in other respects, these slight diagrams will both serve to render evident many circumstances that cannot else be fully explained, and also to exemplify the respective denominations of temples and porticos according to the number of columns in front. The one 'in antis' is a *distyle in antis*, there being only two columns between the antæ, or three intercolumns, as in the two tetrastyle examples (prostyle and amphiprostyle); whereas were there four columns between the antæ, it would become *tetrastyle in antis*, and have as many intercolumns as an *hexastyle*, of which last the peripteral figure is an example. The dipteral and pseudo-dipteral are both *octastyles*; and the hypæthral a *decastyle*. This last may also be taken as an example (though an imperfect one) of a *diprostyle*, for it will be seen that if the portico were a mere prostyle, it would project forward two intercolumns from the body of the temple. In this figure the pronaos may also be termed *polystyle*, on account of the great number of columns in successive rows between the side walls enclosing that part of the plan (pronaos), which may be described as a dipteral or double *tetrastyle in antis*, having a distyle in antis behind it, and a *diprostyle decastyle* in front of it.*

Still there is no variety whatever as to external form, no individual character as to outline or even the general proportions, nothing of combination or of design, as the last term is usually understood; but the difference of effect depended altogether upon the actual dimensions of the structures, upon material and execution, upon circumstances of detail and finish, and on the degree and particular kind of decoration in regard to sculpture and polychromic embellishment. The only instance of combination and grouping is that afforded by the Erechtheion, or triple temple on the Acropolis at Athens, which has two distinct porticos, viz. an Ionic hexastyle monoprostyle at its east end, and a tetrastyle diprostyle of the same order on its north side, and upon a lower level; besides which there is a smaller attached or projecting structure at the south-west angle, forming a tetrastyle diprostyle arrangement of caryatic figures, raised upon a screen-wall or podium. The combination is here not very harmonious, since no regard has been paid to symmetry; for which very reason it is all the more striking, as forming a decided contrast to the unvaried and even monotonous uniformity pervading the temple-architecture of the Greeks. It is almost the only Grecian structure that can be said to be as much distinguished by picturesqueness as by elegance of architectural detail, and it is therefore to be regretted that it has not been studied by modern architects, with especial reference to such quality, instead of their attention being almost exclusively given to the details and proportions of the individual parts. This edifice moreover affords almost the only instance in the Grecian style of distinct porticos or prostyles projecting from a building [Portico], other porticos being either in *antis*, so as to be *recessed* within the main walls forming the sides of the edifice; or are only the end or ends of the colonnades continued throughout the whole exterior: consequently in neither case does such portico show itself as an actual prostyle. The only other known examples of Greek prostyles are the two small Ionic temples at Athens, that on the banks of the Ilissus, called the temple of Panops; and that dedicated to Nike Apteros, or Wingless Victory. Both these were amphiprostyle, and not *in antis*, consequently had a projecting portico at each end; and in both the porticos were tetrastyle. Of the former nothing now remains, but it is well known from Stuart's delineations, and the order itself—of plain and bold but elegant character—has been adopted as the type—not to say stereotype—of most of our modern Grecian Ionic. Though amphiprostyle, the porticos were not exactly similar in plan; for while the one was a mere monoprostyle, that forming the entrance end was also deeply recessed within the main walls, after the manner of a portico in antis without columns. The other temple, the ruins of which have been explored within only a very few years, was a very small structure, a mere votive chapel, close by the west front of the Propylæa of the Acropolis, with its hinder portico facing the south wing of that edifice, yet turned obliquely from it, which want of parallelism is utterly at variance with all modern notions of architectural symmetry and order. Yet although they carried regularity almost to faulty excess, the Greeks seem to have paid no regard to it whatever in disposing buildings relatively to each other, for there is a similar and apparently intentional want of parallelism between the Parthenon and Erechtheion on the Acropolis itself; nor are either of them in a line with the Propylæa, or equidistant from such line or axis. [Parthenon—Plan.]

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* Though such is the case in the plan given above as an example of an hypæthral, it must not therefore be supposed either that all decastyle temples were hypæthral, or all hypæthral ones decastyle; neither, again, that all dipteral ones had deep polystyle pronaoi filled with files of columns continued on the lines of those in front.

This inattention to uniformity of arrangement, where different buildings are brought together on one general plan, shows a striking difference of taste in that respect between the Egyptians and the Greeks. The temples of the Egyptians consist of various architectural parts subordinate to the principal structure, but combining with that and with each other to form a whole; which scheme was sometimes further extended by an architectural avenue of sphinxes in front of the buildings. The Greeks, on the contrary, certainly did not attempt to imitate or rival the Egyptians in the extent and complex arrangement of their temples, though there can be little doubt that they were originally indebted to them for much of their architectural knowledge. Their temples were almost invariably single structures, not only detached from but altogether unconnected with adjacent ones, instead of forming with them a symmetrically arranged assemblage or group. It seems however to have been in some degree the practice to erect several temples in the immediate neighbourhood of each other, and in a particular district of a city, as was the case in the Forum and Capitol at Rome, where temple succeeded to temple almost uninterruptedly; and the ruins of Pæstum, Agrigentum, Selinus, and other places show a somewhat similar concentration of sacred edifices about the same spot. Temples were frequently surrounded by a sacred grove or plantation of trees, *Temenos*, or else placed within an enclosure, *Peribolus*, formed either by mere walls or by colonnades, but there are scarcely any examples of the kind now remaining; and they are chiefly Roman works, viz. the temples at Baalbec and Palmyra. Similarly enclosed and standing in the centre of a peribolus or piazza (therefore very different in plan from an Egyptian temple preceded by a fore-court), were the temples of Jupiter and Juno, Venus and Roma, at Rome [Roman Architecture, p. 74]; that of Jupiter Olympius at Athens, a work completed in the time of Hadrian; and also, among Græco-Asiatic examples, the temples of Minerva Polias at Priene, and Apollo Didymæus at Miletus.

Similar as it is upon the whole to that of the Greeks, the temple-architecture of the Romans differs from it in many other circumstances besides those of style; which latter was, with very few exceptions, Corinthian—the national style of the Romans, as the Doric was of Greece and its Italian colonies. One leading distinction in regard to general arrangement is, that Roman plans were hardly ever *in antis*, and not often *peripteral*, but generally prostyle, with the portico projecting out from the *cella*, or body of the structure, three or more intercolumns, so as to be *triprostyle*, &c. [Portico.] Such façade was generally further distinguished by having a flight of steps enclosed within pedestals at its ends, which were continued as a podium or moulded basement along the sides of the edifice; whereas the Greeks raised the temples only three steps or so above the ground, and carried those gradini quite round the structure, wherefore each elevation or side of their peripteral temples was uniform in design, having no other variety than that produced by greater extent and number of columns in one direction, and by the pediments at the extremities. The Romans certainly evinced greater taste for both contrast and picturesque combination than the Greeks, although decidedly inferior to them in beauty of detail and finish of execution; except perhaps in one or two particular examples of that order which, although called Corinthian, is so peculiarly their own, that Roman would be the more correct name for it. In order to give greater dignity to the whole temple or to the principal structure in an architectural group, they elevated it upon not a mere basement or substructure with an ascent in front or at both ends, but upon a spreading-out platform, constituting a terrace on every side. They appear to have occasionally formed a succession of terraces of flights of steps, leading up to if not continued on every side of the building. The celebrated Temple of Fortune at Præneste, usually supposed to have been originally founded by Sulla, was a very remarkable example of the kind. Very little now remains of it, except the terraces themselves; neither have we any account of the architecture, but besides the principal edifice or temple there were several subordinate ones, on the different platforms. 'I know of no other example,' says Woods, in his 'Letters of an Architect,' 'either of antient or modern times, where so great a number of edifices, and occupying so great an extent, were combined into one regular and symmetrical plan; and our admiration is still increased when we consider that it was necessary not only to erect the building, but absolutely to build a place for it to stand on.'

Circular plans for temples are peculiar to the Romans, and occasion a diversity of character not to be met with in those of the Greeks. Besides the two simplest forms, the monopteral and peripteral, which have been shown above, there were other varieties and combinations. For a notice of some of them we refer to Roman Architecture (p. 73).

Instead of entering into formal descriptions of particular temples, we subjoin a synopsis with accompanying remarks. Some of the measurements and other particulars stated in it may not exactly accord with other accounts of the respective structures; for so great is frequently the discrepancy between different authorities, whether writers or delineators and restorers, that it is impossible to obtain complete accuracy.

Table of some of the Principal Greek and Roman Temples.

Athens	Theseion	Doric	Hexastyle, peripteral, with 12 intercolumns on sides, 46 × 105 feet.
”	Parthenon	Doric	Octastyle, peripteral, hypæthral, 100×228 feet; Ictinus and Callicrates, architects. [Parthenon.]
”	Propylæa	Doric	Hexastyle on both fronts, with wings of a smaller order, at right angles to west front. [Parthenon—Plan.] Mnesicles, architect, 437-432 B.C.
”	Erechtheion	Ionic	Hexastyle, prostyle at east end, with a tetrastyle, diprostyle on north side.
”	Panops	Ionic	Tetrastyle, amphiprostyle. A well-known example, though no longer extant, having been destroyed by the Turks since Stuart's time.
”	Nike Apteros	Ionic	Tetrastyle, amphiprostyle. Recently explored, and since rebuilt.
”	Jupiter Olympius	Corinthian	Decastyle, peripteral, columns 60 feet high, 96×259 feet. Enclosed by a peribolus. A Roman work originally begun in the time of Pisistratus, continued by Antiochus Epiphanes, and completed by Hadrian.
Eleusis	Ceres	Doric	A square building of about 180 feet on each side, with a dodecastyle colonnade forming the west front. This temple begun by Ictinus; colonnade added by Philo, architect, about 315 B.C.
”	Propylæum	Doric	Hexastyle on both fronts, with inner Ionic order as at Athens 50 × 60 feet. A second and smaller propylæa within the peribolus, distyle in antis. See ‘Unedited Antiquities of Attica. None of these buildings now remain.
Thoricus	. . . .	Doric	Eptastyle, peripteral, or with seven columns at each end, and fourteen on each side. No cella remaining; but supposed to have been a double temple, with a passage through the centre, from the sides, dividing the cella into two.
Rhamnus	Nemesis	Doric	Hexastyle, peripteral, 11 intercolumns on sides, 33×70 feet.
”	Themis, or lesser Temp. of Nemesis	Doric	Distyle in antis.
Ægina	Jupiter Panhellenius	Doric	Hexastyle, peripteral, hypæthral, 41 × 90 feet. This structure is celebrated for its polychromy and sculpture (the Æginetan Marbles).
Olympia	Jupiter Olympius	Doric	Hexastyle, peripteral, hypæthral, 95 × 230 feet. Completed about 435 B.C. Libon, architect.
Bassæ	Apollo Epicurius	Doric	Hexastyle, peripteral, hypæthral, 47×125 feet. Date about 430 B.C. Ictinus, architect. In interior, Ionic columns.
Tegea	Athene Alea	Ionic	Peripteral, hypæthral. Doric internally; with upper Corinthian order. Scopas, architect.
Nemea	Jupiter	Doric	Hexastyle, peripteral.

Magna-Græcia and Sicily.

Pæstum	Neptune	Doric	Hexastyle, peripteral, hypæthral, 79×195 feet.
	Ceres	Doric	Hexastyle, peripteral, 47×107 feet. [Pæstan Architecture.]
Agrigentum	Jupiter Olympius	Doric	Apteral, or with engaged columns, eptastyle, 182×369 feet. (For description, see Agrigentum.) Wilkins, in his restoration of it, makes this temple hexastyle amphiprostyle.
”	Juno Lucina	Doric	Hexastyle, peripteral, 57×124 feet.
”	Concord	Doric	Hexastyle peripteral, 31×93 feet. Deep pronaos and opisthodomus.
Segeste	”	Doric	Hexastyle, peripteral, 70×190 feet. All the external columns (unfluted) standing, but no remains of cella.
Selinus	Great Temple	Doric	Octastyle, dipteral, 160 × 330 feet. There are remains of five other temples, two of which appear to have been hexastyle peripteral.
Syracuse	Minerva	Doric	Hexastyle, 13 intercolumns on sides: now converted into a church with a modern Italian Corinthian façade.

Asiatic Greek.

Ephesus	Diana	Ionic	Decastyle, dipteral, hypæthral; columns 60 feet high; one of the largest Grecian temples, being 220 × 425 feet. Ctesiphon and Metagenes, architects. Date about 340 B.C.
Miletus	Apollo Didymæus	Ionic	Decastyle, dipteral, hypæthral, 164 × 303 feet. Columns 9½ diameters. Pæonius, architect. A peribolus.
Magnesia	Diana	Ionic	Octastyle, pseudo-dipteral, 106 × 198 feet. Hermogenes, architect.
Priene	Minerva Polias	Ionic	Hexastyle, peripteral, 64 × 116 feet. Pytheas, architect, about 340 B.C. The order the best example of Asiatic Ionic. This temple had a peribolus and propylæum; the latter tetrastyle with two rows of square pillars within.

Asiatic Greek.

Teos	Bacchus	Ionic	Hexastyle, peripteral. Hermogenes, architect; about the time of Alexander the Great.
Samos	Juno	Ionic	Decastyle, dipteral; 189 × 346 feet.

Roman.

Rome	Concord	Ionic	Hexastyle. Appears to have been a diprostyle, but nothing of the cella remains.
"	FortunaVirilis	Ionic	Tetrastyle, diprostyle, cella pseudo-peripteral; about 24 × 44 feet.
"	Jupiter and Juno	Corinthian	Two separate temples, alongside each other, in centre of a colonnaded peribolus. Similar in dimensions, but the one octastyle, peripteral; the other octastyle, diprostyle. Erected by Metellus Macedonicus, about 140 B.C. No remains; but the authority is the antient plan of Rome in the capitol.
"	Jupiter Stator	Corinthian	Supposed to have been octastyle, peripteral. The celebrated 'Three Columns,' in the Forum, are all that now remain of this very fine example.
"	Jupiter Tonans	Corinthian	Octastyle, dipteral; 92 × 115 feet. Columns 47 feet high.
"	Mars Ultor	Corinthian	Of this temple, sometimes called that of Nerva, only three columns remaining; but it is said to have been octastyle, peripteral.
"	Venus and Roma	Corinthian	Decastyle, pseudo-peripteral, enclosed within a peribolus formed by double colonnades of a lesser order. [ROMAN ARCHITECTURE, p. 74.]
"	Antoninus and Faustina	Corinthian	Hexastyle, triprostyle; 33 × 55 feet.
"	Pantheon	Corinthian	An octastyle, triprostyle, attached to a rotunda. [PANTHEON.]
"	Vesta	Corinthian	A circular peripteral of 20 columns. [For further description, and an account of other temples at Rome, see ROME, p. 93, &c.]
Tivoli	Vesta, or the Sibyl	Corinthian	A circular peripteral, of 18 columns around cella. The order a very peculiar and fine example. [ROMAN ARCHITECTURE.]
Præneste	Fortuna		No remains of this celebrated temple itself; but merely of the series of terraces and flights of steps on which it was elevated.
Pompeii	Jupiter	Corinthian	Hexastyle, tetraprostyle; about 50 × 110 feet.
Nismes	Maison Carrée, or Temple of Caius and Lucius	Corinthian	Hexastyle, triprostyle; order continued along the cella, making it a pseudo-peripteral; 38 × 77 feet. [NISMES.]
Baalbec	Great Temple	Corinthian	Decastyle, peripteral; 160 × 290 feet. [BAALBEC.]
"	Lesser Temple	Corinthian	Octastyle, peripteral; 118 × 225 feet. [BAALBEC.]
Palmyra	Helios, or the Sun	Corinthian	Octastyle, peripteral; 95 × 180 feet. Enclosed within a peribolus about 740 feet square, formed by an outer wall and two ranges of Corinthian columns, making a double colonnade. [PALMYRA.]

The above table might be rendered more copious and greatly extended; and it might also have been differently arranged in several ways, each of which would have had something to recommend it, according to the purpose for which it may happen to be consulted. Chronological order, for instance, if the respective dates could be ascertained with tolerable accuracy, may be considered preferable by some persons; or the buildings might have been classified according to the number of columns in front, and as being *in antis*, *prostyle*, *peripteral*, &c.; or else according to their relative size and dimensions. In fact a separate table is required for each mode of classification and arrangement; but as that could not be done, we have adopted what we consider the most satisfactory upon the whole. We may however render it in some measure more complete by here pointing out that the *decastyle* examples mentioned in it are the Temple of Jupiter, Athens; Diana, Ephesus; Apollo, Miletus; Juno, Samos; Venus and Roma, Rome; and the great temple at BAALBEC. As regards dimensions and relative size, the following are the largest structures, viz.:—

	Width of Front.	Length.
Ephesus	220 feet	425 feet.
Agrigentum, Great Temple	182 "	369 "
Selinus, Great Temple .	160 "	330 "
Venus and Roma .	116 "	350 "
Athens, Parthenon .	100 "	228 "
Temple of Jupiter . .	96 "	259 "

By way of affording a standard of comparison, we add the dimensions of St. Paul's, London, and La Madeleine, at Paris, viz.: the former, 180 by 500; the other 138 by 328 feet.

TEMPLE, SOLOMON'S. For 447 years after the Hebrews had entered the land of Canaan they continued to worship at the tabernacle which had been framed for their use in the Wilderness. The incongruity of a settled people having only a tent for the celebration of their splendid ritual service first occurred to the mind of David. It appeared unseemly to him that the Ark of God should still 'dwell between curtains,' while he abode himself in 'a house of cedar,' and he therefore proposed to build a temple in which the worship of God might be more becomingly conducted (1 *Chron.*, xvii. 1). The prophet Nathan was however commissioned to inform him that having been engaged in constant warfare, and shed much human blood, he could not be allowed to execute the design he had formed, which was to be reserved for the peaceful reign of his son Solomon. This undertaking was however a principal subject of David's thought and care during the remainder of his reign; and to it he appropriated a large proportion of the immense treasure which his many victories produced. He may be said to have provided all, or nearly all, the materials before his death; consisting of large but variously estimated quantities of gold and silver, brass and iron, stone and timber. He also secured the services of skilful mechanics and artificers for every branch of the work, and furnished the design, plan, and site of the building; so that more of the credit of this work seems due to David than to Solomon (1 *Chron.*, xxi.; xxii.; xxviii. 11-19).

The foundation of the Temple was laid in B.C. 1012, being the fourth year of Solomon's reign; and in seven years and a half it was completed. During this time 183,600 persons were employed on the work. Of Jews there were 30,000 serving by rotation of 10,000 monthly; and of Canaanites there were 153,600, of whom 70,000 were labourers, 80,000 hewers of wood and stone, and

3600 overseers of the others. To save the labour of carriage, the parts were all prepared for use at a distance from the site of the building, and when they were brought together, the structure was reared without the sound of hammers, axes, or tools of iron (1 *Kings*, vi. 7).

To furnish a distinct idea of Solomon's temple from the materials which have reached us, even if we take in the ideal temple of Ezekiel, which is conceived to be framed on the same model, would require such a combination of real architectural knowledge with deep Biblical learning as have perhaps never been combined in any one person. Hence all the descriptions which have been deduced from such materials differ greatly from one another. These only claim our confidence in the points in which all, or nearly all, of them agree; for such points of agreement appear to embody all the real information which has hitherto been collected from the text. There are however materials of comparison and illustration, which, taken along with the text, might furnish some clearer notions than have yet been realized in a matter which circumstances have invested with considerable interest. 1. It would be considered that the temple was on the same essential plan as the tabernacle, differing chiefly in materials, extent, and in additions to the enclosure. 2. Reference would be made to other antient Oriental temples, of which we know more, and especially to those of Egypt, some of which are in sufficient preservation to allow their relative parts and proportions to be clearly understood. And in this regard it will be seen that those plans of the temple which appear most in agreement with the text offer the most striking analogies to Egyptian temples (see the chapter 'An Egyptian Temple,' vol. i., pp. 69-127, of 'Egyptian Antiquities,' in *Library of Entertaining Knowledge*). And although it is probable that, from the friendly relations which Solomon had already established with Egypt, Egyptian as well as Phœnician artists supplied the artistic labour for the temple in which the Hebrews were themselves deficient, such analogies need not be necessarily traced to imitation, but to similar conditions and circumstances producing similar results. The popular notion of a temple, as a vast pile of building in which, as in our cathedrals, large multitudes might assemble for worship under cover, does not in these cases apply. A temple was a large area, enclosed by a wall, and laid out in courts, where the crowds worshipped and where sacrifices were offered; and in colonnades around these courts, where the worshippers might walk or find shelter from the sun or rain. Apartments for the numerous officiating priests, and chambers for stores and treasures, also increased the display of building within and around the enclosing walls. The sacred edifice itself, being only intended to contain the sacred symbols, and being entered only by the priests for particular services, was never large; but what it wanted in size was made up in cost of materials and splendour of workmanship. These ideas apply equally to the temples of Jerusalem and of Egypt; and in both the sacred building was divided into three parts, which were in Solomon's temple called the Porch, the Holy Place, and the Most Holy Place, answering in some degree to the porch, the nave, and the chancel of Christian churches, the parts of which were indeed arranged originally with an intended reference to those of the Jewish temple. Even the pillars called Jachin and Boaz, which Solomon set up at the porch, find analogies in the obelisks which the Egyptians placed in a corresponding situation. 3. Another source of illustration is offered in the more ample description which is given by Josephus of Herod's temple; for although that appears to have been architecturally a greater and more imposing fabric than that of Solomon, there is no doubt that it had the same parts, and that they were similarly proportioned to each other. 4. The antient Christian churches also offer some analogies of arrangement, which claim to be considered when viewed as intended retrospects of the Jewish temple. Among the plans of antient churches given in Coleman (*Antiq. of the Christian Church*, Andover, U. S., 1841), that of the church at Tyre affords some remarkable illustrations.

The site of Solomon's Temple was the summit of Mount Moriah, one of the eminences on which Jerusalem stood. This eminence rose to no great height within the city, but was high and steep above the valley of the Kedron, which it overlooked. It faced the Mount of Olives. The Mosque of Omar now occupies the same site; and the imposing figure which it makes in every view of Jerusalem shows that a more advantageous situation could not have been chosen. The top of the hill was levelled, and the sides banked up to afford a sufficient area. This area was divided into two (but in Herod's temple three) courts, in the outermost of which stood the people. It was separated by a low wall (or, as some think, by a latticed fence or trellis) from the inner court, called the Court of the Priests, in which was the great altar of burnt offerings, and where the priests and Levites officiated in view of the people, and in front of the holy house, or proper temple. The proper temple, as previously indicated, was an oblong building. It was 70 cubits in length, 20 in width, and 30 in height: this last was however only the elevation of the house or holy place, for the innermost sanctuary was but 20 cubits high (1 *Kings*, vi. 20); and although the porch is said, in 1 *Chron.*, iii. 4, to have been 120 cubits high, or four times the height of the main building, the numbers in that text are now generally admitted to be corrupted: 20 cubits, which we find in the antient versions, is probably the true number; being the same height as the sanctuary. The porch covered the breadth of the building 20 cubits, and was 10 cubits deep: the holy place was 40 cubits long by 20 wide; and the sanctuary was a perfect square of 20 cubits. The building fronted the east. Along the north and south sides, and the west end of the structure, were attached certain buildings called 'side chambers,' in three stories, each five cubits high. This made 15 cubits of total elevation, which was not more than half the height of the main building, in whose walls, above, there was therefore room for the splayed windows which gave light to the temple.

The sacred utensils were of the same description and occupied the same relative position as in the tabernacle: but some of them were larger, as the altar, candlestick, &c., in proportion to the more extensive establishment to which they belonged. The principal of the new utensils was the great brazen laver for ablutions, which rested on the backs of twelve oxen of the same metal.

The inner sanctuary was separated from the holy place by a rich curtain or veil. The whole of the interior was wainscoted with cedar, carved with figures of cherubim, palm-trees, and flowers, and then overlaid with the finest gold. The doors were also covered with gold: all the utensils in the house were of that metal; and even the floor appears to have been overlaid with it (1 *Kings*, vi. 30). It is this lavish expenditure of precious metal upon the building, and the elaborate workmanship bestowed upon it, which, rather than its architectural effect, accounts for the reports of its surpassing magnificence, and for the immense wealth consumed in its erection. The popular impression concerning it, however, being based rather upon the exaggerated statements of Josephus than upon the more sober accounts in Scripture, does, no doubt, greatly exceed the truth. More might be said of its richness than of its grandeur. Its wealth is indeed attested by the spoliations of successive kings and conquerors; and it may be well to remember that this was not, as in other nations, one of many temples, but was the sole temple of the whole nation, and in the production of which the whole nation could therefore concentrate its resources.

The Temple of Solomon retained its pristine splendour only for forty years, when its treasures were plundered by Shishak, king of Egypt. After undergoing various other profanations and pillages, it was finally destroyed by the Chaldæans under Nebuchadnezzar, B.C. 588, after having stood 417 years. After the Captivity, the temple was rebuilt, on the same plan, and on a more extensive scale, but with greatly diminished splendour. This temple stood until some years before the birth of Christ, when Herod the Great, to propitiate his subjects, whom most of the measures of his reign had tended to exasperate, undertook to rebuild it on a larger scale and with greater magnificence. In nine years, during which 80,000 workmen were constantly employed, he accomplished his original design; and produced a fabric, which, while the same in its essential characteristics, much surpassed the Temple of Solomon in extent and architecture, although the precious metal may have been less lavishly displayed in the interior decorations. Many years after, the Jews kept workmen employed in embellishing the pile, and in the erection of additional buildings (*John*, ii. 20). In A.D. 64, nothing remained to be done, and the dismissal of once of 18,000 workmen excited some alarm for the part they might take in the troubles which had already commenced, and which, a few years after, brought upon the nation the armies of Rome under Vespasian and Titus, and involved the temple and city of Jerusalem in one common ruin, A.D. 70.

TEMPLE, SIR WILLIAM, an eminent statesman, diplomatist, and writer, was born at Blackfriars, in London, in the year 1628, and was the eldest son of Sir John Temple, who was Master of the Rolls in Ireland, and author of a History of the Irish Rebellion which began in 1641. He was educated first by his uncle, Dr. Henry Hammond, a learned divine and zealous royalist, and was afterwards, on his uncle being turned out of his living by the parliament, sent to a school at Bishop-Stortford, and, at the age of seventeen, to Emmanuel College, Cambridge, where the celebrated Cudworth was his tutor. He is said by his sister, Lady Giffard, who wrote a memoir of him, to have passed a gay idle life at Cambridge, and, after having been there about two years, he went away without a degree. He then went abroad, and having spent two years in France, and visited Holland, Flanders, and Germany, he returned to England, skilled in the French and Spanish languages. As he was about to start on his travels, he met, in the Isle of Wight, the young lady to whom, after many delays and difficulties, arising out of want of fortune and the opposition of the friends of both, he was eventually united. She was the daughter of Sir Peter Osborne, a devoted adherent of Charles I., and a great sufferer by his devotion: letters of hers which are preserved show her to have been a very superior woman: she remained faithful to Temple through a long engagement, amid many and great discouragements, and at last, after the death of her father, and after six years' waiting, they were married in 1654. It appears that, among many offers which she rejected for Temple, was one from Henry Cromwell.

Temple was trained to no profession, though his father was poor, independently of his appointment as Master of the Rolls in Ireland, and when deprived of this for some years during the civil wars, was exceedingly hampered in his finances. Sir John Temple was restored to this appointment in 1653, the year before his son's marriage; and his son, after his marriage, resided with him in Ireland. Under his father's roof in Dublin, or in a country-seat in the county of Carlow, Temple passed five years, which were divided between literary pursuits and county business, and which were marked by the birth and death of five children. In 1660 Temple was chosen, without solicitation or even previous knowledge, member of the Irish convention of that year for the county of Carlow.

After the Restoration he was re-elected for the same county in the first regular parliament that was called: he had his father for his colleague, and a younger brother was member for the city of Carlow. He appears to have been a very active and useful member of parliament. In July, 1661, he was one of the commissioners sent to wait on the king, and urge several measures affecting the interests of Ireland. On the prorogation of the parliament in 1663, Temple went to reside in England. He carried an introduction from the duke of Ormond to Lord Arlington, secretary of state, who conceived a great fondness for him, and procured him to be appointed, in 1665, on a secret mission to the bishop of Münster. The object of this mission was to watch over an invasion by the bishop of Münster of the United Provinces, towards which England, then at war with the Dutch, had guaranteed a subsidy; and though the bishop, who had made the first advances to England, went off from his engagement, and, in fear of France, concluded a separate treaty with the Dutch, Temple was not in any way to blame for this failure of the object of his mission. Indeed his employer was so satisfied with the way in which he had acquitted himself in his first diplomatic employment, that he was appointed in the same year, through Lord Arlington's influence, resident at the vice-regal court of Spain at Brussels.

Temple's residence at Brussels for two years presents no feature of peculiar interest. It was his business at first to watch over the neutrality of Spain in the Dutch war, and assist in cultivating a good understanding between Spain and England, with a view to a treaty which was then being negociated at Madrid, but which never came to pass, and subsequently to bring about peace with the United Provinces and with France. This last object was accomplished in July, 1667, by the treaty of Breda, which however Temple had no part in negociating, and the mode of bringing about which he had not altogether approved of. In 1666 Temple's services had been rewarded, without any solicitation on his part, by a baronetcy.

In the close of the year 1667 Temple received orders from Arlington to repair to the Hague, to negociate a treaty against France, and for the protection of the Spanish Netherlands from that power; and by his energy, judgment, and address the celebrated Triple Alliance was concluded on the 23rd of January, 1668. England, Holland, and Sweden bound themselves by this alliance to bring about peace between France and Spain, and to prevent France from entering the Low Countries. Temple had thus achieved an object which he had had at heart, even before the treaty of Breda, so favourable to French views, a blow to the ambition of Louis XIV. The successful conclusion of this treaty established Temple's diplomatic fame, and was of the first importance to England and Europe.

Temple was next appointed ambassador at Aix, where the negociations for peace between France and Spain, in pursuance of the Triple Alliance, were to be carried on. On the conclusion of the peace of Aix, he was appointed ambassador at the Hague. Here he continued, carrying out the policy of the Triple Alliance, till September, 1670, when a complete change having been silently worked in the councils of Charles II., and the celebrated secret treaty having been made with France, Temple was ordered home, found himself on his arrival in England no longer in the confidence of Arlington, and in the summer of 1671 was dismissed from his post. There was a rumour that Temple's dismissal had been made a condition by the French government. (Temple's *Works*, ii., 179.) He now retired to Sheen, and meditated never again returning to public life, saying that 'he had been long enough in courts and public business to know a great deal of the world and of himself, and to find that they were not made for one another.'

During this retirement Temple devoted himself to gardening, the improvement of his house at Sheen, and literature, and published several of the works on which his reputation as a writer rests; among them, the 'Observations upon the United Provinces,' published in 1672. Temple was summoned however from his literary retirement in the summer of 1674, to conclude the second Dutch war, and he obeyed the summons. He was on the point of starting for the Hague, as envoy and plenipotentiary for this purpose, when the Spanish ambassador in London received full power to negociate there, and in three days the treaty of Westminster was concluded. Temple was now offered the embassy to Spain, which, at his father's wish, he refused. He was very soon after appointed again to the Hague, as ambassador extraordinary, and the next year ambassador to the congress at Nimeguen. The peace of Nimeguen, concluded in the beginning of 1679, ill carried out the views which Temple assiduously laboured to establish, and he was glad to avail himself of a point of form for the purpose of withholding his signature to the treaty.

Temple now returned to England to receive an offer of the post of secretary of state, which he refused. He was much consulted by the king, who had just lost the services of Lord Danby; and in the ministerial difficulties which followed upon Danby's impeachment and committal, Temple submitted to the king a plan of a council, which the king adopted: not always following Temple's opinions however as to the persons of whom it should be composed, and, above all, in defiance of his advice, placing Lord Shaftesbury at the head of it. This council was not long-lived, but it did not die until after its author had been removed from it. [CHARLES II.]

Thus ended Temple's political career. The remainder of his life was passed in the country, and divided between learning and rural pursuits. He now composed his 'Memoirs.' He died on the 27th January, 1699. No particulars of his death have been transmitted to us.

After the Revolution of 1688, Sir William Temple refused office from William III., who was very anxious for his counsel and for the authority of his name. But his son, with his permission, accepted the place of secretary at war, and within a week after committed suicide.

Neither as statesman nor as author does Sir William Temple occupy a foremost place; but in both characters he is more than respectable. The following is a happy description, by Sir James Mackintosh, of his character as diplomatist and statesman. 'He was a most admirable person. He seems to be the model of a negotiator, uniting politeness and address to honesty. His merit as a domestic politician is also very great: in an age of extremes he was attached to liberty, and yet averse from endangering the public quiet. Perhaps diplomatic habits had smoothed away his turbulence too much for such a government as England.' (*Life of Mackintosh*, ii. 199.) Dr. Johnson, speaking of Sir William Temple as a writer, has said that 'he was the first writer who gave cadence to English prose.'

There are two or three biographies of Temple; one by Abel Boyer, published about fourteen years after his death, and another by his sister, Lady Giffard, prefixed to the edition of his works published in 1731, 2 vols. folio. A very laboured and somewhat diffuse life has been lately published by the late Mr. Peregrine Courtenay, and to this work all who wish for the fullest information as to Temple's life will resort. The best edition of Temple's works is that published in 1814, in 4 vols. 8vo.

TENACITY (from the Latin 'tenacitas,' 'the power of holding'), a property of material bodies by which their parts resist an effort to force them asunder.

This property is a result of the corpuscular forces acting within the insensible spaces supposed to exist between the particles of bodies: it is consequently different in different materials, and in the same material it varies with the state of the body with respect to temperature and other circumstances.

Those corpuscular forces consist of attractions which vary according to unknown laws with the distances of the particles from one another, and even at certain distances they become repulsions; but, in all bodies except the elastic fluids, the combined actions of all the particles produce that coherence which constitutes the tenacity of the masses. In those fluids the particles have no coherence, and when the pressures to which they are subject are removed, those particles immediately separate from each other with forces depending, probably, upon the quantity of caloric with which they are combined. In non-elastic fluids and in solids, tenacity exists, but in very different degrees; its force depending upon differences in the intensity of the attracting powers between the particles, upon differences in the distances of the particles themselves, upon the action of the caloric, and, in some cases, upon variations in the pressure of the atmosphere.

The molecules of liquids adhere to one another, and generally to those of solid bodies, by attractive forces which decrease very rapidly; and, at insensible distances from the supposed places of contact, the adhesion entirely disappears [Capillary Attraction]: the real tenacity of the molecules being, as Dr. Young observes, equal to the excess of their mutual attractions above the forces of repulsion arising from the actions of the calorific particles. It is on account of the small distance to which the attractions of the fluid molecules extend, and to the freedom with which the particles move on one another, that fluids appear to have so little tenacity; but from the weight of water which it supports in glass tubes, Dr. Robison has estimated that the mutual attractions of the particles of water on a surface equal to one square inch must far exceed 190 pounds.

Grains of dust or sand, while dry, have no power of adhering together, probably because their forms do not permit a sufficient number of points on their surfaces to be brought within the distance at which corpuscular attractions take place; but, if slightly wetted, the mutual attractions between the dust and the liquid produce a certain degree of tenacity: this is very sensible in clay moistened with water; for being then drawn into the form of a rod, it is capable of bearing a small weight suspended from it. Tenacity exists in various degrees in viscid fluids, as oil, gum dissolved in water, &c.: sealing-wax and glass also, when heated, lose their brittleness, and are capable of being moulded into any form, while their particles retain a considerable degree of adhesive power.

The tenacity of solids constitutes, in part, the subject of the power of bodies to resist strains; and under Materials, Strength of, will be found a table (p. 8, col. 2) of the weights which would overcome the force of cohesion in rods immoveably fixed at one end and pulled in the direction of their length: those weights may be considered as the measures of tenacity in the different kinds of material; and it may be here added that, from a mean of several experiments made by Mr. Telford on the tenacity of forged iron, the breaking strength, when reduced to that which it would be if the area of a transverse section of the bars had been one square inch, is 29½ tons. The bars were cylinders or parallelopipeds varying in length from 1 foot 5 inches to 2 feet 3 inches; and in area of section, from 0·56 to 3·14 square inches: they stretched in length from 2 inches to 4 inches before they broke. Mr. Telford found also that a bar of cast-steel bore suspended from it 27·92 tons, a bar of blistered steel 17·27 tons, and of cast-iron (Welsh, pig) 7·26 tons; the area of the section in all being one square inch. Tenacity in solid bodies varies greatly with their temperature. M. Coulomb took a piece of copper-wire, which, when cool, carried 22 lbs. suspended from it; and, upon bringing it to a white heat, it would scarcely bear 12 lbs.

Though, when a piece of metal is fractured, the parts will not by simple adjunction adhere together; yet, in some cases, by hammering them upon one another, so many points on their surfaces may be brought within the limits to which the force of cohesion extends, that they will acquire a tenacity equal to that which the metal had in its natural state.

The tenacity of wood is much greater in the direction of the length of its fibres than in the transverse direction, the fibres being united by a substance having little cohesive power. Few experiments have been made on the tenacity of wood perpendicularly to its grain, as it is called; and from those of Mr. Emerson it appears to vary from one-tenth to one-seventh of the tenacity in the other direction. When a strain takes place in the direction of the fibres, they become disengaged from one another, and thus lose the strength which arises from their lateral cohesion: they then become subject to separate strains; the weaker ones are first ruptured, and at length all give way, leaving an irregular surface of fracture.

With respect to metals, the processes of forging and wire-drawing increase their tenacity in the longitudinal direction; the augmentation of friction and lateral cohesion, arising from the particles being forced together in the transverse direction, more than compensates for the diminution of the attraction which may result from the particles being forced or drawn farther asunder longitudinally. Copper and iron have their tenacity more than doubled, while gold, silver, brass, and lead have it more than tripled by those metals being drawn into wire.

Mixed metals have, in general, greater tenacity than those which are simple: the tenacity varies with the different proportions in which the metals are mixed; and the proportions which produce the greatest strength are different in different metals. The only experiments on this subject with which we are acquainted are those of Muschenbroek; and from these we find that a compound of which ⅚ were gold and ⅙ copper had a tenacity, or force of cohesion, more than double that of the gold or copper alone: brass, composed of copper and zinc, had a tenacity more than double that of the copper, and nearly twenty times as great as that of the zinc: a metal of which ⅘ were block-tin and ⅕ lead, had a strength more than double that of the tin; and a mixture of which ⅘ were lead and ⅕ zinc had a tenacity nearly double that of the zinc, and nearly five times as great as that of the lead alone.

TENAILLE, in Fortification, is a rampart raised in the main ditch, immediately in front of the curtain between two bastions; and, in its most simple form, it consists of two faces coinciding in direction with the faces of the bastions, and, consequently, forming with each other a re-entering angle. Generally, however, it consists of three faces, of which two have the directions just mentioned and the third forms a curtain which is parallel to that of the enceinte. See P, *Fig.* 1, Bastion, and P (in the plan, p. 377), Fortification.

This work was originally proposed by Vauban, in order to serve the purpose, in part, of a fausse-braye [Fausse-braye], since the fires of musketry on its faces may be employed, in conjunction with those of artillery and musketry on the flanks of the bastions, to oppose the passage of the enemy across the main ditch when about to mount a breach in the ramparts of the place.

The relief of the tenaille, or the elevation of its crest above the bottom of the ditch, is determined consistently with the intention of thus defending the main ditch; and in order that the defenders of the tenaille may not be injured by the shot fired over their heads, from the flanks of the bastions, it is usual to make the crest of that work coincide with a horizontal plane passing three or four feet below the point where a line of fire from one of those flanks would cut a vertical plane, bisecting the angle of the tenaille or its curtain. The height thus determined will allow the parapet of the work to be elevated from two to four feet above the terreplein of the ravelin in its front; and, consequently, from the curtain of the tenaille a grazing fire of musketry might be employed to protect the interior of the ravelin, or of its reduit, if there is one, should the defenders of either of those works abandon it (in consequence of an assault being made) before the enemy has time to cover himself in it by a lodgment: that fire will also contribute powerfully to prevent the enemy from attempting to enter the ravelin by its gorge.

Vauban, at first, gave to his tenailles short flanks nearly parallel to those of the bastions, but he soon abandoned that construction, perceiving that though the defenders might thus fire correctly along the main ditch, yet the parapets of those flanks were liable to be destroyed by the fire from the enemy's counter-batteries [H, *Fig.* 1, Bastion], and they were enfiladed from the rampart of the ravelin (Q), or from the glacis of the places of arms (L).

Besides affording additional fires for the defence of the main ditch, the tenaille serves to cover, in part, the revetment of the curtain in its rear, and prevent it from being breached by fire from any lodgments of the enemy on the glacis. Its parapet serves also to mask the postern in the curtain of the enceinte, which would otherwise be so much exposed to the fires from the counter-batteries, that the defenders might be unable to communicate through it with the outworks. On this account the breadth of the ditch between the curtain of the tenaille and that of the enceinte is made such only as to allow the parapet of the former, with the relief determined as above mentioned, to conceal the postern from the view of the enemy on the glacis. This ditch is advantageous in preventing the defenders of the tenaille from being injured by the splinters which may be detached from the flanks and curtain behind it; and, when dry, it serves to cover bodies of troops which may issue from thence and attack the enemy while crossing the main ditch, previously to making an assault. If the main ditch contains water, the tenaille serves to cover the boats and rafts by which the defenders of the enceinte communicate with the outworks.

The tenaille has been considerably improved by Bousmard, who, returning, in one respect, to the original idea of Vauban, has given flanks to the work in order that the main ditch may be directly defended by them. These flanks are raised high enough to cover the revetments of the flanks of the bastions, while their upper surfaces may be grazed by a fire of artillery from thence; and, instead of being formed with open terrepleins, and parapets for musketry, as usual, each flank of the tenaille is provided with casemates, or vaults, for four pieces of artillery which are placed nearly on a level with the terreplein of the covered-way. These guns are consequently capable of being directed against the counter-batteries (H) of the enemy, as well as of defending the foot of a breach in the face of the bastion.

This construction was adopted by Chasseloup de Laubat in the tenailles of the detached works which he executed about Alessandria, in Italy, when Napoleon (after the battle of Marengo) proposed to make that city the base of his operations beyond the Alps. But, in order to avoid the mischief which results from a fire directed against casemates (the shot in striking the cheeks or sides of the embrazures detaching from them splinters, which being driven into the vault do more injury to the defenders than the shot itself), this engineer raised before each flank of the tenaille a mass of earth which was reveted with brickwork, and perforated in such directions that, in defending the ditch, the shot from the casemates could be fired through the apertures, while the mass served as a mask which would prevent the enemy from seeing the embrazures in the flanks of the tenaille.

Belidor, in his 'Science des Ingenieurs' (1729), proposed tenailles with each face in the form of a circular arc, extending between the curtain and the shoulder of the bastion. But this construction, to which the name of 'ram's horns' was given, has seldom been put in practice.

Any work belonging either to permanent or field fortification, which, on the plan, consists of a succession of lines forming salient and re-entering angles alternately, is said to be *à tenaille*.

TENAILLON, or Great Tenaille, in Fortification, is a species of exterior work which has been occasionally constructed before the faces of a small ravelin, with a view of increasing the strength of the latter, procuring additional space beyond the ditch, or covering the shoulders of the bastions. They were invented by Vauban, who, however, very seldom constructed them; and subsequent engineers have generally considered them as inferior in defensive qualities to a counterguard [QQ, Fortification, *Fig.*, p. 377] placed over the faces and salient angle of the ravelin.

The form and position of a tenaillon may be understood, Y being supposed to represent a small ravelin, if beyond the ditch of the latter the ramparts of the right and left faces be produced till each of them meets a rampart nearly perpendicular to the face of the bastion and extending to the place of meeting from the counterscarp of the main ditch at a point opposite the middle of that face. The works thus formed, one over each face of the ravelin Y, constitute a tenaillon; before each line of rampart is a ditch, and part of the general covered-way, the main ditch and that of the ravelin being in the rear. The two faces which are beyond the salient angle of the ravelin would, if produced towards the latter, form with each other a re-entering angle, whose vertex would coincide with that of the said angle.

The objections to tenaillons are, that the besieger would experience little difficulty in establishing a lodgment on that part of the covered-way or glacis which is immediately in front of the salient angle of the ravelin; and in this situation he would be able to breach the faces of the two half-bastions in four places, by fires of artillery directed along the ditches of the ravelin and those on the side faces of the tenaillon. The salient angles of the tenaillon, and of the ravelin which it covers, may be breached at the same time, and, when the ditches are dry, it would be possible to attack and carry the ravelin at the time of making the assaults on the tenaillon: then, the enemy having got possession of the former work, any retrenchments which may have been made in the tenaillon must necessarily be abandoned by the defenders.

At the siege of Lille, in 1708, one of the tenaillons held out a long time, but this is ascribed by French engineers rather to the faulty manner in which the siege was conducted by the allies than to the strength of the work.

The re-entering space between the two faces which are in the prolongation of the faces of the ravelin, and which constitute the head of the tenaillon, is sometimes occupied by a small redoubt, consisting of two ramparts perpendicular to the faces which have been just mentioned; and thus there may be obtained a good crossing fire for the defence of that part of the covered-way which is concealed by the salient angles of the tenaillons from the defenders of the bastions.

Demi-tenaillons are works placed also on the sides of a ravelin, and consisting of two ramparts which are perpendicular to and nearly opposite the middle of the faces of the bastions and ravelins: these are usually accompanied by counterguards which cover the salient angles of the latter works, and are called *Bonnets*.

TENANCY. [Tenant.]

TENANT. [Tenure.] Tenants, in the more extended legal sense of the word, are of various kinds, distinguished from each other by the nature of their estates; such as tenants in fee simple, in fee tail, for life, &c. [Estate; Tenant in Fee Simple, &c.]

TENANT AND LANDLORD. The word tenant in the more limited legal sense, which is also the popular sense, is one who holds land under another, to whom he is bound to pay rent, and who is called his landlord. The present article is confined to this sense of the word, in which it is proposed to show the nature, construction, and effect of the contract by which the relation of landlord and tenant is created; the rights, liabilities, and duties of each under it; how it ceases or may be terminated; and the legal means by which the rights and duties of each may be enforced.

The word land is here used in its comprehensive legal sense, which means not only the actual land itself, but also all things, such as buildings, woods, and water, which may be upon it. Any one who has an estate in land, provided he is also in possession, may let the land to another. The character and duration of the letting are partly regulated by the nature of the interest of the lessor or landlord and partly by the contract of letting. Thus one who is the owner of land in fee simple may let the land for any limited period, while one who holds only for life cannot let for any longer period than the life upon which his estate depends, unless he has a special power to grant leases; and if he should let for any longer period, the interest of the tenant will cease on the expiration of the life. To constitute the relation of landlord and tenant, the period for which the land is let must be shorter than that during which the land is held by the lessor, so that the lessor may have a reversion. If he parts with his whole interest, he is an assignor, not a lessor. Where the letting takes place by an express contract between the parties, the contract is called a lease. [LEASE.] A lease may be made by deed, by writing without deed, or by a mere verbal agreement. By the 29 Ch. II., c. 3, s. 1, all leases, estates, &c. in land, &c. not put into writing, and signed by the parties so making or creating the same, or their agents thereunto verbally authorized or by writing, shall have the force and effect of leases or estates at will only, and shall not either in law or equity be deemed or taken to have any other or greater force or effect, &c. The second section of this act makes an exception in favour of 'all leases not exceeding the term of three years from the making thereof, whereupon the rent reserved to the landlord during such term shall amount unto two third parts at least of the full improved value of the thing demised.' Under the construction which this statute has received, an unwritten lease for a longer period than three years will create a tenancy from year to year, and the terms as to rent, &c. upon which the tenant holds will be those which are agreed upon in the unwritten lease. The loss of a lease will not destroy the tenancy, provided the previous existence and the terms of it can be proved.

But the relation of landlord and tenant may be created otherwise than by a formal lease. If one man with the consent of another occupies his land, a contract of letting is assumed to have been made between them, and the occupier becomes tenant to the owner. Formerly such tenants were called tenants at will, and might have been turned out at any time by the landlord; but now a more convenient and reasonable construction of their occupation prevails, and they are considered to be upon the same footing as if the lands had been let to them for a year dating from the commencement of their occupation. At the end of the first year, a second year's tenancy begins, unless six months' notice of the intention to determine the contract has been given by either party to the other, and so on from year to year. The same construction is applied to cases where a tenant continues to occupy land after the expiration of a lease made by deed; but in this case all the covenants of the expired lease as to payment of rent, repairs, insurance, and the like are held to be in force unless the lease is cancelled by destroying the seal; and even if there should be a verbal agreement for a different rent, still the old covenants subsist, unless the lease is cancelled. If a party who has the power to set aside an existing lease chooses to receive rent under it, he will be held to have confirmed it; and even where a lease has determined, as a lease granted by a tenant for life for a longer period than he was entitled to grant one would become upon his death; yet if the remainder-man or reversioner has allowed the tenant to lay out money on the premises, he will be prevented by a court of equity from disputing the lease.

Besides tenancies for fixed periods, a tenancy may exist at Will and by Sufferance. [TENANT AT WILL; TENANT AT SUFFERANCE.] A tenant at will cannot lawfully be turned out of possession, nor can the landlord succeed in an action of ejectment against him, till after a demand to quit has been made upon him by his landlord; but a tenant by sufferance may be turned out by an action of ejectment without any demand. A master may let land to his servant, but where the servant is allowed by the master to occupy premises belonging to him for the mere purpose of more conveniently performing his duties as servant, or as in part or total payment of wages, the servant does not therefore become a tenant, and the premises are considered to be in the occupation of the master. The law as to landlords and tenants generally applies also, so far as it is not restricted or varied by the particular circumstances of the contract between the parties, to the case of the letters and occupiers of lodgings.

In every case where the relation of landlord and tenant exists, either by express or by implied contract, certain terms are implied by law to have been agreed upon by the parties as forming part of the contract. It is of course in the power of the parties, where the contract is express, to qualify these terms so implied by the language of the contract itself. But it may be observed that as these terms are comprehensive in their nature, and distinctly understood in law, the interests of parties are often better consulted by leaving them to the general protection afforded by these implied terms than by attempts to define by enumeration in detail the respective rights and duties of the landlord and tenant. The terms implied on the part of the landlord are, that the tenant shall quietly enjoy the premises; on the part of the tenant, that he will pay rent, keep the premises in repair to a certain extent, as hereafter mentioned, and use the land, &c. in a fair and husbandlike manner.

As a general rule it may be laid down that the tenant is not entitled to set off against his rent, debts due from the landlord to him; but there are some exceptions. When the landlord is himself tenant of the premises to a superior landlord, and neglects to pay his rent, and the occupying tenant is called upon to pay it to the superior landlord, he may do so, and set it off against the rent due from him to his own landlord. Payments also made by the tenant under the land-tax act (38 Geo. III.) may be set off against the rent due to his landlord. When a landlord is bound to repair, and the tenant, in order to prevent further dilapidations himself, expends money on the repairs, or the landlord has undertaken to repay the tenant the amount of rates and taxes, &c. paid in the first instance by him, the tenant may set off. If a tenant has covenanted without exception or reservation to pay rent during the term for which the lease has been granted to him, he will be bound to pay it even although the premises should be entirely destroyed by fire or other casualty; and even although he should have assigned his lease to another and ceased to be in possession, he will still remain liable under his covenant to pay rent. But the party to whom he has assigned it will, as a general rule, remain liable for rent to the original landlord only so long as he continues in the possession of the premises.

Generally, the tenant is bound to repair the premises. Repairs have been divided into two kinds, substantial repairs and ordinary repairs. The division appears a very simple one, but great difficulty often occurs in practice in determining to which kind any particular item of repair belongs. Tenants for a long term of years are said to be liable for substantial repairs, such as beams, roofing, &c.; tenants from year to year are liable only for ordinary repairs, and for injuries caused by their own negligence. A landlord is in no case, unless under a special agreement to that effect, liable to any action for not repairing nor even for not rebuilding where there has been a total destruction of the premises. But in the case of short tenancies, if the landlord should not rebuild or do the substantial repairs necessary, the tenant would be justified in quitting the premises and would cease to be liable for rent. It has been already observed that a tenant under a lease which contains covenants to repair, who by holding over and paying rent after the expiration of his lease becomes a yearly tenant, will still be liable to repair in the manner provided for by the covenants. Such a tenant, therefore, though only a yearly tenant, may be liable to do substantial repairs; and if he wishes to avoid such a liability, he should guard against it by an express agreement. In the case also of a lease which though invalid has been acted on by the parties as if valid, the covenants of the lease will be looked to for the purpose of determining what are the duties and liabilities of the parties as to repairs, &c. No tenant, in the absence of an agreement to that effect, is bound to rebuild after accidental destruction of the premises by fire. But under a general covenant to repair, and *leave repaired*, the tenant is bound to rebuild even in the case of destruction by fire. Covenants to repair are said to be construed by the courts favourably for the landlord, but the tenant is not bound to counteract the natural consequences of the wear of time and of the elements.

In agricultural tenancies the lease itself generally determines the mode in which the farm is to be treated, and the meaning of the expressions used will be ascertained by the construction put upon them by persons familiar with husbandry. Unless also the lease expressly or impliedly excludes the operation of the custom of the country, the tenant is bound to conform to it. The custom of the country means the general practice employed in neighbouring farms of a similar description, with reference to rotation of crops, keeping up fences, and other like matters. In leases of farms it is often the practice to protect the landlord against certain acts of the tenant, such as ploughing up meadow land, &c., by introducing certain provisions into the lease. These provisions may operate according to the phraseology used, either to assign a penalty or to determine the liquidated damages agreed to be paid for the act done. It is often a matter of great importance and of some nicety to determine under which class the provisions fall. If under the first, the landlord is not entitled to the whole penalty upon the act being done, but he can only recover in an action the amount of the actual damage which has accrued. If under the second, he is entitled to the whole amount of the damages agreed on. A covenant by a tenant not to plough up meadow under a penalty of 5*l.* for every acre ploughed, is an instance of the first class: a covenant to pay 5*l.* rent for every acre of meadow ploughed up, is of the second class. The right to timber and timber-like trees belongs to the landlord; loppings of pollards and bushes, to the tenant. Different definitions prevail in different counties of timber and timber-like trees, and various customs prevail as to what amount of wood the tenant may be allowed to employ (after the landlord has been called on to select it) for the purposes of the farm. No tenant, unless he employs the land as a nurseryman or gardener, can remove any kind of shrub from the soil, not even a row of garden box, though planted by himself. [Waste.] Neither can a tenant remove fixtures, though put down by himself. A fixture is a chattel which is itself let into the soil, or united to some other which is let in. There are some exceptions to this rule in favour of fixtures used for the purpose of trade or agriculture, or merely ornamental purposes, where the removal will cause little or no damage. (Amos and Ferard, *On Fixtures.*)

The tenant in occupation of the premises is, in the first instance, liable for all taxes and rates of every description due in respect of the premises. The party therefore who is authorised to collect them may proceed against the tenant in occupation to recover them. It is generally a matter of agreement between the landlord and tenant that the tenant shall pay all rates and taxes except the land tax. If however the landlord has undertaken to pay the tenant the rates and taxes, and fails to do so, the tenant may deduct the amount from his rent, or bring an action to recover it; but this should be done during the current year, and if the tenant allows a considerable time to elapse without claiming a deduction or bringing an action, he will be held to have waived his claim to recover them from the landlord.

Where a fixed rent has been agreed upon, has become due, and is neither paid nor tendered, the landlord, under the exceptions mentioned hereafter, has a right to seize growing crops, any kind of stock, goods, or chattels, upon the premises, or pasturing any common enjoyed in right of the premises, whether such things are the actual property of the tenant or not; and if the rent remains unpaid, he may sell them. The exceptions are: Things in actual use, as clothes then being worn, or a horse on which a person is actually riding. The reason given for these exceptions is that the seizure of goods so circumstanced would lead to a breach of the peace. Things sent to a tradesman for the purpose of being worked up by him; goods sent by a principal to his factor for sale, and the beasts or carriages conveying them; the goods and cattle belonging to guests at an inn; goods that are already in the custody of the law, such as goods in a bailiff's hands under a writ of execution, &c. The tools, &c. of a man's trade, beasts of the plough, &c., are not liable to distress if there are other goods sufficient in value upon the premises. [Distress.]

The contract of letting may cease otherwise than by the mere lapse of time. By 29 Ch. II., c. 3, the Statute of Frauds, a surrender of a lease can only be by a deed or note in writing, signed by the party surrendering or his agent authorised in writing, or by act and operation of law.

The deed or note in writing must proceed upon mutual agreement between the tenant in possession and his immediate landlord, and, besides being signed, must be duly stamped. A lease may cease to exist by act and operation of law: 1, upon the acceptance by the tenant of a new lease in writing for the same premises from the landlord, the operation of which is to begin at some period during the term for which the original lease was granted; 2, in the case of a yearly tenancy, where the landlord permits the tenant to quit, and he does quit, and the landlord accepts the possession; 3, where the estate of the landlord and tenant become united in the tenant, the tenancy ceases to exist; 4, by forfeiture. A forfeiture may arise either by a breach by the tenant of one of those conditions which are implied by or attached to the relation of landlord and tenant, as where a tenant disclaims or impugns the title of his landlord by acknowledging, for instance, the right of property to be vested in a stranger, or asserts a claim to it himself, or by a breach of a condition which is expressly introduced into the lease, the breach of which is to be attended with a forfeiture of the tenancy, as a condition to pay rent on a particular day, to cultivate in a particular manner, &c. To this head may be referred provisoes in a lease for re-entry by the landlord on the doing or failure to do certain acts by the tenant, such as the commission of waste, the failure to repair, &c. The courts are said to be unfavourable to forfeitures; therefore, when the landlord has notice of an act of forfeiture, or an act which entitles him to re-enter, he must immediately proceed in such a way as to show that he intends to avail himself of his strict legal right. If after the commission of the act he does anything which amounts to a subsequent recognition of the tenancy, as by the acceptance of rent subsequently due, he will be held to have waived his right to insist upon the forfeiture.

A yearly tenancy, where no period of notice is agreed on, must be determined by a notice to quit at the expiration of the current year, given six months previously. If the period at which the current year expires is uncertain, the notice should be to quit at the end of the year which shall first occur after the expiration of six months from the service of the notice. Where a fixed period of notice is agreed on, what has been said as to the period will apply to the period agreed on. Where different portions of the premises have been entered on at different times, the entry upon the principal portion will, for the purposes of quitting the premises, be considered as the entry upon the whole; and in case of a dispute at a trial which is the principal portion, the jury must determine. In the case of lodgings, the time, when less than a year, for which they are taken, will be the time for which a notice is necessary. Thus lodgings taken by the month or week require a month's or week's notice. A notice to quit may be waived by an acceptance of rent or by a distress for rent due after the expiration of the notice.

If by the default of the landlord the premises cannot be occupied beneficially, as where the landlord is bound to repair, &c., and does not, the tenant may quit without notice.

The notice to quit need not be in writing, though, from the greater facility of proving it, a written notice is always desirable. It should distinctly describe the premises, be positive in its announcement of an intention to quit or require possession, be signed by the party giving it, and served personally upon the party to be affected by it.

If a tenant, after having given notice to quit, continues to occupy, he is liable to pay double rent. If he does so, no fresh notice is necessary. If he continues to occupy after the landlord has given him notice, he is liable to pay double value for the premises.

At the expiration of the contract the tenant is bound to deliver up possession of the premises; but if either by special agreement or by the custom of the country the tenant is entitled to the crops still standing on the land, and which are called away-going crops, he may enter for the purpose of gathering them, and also use the barns and stables for the purpose of threshing and conveying them away. The in-coming tenant may also enter during the tenancy of the preceding tenant to plough and prepare the land.

An action for the recovery of rent may, if the land is let by lease under seal, be in debt for the amount, or in covenant for the damages incurred by the non-payment of it. If there is no indenture, the action may be in debt on the simple contract, or in assumpsit for the use and occupation of the land.

If the tenant refuses to deliver the possession of the land, the landlord may bring an action of ejectment to recover it. By 4 Geo. II., c. 28, which was passed with a view to remove the difficulties existing under the common law as to the necessity for a formal entry, &c. by the landlord, it is enacted that where there is half a year's rent in arrear, no sufficient distress on the premises, and the landlord to whom the same is due has a right of re-entry, he may, without any formal demand or re-entry, serve a declaration in ejectment, which shall stand in place of the same.

By the 11 Geo. II., c. 19, and 57 Geo. III., c. 52, if a tenant, under any lease or agreement, written or verbal, though without a clause of re-entry, of lands at a rack-rent, or rent of three-fourths the yearly value, shall be in arrear for half a year's rent, and shall leave the premises deserted and without sufficient distress, any two justices of the county, at the request of the landlord, may go and view the premises, and fix on the most conspicuous part of them notice in writing on what day, distant fourteen days at least, they will return again to view the premises; and if on the second day no one appears to pay the rent, and there is no sufficient distress on the premises, the justices may put the landlord into possession, and the lease shall become void. These proceedings are subject to appeal before the judges of assize for the same county at the ensuing assizes.

By 1 & 2 Vic., c. 74, where the interest of any tenant of land, &c. at will, or for a time less than seven years, liable to the payment either of no rent or a rent of less than 20*l*. a year, shall have ended or been duly determined, and the tenant shall refuse to quit, the landlord may serve him with a notice, a form for which is given in the act, to appear before a justice for the county; and if he fails to show satisfactory cause why he should not give up possession, the justices, on proof of the tenancy and of the expiration of it, may give possession to the landlord. If the landlord was not at the time of the proceedings lawfully entitled to possession, he will be liable to an action of trespass at the suit of the tenant, notwithstanding the act of parliament.

(Woodfall's *Landlord and Tenant;* Coote's *Landlord and Tenant.*)

TENANT AT WILL, AND FROM YEAR TO YEAR. 'Tenancy at will,' says Littleton, s. 68, 'is where lands or tenements are let by one man to another to have and to hold to him at the will of the lessor, by force of which lease the lessee is in possession. In this case the lessee is called tenant at will because he hath no certain or sure estate; for the lessor may put him out at what time it pleaseth him.'

An estate at will may arise by implication, as well as by express words. Thus, where a tenant for years continues in possession after the expiration of his term, and pays rent as before, the payment and acceptance of rent constitute a tenancy at will. So, where a man enters under an agreement for a lease or a contract for the purchase of an estate, he must be considered at law as the tenant at will of the person who has the legal title. (10 Vin., *Ab.*, 400; 1 B. and C., 448; 3 Camp., 8.)

Where a mortgagor continues in possession of his land with the consent of the mortgagee, after default in payment of principal and interest at the time stipulated in the mortgage deed, he is tenant at will. So also, where the legal estate is vested in a trustee, the beneficial owner, or *cestuique trust*, if he be in possession, is considered at law as tenant at will under the trustee. (Cruise, *Digest*, tit. 9, c. 1, § 4.)

A tenant at will having no certain estate, has nothing which he can grant to another, and a person entering under a grant from a tenant at will is subject to an action of trespass. (Co. Litt., 57 a.)

A tenant at will has no right to commit any kind of waste; but, on the other hand, he is not liable to repair or sustain houses, &c., and therefore there is no remedy against him for permissive waste. (Co. Litt., 57 a; 5 *Rep.*, 13 b.)

A tenancy at will may be determined either by express declaration of the lessor that the tenant shall hold no longer, which must be made on the land, or notice given of it to the lessee (Co. Litt., 55 b.), or by some act of ownership exercised by the landlord inconsistent with the continuance of the estate, such as entering on the land and cutting down trees demised, making a feoffment, or a lease for years to commence immediately. On the part of the tenant, any act of desertion, an assignment of the land to another, or the commission of waste, is a determination of his estate. A lessor determining the tenancy before the rent is due loses the rent; and on the other hand, the lessee who determines it before the rent is due must notwithstanding pay it up to that time. If either party die, the tenancy, if it be of a house, continues till the next rent-day; and if of land, until the summer profits are received by the tenant or his representatives. (Co. Litt., 55 b, 57 a.)

Where a tenancy at will is determined by the lessor, the tenant is entitled to emblements; but not if it be determined by the tenant himself. (Litt., § 68; 5 *Rep.*, 116.)

It is settled that a landlord cannot bring an ejectment against the tenant at will or his representatives without giving six months' notice to quit. (Cruise, tit. 9, c. i., § 15.)

The courts are always inclined to construe demises where no certain term is mentioned, not as estates at will, but as tenancies from year to year; and the circumstance of an annual rent being reserved has been considered sufficient to warrant this construction. (2 Blackst., 1171.) Where a remainder-man receives rent from a tenant under a lease for years which is void as against him, before electing to avoid it, a tenancy from year to year is created. (7 *T. R.*, 478.) Also where an agreement for a lease for more than three years is made by parol, and is therefore void by the Statute of Frauds, there is a tenancy from year to year regulated by the terms of the agreement. (5 *T. R.*, 471.)

A tenancy from year to year, when once constituted, is binding not only upon the reversioner, but his assignee (1 *T. R.*, 378), and does not cease upon the death of the tenant, but goes to his executors or administrators. (3 *T. R.*, 13; 15 Ves., 241.) The tenant is entitled to six months' notice to quit, ending at the expiration of the year, and thus a new year is continually added to the term as often as the half year's previous notice is omitted to be given at the proper time. (3 B. and C., 483.)

A tenant at will is capable of taking a release of the inheritance after he has entered, but his estate cannot be the foundation of a remainder. (Litt., iii., 460; 8 Co., *Rep.*, 75 a.)

TENANT AT SUFFERANCE, says Lord Coke, 'is he that at first came in by lawful demise, and after his estate endeth continueth in possession, and wrongfully holdeth over.' Thus a tenant *pur autre vie*, continuing in possession after the death of *cestuique vie*, a tenant for years holding after the expiration of his term, and a person who, having been tenant at will, continues in possession after the death of the lessor, are all tenants by sufferance.

As the tenant at sufferance holds only by the laches of the owner, there is no privity of estate between them, and therefore the tenant at sufferance is not capable of taking a release of the inheritance. (Litt., § 460.) On the same ground it was held that tenants at sufferance were not bound to pay any rent; but by the 4 Geo. II., c. 28, § 1, it is enacted that 'where any tenant holds over after demand made and notice in writing given for delivering the possession, such persons so holding over shall pay double the yearly value of the lands so detained, for so long a time as the same are detained; to be recovered by action of debt, against the recovering of which penalty there shall be no relief in equity.' By the 11 Geo. II., c. 19, § 18, a similar penalty is imposed on tenants giving notice to quit and afterwards holding over. And by the 1 Geo. IV., c. 87, various provisions are made for enabling landlords more speedily to recover possession of lands and tenements unlawfully held over by tenants.

TENANT-RIGHT is the name for a species of customary estates peculiar to the northern parts of England, in which border services against Scotland were antiently performed before the political union of the countries. Tenant-right estates were holden of the lord of the manor by payment of certain customary rents and the render of the services above mentioned, are descendible from ancestor to heir according to a customary mode differing in some respects from the rule of descent at common law, and were not devisable by will either directly or by means of a will and surrender to the use of the same, though they are now made devisable by 1 Vic., c. 26, s. 3. Although these estates appear to have many incidents which do not properly belong to villenage tenure or copyhold, not being holden at the will of the lord, or by copy of court roll, and being alienable by deed and admittance thereon, it has been determined that they are not freehold, but that they fall under the same general rules as copyhold estates. (Doe *d.* Reay *v.* Huntington, 4 East, 271.)

TENANT IN FEE-SIMPLE. A tenancy in fee-simple is the greatest estate which a subject can have in land. [Tenure.] The possession of an estate in fee-simple involves a complete power of disposition over the land; and after a grant made in fee-simple the grantor has parted with his whole interest.

The words necessary for transferring an estate in fee-simple may be reduced to this form: 'I give this land to you and your heirs.' (Litt., 1.) The addition of the word 'heirs' is absolutely necessary in a deed, and no other expression will serve; for any such words as 'I give the land to you;' or 'to you for ever;' or 'to you in fee-simple,' would carry to the grantee nothing more than an estate for life. But words of limitation, such as 'heirs,' are not now necessary to pass a fee-simple by devise. (1 Vic., c. 26, s. 28.)

When the tenant in fee-simple dies intestate, the estate descends to the heirs general of the purchaser (in the sense in which that word is explained in 3 & 4 Wm. IV., c. 106), whether male or female, lineal or collateral. [Descent.]

Lands in fee-simple in possession are subject to the courtesy of the husband and the dower of the wife. [Courtesy; Dower.]

Lands in fee-simple in the hands of the heir were subject at common law to the debts of the ancestor due to the crown and to specialty debts. By the 11 Geo. IV. and 1 Wm. IV., c. 47, a complete remedy was given for all kinds of specialty debts, both against the heir and devisee; and by the 3 & 4 Wm. IV., c. 104, estates in fee-simple are made liable in the hands of the heir or devisee for payment of the simple contract debts of the ancestor.

Estates in fee-simple are forfeited to the crown for high treason. (Co. Litt., 390 b.) In cases of petty treason and felony the forfeiture to the crown is only for a year and a day, called the *annus, dies et vastum;* after which time the estate escheats (in cases of petty treason and murder) to the lord. By the 54 Geo. III., c. 145, the forfeiture and escheat consequent upon attainder for felony, except in cases of high treason, petty treason, and murder, are limited to the life-interest of the offender. It would seem that this statute leaves the offender the power of disposing of the estate after his decease. Trust-estates in fee-simple may be forfeited to the crown, but are not liable to escheat.

An estate to a man and his heirs may be given upon conditions or limitations, which are capable of abridging or defeating it. The estate cannot then properly be called a fee-simple; but is, according to the circumstances, a conditional, qualified, or base fee. (Co. Litt., 1 b.)

TENANT IN TAIL. The origin and general nature of estates tail have been already described. [Estate; Remainder; Settlement.]

The estate of the tenant-in-tail has some essential chaacteristics. He has a right to commit waste of all kinds by felling timber, pulling down houses, opening mines, and doing other like acts; and this right of the tenant-in-tail cannot in any manner be restrained. (11 *Rep.*, 50 a; 3 Mod., 198; 2 Vern., 251.) His estate, being an estate of inheritance, is called a tenant by sufferance: he is one who, though he rightfully entered, continues to occupy wrongfully, as s subject, when it is an estate in possession, to the courtesy of the husband and the dower of the wife. [Courtesy; Dower.] The tenant-in-tail is also entitled to the custody of the title-deeds, which the Court of Chancery will order to be delivered up to him. (2 P. W., 471.) The tenant-in-tail is not bound to pay off incumbrances affecting the fee of the estate, as he has only a particular interest, and not the entire property in the land; and it seems that he is not in general even bound to keep down the interest on such incumbrances; though if he do pay off such incumbrances, it will in general be presumed to have been done in exoneration of the estate. (Cruise, *Digest*, tit. 2, c. 1, s. 40; and tit. 15, c. 4, s. 74.)

By the statute *De Donis* the tenant-in-tail was restrained from alienating his estate in any manner for a longer period than his own life, that is to say, the estate of the alienee, though not *ipso facto* determined by the death of the tenant in tail, became thereupon defeasible by his issue or the remainder-man or reversioner. (2 Ld. Raymond, 779.)

If the tenant-in-tail conveyed his estate by lease and release, covenant to stand seised, or bargain and sale and grant, the right of entry of the issue and remainder-men was not affected by the conveyance. But a feoffment or fine made or levied by the tenant-in-tail in possession by virtue of the entail, caused what was called a discontinuance of the estate tail, whereby the issue and the persons in remainder and reversion lost their rights of entry and were driven to their action. (Litt., 595, 596, 597.) This discontinuance might be either in fee, or for a limited period, according to the duration of the estate created by the conveyance of the tenant-in-tail; but while it lasted it affected not only the estate tail, but all the remainders and reversions. (Litt., 620, 625.) A discontinuance might also be produced by the obligation of a warranty by the tenant-in-tail descending on the person entitled under the entail. This discontinuance however was but partial, extending only to the heirs general of the person who made the warranty. (Co. Litt., 328, 329 a.) A fine duly levied with proclamations was an absolute bar to the issue, though not to the remainder-men, creating what was called a base fee; and by means of a common recovery duly suffered, the tenant-in-tail might bar his issue and all the remainders over, and make an absolute conveyance of the estate. [Recovery.]

By the 3 & 4 Wm. IV., c. 74, fines, recoveries, and warranties of land were abolished, and by the Statute of Limitations (3 & 4 Wm. IV., c. 27) it was enacted 'that no discontinuance or warranty which may happen or be made after that day (31st of December, 1833) shall defeat any right of entry or action for the recovery of land.' It seems therefore that no discontinuance, properly so called, can now be produced by any mode of conveyance, for, whatever may be the form of discontinuance, the last-mentioned statute takes away its effect.

The 3 & 4 Wm. IV., c. 74, which abolished fines and recoveries, has substituted for them certain modes of assurance whereby the tenant in tail may now at once bar his estate tail and all the remainders over. [Fine; Recovery; Settlement.]

In accordance with the principle which prevented a tenant in tail from alienating his estate for more than his own lifetime, leases by tenants in tail might be avoided after their death by the issue in tail. But by the 32 Hen. VIII., c. 28, tenants in tail were enabled to make leases for three lives or twenty-one years, which should bind their issue, though not the persons in remainder or the reversioner.

The estate of the tenant in tail is not subject to any of the debts or incumbrances of his ancestor, except debts due to the crown, by the 32 Hen. VIII., c. 39, s. 75.

Estates tail are subject to the bankrupt laws. The mode of procedure as to bankrupt tenants in tail is regulated by the 3 & 4 Wm. IV., c. 74, the 55th section of which expressly repeals the 6 Geo. IV., c. 16, s. 65, and virtually repeals the 1 & 2 Wm. IV., c. 56, s. 26. The powers of the commissioners of bankrupts as to the disposition of such estates are defined (ss. 56-69).

Estates tail are subject to forfeiture for high treason by the 26 Hen. VIII., c. 13. By attainder for high treason, the estate of the tenant in tail, of his issue, and of all such of his collateral heirs as would have been entitled to take under the estate tail, are forfeited, but not the estates in remainder or the reversion.

The 26 Hen. VIII. extends only to cases of high treason, and therefore as to felonies the statute *De Donis* is still in force, and the forfeiture by attainder for felony extends only to the life interest of the tenant in tail. (Co. Litt., 392 b.)

TENANT FOR LIFE. Tenancy for life of lands or tenements is the possession of a freehold estate or interest, the duration of which is confined to the life or lives of the tenant or some other person or persons.

The estate of the tenant for life is either (1) such as is created by deed or some other legal assurance, or (2) such as arises by operation of law.

(1) An estate for life may be created by lease with livery of seisin, or by any other conveyance at common law which might be employed in conveying the fee, or by a declaration of a use, or by will. The estate so limited may be either to a person for his own life, or it may be given to one for the life of another, or for any number of lives mentioned in the grant. In the last case, the estate is in effect one for the life of the survivor of the persons so named. On the other hand, an estate may be granted for the joint lives of A and B, in which case it is in fact an estate for the life of the person who dies first.

When lands or tenements are conveyed by deed, without any express limitation of the quantity of estate to be taken by the grantee, he takes an estate for life only. This however is the case only when the grantor might lawfully create such an estate; for if he be tenant in tail, the conveyance, unless it be a lease within the provisions of the stat. 32 Hen. VIII., c. 28, will pass only an estate for the life of the grantor. (Co. Litt., 42 a.) Before the 1 Vic., c. 26, a devise without words of limitation conferred on the devisee a life estate only; but now by sec. 28 of that act, a devise, though without any words of limitation, passes the fee simple, or the whole of such other estate as the testator had power to dispose of, unless a contrary intimation appear by the will.

Formerly, when lands were given to A for the life of B without any words of limitation, if A, or the person to whom he had assigned his estate, happened to die in the lifetime of B, the estate was considered as a kind of *hereditas jacens*, belonging to whoever first took possession; and the person who did so was called the general occupant (Co. Litt., 416). [Occupancy.]

A gift to two persons for their lives is an estate in joint tenancy, and for the life of the survivor, if the parties continue joint tenants; but if the jointure be severed, each has then an estate in the moiety for his own life only. (2 Blackst., *Com.*, 187.)

A condition may be annexed to an estate for life, as well as to an estate in fee simple; but the condition, it appears, must not be one prohibiting alienation on pain of forfeiture, such a condition being considered inconsistent with the nature of the estate. (18 Ves., 433.)

(2) The estates for life arising by operation of law are, the estate tail after possibility of issue extinct, and the estate by courtesy and the estate in dower.

The estate tail after possibility of issue extinct arises when, by the death of one of the persons from whom the inheritable issue is to proceed, it has become impossible that any person should exist upon whom the estate tail can descend. Thus, if lands be given to A and the heirs of his body by B, his wife, or to A and B and the heirs of their bodies, and B die without leaving any issue of their two bodies living, A, from being tenant in tail special, becomes tenant in tail after possibility of issue extinct; which is in effect nothing more than a tenancy for life, with certain peculiar privileges remaining to the tenant out of his former inheritance, the principal of which is the right of committing waste. (Co. Litt., 27, 6; Cruise, *Digest*, tit. 4.)

As to the nature and incidents of tenancy by the courtesy and tenancy in dower, see Courtesy and Dower.

Tenants for life are entitled to estovers; that is to say, to an allowance of necessary wood for the repair of houses and fences on the land; but no tenant for life, except tenant in tail after possibility of issue extinct, can cut down more timber than is necessary for such purposes, or build new houses, or open mines, without being guilty of waste, unless his estate be, as it may be, made expressly without impeachment of waste. [Waste.]

When a tenant for life dies before harvest-time, his executors will be entitled to the crops then growing on the lands, as a return for the labour and expense of cultivation, and these are called in law Emblements. (Co. Litt., 55 b.)

A tenant for life is not bound to pay off the principal of incumbrances affecting the inheritance, but he is bound to keep down the interest of all such incumbrances. (1 Bro. *R.*, 208; 1 Ves. jun., 233; 2 Bro. *R.*, 128.)

In real actions all tenants for life, except tenants in tail after possibility of issue extinct, may pray in aid, or call for the assistance of the person entitled to the inheritance to defend his title, because the tenant for life is not generally supposed to have in his possession the evidences of the title to the inheritance. (Cruise, *Dig.*, t. 3, c. 1, s. 26.) It seems to have been formerly considered that the tenant for life had no right to the custody of the title deeds, but the contrary appears now to be established. (2 P.W., 477; 1. Ves., jun., 72; 1 Sch. and Lef., 209.)

The tenant for life may convey or demise his tenement by the same means as a tenant in fee, provided he does not attempt to convey any estate greater than his own.

If he convey by grant, lease for years, bargain and sale, or lease and release, he can pass no interest greater than that which he himself possesses, the conveyance for the excess is merely void, and no forfeiture is incurred. But a conveyance by feoffment, or by any assurance equivalent to a fine or recovery, if purporting to exceed the bounds of the life estate, displaces the estates in remainder and creates a wrongful fee simple. The person entitled to the next estate in remainder or reversion becomes then immediately entitled to enter, thereby restoring all the estates which had been displaced by the tortious conveyance, except that of the tenant for life, which becomes absolutely forfeited. (Litt., 609, 610, 415, 416.)

As to the merger and surrender of estates for life, see Merger and Surrender.

The name tenant for life is also applied to the person to whom, in settlements or wills of personal property, is given an interest for life only in the fund which is the subject of the settlement or will. [Settlement; Will.]

TENANT FOR YEARS. [Estate; Lease; Term of Years; Tenant and Landlord.]

TENANTS or TENANCY IN COMMON. [Common, Tenancy in.]

TENASSERIM, or TENASSERIM PROVINCES, is a term which has lately come into general use to designate those countries on the west coast of the peninsula without the Ganges which lie on the east side of the Gulf of Martaban, and were acquired by the British by the peace of Yandabo (1826) from the Birmans. At that time the boundaries of this country were very imperfectly known, except that they were washed on the west by the Gulf of Bengal. Even during times of peace predatory incursions had been made both by the Birmans and Siamese, which had the effect of converting large tracts contiguous to the boundary-line into complete deserts, and thus it happened that the limits of the Birmese and Siamese countries were unknown to the two states, which here came into contact with one another, and even up to the present time the British are very imperfectly acquainted with the extent of this possession. A river, Pakcham, constituted, according to old records, the southern boundary-line of Birma in these parts, and the first maps which were published after the peace of Yandabo laid the boundary down near 11° N. lat., but it was afterwards ascertained that the mouth of this river is south of 10° N. lat. and of Cape Victoria. During the occupation of the country by the Birmans, it had been considered that all the country drained by the rivers which fall into the Bay of Bengal belonged to their dominions, and that those whose drainage went to the Gulf of Siam formed a portion of the Siamese empire. When the British took possession of Tenasserim, this watershed was thought to be from 30 to 50 miles from the Bay of Bengal, but it has been ascertained that in some parts it is at a much greater distance, and that between 16° and 17° 40′ N. lat. it is probably 100 miles from the sea. On the map annexed to Snodgrass's Birmese War, the northern boundary is laid down between 18° and 19° N. lat., but it is now known that it is formed by the lower course of the river Thoung Yin, a tributary of the Saluen, and that it does not extend beyond 17° 40′ N. lat. Thus we know that Tenasserim extends from 10° to 17° 40′ N. lat., and it is supposed that the eastern boundary, at least in some parts, approaches 99° 30′ E. long. It is evident that in the present state of our knowledge of the country it is impossible to determine the area of Tenasserim, but we are inclined to think that the estimate of Dr. Helfer, who assigns to it an extent of 30,000 square miles, is not too great.

The river Saluen or Salween from its confluence with the Thoung Yin to its mouth divides Tenasserim from Birma, and the Thoung Yin divides Tenasserim from the Shan States (Laos) of Zimmay, Laboung, and Yaihang. A range of mountains running from north to south through the whole of the Malay peninsula constitutes the boundary between Siam and Tenasserim as far south as the source of the river Pakcham, and from that point the course of the last-mentioned river forms the boundary to its mouth. In the Gulf of Bengal and opposite to Tenasserim are the Andaman Islands.

Coast and Islands.—The coast of Tenasserim from the mouth of the Salween river on the north (16° 30′ N. lat.) to that of the Pakcham (10° N. lat.), extends in a straight line about 450 miles, and as its bends are not large, nor its inlets wide or deep, its length probably does not exceed 500 miles measured from point to point. A marked difference exists between this coast and that of the opposite coast of Coromandel. The coast of Coromandel extends in a continuous line without a single break, and does not afford a place of refuge even for a small vessel; that of Tenasserim is frequently interrupted by short projecting capes, by which several small harbours are formed, and a few capable of receiving large vessels. The rivers of Coromandel do not admit vessels of any size, on account of the bars at their mouth, but in those of Tenasserim a considerable depth of water covers the muddy bars which lie across their embouchures. No soundings are found along the coast of Coromandel at a distance of seven or eight miles, whilst along that of Tenasserim there are soundings to the distance of 60 or even 80 miles, and though in some places considerable irregularities occur, the changes may be generally said to be tolerably regular, the depth decreasing gradually to ten and even eight fathoms as we approach the land. The coast from Cape Kyckmi or Kiaykami, situated on the west of and close to the town of Amherst, as far south as Tavoy, is of moderate elevation. Between Tavoy and Mergui it is generally low, and in this part it is lined by a rocky reef, on which a great number of small islands rise to a moderate elevation above the sea-level. These islands are known by the collective name of Long Island, and the reef on which they rest, having little water on it, renders the approach of this part of the coast dangerous, and in many places impracticable even for small vessels. South of Mergui the coast-line is broken by several deep inlets, which form large promontories, and enclose some considerable islands. The intricacies on this part of the coast are so numerous, that even at present it has not been completely surveyed, and is laid down rather by guess, though of late much has been done to clear up its position by Capt. Lloyd. This indented coast extends from 12° 30′ to 11° 30′ N. lat. South of the last-mentioned parallel indentations likewise occur, but though numerous, they do not penetrate to a great distance inland. In these parts the country close to the sea is more elevated than at any place farther north, and probably may contain many harbours for small vessels.

Numerous islands occur along the western coast of the peninsula without the Ganges, between 14° 40′ and 8° N. lat. North of 12° they extend to the distance of 70 or 80 miles from the shore, but south of 12° N. lat. they occupy a space of only 30 miles in width. These islands are comprehended under the collective name of the Mergui Archipelago. All the sea between them and the coast of Tenasserim has soundings, though near the islands they are rather too deep for anchorage. These islands also break the swell of the sea during the south-west monsoon, and accordingly the channels which divide them from the main offer great advantages to vessels coasting along this shore, which however have hitherto been little used, because the Mergui Archipelago has only been surveyed within a few years. The islands themselves are rather high, and most of them are visible at the distance of 30 to 40 miles. Without including the islands which occur between 12° 30′ and 11° 30′ N. lat., near the shores, and which are divided by such long and narrow channels from the continent that they are considered as parts of the mainland, the Mergui Archipelago comprehends seven larger and many smaller islands. The larger islands from north to south are Tavoy Island, King's Island, Ross Island, Domel Island, Kisseroing Island, Sullivan's or Lampee Island, and St. Matthew's Island. These seven islands are more than 20 miles long, but vary in width from three to eight or nine miles. They are covered with timber-trees and well provided with water, but all of them have a very rugged and uneven surface, and do not appear to possess great fertility. No part of them seems to be cultivated, and they are only inhabited by a tribe of fishermen, the Seelongs. Two of these islands require notice, on account of their excellent harbours. The northern of these harbours is called King's Island Bay, being formed by the island of this name and Plantain Island, which lies east of it. This harbour is opposite to that of the town of Mergui on the mainland. It can only be entered from the north by large vessels, as the southern portion of the channel, which divides Plantain Island from King's Island has so little depth as to be only passable for country boats. The harbour is spacious and safe, but the entrance has some difficulties, as a shoal extends over a part of it, which has 19 feet of water on the shoalest part at high-water, and only nine feet at low-water. The second harbour is called Elephant Harbour, and occurs at the northern part of the Island of St. Matthew: it is described as very spacious, and capable of containing the largest navy in the world. The soundings vary from 17 to 12, 11, and 10 fathoms nearly close to the shore in some places, and the bottom is soft. It is protected from the sea by several small islands at the entrance, and on the other sides it is sheltered from all winds by the high hills which surround it, so as to be completely land-locked. This harbour was discovered in 1825, by Lieut. Low. The island of St. Matthew is the most elevated of the group; the highest part, situated in the middle, is nearly 3000 feet above the level of the sea.

Mountains.—It is supposed that a continuous range of mountains forms the watershed between the rivers flowing on one side into the Gulf of Siam, and on the other into that of Bengal, and that this range is the boundary-line between Siam and Tenasserim. It is also supposed that the elevation of this range varies between 3000 and 5000 feet above the sea-level, and that the most northern part, which is known among the natives by the name of Thown-gee Mountains, is the most elevated portion. It is stated that in this part it makes a great bend towards the east, forming nearly a segment of a circle. But we have no account of this part of the range: it has only been traversed at the Three Pagodas, which stand near the sources of the upper branches of the river Atta-yen (Attaran); and in reading the account which Dr. Richardson gives of his travels, one would suppose that at this place the summit of the range can hardly be less than 1500 feet above the sea-level: yet he does not say that he traversed it by a mountain-pass. The southern part of the range, when seen from the Gulf of Siam, presents only a succession of peaked mountains, of which some appear to rise to the elevation of 3000 feet. The Siamese give to these mountains with some propriety the name of Sam-roi-yot, which means in their language 'the 300 peaks.' Two roads are said to have formerly been used in crossing this part of the chain; and it is certain that the chain terminates, or rather has a great depression, at the sources and upper course of the river Pakcham. This river runs from north-east to south-west, and is navigable for large boats to Karaa or Pakcham, about 40 miles from its source. To the east of this place runs another river in an opposite direction, which falls into the Gulf of Siam, and is called the river of Choomphon, from the place where it reaches the sea, or Telimfoung, as Dr. Helfer heard it named by the natives. The interval between the navigable parts of these two rivers, occupying a space of about six hours' march, or 30 miles, is a level tract. It is even stated that at high tides the rivers rise so as to inundate this tract, and to mingle their waters; but Dr. Helfer, who visited the place, does not mention this circumstance, and it seems to have been stated on very slender authority. As far as it is known, this chain is chiefly composed of granite and gneiss. These mountains are scarcely ever very precipitous, and are generally rounded near the tops, which rise in gentle declivities. The surface of the rocks is generally decomposed and covered with vegetation; a bare rock is rarely seen. Only a few spots are occasionally cultivated by the Kareans, who are in exclusive possession of these wildernesses.

Surface, Soil, and Rivers.—The general character of the country is hilly, and in some places even mountainous.

but there are also plains of considerable extent and some wide valleys. The degree of fertility which the soil possesses cannot be determined with any certainty, as only a very small portion of it is under cultivation; but we are inclined to adopt the statement of Dr. Helfer, according to which these provinces are much superior in fertility to the Malay Peninsula, by far the greater part of them being really fertile, or capable of being made productive. He thinks that the unproductive, sterile, or unavailable lands are less than one-fourth of the whole; and he ascribes the fertility not only to the natural constituents of the soil, but partly also to the quantity of humus or decayed vegetable matter which has accumulated through centuries, as the whole country is an uninterrupted forest, the greater part of which has never been felled.

The *Northern portion* of Tenasserim we shall call the Region of the Atta-yen (Attaran), as this river drains the most fertile portion of it, and its valley must soon become the centre of a considerable population. This region comprehends the whole of the country as far south as 15° N. lat., or the districts of Amherst and Yee. The most northern districts are mountainous. Along the southern banks of the Thoung-yin, which forms the northern boundary of Tenasserim, runs a mountain-chain, which, as far as it is known, constitutes a continuous ridge. It is called Bo-Thowng, and rises to more than 2000 feet above the sea-level. It is composed of sandstone, limestone, and clay-slate, and its declivities are very steep. In some parts it is overgrown with forests of bamboo. It is not known how this chain is connected with the Thown-gee Mountains, and the upper course of the Thoung-yin river is equally unknown.

The country south of the Bo-Thoung, adjacent to the river Salween, and to the distance of 50 miles from it, for the more inland parts are not known, is a plain, which however contains numerous masses of rocks, composed chiefly of limestone and sandstone. These masses are isolated, but they are disposed in lines running north-north-west and south-south-east. Some of them rise to the height of 2000 feet above the sea-level, but in proceeding southward they sink lower, and on the banks of the Atta-yen they rarely exceed 600 feet. Their structure, especially that of the limestone rocks, is remarkable, as the sides generally are almost perpendicular, and consequently bare, except in a few places, which are not so steep, and where some stunted trees or shrubs grow. No level ground occurs on their top, where they are also quite bare. On their sides there are numerous chasms and caverns. In the southern districts the number of these isolated masses decreases. The tracts of land surrounding their bases are distinguished by fertility, the soil consisting of fine black loam. The remainder of the plain is much less fertile, the soil being composed of an arenaceous clay mixed with a small portion of saline and vegetable matter. The forests which cover the plain contain only trees of moderate size, and there is no underwood.

Within the country just described there is an extensive alluvial tract, which occurs where the three rivers Salween, Gyeng, and Atta-yen join. The principal of these rivers is the Salween or Saluen, generally called by the natives Than-Lweng: it originates in the south-western part of Proper China, in the province of Yun-nan, or farther to the north; for its upper course is not known: in China it is called Noo-kiang and Loo-kiang. Running in a generally southern course, it is supposed to form the boundary between the Shan States (Laos), which are subject to Siam, and the Birman empire. This part of its course is not known. At the mouth of the Thoung-yin it begins to separate Tenasserim from Birma, and this is the only part of its course which has been investigated. Though at this point the river is only about 100 miles from its mouth, and has a great volume of water, it is not navigable. The limestone and sandstone rocks, which are very frequent in these parts, cross the bed of the river, and form several ledges, over which the current rushes with great impetuosity. Near Towng-bio-myo (about 17° 30′ N. lat.) the rapids are so strong as to prevent every kind of navigation except perhaps during the north-east monsoon. There are several other rapids, though less dangerous, farther down, and they cease only at Colon Island (near 17° N. lat.), where the river divides into two channels. The eastern channel alone is navigable. The island is rocky, and about 10 miles long, but only about two miles wide in the widest part. Even below this island the banks of the river are generally bordered by limestone rocks; and the navigation is very dangerous, owing to the force of the current and the numerous eddies produced by the inequalities in the bed of the river, which in these places is extremely deep. A boat once drawn within the vortex of a whirlpool is inevitably lost; both boat and crew are carried down, and never known to make their appearance again.

The Atta-yen or Attaran is known up to the vicinity of its source. Its principal branch originates to the south of the Three Pagodas in the Thown-gee range, and is called Zimee. It flows north or north by west, and is rather a deep river, for even at a short distance from its source it is three feet deep, and this depth increases as it proceeds farther down, where it is joined by numerous small rivers from the Thown-gee range. The current is never rapid, and hence it is used for floating down teak timber. The tide advances to Nat Kyeaung, about 70 miles from the mouth of the Atta-yen. Above Atta-yen, which is more than 30 miles from the mouth of the river, the Zimee is joined by the Way-nio, which comes from the south, and, after the confluence of the two branches, the river is called Atta-yen. This river has a very winding course, and the current is hardly perceptible. As the tide, which here rises to 19 or 20 feet, advances more than 30 miles above the confluence of the Zimee with the Way-nio, it is very probable that the whole fall of the Atta-yen, which amounts to 50 miles, if all its bends are taken into account, does not exceed 12 feet. The river is very deep: in the lower part no bottom is found with 9 fathoms, and up to Atta-yen there is never less than 3 fathoms of water.

The Gyeng or Gain comes from the east, but its upper course is imperfectly known. It is a broad river in its lower course, but is shallow and full of sand-banks.

These three rivers unite nearly at the same place, about 30 miles from the open sea, and by their confluence form a broad sheet of water, which is about 15 miles long from north-east to south-west, and from five to six miles wide, and interspersed with numerous wooded islands. This expanse of waters is separated from the sea by a large island called Phulloo-gewn, or, according to Crawfurd, Balú. This island is about 20 miles long, and 10 in average width. A chain of low sandstone hills runs through its length, never exceeding 200 feet in height. The shores of the island are covered with low mangrove jungle, but it forms only a narrow belt, which is traversed by several creeks that penetrate several miles into the island, and on which behind the mangrove jungle there are plains which extend to the hills and are covered with rice-fields. The water which is collected above this island finds its way to the sea by two channels, of which the southern runs due south and is about 20 miles long, and called the Martaban river. The navigation of this river is difficult, as the depth of the channel is not more than two or three fathoms at several places, and there are many sand-banks. It does not appear that the channel north of the island of Phulloo-gewn is visited by large vessels.

The country which surrounds the expanse of water into which the three rivers disembogue is interspersed with limestone hills, but the intervening plains are covered with a thick layer of alluvial soil. The banks of the lake and of the rivers are covered with mangroves, and unfit for any agricultural purpose, but at a short distance from the water's edge the alluvial plains are destitute of trees and shrubs, and exhibit a very considerable degree of fertility, producing rich crops of rice where they are cultivated. This rich agricultural tract extends to the confluence of the Zimee and Way-nio rivers.

The country drained by the Zimee is also a plain, which is much higher than that on the Atta-yen river, as the banks of the first-named river rise to 20 feet above its surface, whilst those of the Atta-yen are very low and subject to inundation during the rains. The plains on the Zimee river are nearly a dead level in their lower districts, and no limestone hills occur above the confluence of the two rivers; but in proceeding farther south the surface of the country becomes undulating, and in approaching the Thown-gee range it is broken by numerous deep ravines, though it cannot be called mountainous. This extensive tract is covered with a deep layer of clay of considerable fertility, and the country contains extensive forests, in which the teak-tree grows to a large size. But there are also tracts of less fertility, where the soil is very hard and intermixed with small nodules of ironstone: such tracts are always overgrown with bamboo jungle, and are the haunts of numerous elephants, rhinoceroses, and other wild animals.

The country between the Atta-yen river and the sea is covered by ridges of sandstone hills about 500 feet high. These hills run in continuous swells as far south as 14° 30′ N. lat. This tract, whose surface is strongly undulating, is of indifferent fertility, owing to the aridity of the soil, which absorbs the moisture. It is chiefly covered with forests, more or less thick according to the depth of the soil. In many places the rocks approach the surface, and have only a thin layer of earth over them, and in such places there are only a few bushes, and patches of grass which soon dry up after the rains. This tract contains two small rivers, which form harbours. The most northern, called Kal-yen, falls into the sea east of the new town of Amherst, of which it constitutes the harbour. On its bar, which is of soft ooze, there are two fathoms and a half of water at low tide; but within the bar, and as far as 8 miles up, it is between five and a half and five fathoms deep; and near its mouth, from 400 to 500 yards wide. It thus forms a spacious harbour, which most merchant ships can enter at low-water neap-tides, and at high-water ships of any burden. Near 15° 12′ is the mouth of the Yee river, which forms a wide æstuary, but it is too shallow to admit large vessels: smaller ships may sail up to the town of Yee, which is about five or six miles from the river's mouth.

The country east of the sandstone tract, and surrounding the river Way-nio and extending to the Atta-yen, is the most sterile part of Tenasserim. The vegetation is stunted, and a great part of this tract is covered with bamboo jungle. The soil is an argillaceous transition schist, unmixed with sandy particles, which quickly absorbs all moisture.

The *Region* of the *Tenasserim River* comprehends the Central portion of the country, extending from 15° to 12° N. lat. The northern districts, as far south as 13° 30′, present a very uneven surface. Several ridges of hills traverse the country from north to south: they consist chiefly of granite and gneiss, and rise to a moderate elevation. They are generally rounded near the tops, and their declivities are rather gentle. The valleys which are inclosed by them are of moderate width, and fertile. The decomposed particles of the adjacent rocks are washed by the rains from the sides of the hills, and deposited at the bottom of the valleys, where they are mixed with a large quantity of decayed vegetable matter, which makes a rich soil. Level tracts of a great extent are rare: the largest are near the town of Tavoy and at the foot of the Thown-gee range, where an elevated table-land occurs, called Meta-mio. The soil of these plains consists of clay or loam, with little sand, and it is very fertile.

The southern districts resemble the northern, except that the hilly ranges, which here also run north and south, occupy a much smaller portion of the surface, the plains being more numerous and of greater extent. The largest are those which occur along the sea-shore, but especially the Plain of Tenasserim, which is many miles in length and several in width, and extends along the left bank of the river above the town of Tenasserim. It is covered with a deposit of argillaceous marl of great depth and fertility. No less fertile is the extensive alluvial tract which surrounds the several branches into which the Tenasserim river divides before it reaches the sea, and which occupies also the greater part of the islands which lie between these branches. A part of this alluvial tract is unfit for cultivation, being inundated at high-water, and covered with mangroves. The whole region is overgrown with forest-trees, with the exception of a few spots which are under cultivation.

The most important river of this region is the Tenasserim. According to Low, it rises near 15° 30′ N. lat., but other known facts render this improbable, and its sources are laid down in our maps south of 15° N. lat. It flows in a southern direction over nearly three degrees of latitude, or more than 200 miles in a straight line. The upper part of its course is interrupted by numerous rapids and falls, which occur even farther down, and as far as 13° 15′, where the last great rapids are. To this place the tides ascend, but the river still has a rapid current, numerous shallows, annually changing banks, and shifting shoals. During the dry season it is impracticable for boats drawing more than 17 inches. It becomes deeper at its confluence with the Little Tenasserim, or Khioung-gale, which joins it at its most southern bend, and brings down a large volume of water from the Sam-roi-yot range. Up to this place, where the town of Tenasserim is built, the river is deep enough for vessels of 100 tons. At the same place the Tenasserim turns to the west, having passed between two high hills to the north-west. Soon afterwards it begins to divide into two arms, which in approaching the sea again subdivide, so that, according to the survey of Captain Lloyd, it reaches the sea by six or seven channels. There are sand-bars across these channels, but the bar which is found on the channel south of the town of Mergui has depth enough for vessels of moderate size at high-water, the tide rising between 14 and 15 feet. Below the town of Tenasserim the river still runs above 40 miles in a straight line. Its whole course is about 240 miles.

The river Tavoy, which originates near 15° N. lat., runs first to the south-west, but turns gradually to the south, so that its lower course is parallel to the shore. The wide æstuary by which it is connected with the sea reaches to 13° 30′ N. lat.; the whole course of the river in a straight line is not less than 100 miles. It is stated that the tide, which rises from 13 to 14 feet, runs up more than 50 miles from the sea, and that to this distance the river may be navigated by boats, though the navigation is rendered difficult by numerous low islands and shoals. The town of Tavoy is about 35 miles from the sea, and so far vessels of 120 tons burden may ascend. There is no bar at the entrance of the river, but the navigation is intricate, owing to the numerous shoals and low islands, as there are various channels among them which in some places have only 2 or 2½ fathoms, but in most parts the depths are from 6 to 12 fathoms. There is good anchorage on the east side of Tavoy Point, which is on the west side of the entrance of the river, in 6 fathoms, on a soft even bottom, and it is well sheltered, except against southern winds.

The *Southern Region* of Tenasserim, or that which lies between 12° and 10° N. lat., is situated on the long isthmus which connects the Malay Peninsula with the main body of Asia, and is known as the Isthmus of Krah. It is the least known part of Tenasserim. Dr. Helfer, who lately investigated its geology and minerals, found it uninhabited, with the exception of a few spots, and from his observations it appears that the whole country is covered with high hills, and contains only a few small valleys. The soil does not appear to be distinguished by fertility, and it may be conjectured, that with the Isthmus of Krah that sterile tract begins which extends over the whole of the Malay Peninsula to its most southern extremity, and which, though favourable to the growth of fruit-trees, produces only scanty crops of rice and other grain. The inhabited places of this tract are almost exclusively confined to the banks of rivers, and do not extend far inland. The rivers, though they have not a long course, are said to be large and navigable to a considerable distance from their mouths. The largest are, from north to south, the Lenya, the Bockpyn, and the Pakcham. The last-mentioned river, which divides Tenasserim from Siam, has already been noticed.

Climate.—Like all other intertropical countries, Tenasserim has only two seasons, the dry and the wet season. They depend on the monsoons, the rains being produced by the south-west monsoon, whilst the dry season lasts during the north-east monsoon. There appears to be some difference in the wet season between the climate of Maulmain and of Mergui, the only two places in which a few meteorological observations have been made, and this difference appears to depend on the circumstance, that along the southern coast the effects of the south-west monsoon are diminished by the elevated islands of the Mergui Archipelago, whilst farther north they reach the land in all their force. At Maulmain the rainy season sets in towards the end of May or the beginning of June, and during the first three months the rains are heavy and nearly incessant, but they gradually diminish in September, and entirely cease in October. This is the hottest part of the year, but the heat is far from being so oppressive as on the coast of Coromandel. In May the thermometer averages at 8 o'clock in the morning 78°, and at 4 o'clock in the afternoon 82°, in June it keeps at 72° at 8 o'clock, and at 76° at 4 o'clock, and in July and August at 77° at 8 o'clock, and at 80° at 4 o'clock. The thermometer has never been observed to rise above 90°. The difference between the temperature of the air in the day and at night is remarkable, as the thermometer is often found at 65° at sun-rise, even in July. In the dry season the thermometer varies between 60° and 80°, and the weather is very constant, rain rarely falling, and only in short showers. The heat is moderated by the sea and land breezes, which blow very regularly in this season.

At Mergui the rainy season sets in towards the end of April or the beginning of May, and lasts to the month of November. During the first two months the rains are moderate, but from the middle of June to the beginning of September they are heavy, when they again begin to abate, and gradually to diminish. Rain falls also during the dry season, but only in showers, which occur at intervals from four to six weeks. The greatest heat occurs before the rains, and in the first two months after they have set in, but it is stated that the average temperature of the six hottest months does not exceed 84°. Land and sea breezes are regular during the dry season. At some places in the interior, which are considerably elevated above the sea, as the table-land of Meta-mio, the climate is some degrees more temperate than near the coast.

The climate is considered very healthy. This opinion is confirmed by Dr. Helfer, who lived there many years, and who says that it is the most healthy of all known tropical countries for Europeans; and he supports his opinion by the statement that the lists of mortality kept by the medical gentlemen of the European British corps stationed at Maulmain and its dependencies show that the rate of mortality scarcely ever exceeds and is sometimes less than it would be under similar circumstances in Europe. This is the more remarkable, as many of the adjacent countries, and especially Aracan, which resembles Tenasserim in nearly every respect, have acquired a bad name for their insalubrity. Helfer cannot account satisfactorily for this phenomenon. He finds no other reason than that the country is either part of a narrow peninsula or immediately adjacent to one, and that the extensive seas on both sides produce a constant though not always perceptible current of air, by which the noxious vapours that rise from vegetable matter and other elements of malaria are either destroyed or carried away. Even the exposure to the sun is rarely attended by bad effects, and the climate does not produce languor or mental inactivity, which is partly to be attributed to the coolness of the nights.

Productions.—If the value of a country were to be estimated by the number of marketable articles exported from it, Tenasserim would certainly be one of the least valuable. For, if a small quantity of rice and some teak timber are excepted, hardly any article worth mention has been exported from that country up to the last few years. But it vies with any country on the globe in the varieties of its natural products, and when cultivated it will export almost every article which belongs to tropical countries.

Though the greater part of the country has not been explored, it is known to be rich in minerals. Gold is found in some of the rivers, but in small quantities. A silver-mine exists in the range of the Bo-Thowng, but its value is still doubtful. It has lately been ascertained that there is copper-ore in the north-east portion of Sullivan's Island, and on the island of Calla-gkiank, near Mergui. Tin is the only metal which has ever been worked. The tin-mines are about one day's journey to the east of the town of Tavoy, and in the vicinity of Mergui. But Dr. Helfer, who has explored the southern districts, states that the range of hills which runs north of the Pakcham River is the richest in tin-ores, the grains or crystals being sometimes of the size of a pigeon's egg, and the layer in which they are found being 8 or 10 feet thick. It is however difficult to work these ores, as the contiguous country is entirely uninhabited. Tin-ore is also found on the banks of the Bokpyn river and on Domel Island. The richest deposits of tin-ore are probably yet unknown. Iron-ore of good quality is found in abundance in the vicinity of Tavoy, and at several other places farther south, especially in the districts south of the Tenasserim river. Antimony occurs in the neighbourhood of Maulmain. Extensive coal-measures have been lately discovered in several places on the banks of the Tenasserim river. The coal is generally of good quality, and the best kind is near the banks of the river below the last rapids, so that it can be brought to Mergui at moderate expense. Three or four years ago this mine began to be worked at the expense of the East India Company. It is thought that the discovery of these coal-measures will have some effect on the steam-navigation of the Gulf of Bengal and the Straits of Malacca. Limestone and marble are common in the northern districts.

Rice constitutes the principal object of cultivation: but it does not appear that irrigation is practised; and only one crop is taken. Wheat is cultivated at a few places on a small scale. Other objects of agriculture are sesamum, chilies, yams, sweet potatoes, plantains, and melons. The sugar-cane, indigo, and tobacco are only grown for home consumption, and also cotton, which is of an inferior kind. It is thought that these last articles could be raised to a great extent if there was a demand for them. Among the trees which are cultivated the most important is the areca palm, which succeeds well as far north as 15° N. lat. Since the occupation by the British, the natives have begun to cultivate it on an extensive scale, and it will soon yield a large article of export if the fruits of this palm should continue to be used in Europe for tanning, instead of oak-bark and sumach. Of late years coffee-trees, nutmeg-trees, and clove-trees have been introduced. The first two thrive well, and promise to remunerate the cultivators, but the success of the clove-trees is still doubtful. The produce of the coffee-trees is compared with the second quality of Java. Nearly all the delicious fruits which grow in the Malay Peninsula and the Indian Archipelago may be raised in Tenasserim. The durian is found up to 16° N. lat., and is exported to Rangoon and other places of Ava. The mangosteen has lately been introduced, and thrives well, but only south of 13° N. lat.; mangoes, pine-apples, guavas, and oranges also succeed well. In some parts the arnotto (Bixa orellana) is raised. Cocoa-nut plantations are rather extensive near the sea, and also the nipah palm (Nipa fruticans). The toddy or palm-wine of the latter contains more saccharine matter than the cane. Nearly the whole of Tenasserim is covered with timber-trees, which are not much used at present; but as the countries surrounding the Bay of Bengal are mostly destitute of such forests, and the demand for timber is rapidly increasing, they will soon be considered as a source of wealth. Extensive forests of teak-trees still exist on the banks of the Attayen, and furnish at present the most important article of export. A small number of junks are annually built by Chinese at Mergui and Tavoy from the Hopea odorata, which is also employed by the Birmese in the construction of small craft. The best timber-trees, except the teak, belong to the Hopeas, Vaticas, and Shoreas; the most numerous are the Dipterocarpeæ, which attain an enormous size, but furnish an inferior wood. All these trees when full grown are from 70 to 120 feet in height, rising with a straight trunk 40 or 60 feet high, and before they throw out any branches they have a circumference of 10 to 30 feet. In addition to timber, the natural productions which are derived from the forests and plants which grow wild are numerous. There are various kinds of trees yielding caoutchouc, sticklac, gamboge, sassafras, cajeput-oil, different gum-resins, nut-oil, black varnish, sandal-wood, dammar, several tanning substances, several dyes, aloes, and sapan-wood. Cardamum-plants are said to be found in the mountains on the eastern boundary, and hemp grows wild on some of the river islands. Large tracts are covered with bamboo-jungle, and bamboo begins to be exported, having been found of a superior quality to that grown in the neighbouring countries. On the Sam-roi-yot range there is an aromatic wood, called by the natives callame, which is brought down to Mergui, and there shipped for Rangoon.

Domestic animals are not numerous, with the exception of buffaloes, which are large. As to wild animals, Helfer observes that as Tenasserim constitutes as it were the bridge by which the continent of Asia is united to the Indian Archipelago, its zoology possesses several species peculiar to these two great natural divisions of Southern Asia. The number of species common to Bengal and Hindustan is comparatively small, but in the northern districts of Tenasserim there are many species which are peculiar to the countries east of the Brahmapootra, and even several of Bootan and Nepaul; and in the southern others which have hitherto been exclusively found in the Indian Archipelago.

There are five different kinds of quadrumana: a species of cercopithecus belongs to the rarest animals of this class;

it is chiefly found in the northern districts, on the isolated limestone rocks. The Malay bear occurs in the more mountainous parts as far north as 13° N. lat. The royal tiger is found in great numbers, and is very strong and large; but it is said that it rarely attacks men. The black tiger is common. There are also leopards and wild-cats. Elephants are numerous, and they have a wide extent of forests to range in. They are killed and eaten by the natives, who bring their teeth to Maulmain. The rhinoceros is very common, and all the known Asiatic species are found. The Malay tapir, called by the natives the 'great pig,' is found in the most southern districts. The wild hog is common, and also the Sus Babiroussa. The Cervidæ are numerous: Rusa Hippelaphus, Elaphus Wallichii, Cervus Aristotelis, C. Axis, and C. Muntjac, with two other species, are known to exist. The Bubulus Arni and Domesticus are both in a wild state; and of the Bisons, the great Gaurus is rather rare, but Bison gayal is very common. A variety of Cinnyris, and Nectarinia, in its splendid plumage and diminutive size, resembles the humming-birds. Four species of Merops rival in colours the species of Java and Australia. The Indian peacock is abundant in the interior near mountain-torrents. There are five species of parrots. The Phasianus gallus, the origin of our domestic fowl, is very common in the jungle, and the native breed is kept up by supplies of eggs from the forests. The Hirundo esculenta inhabits the cliffs along the southern coast and the islands of the Mergui Archipelago, and a considerable number of the nests are annually collected and exported by the Chinese. There are several species of hawks, falcons, and herons, and five kinds of pigeons, some of which are very beautiful. Fish is abundant between the islands of the Mergui Archipelago, where an extensive fishery is carried on by the Seelongs, Malays, and Chinese, who prepare fish for market, which is done by spreading it over a framework of mangrove-trees, and drying it in the sun: it is also daily trodden with the feet twice. No salt is ever employed in curing the fish: some kinds of fish are smoked. In these parts there are also shrimps, prawns, &c., of which balachong, or pressed fish, is made, which is an article of commerce. Whales are frequently seen among the islands of the archipelago, and a little oil is got. There are also some pearl-banks, which were formerly fished, but an attempt made for that purpose some years ago was not successful. Trepang is one of the principal objects of fishery. Tortoise-shells, mother-of-pearl, and ambergris are collected in small quantities by the Seelongs. Wax and honey constitute an important article of internal commerce, and are partly also exported. There are said to be five different species of wild bees, two of which are without stings. Snakes are numerous, but only a few kinds are poisonous.

Inhabitants.—Helfer estimates the population of Tenasserim at about 100,000 individuals, and consequently there are about three to a square mile. Though this population is very small, it consists of very different races, or rather we find different races mixed. This is chiefly to be ascribed to the frequent conquests to which the country has been subjected since the time when it was first visited by Europeans. In the last two centuries the Siamese, Thalians, and Burmese have alternately and more than once possessed Tenasserim. These nations appear to have adopted a policy which we find mentioned in the most antient historical records of Western Asia, namely, the transplanting of the inhabitants of one country to another at a great distance from it.

The bulk of the population consists of Birmans, Thalians or Thalains, Siamese, and Karians or Karens. Though all these nations have some physical features which belong to the Mongol race, yet there are others which indicate that a mixture with other races has taken place. The Siamese approach nearest to the Chinese: they have a flat forehead, a small nose, prominent cheek-bones, black hair, very thin beards, thin lips, and a colour more or less yellow. The Birmans and Thalians are half Malays and half Chinese, and the Karians half Malays and half Caucasians; indeed the features of the Karians approach so much to the Caucasian form, that many of them have aquiline noses, a high forehead, and the European facial angle. This resemblance to the Caucasian race seems one of the reasons which has led some American Baptist missionaries to consider the Karians as the lost tribes of Israel.

The Birmans, who were the lords of the country up to the peace of Yandabo, are still the most numerous. They are settled in the plains on the rivers Atta-yen and Gyeng, in the vicinity of Mergui, Tavoy, and Yee, either near the sea-coast or on the banks of navigable rivers or creeks, and never far inland. They are healthy, strong, and muscular. Their principal occupation is agriculture. They are indolent and self-conceited; but honest, polite in their manners, and neither passionate nor revengeful, by which they are distinguished from the Malays. They are Buddhists, and consider the sovereign of Ava as the head of their religion: they are quiet subjects. The children are placed at an early age in monasteries, established in almost every village, and endowed by the voluntary contributions of the inhabitants: the children remain here for a certain time, during which they are fed by the monks, and instructed in reading, writing, and religion; and thus elementary knowledge is more generally diffused among the lower classes than in most countries of Europe; but the knowledge of the higher classes is not much greater. The knowledge of their priests is limited to the explanation of theological and metaphysical doctrines. The missionaries have hitherto failed in their attempts to convert them to Christianity, with the exception of a few isolated instances, where Birmans have nominally become Christians for the sake of worldly gain. This want of success is not to be ascribed to fanaticism or obstinacy on the side of the Birmans, but to their religious dogmatical indifference. They admit the beauty of the Christian morals, but contend that theirs are equally good; and with reference to the dogmas, they say that the Christian are as unintelligible as the Buddhist.

The Thalians or Peguans do not differ in physical constitution from the Birmans, and their separation into two nations might be considered merely a political one, as they had formerly two different governments, if it were not that the Thalians speak a different language, which is said to have scarcely any resemblance to that of the Birmans. But this language is fast declining, as the greater number of the Thalians speak the Birman language, which has been adopted as the language of the courts, of public transactions, and of general conversation. The Thalians are likewise Buddhists, and participate in the education provided by that religious establishment. Their chief and almost sole occupation is agriculture, and rice is almost the only object of cultivation. A small number of Thalians were settled on the Atta-yen previous to the occupation of Tenasserim by the British, but a much greater number have emigrated since that event. Having shown during the war a great partiality for the British, they feared the vengeance of the Birmans when their country (Pegu) was restored to that nation, and took refuge in Tenasserim, where they settled in the vicinity of the new settlement of Maulmain, where there are at present twenty Thalians for one Birman.

When Tenasserim was subject to the king of Siam, the Siamese were very numerous, but after their conquest by Alompra they retired from these provinces almost entirely, except the districts south of Mergui, where a number of them remained on the banks of the rivers Lenya and Bokpyn, that part of the country having always remained a disputed district. The security and equitable administration introduced by the British have attracted a considerable number of emigrants from Siam, who have formed settlements in several parts of the country, especially on the banks of the Greater and Lesser Tenasserim rivers. They are, according to Helfer, an industrious, hardy race, and more enterprising than the Birmans, besides being quiet, obedient, and orderly. He thinks that their immigration in greater numbers would be a desirable accession in the wilds of Tenasserim. They have introduced the cultivation of the sugar-cane for the purpose of making sugar, which art they have learned from the Chinese who are settled in their country, though this cultivation has not yet become important. Many of the Siamese are huntsmen by profession, living for months in the wildest forests, where they shoot elephants for the ivory; they are also the trappers, tamers, and managers of elephants in general. Under the Birman rule few elephants were tamed, but at present the practice is becoming more general through the Siamese, in whose country elephants are the most important of domestic animals.

The Karians occupy exclusively the country adjacent to the mountain-range which divides Tenasserim from Siam.

never being found near the sea-shore. They are said to be the same nation which occupies several mountain-tracts in Birma, and is dispersed over the delta of the Irawaddi [Birma, vol. iv., p. 440], and to support this opinion it is affirmed that the Birman Karians bordering upon China, at the distance of 13 degrees of latitude, speak a dialect of the same language which is current among the Karians of Tenasserim. This fact requires to be confirmed, for in other respects these nations differ greatly in habits. In Birma the Karians are the most industrious cultivators of the soil, and manufacture several kinds of cotton and silk cloth, but those of Tenasserim are an agricultural people without any fixed habitations, migrating every second or third year. When a Karian family has chosen a place for a plantation, huts of bamboo thatched with palm-leaves are constructed, and a part of the forest is cleared, just as much as is necessary to plant the ground with rice sufficient to maintain the settlers for a year. The paddy is sown upon the ground, which is imperfectly cleared, without any tillage or other preparation, and whatever else is wanted (cotton, indigo, sesamum, vegetables, &c.) is sown or planted promiscuously on the same spot. The following year another spot is cleared in the vicinity, and after some years, or when a death happens, the family removes to a greater distance, and begins again the laborious task of felling immense forest-trees, visiting only from time to time the old establishment, which yet yields fruit for several seasons, and thus the Karian wanders all his lifetime without ever settling permanently. It seems however that an improvement in the condition of the Karians is taking place. Their religion is heathenism. They believe in evil spirits, called nâts, which have a direct influence on the destinies of mankind, and they try to propitiate them by sacrifices of fowls, tobacco, rice, and pieces of money, which they deposit at certain places. The attempts to convert them to Christianity by the American missionaries have been successful. A tribe of the Karians, called the Red Karians, inhabit the mountains north-east of Maulmain, and these mountaineers are said to live by robbery.

The Seelongs are the lowest in civilization among the nations of Tenasserim. They are confined to the islands of the Mergui Archipelago, and are a race of wandering fishermen, who build temporary huts of reeds, palm-trees, and bamboos, during the inclemency of the monsoon, and pass the rest of the year either in boats or on the sea-beach under the shade of trees. They never cultivate the ground, but live upon the spontaneous products, chiefly turtles, fish, and shell-fish, which form their principal food. They have a peculiar language, but too little is known of it for us to determine whether it is a mixture of languages or a peculiar tongue. They form a petty tribe, not exceeding, it is said, 1000 souls in number, and it is very difficult to meet them in the islands which they visit, as they hide themselves whenever they see a strange sail approaching. This is probably the effect of their having suffered much from the pirates, who, until lately, infested those seas, and it serves to explain the statement of the early European navigators, who landed on these islands, and found them uninhabited. The Seelongs have a vague idea that there are certain invisible beings which exercise an influence over the destinies of mankind, but there is no established mode of worship, and they are entirely ignorant of a future state. No attempt has yet been made to convert them.

Helfer reports, that among the natives the opinion is general that in the most mountainous part of the country there is a race of wild men, who shun all intercourse with their neighbours, and seem to be hardly superior to monkeys. He is much inclined to think that these wild men are the gigantic orang-outang of Sumatra. But the Andaman Islands are inhabited by a puny race of men, the lowest in the scale of intellectual beings, which seems to belong to the race of the Australian negroes; and only a few degrees farther south, in the kingdom of Queda, a small tribe, the Samang, are found [Malay Peninsula, vol. xiv., p. 327], who greatly resemble the inhabitants of the Andaman Islands. It is therefore not improbable that a small remnant of such a tribe may still exist in Tenasserim.

The Karians, Seelongs, and the last-mentioned race are probably aborigines: the others have emigrated from the neighbouring country. Many Chinese are settled in the sea-ports, where they are merchants, ship-owners, ship-builders, spirit-distillers, carpenters, blacksmiths, bakers, and gardeners. A few of them settled when the country was subject to Birma, and others have come since the occupation by the British. They are married to Birman women, but their children, if males, are brought up as Chinese, and adopt the customs, manners, and dress of their fathers. There are also a number of Chuliahs, or natives of Coromandel, settled in the places where Europeans reside, with whose customs and wants they are much better acquainted than the natives, and by administering to which they gain their livelihood. The same may be said of the Bengalees, who however are always inferior to the people of the peninsula of Hindustan in enterprise and capacity. Their number is not great. As Tenasserim is the penal settlement for the British possessions in Hindustan, about 2000 convicts have been sent there, especially Thugs. They are treated with great mildness, and most of them have been converted into useful members of society. Many of them have married, and on the term of their banishment expiring have settled in the country. At Maulmain a few Armenians and Parsees are settled, this being the only place in Tenasserim where trade is carried on.

The English settled in Tenasserim are almost all in official capacities, either civil officers of government or the military officers of the two regiments which are stationed here. The number of private persons is small, and almost all of them are congregated in Maulmain, where they are chiefly engaged in ship-building, or otherwise connected with the teak-timber trade. Besides a few American Baptist Missionaries, there are many descendants of Portuguese. By intermarrying with native women, they have partly lost the advantages of European civilization, their condition being nearly the same with that of the natives, and frequently much lower. Their steadiness in adhering strictly to their faith preserves them as a distinct class. They have also mostly preserved their language, but it is barbarously corrupted.

Towns.—In a country so little cultivated, and the population of which is dispersed over such an extent, there can be no large towns. When the British took possession of the country they founded the town of Amherst, near the mouth of the Martaban river, hoping that the commerce of the country would concentrate at this place. [Amherst, vol. i., p. 452.] But these expectations have not been answered. Maulmain, which was at first only a military post, has since risen into importance and is rapidly increasing, as its situation near the confluence of the Attayen with the Salween is the most favourable place for carrying on the trade in teak, which constitutes the most important article of export. Ship-building is the only trade which is carried on to any extent. The town of Tavoy is also small, but it has some commerce with Rangoon and Mergui. The town of Mergui has the advantage of a safe and well-protected harbour. The roadstead is between the mainland and Madramacan Island, with a soft bottom in from 6 to 15 fathoms, and large vessels are sheltered from all winds. It is about six miles from the town. But vessels of moderate size can go over the bar into the river, and anchor off the town in five fathoms. Though it is at present a small place, it will probably rise to great importance, as in the country at the back of it the richest deposits of coal and tin have been discovered. The neighbourhood is also particularly well adapted for plantations of spice-trees, and the Siamese have begun to cultivate the cane for making sugar: it is also well situated for commercial intercourse overland with Bangkok and the countries of Siam which surround the gulf of that name. Tenasserim, an antient town, which however was destroyed in the wars between the Siamese and Birmans, is in ruins, but will probably be revived, owing to the coals in the neighbourhood and the sloop navigation extending to this place.

Manufactures and Commerce.—If we except the building of vessels and small craft at Mergui, Tavoy, and especially Maulmain, there is no manufacturing industry in Tenasserim; nearly the whole population is in that stage of civilization in which it has not yet acquired a taste for refinement and comforts, and articles of foreign manufacture are not much in demand. Such articles as cotton-cloth, coarse china-ware, and iron cooking-vessels, are brought by the Chinese from Bangkok, and cotton-cloth, gunpowder, and arms imported from England by way of Penang or Calcutta. There are also imported petroleum and tobacco from Rangoon, and spices and sugar from Penang. The chief exports are teak and rice; there are also exported ivory, wax, tin, nut-oil, trepang, edible birds' nests, and bamboos. The only places with which a commercial intercourse exists are Calcutta, Rangoon, and Penang. It is hoped that an overland commerce will soon be established between Maulmain and the south-western provinces of China, especially Yun-nan, as caravans from those parts annually visit the Shan States (Laos) north of Tenasserim, and the merchants of the caravans manifested a few years ago an intention to proceed to Maulmain, but were prevented by political circumstances.

History.—Nothing is known of the early history of these provinces. When they were first visited by the Portuguese, several places were much more thriving than they now are. It seems that at that time the bulk of the population consisted of Thalians, and probably the country formed a portion of the kingdom of Pegu. It was afterwards connected with Siam, from which it was wrested by Alompra, the founder of the present Birman dynasty, about the middle of the last century. Notwithstanding the repeated contests and incursions of the Siamese, it remained a part of the Birman empire until it passed into the hands of the British by the peace of Yandabo (1826). At that time the population was estimated at 50,000 individuals: at present it probably considerably exceeds 100,000. It forms part of the government of Penang.

(Crawford's *Journal of an Embassy to the Court of Ava;* Low's 'Observations,' &c. in *Asiatic Researches*, vol. xviii.; Forrest's *Voyage to the Mergui Archipelago;* Helfer; several 'Reports on the Tenasserim Provinces, and its Coal-mines,' inserted in the *Journal of the Asiatic Society of Bengal*, 1838 1840; Foley's 'Notes on the Geology, &c. of the country in the neighbourhood of Manlamyeng,' in *Journal of the Asiatic Society of Bengal*, 1836; Richardson's 'Journal of a Mission to the Court of Siam,' in *Journal of the Asiatic Society of Bengal*, 1840.)

TENBURY. [WORCESTERSHIRE.]

TENBY. [PEMBROKESHIRE.]

TENCH, a fresh-water fish belonging to the family *Cyprinidæ*, or Carp tribe. [TINCA.]

TENDER. A tender is the offer to perform some act. In practice it generally consists in an offer to pay money on behalf of a party indebted, or who has done some injury, to the creditor, or to the party injured.

A tender to the amount of forty shillings may be made in silver; but beyond that amount it must be in gold. If a tender be made of a larger amount in silver, or in bank-notes, and no objection be taken at the time to the medium in which it is made, the objection to the tender on that ground will be held to be waived, and the tender will be held good to the full amount to which it is made. The money tendered must be actually produced and shown, or at least the bag or other thing which contains it shown to the party to whom it is intended to be made, unless it is dispensed with by some declaration or act by the creditor. This is insisted upon with such strictness, that even though a party tell his creditor that he is about to pay him so much, and put his hand into his pocket to produce the money, yet if the creditor leave the presence of the debtor before the money is actually produced, no tender will have been made: but if the creditor refuse to receive the money mentioned on the ground that it is insufficient in amount, the actual production of it is not necessary to constitute a valid tender. The offer must be absolute and without conditions. An offer of a larger amount with a request of change; an offer with a request of a receipt, or on condition that some thing shall be done on the part of the creditor, are not valid tenders; but an offer of a larger sum absolutely without a demand of change is good. A tender may be made either to the party actually entitled to receive it, or to an agent or servant authorised to receive it, or to a managing clerk; and a tender will not be invalidated even though before it is made the creditor has put the matter into the hands of his attorney and the managing clerk of the creditor refuses to receive it, assigning that circumstance as his reason for doing so. If the attorney write to the debtor demanding the money, a tender afterwards made to him or to his managing clerk is good, unless at the time when it is made they disclaim authority to receive the money. A tender ought to be made on behalf of the party from whom the money is due; but if the agent appointed by him to make the tender offer a larger sum than he is authorized to do, the tender will nevertheless be good for the full amount to which the tender is made.

If the defendant in an action plead a tender, he must state that he has always been ready to pay the money, and he must also pay it into court. The effect of the plea is to admit the existence of the contract or other facts stated in the declaration which form the cause of action in the plaintiff. The plea goes only in bar of damages. The plaintiff therefore in such case can never be nonsuited: but if issue is taken on the mere fact whether or not the tender has been made, and that fact is found for the defendant, it is a good defence to the action.

By various statutes, magistrates, officers of excise, &c. are empowered after notice of action to be brought against them, to tender amends; and if the amount tendered is sufficient, the tender is a defence to the action.

TENDON, or Sinew, is the tough white and shining tissue by which muscles are attached to the bones or other parts which it is their office to move. The name of tendons however is generally applied only to those which are thick and rounded, and which serve for the attachment of the long round muscles, such as those of the biceps muscle on the front of the upper arm: those which are broad and flat, and which serve for the attachment of the membranous muscles, are commonly called aponeuroses. But whatever be the external form of a tendon, its intimate construction is the same, being chiefly composed of the same fibrous or tendinous tissue of which a large class of organs, including the ligaments, fasciæ, periosteum, and several others, consist.

The fibrous or tendinous tissue is of a peculiarly glistening bluish-white colour, dense and tough, nearly insensible, not vitally-contractile, and very little elastic. It is composed of bundles of delicate fibres, which are united by cellular tissue; and each fibre is made up of several fibrillæ; or filaments, which are discernible only with the microscope. The filaments are transparent and cylindrical, with well-defined outlines: they vary in diameter from $\frac{1}{20000}$ to $\frac{1}{10000}$ of an inch, and, though they have a generally straight direction, are finely undulated. The tendinous fibres are from $\frac{1}{7500}$ to $\frac{1}{3750}$ of an inch in diameter; the filaments are arranged within them in parallel lines, and are connected by a firm substance, in which no distinct structure can be discerned. The bundles of the fibres are arranged in various plans in the different tendons and aponeuroses: in some, they are parallel; in some, interlaced or variously woven together; but their arrangement is always such that they possess the greatest force of resistance in the direction in which the muscle acts upon them.

The tendons, like the other fibrous tissues, are composed of a substance slowly yielding gelatine by boiling. A large quantity of the ordinary glue of commerce is obtained by boiling down the tendons and ligaments about the feet of horses. They contain about 60 per cent. of water; and when dry become hard, brittle, yellow, and transparent. In vital properties they are distinguished by a very low degree of sensibility. No pain is excited by the application of stimuli; but when stretched or twisted, the dull aching pain is produced, with which most persons are acquainted as characteristic of a sprain. Their diseases are few and are peculiarly slow in their progress.

The chief differences of appearance in the tendons depend on the quantity of cellular tissue interposed between the bundles of tendinous fibres. In the round tendons there is so little, that it is with difficulty demonstrated, and they are, in a corresponding degree, compact and strong. In the flat membranous aponeuroses the cellular tissue is much more abundant, and fills up large interspaces between the fibrous bundles. The more abundant the cellular tissue, the more numerous do the blood vessels of the tendons seem to be. In the round compact tendons they are scarcely discernible; but when well prepared, the same arrangement is observed in them as in the blood-vessels of all the fibrous tissues; that is, they run in parallel lines between the fibrous bundles, rarely dividing into smaller branches, and communicating by short canals which pass transversely across the bundles. The blood-vessels of the tendon are chiefly derived from those of the muscle to which it is attached. In most instances a large branch runs across the line of boundary between the muscular and tendinous fibres, and gives off many smaller branches to the latter.

At that end of a tendon which is affixed to a muscle each primitive fibre or fasciculus of the latter [MUSCLE] terminates in an abruptly-rounded extremity, which is embraced by a fasciculus of the filaments of the tendon, expanding and enclosing it in a sheath, or in a manner which may be coarsely represented by placing the end of the fore finger of one hand within a circle formed by the ends of all the fingers of the other hand. The larger bundles of cellular and fibrous tissue in the tendon are also continuous with the cellular tissue which is placed between the secondary fasciculi of the muscle.

At their opposite extremities the tendons are usually affixed to bones. Their fibres are intermixed and firmly united with those of the periosteum, and often pass into the very substance of the bone.

Although the chief and proper office of tendons is to serve as media for the action of muscles, yet many of them fulfil other purposes in the economy. Thus the aponeuroses of the abdominal muscles form a great part of the walls of the abdomen, and, by their toughness, support and protect the organs within its cavity; the tendons of the muscles of the fingers add strength to each joint over which they pass; and many, in other parts, are arranged so as to act like ligaments.

TENDRAC. [TENREC.]

TENDRILS, or *Cirrhi*, are those elongated and filamentous organs of plants which possess a power of twisting in one direction or another, and by which the plants on which they grow are enabled to embrace other plants, and thus to elevate themselves. Tendrils are only found on those plants which are too weak in the stem to enable them to grow erect. In most cases the tendrils are only forms of the petiole; for although they may occur on the parts of flowers, yet the flowers must be regarded as metamorphoses of the leaf. Tendrils are distinguished according to the parts of the leaf from which they grow. When the tendril consists of the elongated petiole of a compound leaf, it is called a *cirrhus petiolaris*, as in the common pea. When, as in Smilax horrida, it branches off on each side at the base of the lamina into a twisting branch, it is called a *cirrhus peduncularis*. When it is extended from the point of a single leaf, as in the Gloriosa superba, it is a *cirrhus foliaris*; and when it occurs in the petals of a flower, as in Strophanthus, it is called *cirrhus corollaris*. Those tendrils which are in connection with the stem alone, as those of the passion-flowers and vines, are called *Capreoli*. The type of these organs however is the same in all cases. (Bischoff, *Wörterbuch der beschreibenden Botanik*.)

TENEDOS (Τένεδος), an island in the Greek Archipelago, off the coast of Troas, in 39° 47′ to 51′ N. lat. and 25° 58′ to 26° 5′ E. long. It is said to have been antiently called Leucophrys, and to have derived the name Tenedos from Tennes, the son of Cycnus, king of Colone in Troas, who reigned over the inhabitants, and was afterwards deified by them. (Pausanias, x. 14; Schol. in Hom. *Il.*, i. 37; and more fully Diodor., v. 83.) According to Homer (*Il.*, xi. 624), it was sacked by Achilles, and occupied by the Greeks when they retired from the siege of Troy immediately before its capture. (Virg., *Æn.*, ii. 21.) This connection with the story of the Trojan war has given Tenedos some celebrity. It was colonized by Æolians from Amyclæ in Laconia, under the command of Peisander and Orestes. (Pindar, *Nem.*, xi. 45-6; Herod., i. 151.) Little mention is made of Tenedos in antient history. It was independent in the time of Cyrus, king of Persia, but was made subject to Persia after the revolt of Ionia in the time of Darius (B.C. 493): it was afterwards a tributary of Athens, and in the fourth year of the Peloponnesian war took part with the people of Methymna against the rest of the Lesbians. (Thucy., iii. 2.) Pausanias states that the Tenedians, becoming unable to defend themselves, submitted at some period of their history to Alexandria in Troas. Aristotle (*Rhet.*, i. 16) mentions some dispute as having recently occurred between them and the Sigeians, in which they cited in support of their cause the writings of Periander of Corinth. According to Cicero, Verres robbed the Tenedians of a statue of Tennes, their founder, of most beautiful workmanship. (*In Verrem*, i. 19.) Pindar (*Nem.*, xi.) speaks of the Prytanes, or yearly magistrates of Tenedos, to one of whom, Aristagoras, he addresses this ode. It appears from Stephanus Byzantinus that Aristotle wrote on the constitution of Tenedos. On the antient silver coins of the island are the types of a double-edged axe of a peculiar form; and on the reverse a bifacial head like that of Janus. The 'Tenedica securis' (axe of Tenedos) was a proverb expressing any summary mode of executing justice or dispatching an affair; derived from the law of a king of Tenedos, mentioned by Aristotle as quoted by Stephanus, which permitted a person who caught others in adultery to kill both parties with an axe. (See the passages quoted by Eckhel, and Cic. *Ad. Quintum Fr.*, ii. 11.) The head of Apollo also occurs on coins. On the worship of this deity here, and its transmission to Tenea near Corinth, see Müller, *Dorians*, i. 247.

According to Strabo (p. 604) there were two harbours at Tenedos. It was used by the emperor Justinian as a depôt for corn going from Egypt to Constantinople when detained by contrary winds. According to Nymphodorus (Athenæus, xiii. 609) the women of the island were of surpassing beauty.

Tenedos was visited by Chandler, who 'found there but few remains of antiquity worthy of notice. In the streets, the walls, and burying-grounds were pieces of marble and fragments of pillars, with a few inscriptions.' (*Travels in Asia Minor*, p. 20; *Inscriptiones Antiq.*, pp. 3, 4.) The greatest length of the island is from east to west; the town with its harbour is situated in a low and sheltered spot at the north-east corner. In the market-place is the Soros of Atticus, father of Herodes Atticus. (Clarke's *Travels*, ii. 178; who refers to an accurate plan and account of the island in Tournefort, *Voyage du Levant*, i., Paris, 1717.) It contains two hundred Turkish and three hundred Greek houses. To the north of the harbour is a good fortress with forty-two pieces of cannon, but commanded from the heights in the rear. (Frankland's *Constantinople*, i. 232.) The aspect of Tenedos from the sea is barren, but it is cultivated in the interior, and produces wheat and very fine red wine.

TENEMENT is a word employed in descriptions of real property. Though in its usual and popular acceptation it is applied only to houses and other buildings, yet in its original proper and legal meaning it includes everything of a permanent nature that may be holden, whether corporeal or incorporeal. It is sometimes used in a more confined sense, in which it is appropriated to subjects of feudal tenure; but in general it includes not only land, but every modification of right concerning it. Thus the word 'Liberum tenementum,' frank-tenement, or freehold, is applicable not only to lands and other solid objects, but also to offices, rents, commons, and the like. (Harg.; Co. Litt., 154, a. n. 7.)

TENERIFFE, or more properly **TENERIFE**, called Chinerfe by the original inhabitants, the Guanches, is the largest and most important of the Canary Islands. The most southern cape, Punta Roxa, is in 28° N. lat.; and the most northern, Punta del Hidalgo, in 28° 36′ N. lat. The most eastern part, Punta de Anaga, is in 16° 5′ W. long.; and the most western, Punta de Tena, in 17° 55′ W. long. Its length from south-west to north-east is about 60 miles. Towards the south-eastern extremity it is nearly 30 miles across, but it grows gradually narrower towards the north-east, being near that extremity hardly more than five miles wide. In Humboldt's Travels, the area of the island is stated to be 73 maritime square leagues, or 897 English square miles; but according to a more recent estimate, the area is 83·805 Spanish square leagues, or 1012 English square miles, which is nearly equal to the area of Cheshire.

About one-seventh of the area (comprehending 100,000 acres, or 156·25 square miles) is available for agricultural purposes. The remainder is covered with lava and other volcanic productions, and a great part is destitute of vegetation; a small portion only is covered with trees. The highest ground of the island is the Peak of Teneriffe, called by the inhabitants Peak of Teyde, which name is derived from Echeyde, by which term the Guanches meant Hell. This mountain is situated towards the north-western part of the island, and is a volcano with two summits, of which the south-eastern and more elevated, called Piton, is 11,946 feet above the sea-level, and the north-western, Mount Chahorra, is 9888 feet. Their bases are united by a short ridge, which is somewhat lower than the summit of Mount Chahorra. Both summits are extinct volcanoes. The crater of the Piton, called Caldera, is of oblong shape, and only 300 feet long from south-east to north-west, and 200 feet in the opposite direction. It is distinguished by a high circular wall which surrounds it, and which would prevent access to the crater, if it were not broken down on its western side. The depression of the crater does not exceed 160 feet. The crater of Mount Chahorra is very large, as it takes more than an hour to go round it: it is about 140 feet deep. It is not on record that volcanic matter has issued from either of them: they are at present only solfataras, from the crevices of which sulphuric vapours are continually arising. But to the west of Mount Chahorra are four volcanic cones, from which in 1798 great quantities of lava flowed and covered the adjacent tracts. In 1706 a great quantity of lava issued from the north-eastern side of the ridge which unites the Piton to Mount Chahorra. These lavas reached the sea and almost filled the harbour of Garachico, which up to that time was the best, or, more properly speaking, the only harbour in the island. Very elevated volcanic masses extend from Mount Chahorra in a north-west direction to the Punta de Tena, which is the most elevated cape of the island. These masses rise to 7000 feet above the sea-level.

The Peak of Teyde is surrounded on the south-west, south, and south-east by an uninterrupted ridge of mountain masses, which form a semicircle, and are about three miles from its base. These mountains are very steep towards the volcano. On the other sides only single mountains occur. The tract which lies between the base of the volcano and the semicircle is called Los Llanos de las Retamas, from a plant called retama, nearly the only plant which vegetates on this tract, which is covered with pumice-stones. Its surface is uneven, but has a regular slope from the base of the volcano towards the masses forming the semicircle. Near the base of the volcano it is about 8000 feet, and near the semicircle about 6000 feet above the sea. The mountains forming the semicircle rise from 1000 to 1800 feet above their base. It is supposed that the Peak de Teyde and the mountains that belong to it cover an area of 120 square miles.

From the outer edges of the semicircle the country descends in rapid and broken slopes towards the sea on the west and on the north, but on the south and east the semicircle is surrounded by table-lands, whose surface is likewise much broken, but which at the distance of several miles preserve an elevation of between 4000 and 6000 feet above the sea. These table-lands are most extensive to the east, where they terminate, about 20 miles from the semicircle, on the Plain of Laguna. These table-lands and the volcano taken together probably cover nearly half the island. In many places the table-lands and the slopes of the hills which cover it are overgrown with pines, but the greater part consists of bare volcanic rocks or lava. No part of them is cultivated, with the exception of a small portion in the vicinity of Chasna, south of the semicircle, where corn is grown, and where there are extensive plantations of fruit-trees. On the edge of the table-land, west of Guimar, is a small volcano, which made an eruption in 1705.

The Plain of Laguna is traversed by 16° 20′ W. long. West of that plain the cultivable country is found only near the sea, and from three to four miles from it, with the exception of the table-land of Chasna, which is more than eight miles distant. The cultivable tract along the sea is so uneven that it is almost impossible to find a square mile which can be called level. A portion of it rising in steep and sharp ridges cannot be cultivated, but where the declivities are moderate the soil generally repays the labour bestowed on it. The most fertile tract is on the north side of the island, between Tegina and San Juan de la Rambla, especially west of Santa Ursula, which portion is called the Valley of Taoro. The soil consists of a mixture of sand, volcanic matter, and some clay, and produces rich crops of wheat and all kinds of fruit, especially grapes. West of San Juan de la Rambla are a few fertile valleys, but a great part of the country is covered with recent lava. The most sterile part lies along the west coast, between Punta de Tena and Punta Roxa, where there are only a few narrow valleys, and where a tract several miles in length on both sides of Puerto de los Christianos is quite barren. Between Punta Roxa and Santa Cruz there are several fine valleys, which have a fertile soil composed of decomposed pumice-stone and tufa intermixed with gravel; but their fertility cannot be compared with that of the valley of Taoro, which is mainly to be ascribed to the smaller quantity of rain which falls on the southern shores.

The plain of Laguna occupies the middle of the island, near 16° 20′ W. long.: it is about 1700 feet above the sea, and enclosed by hills; the surface is nearly a dead level, occupying a space of about 12 square miles. After the rains it is partly covered with water, and hence is derived its name. The soil consists of a reddish clay, and produces abundant crops of grain, but no part of it is covered with trees.

The eastern portion of the island, or the peninsula which extends east of the plain of Laguna, is only hilly in comparison with the western portion, as the highest summit, the Bufadero, rises only to 3069 feet above the sea-level. In this part no traces of lava and no volcanic cones occur: the hills consist mostly of black basalt: the valleys are numerous, but narrow. These valleys and the adjacent hills are cultivated and planted with trees where the surface is not too steep: they produce the finest fruits in the island. The country descends gradually towards the east, and Punta de Anaga is only elevated a little above the sea-level.

Climate.—Teneriffe, being situated near the tropic, partakes of the climate both of the countries within and without the tropic: it has only two seasons, a rainy and a dry season, but the rainy season does not occur when the sun is nearest, as in the tropical countries, but when it is near its greatest southern declination. It occurs in the same period of the year as in southern Europe. The dry season is produced by the trade-winds, which, when the sun approaches the northern tropic, proceed farther north, and are met with at 30° and even 33° N. lat. These winds blow on Teneriffe without interruption from April to October, and always from the east-north-east: they are strongest from the middle of May to the middle of August. The wind begins in the morning between ten and eleven o'clock, and continues to five or six in the afternoon, when it is followed by a calm, which lasts till midnight. From midnight to seven or eight o'clock the land-breezes blow, and they are again followed by a calm, which lasts till the trade-wind sets in. Along the western shores of the island these winds are not felt, but there is a continual calm, which extends about 15 miles into the sea. The trade-wind renders the communication between the islands tedious and difficult. From Teneriffe a vessel can run to Hierro in less than one day, but to return from Hierro to Teneriffe it generally takes ten or twelve days, and sometimes even three or four weeks. A voyage from Madeira to Teneriffe is made in two days, but it takes more than a month to sail from Teneriffe to Madeira. During the prevalence of the trade-winds the weather is constantly fine, and not a drop of rain falls.

In the rainy season, from October to April, south-west winds prevail: in October the winds turn to the east and south-east, and then the summit of the Peak of Teyde begins to be covered with clouds which proceed from the south. These clouds accumulate on the Peak, and gradually descend lower. When they have sunk to about 6000 feet above the sea-level, and cover the most elevated part of the island, they produce terrible thunder-storms. The rain begins to descend in torrents on the sides of the mountains, and the summit of the peak is covered with snow. In summer the mountain is quite free from snow, which is only found in a deep depression on the northern slope. This depression is called Cueva del Yelo. The snow rests on the mountain about four months. At the beginning of November the wind is settled in the south-west, and whilst it blows the rains sometimes last for three days. In February, March, and April the wind turns to the west-north-west, north-west, and north-north-west, and the rains decrease gradually. They cease at the end of March.

The climate of Teneriffe and of the Canary Islands in general is disagreeably affected by the wind called El Levante, which comes from the south-east, and generally blows before or after the beginning of the rainy season. Its effect on all organic bodies is very great, and the heat which it brings from the Sahara is felt much more in elevated places than near the sea-shore, the more so as water is very scarce in those parts, and the thirst which the wind produces is intolerable. In those higher places it blows with such force that it frequently throws down men and horses. The air is misty, and it is not possible to distinguish objects even at a moderate distance; but there are no clouds in the sky. Sometimes this wind brings locusts in large numbers to the island. It was formerly thought that these insects reached the island by flying, but MacGregor states that such immense numbers of them are carried from the Sahara into the sea as to form a thick layer; and that in this way they are carried to the Canary Islands, and that most of them are dead when they arrive there, but those which cover the upper surface are alive, and spread their devastation over the corn-fields and plantations.

We subjoin the meteorological observations made at Santa Cruz and at Laguna: the last-mentioned place is about 1700 feet above the sea.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
Santa Cruz	63·83°	64·34°	67·16°	67·32°	72·12°	73·89°	77·27°	78·89°	77·42°
Laguna .	55°	56°	58°	59°	62°	65°	69°	71°	70°

	Oct.	Nov.	Dec.	Wintr	Spring	Sum.	Autm.	Ann. mean.
Santa Cruz	74 66°	70·43°	65·81°	65·11°	71 11°	77·86°	70·11°	71 04°
Laguna .	66°	62°	58°	56·33°	62·00°	70·00°	62·00°	62·85°

This table shows that the climate of Teneriffe is distinguished by its moderate temperature, and that the heat of the summer is prolonged to the month of November, October being considerably warmer than May, and November than April.

Productions.—All European domestic animals are reared, and also white camels, which are used as beasts of burden, and reared on the west coast of the island, but not in large numbers. Cattle are rather scarce, on account of the want of pasture-ground. They are only kept for slaughter and for the plough: the cows are never milked. Horses are still less numerous. They are of good breed, of a middling size, and very hardy. Goats are very numerous, and their milk is exclusively used, and butter of a white colour, called 'mantequilla,' and a large quantity of cheese, are made of it. These goats are of a peculiar breed, which existed on the island before the arrival of the Europeans. They constituted the principal riches of the Guanches. Sheep are also numerous. The breed is small, and the wool is coarse, but abundant: it is consumed in the island. Asses are rather numerous, but small: mules are much used as beasts of burden. According to MacGregor, the number of cattle is about 4900, of horses 1000, of camels 60, of mules 1400, of asses 2200, of goats 30,000, of sheep 18,000, and of hogs 3000. The silk-worm is extensively reared, and the annual produce of silk may amount to 8000 lbs., but it fetches a less price than the Italian silk, not being so well prepared. In 1828 the cochineal insect was introduced, and the first trials at rearing it succeeded very well. We are not acquainted with the result of this attempt. Bees are abundant, domestic as well as wild. The honey is of the best quality, especially that which is collected in the neighbourhood of the Peak of Teyde, which is extracted by the bees from the blossoms of the retama plant. Between 7000 and 8000 lbs. of wax are annually collected. Rabbits are very numerous.

The domestic birds are fowls, ducks, geese, and pigeons. A great number of turkeys are reared. The number of wild birds is very great. Some of them are always found on the island, and others arrive only at certain seasons, in their migration from north to south, and *vice versâ*. The most remarkable belonging to the first class are the wild pigeon, various species of Tetraonidæ, quails, and larks. The canary-bird is common. Fish is far from being abundant. The inhabitants live mostly on potatoes and salt fish, which is obtained from the fishery on the coasts of Africa [SAHARA, vol. xx., p. 317]; but of late the inhabitants of Teneriffe have abandoned this branch of industry, and buy the fish from the fishermen of the other islands. Whales are sometimes met with among the Canary Islands, and still more frequently dolphins. Seals rarely visit the coast.

The principal objects of agriculture are potatoes, wheat, maize, barley, and rye. Where the soil is good, and means of irrigation are at hand, two crops of maize, and one of potatoes, or two of potatoes and one of maize, may be raised in twelve months. According to an average of five years (1800-1804), the annual produce was about 70,000 quarters of potatoes, 21,700 quarters of wheat, 6511 quarters of maize, 5533 quarters of barley, 2200 quarters of rye, and only 40 quarters of oats. It is however stated that since that time the cultivation of grain, and especially that of potatoes, has considerably increased. Other objects of cultivation are flax, canary-seed, sumach for the tanneries, pumpkins, cucumbers, yams, cabbage, peas, Turkish beans, garbanzos, lentils, lettuce, capsicum, onions, and garlic. The orchards produce apples, pears, cherries, plums, apricots, peaches, mulberries, almonds, chesnuts walnuts, figs, Indian figs, oranges, and lemons, and also plantains, pineapples, dates, pomegranates, papayas, guavas, anonas, and a few other fruits derived from the West Indies. The most important object of cultivation is the vine, which yields the largest article of export. According to an average of five years (1800-1804) the annual produce amounted to 24,846 pipes, each containing 100 gallons, but it is stated that to this quantity from 5000 to 8000 pipes must be added, which during the vintage were converted into brandy. Thus the annual produce amounted to about 30,000 pipes. But the war between Spain and its American colonies, to which a large quantity of wine and brandy was exported, has considerably diminished this branch of industry, and at present the annual produce hardly exceeds 20,000 pipes. The best sort, known by the name of Vidonia, resembles Madeira, and is sent to England. The Malvasia wine was formerly in great request, but the demand for it has diminished. The difficulty of obtaining a remunerating price for their wines and brandies has of late induced the inhabitants to introduce some other objects of cultivation. Cotton has begun to be cultivated; the produce resembles that of Pernambuco. They have also made some successful trials with coffee. Two centuries ago the sugar-cane was the most important branch of cultivation, but at present there is only one sugar-mill on the island.

Large forests still cover some of the higher parts of the island, though they have been greatly reduced. Among the trees there are numerous kinds of Laurus, as L. Indica, L. barbussana, L. nobilis, &c. Two or three wild-growing plants are used for making barilla, and the Mesembryanthemum crystallinum is cultivated for that purpose on a small scale. Two kinds of lichens which grow on the rocks are collected for their dyeing qualities: the rocella tinctoria, which yields the archil, and the parella: they are mostly sent to England.

Teneriffe has no metals, except some iron-ore, of which no use is made. Sulphur occurs in large quantities on the Peak of Teyde.

Population and Inhabitants.—According to an estimate of MacGregor, founded on the old census of 1802 and other data, the population of Teneriffe amounted, in 1829, to 85,000 individuals; so that on the average there were 84 persons to each square mile. The greater part of the tribe of Guanches, who inhabited the island at the arrival of the Spaniards, perished in the war by which the Spaniards got possession of it, and the remainder intermarried with the Spaniards. The present inhabitants must therefore be considered as Spaniards, whom they also resemble in person and character. The Spanish language alone is spoken, intermixed in the parts remote from the towns with a few other words.

Political Divisions and Towns.—For the administration of justice the island is divided into three jurisdictions, the courts for which are at Santa Cruz, Laguna, and Orotava. Santa Cruz de Santiago, the seat of the governor-general of the Canary Islands, is built on the south coast of the island, not far from its eastern extremity. The harbour is not large, and is well protected against the winds, except those that blow from the south. At the distance of from 75 to 100 fathoms from the land there is good anchorage in 6 to 12 fathoms, and half a mile off in 25 to 30 fathoms. The lowest part of the town is more than 20 feet above the sea-level, and the ground rises gently. The houses are built in the Spanish Moorish fashion, with a court-yard (patio) in the middle, and have only one floor. The streets are straight, but narrow, and have foot-pavements. The population amounted, in 1829, to 8620 individuals. The place carries on a considerable commerce, and the harbour is annually visited by 80 to 100 vessels.

San Christoval de la Laguna is considered the capital of the island, being the seat of administration. It is built in the middle of the plain of Laguna, and is a pleasant place. The streets are straight and wide, well paved, and have foot-pavements. Most of the houses have only one floor. The population amounts to more than 10,000. The rich inhabitants of Santa Cruz pass the summer months here, as the climate of Laguna is much cooler.

Tacoronte, not far from the northern coast, in a fine valley, has 4600 inhabitants.

Orotava is on the declivity of a steep hill, nearly 1200 feet above the sea-level: it is a well-built and thriving place, with nearly 8000 inhabitants. It carries on a considerable commerce by means of its harbour, called Puerto de la Orotava, which is about 2 miles distant, and contains a population of 4600.

Guimar, on the southern coast, is in a very fertile valley, which produces much wine and wheat: it is rather well built, and contains 3500 inhabitants. In the vicinity are the tombs of the antient inhabitants, the Guanches, which contain mummies.

Manufactures and Commerce.—There are a few manufactures of silk stuffs at Icod de los Vinos, a town on the north coast, with 4000 inhabitants. These manufactures were formerly very active, and their produce went to America; but they are now in a declining state, especially since the population of Teneriffe have begun to wear cotton instead of silk. Linen and woollen stuffs are made by the families for their own consumption. Woollen stockings were formerly made for the American market, but this branch of industry has entirely ceased. Earthenware, especially large water-filters, is still sent to Cuba and Puerto Rico. There are manufactures of soap and vermicelli at Santa Cruz. The tanneries produce a very indifferent leather, which is not exported. The number of distilleries is large, and the brandy is hardly inferior to Cognac. Ropes are made from the agave; and hats, baskets, and mats from the leaves of the date-palms. Good cabinet-work has lately begun to be made for the South American market.

The maritime commerce is concentrated in the port of Santa Cruz and Port Orotava, which are annually visited by about 120 vessels, mostly English. The inhabitants have a few vessels, with which they visit the American harbours. The most active commerce is that with England, in which about 80 vessels are constantly employed. The imports consist of iron utensils, hardware, iron in bars, flax, glass-ware, crockery, leather, candles, soap, large quantities of cotton goods, provisions, cod, and some minor articles. The most important exports are wine, brandy, and barilla: there are also exported almonds, dry fruits, raw silk, and archil. The commerce with the United States of America and with Hamburg is also considerable.

History.—The Canaries were known to the antients, who called them the Fortunate Islands. [CANARIES, vol. vi., 226.] Teneriffe was occupied by the Spaniards in 1496, and has always remained in their possession.

(Glas, *History and Conquest of the Canary Islands;* Humboldt, *Voyage aux Régions Equinoxiales du Nouveau Continent*, vol. i.; Von Buch, *Physikalische Beschreibung der Canarischen Inseln;* and *Die Canarischen Inseln nach ihrem gegenwärtigen Zustande*, von Mac Gregor, Hannover, 1831.)

TENIERS, DAVID (the Elder), was born at Antwerp in 1582. He had the good fortune to study painting under Rubens, who highly esteemed him for his promising genius. Besides the benefit of the instruction of that great master, he had the advantage of learning his manner of preparing his grounds and managing his materials. It is said that he began by painting pictures on a large scale; but having gone to Rome with the intention of improving himself in the higher branches of the art, he there contracted an intimate friendship with his countryman Adam Elsheimer, whose exquisitely-finished cabinet pictures were greatly esteemed, and he studied with him several years, painting only small pictures. It was here that he acquired the neatness of pencilling for which his works are esteemed, and which, with the knowledge of colours acquired under Rubens, gives to his works so great a charm.

Returning to his native country after ten years' absence, he devoted himself with the greatest ardour to the practice of his art, and chose the familiar scenes of ordinary Flemish life, such as merry-makings, weddings, the interior and exterior of public-houses, rural games, chemists' laboratories, and grotesque subjects, such as the Temptation of St. Anthony and the like. These subjects he treated with the utmost truth and fidelity to nature. His colouring, his touch, his design, the pleasing distribution of light and shade, the skilful composition of his groups, procured him great reputation and constant employment: every lover of the art was eager to possess some of his works. He may in fact be considered as the inventor of a new manner, which was followed and carried to a still higher degree of perfection by his son. He died at Antwerp in the year 1649, at the age of sixty-seven.

TENIERS, DAVID (the Younger) was born at Antwerp in 1610, and received his first and principal instruction from his father. Some authors have affirmed that he left his father to become a disciple of Adrian Brouwer, who however was only two years older than himself, and that he had the advantage of the precepts of Rubens. Others have pretended that he was likewise a pupil of Elsheimer, who died when Teniers was only ten years old. He adopted, as we have observed, the subjects and style of his father; but, with a more fertile imagination, he produced compositions much more varied and ingenious; his colouring is more vivid, rich, and transparent, and the facility of his execution is enchanting. He studied nature in all her varied forms with the most critical attention. He possessed, in perfection, what we have heard one of the brightest living ornaments of the British school call 'the art, or rather the gift, of seeing.' Hence the truth and nature of his pictures, which look almost like reflections in a convex mirror. His pencil is free and delicate; the touching of his trees light and firm; his skies are admirably clear and brilliant, though not much varied. The expression of his figures, in every varying mood, of mirth or gravity, good or ill humour, is strongly marked, striking, and natural; he represented them however precisely as he saw them before him, but was perhaps inferior in delineation of character to Jan Steen or Wilkie.

It is remarkable that at the commencement of his career very little regard was shown to his merit, so that he was often obliged to go in person to Brussels to dispose of his pictures. But he was not long neglected. The archduke Leopold having seen some of his pictures, immediately distinguished him by his patronage, appointed him his principal painter and gentleman of his bedchamber, presented him with a chain of gold to which his portrait was affixed, and gave him the direction of his gallery of paintings, which contained works of the most eminent masters of the Italian and Flemish schools. Teniers, who possessed an extraordinary talent in imitating the works of other artists, made copies of this gallery, in which the touch, the colouring, and the manner of the several painters, however different from each other, were reproduced with such a deceptive fidelity, that he acquired the name of the Proteus of painting. Some writers have objected that his figures are too short and clumsy, and that there is too much sameness in their countenances and habits: but it must be remembered that he designed every object as he saw it; and the charm which his art has thrown on scenes flat and insipid in their forms, even subjects low, barren, and commonplace, justly excites the admiration of all lovers of the art, and the extraordinary prices which are given for his works in every part of Europe are an incontestible proof of the universal admiration and esteem in which they are held. This circumstance is the more deserving of attention, as his works, far from being scarce, are extremely numerous: his extraordinary facility of execution and the great age to which he attained enabled him to produce such a number of pictures, that he was used to say in joke that to hold all his paintings (though they were of such small dimensions) it would be necessary to build a gallery two leagues in length. It is worthy of remark that while of all the Flemish painters his works are the most popular, he was habitually conversant with the higher classes of society. The suavity of his manners and his irreproachable conduct secured him the esteem of all his countrymen. Besides the archduke Leopold, he was honoured with the favour and protection of Christina, queen of Sweden, the king of Spain, Don John of Austria, who became his pupil, the Prince of Orange, the bishop of Ghent, and other eminent personages. He often assisted the landscape-painters of his time by inserting figures into their pictures, and many works of Artois, Van Uden, Breughel, and others derive additional value from this circumstance. The galleries and collections in England contain a great number of his finest works. He died at Brussels, in the year 1694, at the advanced age of eighty-four years.

(Pilkington; Fuseli; *Conversations Lexicon: Biographie Universelle;* Dr. Waagen, *Arts and Artists in England.*)

TENIMBAR ISLANDS. [SUNDA ISLANDS, LESSER.]

TENISON, THOMAS (born 1636, died 1715), an English divine, son of a clergyman in the diocese of Ely, who was advanced by his own deserved reputation for piety, charity, learning, and liberality, to the highest station in the English church. He was born at Cottenham in Cambridgeshire, educated in the grammar-school at Norwich, from whence he passed to Corpus Christi College, Cambridge, where he was admitted in 1653, and took his bachelor's degree in 1657. The university was then in the state to which it had been brought by the parliamentary commissioners, and the turn of mind of Tenison not according with what at that time was expected from persons undertaking the ministry, he for a time turned to the study of medicine; but about 1659 he was privately ordained in the episcopal method then proscribed by the government of the time. The ordination was performed at Richmond in Surrey by Dr. Duppa, the expelled bishop of Salisbury. The restoration of the king, and with it of the episcopal church, soon following, he was made minister of St. Andrew's Church in Cambridge, in which situation he gained much credit by his attention to his parishioners during the time of the plague, in 1665. He had other preferment in the country, as the church of St. Peter Mancroft in Norwich, and the rectory of Holywell in Huntingdonshire. This brings down his history to the year 1680, when, being then doctor in divinity, he was placed on a more conspicuous stage, being presented by King Charles II. to the living of St. Martin's in the Fields.

In this public situation he acted with great prudence, and with a liberality which emulated the munificence of the clergy of earlier times, giving more than 300*l.* to the poor of his parish in the time of the distress occasioned by the hard frost of 1683, and endowing a free-school, and building and furnishing a library. In 1685 he discharged the difficult duty of attending the duke of Monmouth previous to his execution with singular discretion. In his politics he was a Whig, and favourer of the Revolution, and was accordingly early marked out by King William for advancement in the church. In 1689 he was made archdeacon of London, and in 1691 bishop of Lincoln. This large diocese, which had been too much neglected, he brought into order. In 1694, on the death of Dr. Tillotson, he was made archbishop of Canterbury, in which high dignity he remained for twenty years. He died on the 14th of December, 1715, and was interred in the parish church of Lambeth.

A large account of his life was published soon after his death, without the name of any author in the title-page, but evidently written by a person possessed of good information, and who was fully sensible to his merits. He speaks of him thus:—'And as he was an exact pattern of that exemplary piety, charity, stedfastness, and good conduct requisite in a governor of the church, so perhaps since the primitive age of Christianity and the time of the Apostles there has been no man whose learning and abilities have better qualified him to discharge and defend a trust of that high importance.'

The library which he founded in the parish of St. Martin's still exists; and he may be regarded as the founder of the library in the cathedral church of St. Paul, having presented two hundred and fifty pounds to make up four hundred and fifty, which the dean and residentiaries gave for the libraries of two clergymen bought by them in 1707. His will contains many munificent bequests for charitable and religious objects.

Archbishop Tenison has left no writings behind him which can be said to make part of the general literature of the country, or to establish for him a literary reputation. Yet he published several treatises, mostly connected with the religious and political controversies of his age.

TENNANT, SMITHSON, a distinguished chemist, was born at Selby, in Yorkshire, November 30, 1761, and died February 22, 1815. He was the only child of the Rev. Calvert Tennant, of whom little is known except that he had been a Fellow of St. John's College, Cambridge, and was a friend of Dr. Rutherford, Regius Professor of Divinity in that University.

While very young he gave many proofs of a particular turn for chemistry and natural philosophy, and after quitting school he was very desirous of completing his chemical studies under the immediate instruction of Dr. Priestley, who was then enjoying high and deserved reputation for the extent and variety of his discoveries in pneumatic chemistry, but this was found impracticable in consequence of the previous engagements of Dr. Priestley.

In the year 1781 he went to Edinburgh with the intention of studying medicine. Of his companions, occupations, or studies while in Scotland, little is known, except that he received instruction from Dr. Black; he did not however continue long in that University, for in October, 1782, he was admitted a member of Christ's College, Cambridge, where he then began to reside.

In the summer of 1784 he travelled into Denmark and Sweden, with the intention, partly of examining the mines of the latter country, but chiefly with the view of becoming personally acquainted with Scheele, for whom he had conceived a high degree of admiration, especially on account of the simplicity of the apparatus which he employed in his chemical researches. In a year or two afterwards he went to Paris, where he became acquainted with some of the eminent chemists; thence he went to Holland and the Netherlands, after having recovered from a serious illness with which he was seized during his residence in the French capital.

In January, 1785, he was elected a Fellow of the Royal Society, and in 1786 he left Christ's College and removed to Emmanuel College; in 1788 he took his degree as bachelor of physic, and soon after quitted Cambridge and came to reside in London. In 1796 he took a doctor's degree at Cambridge, but as his fortune was independent, he relinquished all idea of practice as a physician. In 1813 he was elected Professor of Chemistry at Cambridge, having in the previous year delivered, with great success, a few lectures on the principles of mineralogy to some of his friends.

In the month of September, 1814, Mr. Tennant went for the last time to France, and on his return home on the 20th of February, 1815, he arrived at Boulogne with Baron Bulow, in order to embark there. They embarked on the 22nd, but were forced back by the wind, and meant to embark again in the evening: in the meantime they took horses and went to see Bonaparte's pillar, about a league off, and going off the road on their return to look at a small fort, of which the drawbridge wanted a bolt, they were both thrown, with their horses, into the ditch. Baron Bulow was merely stunned, but Mr. Tennant's skull was so severely fractured, that he died within an hour after.

The following character of Mr. Tennant is chiefly copied, with some variations, from the 'Annals of Philosophy,' vol. vi., and the writer of this brief notice, having well known the subject of it, is able to testify to the accuracy of the statements in all the more important particulars.

Mr. Tennant was tall and slender in his person, with a thin face and light complexion. His appearance, notwithstanding some singularity of manners, and great negligence of dress, was on the whole striking and agreeable. His countenance in early life had been singularly engaging; and at favourable times, when he was in good health, was still very pleasing. The general cast of his features was expressive, and bore strong marks of intelligence; and several persons have been struck with a general resemblance in his countenance to the well-known portraits of Locke.

Of his intellectual character, the distinguishing and fundamental principle was good sense; a prompt and intuitive perception of truth, both upon those questions in which certainty is attainable and those which must be determined by the nicer results of moral evidence. In quick penetration, united with soundness and accuracy of judgment, he was perhaps without an equal. He saw immediately and with great distinctness where the strength of an argument lay, and upon what points the decision was ultimately to depend; and he was remarkable for the faculty of stating the merits of an obscure and complicated question very shortly, and with great simplicity and precision. The calmness and temper, as well as the singular perspicuity, which he diplayed on such occasions, were alike admirable; and seldom failed to convince the unprejudiced, and to disconcert or silence his opponents. He had a peculiar cast of humour, which was heightened by a perfect gravity of countenance, a quiet familiar manner, and a characteristic simplicity of language. In consequence, principally, of the declining state of his health, his talent for conversation was perhaps less uniformly conspicuous during his latter years, but his mind had lost none of its vigour, and he never failed, when he exerted himself, to display his peculiar powers.

The 'Philosophical Transactions' contain eight papers by Mr. Tennant:—1. 'On the Decomposition of Fixed Air, 1791; 2, 'On the Nature of the Diamond,' 1797; 3, On the Action of Nitre upon Gold and Platina;' 4, 'On the Different Sorts of Lime used in Agriculture,' 1799; 5, 'On the Composition of Emery,' 1802; 6, 'On two Metals found in the Black Powder of the solution of Platina,' 1804; 7, 'On an easier Mode of procuring Potassium than that which is now adopted;' 8, 'On the Mode of producing a Double Distillation by the same Heat.'

In the first volume of the 'Transactions' of the Geological Society, 1811, he published the analysis of 'A Volcanic Substance containing the Boracic Acid.'

In his experiments on the diamond, he proved it to be pure carbon, by heating it in a gold tube with nitre; the diamond was converted into carbonic acid by combining with the oxygen of the decomposed nitric acid, and this united with the potash of the nitre; by the evolution of the carbonic acid, the quantity of carbon, in a given weight of diamond, was estimated. In his paper on 'Limestones,' he showed that the presence of carbonate of magnesia in them rendered them prejudicial when calcined and applied as a manure.

In the paper on 'Emery,' he proved that this substance is merely a variety of corundum, or sapphire. The two metals which he found in native platina were osmium and iridium.

With respect to these memoirs it may be observed that they all bear the impress of originality, and that the operations which they include and describe are of the greatest possible simplicity, and stated in the plainest language.

TENNANTITE, a variety of grey copper-ore, so named in honour of Smithson Tennant, a distinguished chemist. It occurs in attached crystals, which are usually small. Primary form a cube. Cleavage parallel to the planes of the regular octohedron. Fracture uneven and imperfectly lamellar. Hardness: scratches carbonate of lime, but is scratched by the phosphate. It is brittle. Colour varying from tin-white to blackish iron-grey, frequently tarnished on the surface. Streak reddish-grey. Lustre metallic, sometimes splendent. Specific gravity 4·375.

When heated by the blowpipe, it decrepitates, and burns with a blue flame, emitting arsenical vapours, and then fuses into a black scoria, which is attracted by the magnet.

It occurs only in Cornwall, and has there been found in several copper-mines.

Analysis by—

	R. Phillips.	Hemming.
Sulphur	28·74	21·8
Copper	45·32	48·4
Iron	9·26	14·2
Arsenic	11·84	11·5
Silica	5·00	5·0
	100·16	100·9

TENNESSEE is one of the inland states of the North American Union, and lies between 35° and 36° 40′ N. lat. and between 81° 30′ and 90° W. long. The southern boundary, which runs along 35° N. lat., is contiguous to the northern limits of the states of Georgia, Alabama, and Mississippi, and is 356 miles long, of which the boundary with Georgia amounts to 100, that with Alabama 140, and that with Mississippi 116 miles. On the west of it are Arkansas and Missouri, from which it is separated by the Mississippi, whose course along this border amounts to about 150 miles, measured along the numerous bends. North of Tennessee are Kentucky and Virginia. The boundary-line towards Kentucky between the rivers Mississippi and Tennessee runs along 36° 30′ N. lat. for about 64 miles, but east of the last-mentioned river it follows its course for about 12 miles until it reaches 36° 40′ N. lat. and 36° 33′ W. long., and then extends a little south of east until it meets the south-western angle of Virginia near 83° 30′ W. long. The distance between the Tennessee river and the last-mentioned point is about 250 miles. The line which divides Tennessee from Kentucky is continued eastward between Tenessee and Virginia for 105 miles, when it arrives at the most eastern point of the state. East of Tennessee is North Carolina; the boundary-line between them, which is 150 miles long, is formed by one of the ranges of the Appalachian Mountains, called the Iron Mountains. The length of Tennessee from east to west is about 445 miles, and its breadth from north to south 104 miles. The area is about 40,200 square miles, or 26,728,000 acres. It is about 10,000 square miles less in extent than England without Wales.

Surface and Soil.—This state is naturally divided into three regions, which may be called the Eastern or Mountain region, the Middle or Hilly region, and the Western or Level region; and this division coincides tolerably well with that made for the administration of justice, according to which the country is divided into the Eastern, the Middle, and the Western District. The first and the last are nearly equal in extent, each comprehending about 10,000 square miles, but the Middle District is about double that size.

The *Eastern* or *Mountain Region* lies within the ranges of the Appalachian Mountains. This extensive mountain-system may be said to commence along and near the southern boundary-line of Tennessee. Near 35° N. lat. and 82° W. long., on the boundary-line between South and North Carolina, the country forms a ridge of hills, a continuous high ground which extends westward to 85° W. long., a distance of more than 160 miles. In the Carolinas it is known by the name of the Blue Ridge. It does not terminate at 85° W. long., but west of that meridian it forms a kind of mountain-knot, consisting of several ridges, which extend south-west and north-east, in the direction of the whole mountain-system. These ridges lie between 34° and 35° 20′ N. lat., and the Tennessee river traverses this tract in a south-west direction. The highest of these ridges is on the east of the river valley, and is called the Look-out Mountains. The elevated ground just mentioned constitutes the southern extremity of the Appalachian Mountains; for from its eastern extremity, west of 82° W. long., a ridge runs in a general north-east direction, which is also called the Blue Ridge, being considered as the continuation of the before-mentioned ridge so called, and from its western termination (near 86° W. long.) there runs another ridge under the name of the Cumberland Mountains, first north-north-east, and afterwards east-north-east and north-east. The space included between these two ranges extends from east to west about 200 miles. It is traversed by several minor ridges, among which the most elevated and least interrupted is called the Iron Mountains. It extends south-west and north-east, is much nearer the eastern Blue Ridge than the Cumberland Mountains, which are west of it, and constitutes the boundary-line on the east between North Carolina and Tennessee.

The mountain-region of Tennessee occupies the tract enclosed by the Iron Mountains and the Cumberland Mountains, whose most elevated parts are about 70 miles distant from one another. The northern half of this tract is traversed by three minor ridges, which in general run parallel to the larger ranges, and thus with the two outer ranges form four valleys, which are traversed by four of the upper branches of the Tennessee River, namely, Powell's, Clinch, Holston, and Frenchbroad River. The valleys are rather wide, but as there is little alluvial land along the water-courses, their surface is uneven and broken, and the soil, which consists mostly of siliceous gravel, is of indifferent quality, except in the valleys of the Holston and Frenchbroad rivers, where it contains a mixture of clay. Only a comparatively small portion of it is strong enough for the growth of wheat; the greater part produces rye and oats; but the mountains afford good pasture-grounds, and large herds of cattle and sheep are kept. The most elevated part of the mountains is overgrown with forests of pitch-pine, which yield timber, and from which tar, pitch, and turpentine are extracted. The minor ridges terminate near 35° 50′ N. lat., where the upper branches of the Tennessee river form their union. The country south of 35° 50′ can only be called mountainous near the southern portion of the Blue Ridge and the Cumberland Mountains, the interior being covered by a succession of hills rising hardly more than 300 feet above their base. The soil of this tract is of indifferent quality, and mostly used as pasture-ground, but the forests contain many large trees, as pitch-pine, red cedar, and black walnut. Along the watercourses there are some tracts of moderate extent fit for the growth of rye and oats.

The *Hilly* or *Middle Region* extends from the Cumberland Mountains westward to the Tennessee River, where it traverses the state by running from south to north. The general level of this region is several hundred feet above the sea-level, and it is covered with numerous hills, which form several continuous ridges, such as that which, under the name of Elk Ridge, runs from east to west near 35° 20′ N. lat. between the Elk River and Duck River. The water-courses are usually much depressed below the general level, and most of them run in narrow channels. This tract varies greatly in fertility. Near the Cumberland Mountains, and to the distance of 20 miles from them, the soil consists chiefly of gravel mixed with limestone, and is of moderate fertility, but in general it is better than in the mountain-region, and larger tracts are fit for the growth of wheat. The country west of this tract is the most fertile portion of Tennessee: it extends over the whole of the state from north to south, and reaches westwards to 87° W. long. The soil is not inferior to the best part of Kentucky, and consists of a large portion of clay and loam mixed with sand and gravel. A large quantity of wheat is produced, but the staple articles are tobacco and maize. In the better lands, especially along the Cumberland River, the common produce of maize is from 60 to 70 bushels for one, and in other places 40 or 50. The forests, which still cover a great part of the surface, consist chiefly of ash, elm, black and honey locust, mulberry, sugar-maple, and the wild plum; and wild grapes are abundant. The western districts, or those which lie near the Tennessee River, and extend about 30 miles east of it, are less hilly, but they are also less fertile: they produce the same articles, but the crops are less plentiful. In some places cotton is cultivated.

The *Western* or *Level Region* lies between the Tennessee and Mississippi rivers. The surface is traversed by some swells of high ground: the most extensive is that which runs across the state from north to south, about 12 miles from the western bank of the Tennessee River, and is several miles wide. Other swells traverse the southern districts, running from south-east to north-west, and terminating on the banks of the Mississippi with the Chickasaw Bluffs. The north-west districts are nearly a dead level, which descends imperceptibly to the banks of the Mississippi, where it terminates in a large wooded swamp, called the Wood Swamp. This region was very thinly inhabited twenty years ago, but it cannot be of indifferent quality, if we judge by the rapidity with which the population has increased. It appears however that the more elevated portions of the country are much more thickly settled than the level tract, which may be attributed to the circumstance that the last-mentioned tract contains many swampy places, and is less favourable to health. In these regions every kind of grain is grown, and cotton and tobacco are extensively cultivated.

Rivers.—Numerous rivers drain this state, and some of them have a long course. The larger rivers are navigable for keel-boats and for steam-boats, but only during the boating-season, which generally commences on the 20th of February, and terminates early in June. Occasional freshets contribute to render them navigable during a short portion of the other months, but no reliance can be placed on periodical returns of freshets, except those of the spring season.

The Tennessee River rises with numerous branches in the Appalachian Mountains: the most remote of them originate in Virginia near 81° 20′ W. long. and and 37° N. lat., and run south-west. The largest branches are the Clinch and Holston rivers: they unite with other branches, which rise in North Carolina, in the country enclosed by the Blue Ridge and the Iron Mountains, and which break through the last-mentioned chain. The largest of them are the Frenchbroad River, the Tennessee, and the Hiwassee. After these numerous branches have united, the Tennessee traverses the mountain-knot between 34° and 35° 20′ N. lat. It passes through the ridge, which on the south is called Look-out Mountains, and on the north Walden's Range. It rushes through this gap with great impetuosity over a rocky bed: this place is called the Suck: its course within the mountain-tract is very rapid, and it escapes from it by another gap near Fort Deposit, in Alabama. At this place it changes the south-west course into a western course, and after draining Alabama for about 200 miles, it returns to Tennessee. In Alabama the river widens from two to three miles, and in this part there are extensive rocky shoals, which are known under the name of the Mussel Shoals, and occupy for seven or eight miles the whole of the bed. In low-water these rocks entirely obstruct the navigation, but in the time of the freshets boats of moderate size may ascend and descend without danger. The lower course of the Tennessee River, as far as it lies within Tennessee, is from south to north. After having entered Kentucky it gradually declines to the west, and falls into the Ohio. The whole course of the Tennessee probably does not exceed 800 miles, reckoned from the source of the Holston or Clinch. In the boating season it may be ascended by large river-boats to the Mussel Shoals, and even to the gap by which it escapes from the mountains by small boats. Some of its upper branches are navigable for small boats above the Suck. It appears that within the Appalachian Mountains it may be descended by boats, but the ascent is very laborious and even dangerous.

The Cumberland River rises in Kentucky, in the valley formed by the Cumberland Mountains and the Laurel Mountains, and traverses the south-eastern district of that state by a general western course: after a run of about 150 miles it turns to the south-west and enters Tennessee, where it soon resumes its western course. It drains the northern districts of Tennessee by a course of about 200 miles; and turning gradually more to the north, re-enters Kentucky, where its general course is to the north. It falls into the Ohio a few miles above the mouth of the Tennessee. This river runs about 450 miles, and as the current is very gentle, the navigation is easy for sloops as far as Nashville, more than 150 miles from its mouth. It is stated to be navigable for river-boats 150 miles farther up, but in Kentucky the upper course is obstructed by extensive shoals in several places.

Climate.—No meteorological observations made in Tennessee having been published, we are unable to form a precise idea of the climate. It is very probable, as it is assumed by Darby, that the general level of the Mountain Region is about 800 feet more elevated than the level tract on the Mississippi, which is about 300 feet above the sea. This of course must produce a considerable difference in the climate of the two regions. Cornelius found the vegetation in Virginia, east of the Blue Ridge, two weeks earlier than in the valley west of it. It is probable that the winter in the Mountain Region lasts for several weeks, and that the frost is rather severe. In the countries west of the range the rivers are generally covered with ice for a few days in the winter. Snow falls to the depth of ten inches, but seldom lies more than twelve or fifteen days on the ground. In winter and spring a considerable quantity of rain falls; but in the other seasons rain is not frequent, nor does it continue for any length of time. The air in some parts of Tennessee is remarkable for its dryness.

Productions.—The state of agriculture in Tennessee will best be inferred from the statement of the returns of 1840, according to which the quantity of maize grown amounted to 42,467,349 bushels, a quantity much larger than that produced in any other of the United States. As this grain is best adapted for the feeding of hogs, the number of hogs was also larger than in other states, amounting to 2,795,630. Oats were raised to the amount of 6,770,116 bushels; wheat, 4,547,273 bushels; potatoes, 2,373,034 bushels; rye, 297,033 bushels; buckwheat, 6187 bushels; and barley, only 4758 bushels. The quantity of cotton amounted to 128,250,308 lbs., which was not half as much as that produced in Mississippi (289,838,818 lbs.), and little more than half the quantity that was raised in Alabama (240,379,669 lbs.), but nearly as much as was grown in Georgia (148,907,880 lbs.), and Ohio (134,322,735 lbs.). Tobacco was produced to the amount of 26,542,448 lbs., more than one-third of the quantity grown in Virginia (74,157,841 lbs.). Flax and hemp yielded 45,053 tons, and the meadows only 38,512 tons of hay. Rice is little cultivated, as the produce was only 7729 lbs.: the hop plantations yielded only 840 lbs. The cultivation of the silkworm seems not to have made much progress, as only 1163 lbs. of cocoons were gathered. The value of the produce of the orchards was estimated at 336,767 dollars, which proves that horticulture has made considerable progress. A small quantity of wine was made, amounting to 653 gallons. The sugar made from the sugar-maple amounted to 251,745 lbs. Though the produce of the articles drawn from the forests has decreased, it was still considerable: the lumber was estimated at 2,000,266 dollars, besides 3119 barrels of pitch, tar, turpentine and rosin, and 212 tons of pot and pearl ashes. The number of horses and mules amounted to 327,526, that of neat cattle to 773,390, and that of sheep to 748,459. The value of the poultry was estimated at 581,531 dollars. The produce of the dairy was to the value of 930,603 dollars; the quantity of wool was 1,029,526 lbs.; and the wax 50,715 lbs.

Buffaloes were once numerous, but they have entirely disappeared; the elk and moose-deer are only found in the Mountain Region, and the deer is still abundant there. There are bears, pumas, wild-cats, and wolves; also beavers, otters, and musk-rats. Racoons, foxes, squirrels, opossums, rabbits, polecats, and minxes are very numerous: pheasants, partridges, pigeons, swans, wild turkeys, ducks, and geese are abundant. There is fish in all the rivers, but not very abundant. The wild trees and plants which yield fruits are the wild plum, the crab-apple, the wild vine, and the strawberry.

There is gold in the mountains bordering on North Carolina, but up to 1834 only 12,000 dollars' worth had been collected. Lead exists in the same mountains, but is not much worked. Iron-ore is found in great abundance on the south side of the Cumberland River, and also at a few other places. Limestone and marble are got in the Cumberland Mountains, and nitre in abundance in some extensive caves near the Mountain Region. Salt-springs are very numerous, and some of them are strong. Some salt is made, but not to a great amount, as salt is easily obtained from the western districts of Pennsylvania and from Ohio.

Population.—In 1838 the Cherokees, who up to that time were in possession of the southern districts of the Mountain Region, left Tennessee, and went to the west of the Mississippi. [NORTH AMERICAN INDIANS.] At present the population consists of the descendants of Europeans and of slaves.

By the census of 1820 the population consisted of 422,813 individuals. At the census of 1830 it had increased to 681,904, which gives an increase of 61·3 per cent. in ten years. According to the last census (1840) the population amounted to 829,210, so that in the ten years preceding the census it had increased 21·6 per cent., which is still about double the rate of increase in most countries of Europe. The increase however has not been equal in all parts of the state. In the Eastern District it had risen from 196,301 to 224,259, or about 14·7 per cent.; in the Middle District, from 374,749 to 411,710, or only 9·9 per cent.; and in the Western District, from 110,854 to 193,241, or 74·3 per cent.

In 1830 the population consisted of 535,746 whites, 4555 free coloured people, and 141,603 slaves; and in 1840, of 640,627 whites, 5524 free coloured people, and 183,059 slaves; whence it is evident that the slave population has increased more rapidly than the white, as the increase of the number of slaves amounts to 29·2 per cent. The proportion of the white inhabitants to the slaves is greatest in the Eastern District, which contains only 18,714 slaves and 203,371 whites, so that the slaves constitute only 9·2 per cent. of the number of the whites. In the Middle District there were 301,157 whites and 107,735 slaves, which raises the slave population to 32·4 per cent. of the number of the whites. In the Western District the number of whites amounted to 136,099, and that of the slaves to 56,610, so that the slaves constituted 41·6 per cent. of the white population.

If the population were equally distributed over the state, there would be 20·6 individuals to each square mile. In Scotland there are 90, and in southern Sweden about 42 individuals to each square mile. It is remarkable that the most sterile part of Tennessee, the mountain-region, is the most populous. If we allow it 10,000 square miles, which is probably somewhat too much, it contains 22·4 individuals, whilst the Middle District has only 21·2, and the Western District only 19·3 individuals to each square mile.

Political Divisions and Towns.—For the administration of justice the state is divided into three districts; and for political purposes into seventy-two counties. As Tennessee is eminently an agricultural country, none of the towns have risen to any importance. The capital is Nashville, built on the left bank of the Cumberland River, where the navigation for large boats begins. It is a well-built and thriving place, which in 1830 contained 5565 inhabitants; and in 1840, 6929. Knoxville, on the river Holston, nearly in the centre of the mountain-region, has a population of about 3000. The other towns are small. Murfreesborough, south-east of Nashville, in one of the most populous districts of the state, has about 1500 inhabitants; and Memphis, on the Mississippi, near the boundary-line of the State of Mississippi, is a very thriving town, being a place of resort for the steam-boats which navigate the river.

Manufactures.—Manufacturing industry has not made much progress in Tennessee. In 1840 the number of persons employed in manufactures and trades was only 17,805: of whom 10,409 were in the Middle District; 4679 in the Eastern; and 2727 in the Western. The number of distilleries was 1381, but all on a small scale, as may be inferred from the produce, which amounted only to 1,080,693 gallons: in New York 38 distilleries produced more than 4 millions of gallons, and in Massachusetts 37 distilleries more than 5 millions. Cotton and linen stuffs for clothing are made at home. There is a small number of families who make coarse cotton, linen, and hempen fabrics for sale; and there are also a few paper-mills and manufactures of cordage and ropes. Some bar-iron is made, and nails are manufactured. There are also several small tanneries.

Commerce.—Tennessee is not favourably situated for commerce, as the only river which is navigable for large boats all the year round washes its western extremity. The mountain-region labours under the greatest disadvantages, as the mountains which separate it from the Atlantic regions are difficult to pass. Its commercial wealth consists of live stock: they send their neat cattle to Virginia, and their horses, mules, and hogs to the Carolinas. The Middle and Western Districts are commercially connected with New Orleans, to which place they send, by the Mississippi, cotton, tobacco, maize, pork, potatoes, flour, hemp and flax, deer-skins, lumber, ginseng, and bar-iron. The foreign articles consumed in the country, which consist mostly of grocery and some other articles of manufacture, are imported from Pittsburg and Philadelphia, or from New Orleans.

Education is not neglected. The number of white persons above twenty years of age unable to read and write amounted, in 1840, to 58,532; the number of elementary and common schools was 983, and the number of children attending them 25,090, of which number 6005 were taught at the public expense. The number of academies and grammar-schools was 152, and they were attended by 5548 boys. There are five universities or colleges. The best is the university of Nashville, which has six instructors and a library of about 8500 volumes. Jackson College is near Columbia. The colleges of Greenville, Washington, and Knoxville are smaller. There is a theological seminary at Maryville in East Tennessee for Presbyterian clergymen.

History and Constitution.—The first settlements in Tennessee were made about the middle of the last century, but in 1760 they were destroyed by the Cherokees, then the possessors of this country, from the northern and central part of which they were expelled in 1780. Since that time the number of settlements has continually and rapidly increased. Up to 1790 Tennessee formed a part of North Carolina, but in that year it was ceded by that state to the United States, who converted it into a territory. In 1796 it was admitted into the Union. The legislative power is vested in a general assembly consisting of a senate and a house of representatives, elected by the freeholders for two years. The senate is at present composed of 25 members, and the house of representatives of 75 members. The executive power is vested in a governor, who is chosen by the electors for the term of two years, and is not capable of holding office more than six years out of eight.

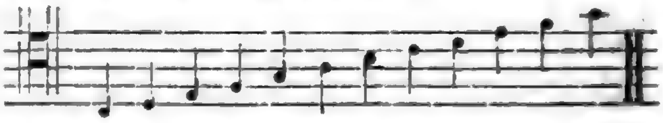
(Cornelius, *Tour in Virginia, Tennessee*, &c.; Long's *Expedition to the Rocky Mountains*, by James; Darby's *Geographical View of the United States*; Pitkin's *Statistical View of the Commerce of the United States*; *the American Almanack and Repository of Useful Knowledge* for 1842.)

TENNIS, a game in which a ball is driven to and fro by several persons striking it alternately, either with the palm of the hand, naked or covered with a thick glove, or with a small bat called a racket, held in the hand; the aim being to keep the ball in motion as long as possible without allowing it to fall to the ground. Strutt, on the authority of St. Foix, a French author, states that the French game of ball called palm-play, or 'jeu de paume,' was formerly played with the naked hand, then with a glove, which in some instances was lined, and that afterwards the players bound cords and tendons round their hands to make the ball rebound more forcibly; and hence it is added, the racket derived its origin. He states that palm-play, or hand-tennis, was exceedingly fashionable in

France during the reign of Charles V., it being often played by the nobility for large sums of money. Perhaps the first historical notice of the game in England is that which Shakspere has introduced, almost in the words of the old chroniclers, in his 'Henry V.' (act i., sc. 2), where the dauphin sends a present of tennis-balls in answer to Henry's demand for the sovereignty of France. Henry VII. was a tennis-player; and, as an entry in a MS. register of his expenditure in the thirteenth year of his reign mentions an item of twelve-pence for his loss at tennis and three-pence for the loss of balls, it may be inferred that the game was played abroad, as the loss of balls is not likely to have happened in a tennis-court. Be this as it may, in the sixteenth century tennis-courts were common in England, and the game was very popular with the nobility, which it continued to be down to the reign of Charles II., who frequently diverted himself by playing at tennis with his courtiers. Tennis-courts were divided by a line stretched in the middle, and the players, standing on each side with their rackets in their hands, were required to strike the ball *over* this line. A similar game was sometimes played with a hollow leather ball, inflated with air, and called a *balloon*, which was driven from one player to another by striking with the hand, or with a wooden bracer fixed upon the hand and lower arm. Further particulars respecting these and other games played with a ball may be found in Strutt's 'Sports and Pastimes,' and 'Horda-Angel-Cynnan.'

TENON, JACQUES-RE'NE', an eminent French surgeon, whose father also belonged to the medical profession, was born in 1724. He went to Paris in 1741, where his zeal and talents soon gained him the notice of Winslow, and also of Antoine and Bernard de Jussieu. The first of these celebrated men initiated him in the study of anatomy; the two others developed in him a taste for botany and natural history. In spite of the prejudices and example of his contemporaries, Tenon understood that surgery, far from being separated from the other branches of medical science, and restricted to the mere performance of operations, is on the contrary most strictly united to them. Accordingly from this time he had a wider field opened to him for his professional labours; and he united to the study and treatment of surgical affections minute anatomical investigations and ingenious physiological experiments. In a short time he acquired a well-merited reputation; and though inferior to some other modern French surgeons in skill and genius for that particular department of science, yet few have surpassed him in the extent of his studies and the variety of his information. In 1744 Tenon was appointed an army surgeon of the first class (*chirurgien de première classe aux armées*), and served in the following year throughout the campaign in Flanders. On his return to Paris he obtained by competition (*au concours*) the situation of chief surgeon to the hospital of La Salpetrière, and founded near it a celebrated establishment for inoculation, a practice which his labours contributed much to propagate. He afterwards became a member of the College and of the Royal Academy of Surgery, and succeeded Andouillé as professor of pathology. In 1757 he was received into the Academy of Sciences. Tenon belonged to the first Legislative Assembly, and there displayed the same zealous philanthropy which seemed to belong to all his actions. Upon the re-organization of the learned societies, he became a member of the Institute of the first class, and read in that assembly many interesting papers. He was also a member of the Legion of Honour and of several learned and scientific societies, and preserved to the end of his life the same love of labour and the same zeal for the advancement of science which had marked the early years of his career. He died at Paris, on the 15th of January, 1816, at the advanced age of ninety-two. Few persons have written so many memoirs and monographs as Tenon; many of these have only been published in the annual analysis of the proceedings of the Institute: he is also said to have left behind him a great number of manuscripts. More than thirty of his works are mentioned in the *Biographie Médicale*, of which the following are the most important:—'De Cataracta,' Paris, 1757, 4to. 'Mémoires sur l'Exfoliation des Os,' read before the Academy of Sciences in 1758, 1759, and 1760, and afterwards printed, together with some others, with the title 'Mémoires sur l'Anatomie, la Pathologie, et la Chirurgie,' Paris, 1806, 8vo. 'Mémoire sur les Hopitaux de Paris,' Paris, 1788, 4to.; a very able memoir, which has served as a model for many that have been since written on the same subject, in which are pointed out almost all the improvements that have been introduced into the French hospitals. His last work, which was published when he was ninety years old, is entitled 'Offrande aux Vieillards de quelques Moyens pour prolonger la Vie.'

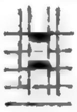
TENOR, the name of the most common of adult male voices, that which is between the extremes of highest and lowest, or Contratenor [Alto] and Base. [Base-Voice.] The compass of the Tenor is from c, the second space in the base, to g, the second line in the treble. Example, in the tenor clef:—



Hence it will be seen that the tenor and treble are reciprocally at the distance of an octave; consequently, what is calculated for the one voice, as relates to compass, will at a distance of eight notes, invariably suit the other.

The word is derived from *Teneo, to hold;* for in antient part-compositions, the plain-song, or air, if it may be so denominated, was given to, or *held* by, the Tenor. [Clef.]

Tenor-Clef is the c, or mean clef, placed on the fourth line for the use of the tenor-voice. Example:—



It is also occasionally used for the violoncello: and the part of the tenor trombone is written in this clef.

Tenor is also the English name for a larger instrument of the violin kind. See Viola.

TENOS (Τῆνος), now Tino, a small island in the Greek Archipelago lying to the south-east of Andros, and between that island and Myconus, and forming one of the group called the Cyclades. S. Nicolo, on its north coast, is in 37° 30′ N. lat. and 25° 15′ E. long. It is about 15 miles long, and its greatest length is from north-west to south-east. It was antiently called Hydrusa, because it was well watered (κατάῤῥυτον) (Steph. Byzant., v. τῆνος; Pliny, *Hist. Nat.*, iv. 12); and Ophiusa (Strabo, p. 487, ed. Casaub.), because it abounded in snakes. In the time of the Persian invasion of Greece a Tenian trireme rendered good service to the Greeks by deserting from the enemy, and giving intelligence of their movements immediately before the battle of Salamis (B.C. 480). The name of the Tenians was in consequence inserted upon the tripod at Delphi in the list of states to whom Greece was indebted for the repulse of the invader. (Herod., viii. 82.) According to Pausanias (v. 23) the Tenians were among those whose names were inscribed on the statue of Jupiter at Olympia, dedicated by the Greeks who fought at Platæa. The island paid tribute to Athens during the Peloponnesian war. (Thucyd., vii. 57.) It was taken, and the inhabitants enslaved by Alexander, tyrant of Pheræ, B.C. 362. (Demosthen. *in Polycl.*, 1207, Reiske; Clinton, *Fasti Hellen.*, a. 362.) In the reign of Tiberius, when the Roman senate instituted an inquiry into the rights and privileges attached to temples in the provinces of the empire, the Tenians quoted an oracle of Apollo, by which they had been commanded to consecrate a statue and temple to Neptune. (Tacitus, *Annal.*, iii. 63.) This temple was of considerable size, as appears from Strabo (p. 487), and on the coins of Tenos the trident of Neptune is a common type; on the reverse there is usually a bunch of grapes. The island is still celebrated for its wine, of which about twenty sorts are grown.

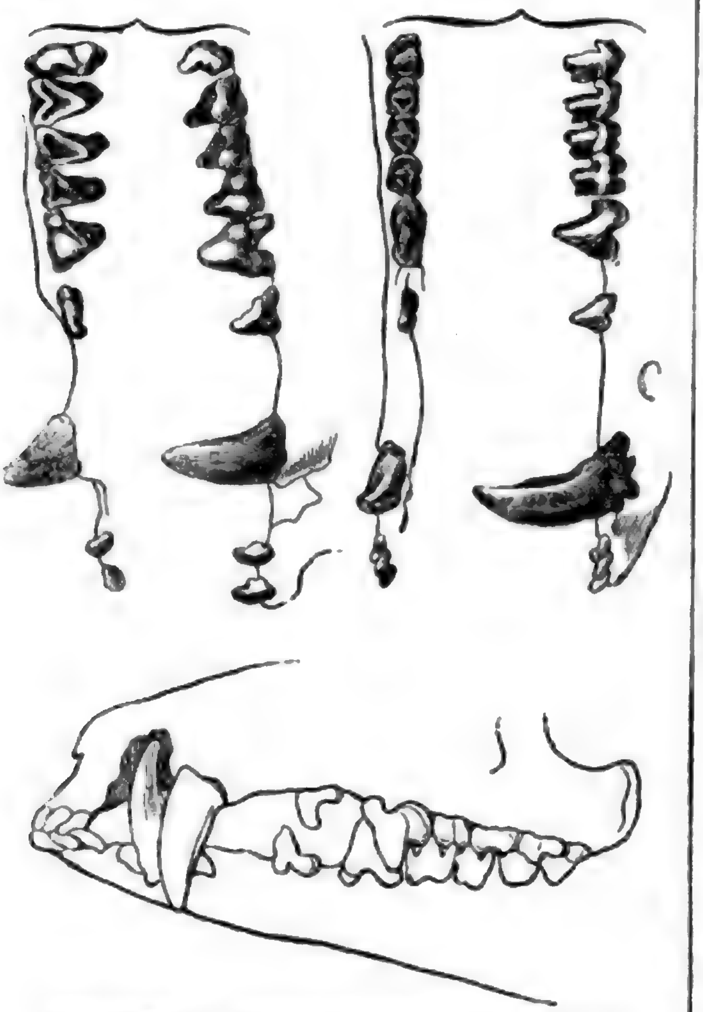
TENREC. *Centetes*, Ill.; *Centenes*, Desm.; *Setiger*, Geoff. The Tenrecs may be considered—indeed they have been considered by most zoologists—as Hedgehogs without the power of rolling themselves up into a ball. They were not included in the genus *Erinaceus* of Linnæus, as he left it, in his last edition of the *Systema Naturæ* (the 12th), but in the 13th (Gmelin's) all the known species were included under that genus. They have no tail, are nocturnal for the most part in their habits, feed on insects, lie dormant during a considerable portion of the year, and that during the hot season, and have the skin beset with spines or spine-like bristles.

It is in this genus that we first find the jugal bone wanting among the Insectivora.

Geographical Distribution and Habits of the Genus.—Cuvier remarks that three species are found in Madagascar, the first of which, the *Tenrec*, properly so called, *Centetes ecaudatus* (*Erinaceus ecaudatus*, Gmel.) is, he observes, naturalized at the Isle of France.

Mr. Swainson (*Classification of Quadrupeds*) states that the second division of the family SORECIDÆ is composed of mole-like animals, apparently connected to the Shrews by the American *Scalops* and the African *Chrysochloris*, and that it includes but three genera. [SORECIDÆ, vol. xxii., p. 261.] Of the Tenrecs (or Tendrics as he writes the word) he treats as animals peculiar to Madagascar, apparently as capable of domestication as their European congeners. 'Although inhabiting a warm region,' proceeds Mr. Swainson, 'they are said to pass the three warmest months of the year in a state of torpidity: this, it must be owned, is a singular circumstance, and is the only one upon record of an animal hybernating, so to speak, in the height of summer. In other respects they feed like the European Hedgehog, and are nocturnal animals.' The singularity of the circumstance vanishes when we find that the period in which the Tenrec becomes dormant is not only the warm season, but the dry season, and the apparent anomaly becomes another instance of the harmony of adaptation which prevails throughout nature. A suspension of the active powers of life becomes absolutely necessary to insectivorous quadrupeds, because there must be certain seasons when they would find no food. Our usual term for the act of retiring, in order to give way to this suspension, is hybernation; because, in our latitudes, this abstraction of worms and insects takes place in winter, when our Bats, Hedgehogs, and Shrews lay themselves up till spring returns to call forth their prey. But in Madagascar the dry season is that in which the absence of worms and insects occurs; and then it is that the Tenrec sinks into its half living and half dead state.

Dental Formula:—Incisors $\frac{6}{6}$; canines $\frac{1-1}{1-1}$; molars $\frac{6-6}{6-6}$: =40.



Teeth of Tenrec, one-third larger than the natural size. (F. Cuv.)

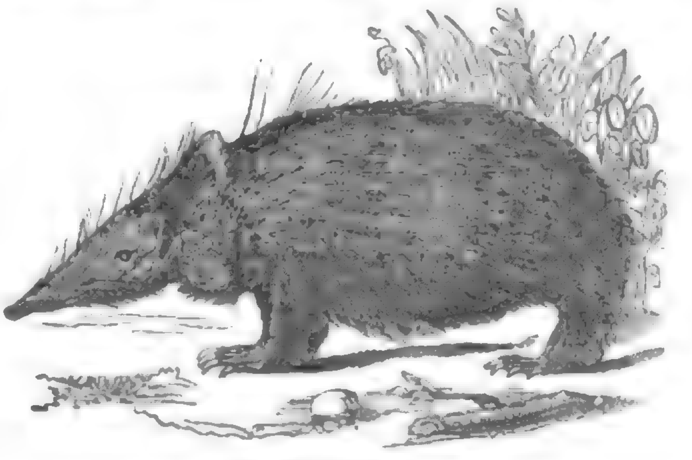
The situation assigned by Cuvier to the Tenrecs is between the Hedgehogs (*Erinaceus*, Linn. and *Cladobates*. [TUPAIA.]

Cuvier remarks that the muzzle of the Tenrecs is very pointed, and that their teeth are very different from those of the Hedgehogs.

Generic Character.—Body spiny; not capable of being rolled up into a ball, as in the Hedgehogs; muzzle elongated; five toes on each foot, separated and armed with crooked claws.

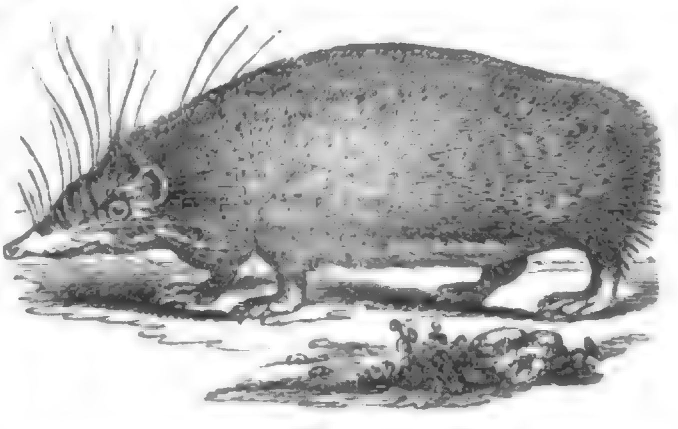
Examples.—The species are called Tenrec and Tendrac; but the latter name is confusedly applied to at least two species.

Of the first, the *Centetes ecaudatus*, Ill., is the largest, exceeding our Hedgehog in size. It is covered above with long flexible spines, except on the vertex and occiput, and has no coloured bands: the under part of the body is clothed with hairs or bristles only, which are yellowish, mixed with some longer black ones. Baron Cuvier, who is followed by Lesson, states, in his last edition of the *Règne Animal*, that this species has only four incisors in the lower jaw; but M. F. Cuvier, who makes the number six in each jaw, says that his illustration is taken from *Cent. ecaudatus* and *Cent. setosus*; and Fischer gives the same number.



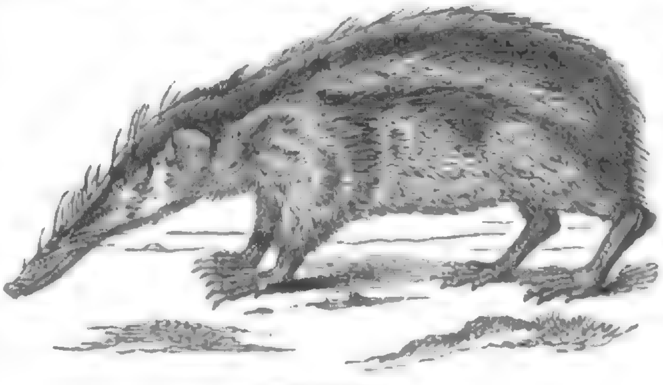
Centetes ecaudatus.

Centetes setosus, Ill.—The *Tendrac* of Buffon and Zimmerman—is less than the former, and the spines are short and rigid.



Tendrac.

The *Centetes semispinosus* is still less, and hardly so large as a common mole. Its body is clothed with a mixture of spines and bristles, and is banded longitudinally with yellow and black.



Striped Tenrec.

TENSION (Mechanics), the name given to the force by which a bar or string is pulled, when forming part of any system in equilibrium or in motion. Thus when a weight is supported by a string, the tension of the string is the weight which is suspended to it. Every point of the string may be considered as a point of application of two equal and opposite forces, downwards and upwards, each equal to the weight applied.

TENTERDEN. [Kent.]

TENTERDEN, CHARLES ABBOTT, LORD, born at Canterbury, on the 7th of October, 1762, was the son of a barber, who has been described as 'a tall, erect, primitive-looking man, with a large club pigtail, going about with the instruments of his business, and attended frequently by his son Charles, a youth as decent, grave, and primitive-looking as himself.' He was entered in 1769 on the foundation of the king's school of the cathedral, under Dr. Osmund Beauvoir, who is stated by Sir Egerton Brydges to have been an admirable classical scholar, of fine taste, and some genius. Sir Egerton, who for some years held the place next to Abbott in the class, speaks of him as remarkable even in his school-boy days for accuracy, steadiness, and equality of labour; as well acquainted with the rules of grammar, sure in any examination or task, and a tolerably correct writer of Latin verses and prose themes.

In the beginning of 1781 Abbott was elected scholar of Corpus Christi College, Oxford, with an allowance, including his exhibition, of 50*l*. a year. His mathematical acquirements are said by his friends to have been considerable. In 1784 he obtained the chancellor's medal for the best Latin verses on Lunardi's balloon, 'Globus Aerostaticus;' in 1786 his essay 'On the Use and Abuse of Satire,' obtained the chancellor's medal for the English essay. This essay displays the turn for neat, lucid, and exhaustive arrangement, which was the most marked feature of his matured intellect, and also a good deal of that want of passion and imagination which, perhaps as much as any of his positive qualities, contributed to his judicial eminence. He was elected a fellow of his college, and appointed junior tutor to Mr. (afterwards bishop) Burgess.

By the advice of Mr. Justice Buller, whose son was one of his private pupils, Abbott entered himself of the Inner Temple in 1788. He also, in compliance with the suggestion of the same experienced lawyer, attended some months the office of the London solicitors Messrs. Sandys and Co. He afterwards became a pupil of Mr. (subsequently Baron) Wood; and, aided by his recommendation, began to practise as a special pleader with marked success. He was called to the bar in Trinity term, 1795.

He married, on the 13th of July, 1795, Mary, eldest daughter of John Logier Lamotte, Esq., a gentleman of fortune in Kent. It is said that when the father hinted at the expediency of a marriage-settlement, Abbott said he had nothing but an excellent law-library, which the lawyers might tie up as tightly as they pleased.

Having selected the Oxford circuit, he speedily rose into great business. The jealousy of his young rivals gave rise to rumours of his being too courteous to attorneys; but by whatever means he may have obtained his position, he kept it by the preference the leaders evinced for a junior who could often suggest a case in point, and was master of all the technicalities of pleading. To this he owed his appointment, by Sir Vicary Gibbs, when solicitor-general, to the office known among the members of the bar by the name of treasury-devil, the junior counsel to whose care the business of government is intrusted. In this character he took part in most of the numerous state-trials which occurred about the close of last century. As his character became established, he was appointed standing counsel to the Bank and other great mercantile communities. When the returns of the income-tax were called for, Mr. Abbott's account was looked upon as a curiosity, both for its minute accuracy and for the largeness of the sum-total of his fees during the past year —8026*l*. 5*s*.

In a sketch of Lord Tenterden, which appeared in the sixty-ninth volume of the 'Edinburgh Review,' Lord Brougham says of his career at the bar:—'As a leader he very rarely, and by some extraordinary accident only, appeared; and this in a manner so little satisfactory to himself, that he peremptorily declined it whenever refusal was possible; and he seemed to have no notion of a leader's duty beyond exposing the pleadings and the law of the case to the jury, who could not comprehend them with all his explanation. His legal arguments, of which for many years the books are full, were extremely good, without reaching any very high pitch of excellence; they were quite clear, abundantly full of case law; betokening some dread of grappling with principle, and displaying none of the felicitous commentary that marked Mr. Holroyd's.'

In 1802 Mr. Abbott published his 'Treatise of the Law relative to Merchant-Ships and Seamen.' This work has gone through many editions: it exhausts the subject, is well arranged, and well written: its merits have been repeatedly acknowledged: it is one of the best English law treatises.

In 1808 Mr. Abbott was offered a seat on the bench, but declined from prudential motives, his professional income far exceeding the salary of a judge. As years grew upon him however, and his fortune increased, he began to long for the comparative repose of the bench. In February, 1816, he was offered a seat as puisne judge in the Court of Common Pleas, and accepted it. In May of the same year, on the death of Mr. Justice Le Blanc, he yielded to the importunity of Lord Ellenborough, and was chosen to supply the vacancy in the Court of King's Bench, and was knighted about the same time. On the 4th of November, 1818, Sir Charles Abbott succeeded Lord Ellenborough as chief-justice of that court.

It has been alleged that at the outset of his judicial career chief-justice Abbott was apt to lose himself among the minute details of the cases which were brought before him. It is allowed at the same time that during the last seven or eight years of his time he took broader and more comprehensive views of questions, and displayed great judicial capacity. He had learned to deal with facts, and his law was, as it always had been, safe, accurate, and ready. His statements and decisions were clothed in correct, succinct, and appropriate language. He was averse to over-curious subtleties; loved to overrule technical objections both in civil and criminal pleadings; and showed great anxiety to make his decisions accord with common sense and substantial justice. Perhaps he shone most in the management of arguments which required a combination of scientific with legal knowledge: 'to see him preside over a complicated patent case was a very great treat, whether to a lawyer or a man of science.' A reasonable distinction, a reasonable interpretation of the law, were his favourite phrases. He was, as every learned and judicious lawyer must be, rather impatient of the check of a jury; and was not always able to keep his temper in command when arguing with the bar. His impartiality, as far as the parties were concerned, was unquestioned. 'It was an edifying sight,' says Lord Brougham, 'to observe Lord Tenterden, whose temper had been visibly affected during the trial (for on the bench he had not always that entire command of it which we have described him as possessing at the bar), addressing himself to the points in the cause with the same perfect calmness and indifference with which a mathematician pursues an abstract truth; as if there were neither the parties nor the advocates in existence, and only bent on the discovery and the elucidation of truth.' Chief-Justice Abbott's anxiety to support the executive authority on all occasions was beyond a doubt excessive; but this appears to have been the consequence of temperament and very early associations: it shows itself even in his prize essay upon Satire.

Sir Charles Abbott was raised to the peerage in 1827, by the title of Baron Tenterden. He made a successful début as a speaker in the House of Lords in support of Miss Turner's divorce bill; he pertinaciously opposed the passing of the Corporation and Test Act Repeal Bill; and was the most impressive speaker against the Roman Catholic Relief Bill. His judicial labours rendered him for the next two years an unfrequent attendant in the House of Lords; but he recorded his protest against the Reform Bill. He took at the same time an active part in the business of legislation. Among his well-studied and carefully prepared acts are—9 Geo. IV., c. 14, for the alteration of the law as to the limitation of actions of account and upon the case; 9 Geo. IV., c. 15, to prevent a failure of justice by reason of variances between records and writings produced in evidence; 1 Will. IV., c. 21, Mandamus and Prohibition Acts; 1 Will. IV., c. 22, Interrogatories Act; 1 & 2 Will. IV., c. 58, Interpleader Act; 2 & 3 Will. IV., c. 39, Uniformity of Process Act; 2 & 3 Will. IV., c. 71, Prescription Acts; and (prepared under his sanction) 3 & 4 Will. IV., c. 27, for the limitation of actions and suits relating to real property, and for simplifying the remedies for trying the rights thereto.

As his political opinions were of the kind generally understood to predominate at Oxford, so his literary tastes retained the impress of his University education. When Sir James Scarlett, on the trial of Mr. Hunt for the publication of 'The Vision of Judgment,' alluded to the poetry of Lord Byron as familiar to the jury, Lord Tenterden could not repress the observation that, for himself, 'he was bred in too severe a school of taste to admire the modern poets.' His favourite recreations during the long vacation were the perusal of the classics, the study of botany, and the composition of Latin verses on flowers and plants. He founded and endowed, in the grammar-school of his native city, two annual prizes; the one for the best English essay, the other for the best Latin verse. In his relaxations, as in the discharge of his public duties, he displayed a mind narrow, it may be, and unimpassioned, but active, dexterous, and elegant.

His later years were overclouded with ill-health, and alarm occasioned by the aspect of public affairs. He continued however to discharge assiduously the duties of his high office. He presided for the two first days at the trial of the mayor of Bristol for misconduct during the riots in that city at the time of the Reform Bill, but on the third he was confined to bed by a violent attack of inflammation. The disease baffled the skill of his physicians, and he expired on the morning of Sunday, November 4, 1832. Lady Tenterden died on the 19th of December following. He had two sons, one of whom succeeded him in the title, and two daughters.

(The materials for this article have been found in a notice of Lord Tenterden in the Obituary of *The Gentleman's Magazine* for December, 1832; in a 'Life of Lord Tenterden' which appeared in the 26th volume of *The Law Magazine*, pp. 51-87; in a sketch of the 'Judicial Character of Lord Tenterden' by Mr. Sergeant Talfourd, in the 9th volume of the same work, pp. 234-6; and in a sketch of his career and character by Lord Brougham in the 76th volume of the *Edinburgh Review*, pp. 14-23. There is a portrait of Lord Tenterden taken by Owen in 1819, and engraved in mezzotinto in a quarto form by S. W. Reynolds, and another by C. Penny engraved by H. Meyer. A cast for a bust was taken from his countenance after death.)

TENTHRE'DO, a genus of Hymenopterous insects of the section *Terebrantia*. The genus *Tenthredo* of Linnæus is in modern systems regarded as constituting a family, to which the name *Securifera* has been applied by Latreille, and *Tenthredinidæ* by Leach.

Latreille restricts the generic term *Tenthredo* to those species which have nine joints to the antennæ, and in which these organs are not distinctly thickened at the apex. Their larvæ have from eighteen to twenty-two feet. The genus *Tenthredo* is however still further restricted by many other authors, and it is especially to Dr. Leach (*Zoological Miscellany*, vol. iii.) that we are indebted for pointing out distinguishing characters for the subdivisions of the very extensive Linnean genus. By this author the *Tenthredinidæ* are divided chiefly according to the structure of the antennæ, and the cells enclosed by the nervures of the wings. The first section, according to Dr. Leach, contains those species which have the antennæ short and clubbed at the extremity and the third joint long; the superior wings with two marginal and three submarginal cells. It includes the genera *Cimbex*, *Trichiosoma*, *Clavellaria*, *Zarea*, *Abia*, &c.

The species of the second section have the antennæ of moderate length, filiform, and composed of three joints; the last joint long, slightly thickened at the extremity, and in the males ciliated, and sometimes forked. It contains the genera *Hylotoma* and *Schizocerus*. The characters of the third section are—antennæ short, with nine or ten joints, increasing in thickness in the middle, but ending in a point; the third joint longer than the fourth; body short and increasing in thickness towards the apex. Genera: *Messa*, *Selandria*, and *Fenusa*.

Section 4.—Antennæ composed of nine joints, moderately long; body moderately long; upper wings with two marginal cells. To this section belongs the genus *Tenthredo* as at present restricted; it is distinguished by the upper wings having four submarginal cells, and the antennæ with the third and fourth joints of equal length. The genus *Allantus* differs only from *Tenthredo* in having the third joint of the antennæ longer than the fourth. The *Allantus scrophulariæ* is a very common species in this country, and is found on the scrophulariæ, on the leaves of which its larvæ feed. The perfect insect somewhat resembles a wasp, but is of a rather more slender form; it is black, and has the body adorned with yellow rings; the legs (with the exception of the thighs) and antennæ are also yellow. The larva, which is provided with twenty-two feet, is white and has black dots, and the head is black. When touched it rolls itself up in a spiral manner, as indeed do the larvæ of other *Tenthredinidæ*.

Section 5.—Superior wings with but one marginal cell; body short, narrower at the extremity in the males; antennæ simple, nine-jointed, slightly ciliated, increasing in thickness in the middle, and decreasing at the extremity. This section contains the genera *Cræsus*, *Nematus*, and *Cladius*, examples of each of which are found in this country.

Section 6.—Antennæ with numerous joints; body rather depressed; wings with two marginal and four submarginal cells. British genera *Tarpa*, *Lyda*, and *Lophyrus*. The larvæ of the species of *Lophyrus* live in society, more particularly on the pines, and are said to be very injurious to the young plants. The species of this genus are very rare in England. The antennæ are serrated in females, and in the males they are provided with a double series of denticulations.

TENTHS are the tenth part of the yearly value of all ecclesiastical livings. They were formerly claimed by the pope as due to himself by divine right, after the example of the Jewish high-priest who had of the Levites a tenth-part of the tithes; and his claim was sanctioned, in this country, by an ordinance in the 20th year of Edward I., when a valuation of all livings was made, in order that the pope might know the amount of his revenue from this source. The possessions afterwards acquired by the church were not liable to the payment of tenths to the pope, as all livings continued to be charged according to that valuation. (Coke, 2 *Inst.*, 627.) When the authority of the pope was extinguished at the Reformation, Henry VIII. transferred the revenue arising from tenths to the crown, and had a new valuation of all the livings, so as to obtain the tenth of their true yearly value at that time. (26 Hen. VIII., c. 3, s. 9-11.) By royal grants under 1 Eliz., c. 19, s. 2, the Archbishop of Canterbury and the Bishop of London were exempted from tenths and were also authorized to receive the tenths of several benefices as a compensation for certain estates which were alienated from their sees. By the 6 Anne, c. 24, all benefices were discharged from the payment of tenths which, at that time, were under the annual value of 50*l.*, except those of which the tenths had previously been granted by the crown to other parties. There are also some other special exemptions. At the present time, out of 10,498 benefices, with and without cure of souls, there are 4898 which remain liable to tenths. (*Parl. Rep. First-Fruits and Tenths*, 1837, No. 384.) Queen Anne gave up the revenue arising from tenths, as well as from first-fruits, which had been enjoyed by her predecessors since the Reformation, and by act 2 and 3 of her reign, c. 11, assigned it to the augmentation of poor livings; for which purpose she erected a corporation by letters patent in 1704 to administer the funds, called the Governors of Queen Anne's Bounty. This act declared that Episcopal sees and livings not exempted should continue to pay in such rates and proportions only as heretofore, or according to the valuation of Henry VIII., commonly known as the 'King's Books.' Tenths under the act 1 Vict., c. 20, are collected by the Treasurer of the Governors of Queen Anne's Bounty. Payment is enforced by Exchequer process, when not duly made, and the treasurer is required to give notice of arrears within one month after the proper time of payment. In case of a living being vacated, the Exchequer is empowered by act 28 Hen. VIII., c. 3, s. 18, to recover arrears of tenths, not only from the executors and administrators, but also from the successor of the last incumbent. (2 Burn's *Ecclesiastical Law*, 9th ed., pp. 273-295.) [First-Fruits, Taxatio Ecclesiastica; Tithes.]

TENTZEL, or TENZEL, WILHELM ERNEST, a German historian and antiquarian, was born in 1659, at Greussen in Thuringia, where his father was pastor. After the completion of his school education he went, at the age of eighteen, to the university of Wittenberg, where he chiefly devoted himself to the study of the antient and Oriental languages in connection with history. In 1685 he was appointed teacher at the gymnasium of Gotha, and was at the same time intrusted with the care of the collection of antiquities and coins belonging to the Duke of Saxe-Gotha. Several learned dissertations which he published shortly after this time attracted the attention of his learned countrymen, in consequence of which he became a very active contributor to the 'Acta Eruditorum,' and to the 'Observationes Hallenses.' Tentzel was the first German who conceived the idea of establishing a German journal for reviewing new books and for publishing interesting essays. This periodical was set on foot in 1689, under the title 'Monatliche Unterredungen einiger guten Freunde von allerhand Büchern und andern annehmlichen Geschichten.' The undertaking had great success, and was carried on till 1698. The whole was published in monthly parts, and consists of ten volumes. The extensive knowledge of history, especially of the history and antiquities of Germany, procured Tentzel, in 1696, the honourable post of historiographer to the house of Saxony of the Ernestine line. Before he commenced writing on the history of Saxony he travelled through the greater part of Germany, visiting several courts and examining various libraries to find materials. In 1702 the elector of Saxony (also king of Poland) conferred upon Tentzel the title of councillor, and made him historiographer of the electorate. In this capacity Tentzel took up his residence at Dresden, and was frequently obliged to appear at court. But the simple honesty and straightforwardness of the man made him a subject for ridicule among the ignorant and idle courtiers, and as soon as Tentzel became aware of it he resigned his office and retired to private life, devoting himself entirely to his historical and antiquarian studies. He died on the 24th of November, 1707, in great poverty.

Besides the numerous essays in the periodical publications mentioned above, the following separate works of Tentzel deserve to be mentioned: 'De Ritu Lectionum Sacrarum,' Wittenberg, 1685, 4to.; 'Exercitationes Selectæ, in duas partes distributæ,' Leipzig, 1692, 4to.; 'Epistola de Sceleto Elephantino Tonnæ nuper effosso,' Gotha and Jena, 1699, 12mo.; 'Von dem Alter der Buchdruckerkanst,' Gotha, 1700, 12mo.; this interesting work is translated into Latin and incorporated in Wolf's 'Monumenta Typographica,' ii. 644, &c. The principal work of Tentzel is his 'Saxonia Numismatica, sive Nummophylacium Numismatum Mnemonicorum et Iconicorum à Ducibus Saxoniæ cudi jussorum,' Frankfort, 1705, 2 parts in 4to. He also continued the history of Gotha which had been commenced by Caspar Sagittarius, in two supplementary volumes. His history of the Reformation, 'Historischer Bericht vom Anfang und Fortgang der Reformation,' which was edited by E. S. Cyprian, in 2 vols. 4to., Leipzig, 1718, is a valuable work, which should still be consulted by the student of that important period.

(Jöcher, *Allgem. Gelehrten-Lexicon*, iv., p. 1057, &c.; *Conversations-Lexicon*, s. v. 'Tenzel.')

TENUIPEDES, Lamarck's second division of the *Conchifera Dimyaria*, consisting of the *Mactracea*, *Corbulacea*, the *Lithophaga* (*Saxicola*, *Petricola*, and *Venerupis*), the *Nymphacea*, the *Cardiacea*, the *Trigonacea*, the *Naiades*, and the *Chamacea*.

In the first division, *Crassipèdes*, are comprised the *Tubicolées*, the *Solenacea*, and the *Myaria*.

M. Deshayes, in the last edition of Lamarck, objects, and we think with reason, to these divisions as being defective; nor does he consider the arrangement capable of amelioration, because the principal character is too exclusive. He observes that to follow it rigorously it would be necessary to break very natural links which bind certain genera together.

TENUIROSTRES. Cuvier made the *Tenuirostres* the fourth family of his *Passereaux*, placing it between the *Conirostres* and the *Syndactyles*, and comprising under it the genera *Sitta*, Linn. (with the subgenera *Xenops*, Ill.; *Anabates*, Temm.; and *Synallaxis*, Vieill.); *Certhia*, Linn. (with the subgenera *Certhia*, Cuv.; *Dendrocolaptes*, Herm.; *Tichodroma*, Ill.; *Nectarinia*, Ill.; *Dicæum*, Cuv.; *Melithreptus*, Vieill.; *Cinnyris*, Cuv.; and *Arachnathera*, Temm.); *Trochilus*, Linn. (dividing the genus into the Humming-birds properly so called, or *Colibris*, *Trochilus*, Lacép.; and the *Oiseaux Mouches*, or Fly-birds, *Orthorhynchus*, Lacép.); *Upupa*, Linn. (with the subgenera *Fregilus*, Cuv.; the Hoopoes properly so called, *Upupa*, *Promerops*; and *Epimachus*).

Mr. Vigors, after pointing out the place of one group of the Linnæan *Certhiæ* which climb and feed on animal food among the SCANSORES, and that of the other group which live only on the nectar of flowers, and have feet formed for perching only [CREEPER, vol. viii., p. 146], thus enters the family now before us, and designates the *Suctorial Birds* as the most interesting group perhaps of the animal world. [SUNBIRDS, vol. xxiii., p. 284.] He remarks that the aberrant families of the order are so numerous in their forms, and hitherto have been so unsatisfactorily characterized, that it is impossible to speak of them with that certainty which may attend observations on better defined groups. The genus *Promerops* appears to him to be that form of the present tribe which approaches nearest to the adjoining tribe of FISSIROSTRES. Retaining, Mr. Vigors observes, the slender bill of the *Tenuirostres*, *Promerops* exhibits somewhat of the broad base of the bill of the *Fissirostres*, and, at the same time, the gressorial feet. By means of *Merops*, he remarks, the curved bill of which approaches the structure of its own, it appears to be immediately connected with that group. 'Of the limits of this family, which may receive its appellation from M. Brisson's above-mentioned genus,' continues Mr. Vigors, 'I can say nothing at present; nor do I wish to enter into more than a general reference to the succeeding family of *Meliphagidæ*.' (See the article for this.)

The families admitted by Mr. Vigors into this tribe of INSESSORES will be found in the article SUNBIRDS, *loc. cit.*

Mr. Swainson (to whose publication on this order, in the 1st vol. of the 'Zoological Journal,' which appeared after the paper *On the Natural Affinities that connect the Orders and Families of Birds* was sent to press, Mr. Vigors refers), in his tenth chapter of the second volume of the 'Classification of Birds,' remarks, that the most aberrant division of the insessorial order is that of the *Tenuirostres*, or honeysuckers, so called from the great majority deriving their subsistence both from insects and the nectar of plants, which they suck up by means of a long or filamentous tongue adapted for the purpose. 'As these birds,' says Mr. Swainson in continuation, 'are furthest removed from the types of their order, they consequently show a greater affinity to the *Scansores* on one hand, and to the *Fissirostres* on the other, than to the more perfect groups of the perchers, as seen in the *Dentirostres* and *Conirostres*: like the scansorial creepers, the bill is slender, and the feet very short; but there the comparison ceases. The scansorial birds derive their food entirely from insects, and, in general, have a simple and pointed tongue; but those we are now to consider are chiefly supported by vegetable juices, extracted by means of a very long tongue, always retractile, and either simply forked, or divided into so many slender filaments as to resemble a painter's brush; the bill moreover is so soft or delicate, that it is often incapable of grasping food, and appears, in the typical groups, principally intended to protect the tongue, as the chief member by which life is supported.'

Mr. Swainson includes the following families under the tribe:—MELIPHAGIDÆ; *Cinnyridæ* [SUNBIRDS]; TROCHILIDÆ (Humming-Birds); PROMEROPIDÆ (Hoopoes); and *Paradisiadæ* [BIRDS OF PARADISE].

The *Tenuirostres* are placed by this author between the SCANSORES and the FISSIROSTRES.

M. Lesson makes the tribe *Tenuirostres* (which he arranges between the *Latirostres* and the *Syndactyles*) consist of the following families and genera:—

1. Promeropidæ.

Genera.—*Upupa*; *Promerops*.

2. Certhiadæ.

Genera.—*Certhia*; *Tichodroma*; *Dendrocolaptes*; *Climacteris*; *Furnarius*; *Cæreba*; *Dicæum*.

3. Philedonidæ.

Genera.—*Drepanis* *Cinnyris*; *Pomatorhinus*; [illegible]; *Orthotomus*; *Myzomela*; *Myzantha*; *Anthochæra*; *Tropidorhynchus*; *Mellisuga*.

4. Trochilidæ.

Genera.—*Polytmus*, Briss.; *Ornismya*, Less.

In Mr. G. R. Gray's 'List of the Genera of Birds' (2nd edit., 1841), a work remarkable for its accuracy and the quantity of condensed labour which it contains, the *Tenuirostres* stand as the second tribe of Insessores, between the *Fissirostres* and the *Dentirostres*, and comprise the following families, subfamilies, and genera:—

1. Upupidæ. (See the article.)
2. Nectarinidæ. [SUNBIRDS.]
3. Trochilidæ. (See the article.)
4. Meliphagidæ.

Subfamily 1. *Myzomelinæ.*

Genera.—*Myzomela*, Vig. and Horsf. (*Phylidonyris*, Less.; *Certhia*, Gm.; *Meliphaga*, Vig. and Horsf.): *Acanthorhynchus*, Gould (*Leptoglossus*, Sw.; *Melithreptus*, Vieill.; *Certhia*, Lath.; *Meliphaga*, Vig. and Horsf.): *Glyciphila*, Sw. (*Meliphaga*, Lew.).

Subfamily 2. *Meliphaginæ.*

Genera.—*Meliornis*, G. R. Gray (*Certhia*, Lath.; *Meliphaga*, Lew.; *Philedon*, Cuv.; *Strigiceps?* Less.): *Prosthemadera*, G. R. Gray (*Merops*, Lath.; *Anthochæra*, Vig. and Hors.; *Philemon*, Vieill.; *Sturnus*, Daud.; *Meliphaga*, Temm.; *Philedon*, Cuv.): *Ptilotis*, Sw. (*Meliphaga*, Lew.; *Philemon*, Vieill.; *Certhia*, Lath.): *Anthornis*, G. R. Gray (*Anthomyza*, Sw.; *Melithreptus*, Vieill.; *Furnarius*, Steph.; *Certhia*, Sparr.; *Philedon*, Less.): *Philemon*, Vieill. (*Anthochæra*, Vig. and Hors.; *Merops*, Gm.; *Meliphaga*, Temm.; *Philedon*, Cuv.): *Phyllornis*, Boie (*Turdus*, Gm.; *Chloropsis*, Jard. and Selby; *Meliphaga*, Horsf.): *Meliphaga*, Lew. (*Zanthomyza*, Sw.; *Merops*, Lath.; *Philemon*, Vieill.; *Anthochæra*, Vig. and Hors.; *Xanthomyza*, Strickl.; *Philedon*, Cuv.): *Anthochæra*, Vig. and Hors. (*Creadion*, Vieill.; *Philedon*, Cuv.; *Merops*, Lath.): *Acanthogenys*, Gould (*Anthochæra*, Fras.): *Entomyza*, Sw. (*Gracula*, Lath.; *Philemon*, Vieill.; *Gymnops*, Cuv.; *Entomyzon*, Sw.; *Tropidorhynchus*, Vig. and Hors.; *Meliphaga* (Lew.), Temm.): *Tropidorhynchus*, Vig. and Hors. (*Philedon*, Cuv.; *Merops*, Lath.; *Meliphaga*, Temm.; *Gymnops*, Cuv.).

Subfamily 3. Melithreptinæ.

Genera:—*Plectorhamphus*, G. R. Gray (*Plectorhyncha*, Gould): *Manorhina*, Vieill. (*Myzantha*, V. and H.; *Philanthus*, Less.; *Gracula*, Lath.): *Psophodes*, V. and H. (*Muscicapa*, Lath.; *Timalia*, ? Sw.): *Eidopsarus*, Sw. (*Sturnus*, Wagl.): *Melithreptus*, Vieill. (HÆMATOPS, Gould; *Gymnophrys*, Sw.; *Meliphaga*, Temm.; *Philedon*, Cuv.; *Meliphaga*, V. and H.; *Certhia*, Shaw): *Entomophila*, Gould.

5 Certhidæ.

Subfamily 1.

Genera:—*Cinclodes*, G. R. Gray (*Furnarius*, Less.; *Opetiorhynchus* (Temm.), Gould and G. R. Gray; *Upucerthia*, D'Orb.; *Motacilla*, Gm.): *Upucerthia*, J. Geoffr.: *Furnarius*, Vieill. (*Opetiorhynchus*, Temm.; *Figulus*, Spix; *Merops*, Gm.; *Turdus*, Licht.): *Geositta*, Sw. (*Certhilauda*, D'Orb.; *Furnarius*, G. R. Gray; *Alauda*, Kittl.): *Lochmias*, Sw. (*Picerthia*, J. Geoffr.): *Enicornis*, G. R. Gray (*Eremobius*, Gould): *Ochetorhynchus*, Meyen (*Upucerthia?* D'Orb. et Lafr.): *Limnornis*, Gould: *Sclerurus*, Sw.: *Cinclocerthia*, G. R. Gray (*Stenorhynchus*, Gould).

Subfamily 2. Anabitanæ.

Genera:—*Synallaxis*, Vieill. (*Sphenura*, Licht.; *Parulus*, Spix; *Synallaxis*, D'Orb. et Lafr.): *Diglossa*, Wagl. (*Serrirostrum*, D'Orb. et Lafr.; *Dendroma*, Sw.; *Agrilorhynchus*, Bonap.; *Uncirostrum*, D'Orb. et Lafr.): *Anumbius*, D'Orb. et Lafr. (*Annumbi*, Azara; *Furnarius*, Vieill.; *Sphenura*, Licht.; *Malurus*, Sw.; *Anabates*, Spix; *Anthus*, Less.; *Synallaxis*, Gould): *Anabates*, Temm. (*Philydor*, Spix; *Sphenura*, Licht.; *Motacilla*, Gm.; *Xenops*, Lafr.): *Oxyrhamphus*, Strickl. (*Oxyrhynchus*, Temm.; *Oxyruncus* (olim), Temm.).

Subfamily 3. Dendrocolaptinæ.

Genera:—*Dendroplex*, Sw. (*Nasica*, Less.; *Oriolus*, Gm.; *Dendrocolaptes*, Cuv. and Temm.): *Glyphorhynchus*, Pr. Max. (*Sphenorhynchus* (olim), Pr. Max.; *Dendrocolaptes*, Licht.; *Sittacilla*, Less.; *Zenophasia*, Sw.; *Xenophasia*, Strickl.): *Dendrocops*, Sw. (*Dendrocolaptes*, Spix): *Dendrocincla*, G. R. Gray (*Dryocopus*, Pr. Max.; *Dendrocolaptes*, Licht.): *Dendrocolaptes*, Herm. (*Dendrocopus*, Vieill.; *Gracula*, Gm.): *Xiphorhynchus*, Sw. (*Dendrocolaptes*, Temm., Cuv.; *Picolaptes*, Less.; *Dendrocopus*, Vieill.): *Prolaptes*, Less. (*Ziphorhynchus*, Sw.; *Dendrocolaptes*, Spix; *Oxyurus*, Less.; *Dendroplex*, Sw.): *Sittasomus*, Sw. (*Neops*, Vieill.; *Synallaxis*, Cuv.; *Dendrocolaptes*, Temm.).

Subfamily 4. Certhinæ.

Genera:—*Certhia*, Linn.: *Oxyurus*, Sw. (*Synallaxis*, Less.; *Sylvia*, Lath.; *Motacilla*, Gm.): *Climacteris*, Temm. (*Petrodroma*, Vieill.; *Meliphaga*, Temm.): *Tichodroma*, Ill. (*Petrodroma*, Vieill.; *Certhia*, Linn.): *Geobates*, Sw.: *Tatare*, Less. (*Sitta*, Less.; *Turdus*, Gm.; *Thryothorus*, Quoy et Gaim.; *Oriolus*, Forst.).

Subfamily 5. Sittinæ.

Genera:—*Sittella*, Sw. (*Neops*, Vieill.; *Sitta*, Lath.): *Sitta*, Linn.: *Dendrophila*, Sw. (*Orthorhynchus*, Horsf.; *Sitta*, Horsf.): *Dendrodromus*, Gould: *Xenops*, Hoffm. (*Neops*, Vieill.).

Subfamily 6. Orthonycinæ.

Genera:—*Orthonyx*, Temm.: *Mohoua*, Less. (*Certhia*, Quoy et Gaim.; *Muscicapa*, Gm.; *Orthonyx*, Less.).

Subfamily 7. Troglodytinæ.

Genera:—*Rhinocrypta*, G. R. Gray (*Rhinomya*, D'Orb. et Lafr.): *Menura*, Dav. (*Parkinsonius*, Bechst.; *Megapodius*, Wagl.): *Pteroptochos*, Kittl. (*Hylactes*, King; *Megalonyx*, Less.; *Leptonyx*, Sw.): *Scytalopus*, Gould (*Myiothera*, Pr. Max.; *Platyurus*, Sw.; *Motacilla*, Gm.; *Malacorhynchus*, Menetr.; *Sylvia*, Lath.; *Troglodytes*, Kittl.; *Sylviaxis*, Less.; *Leptonyx*, D'Orb et Lafr.): *Microura*, Gould (*Micrura*, Strickl.): *Merulaxis*, Less. (*Platyurus*, Sw.; *Malacorhynchus*, Menetr.; *Merularis*, D'Orb. et Lafr.): *Thriothorus*, Vieill. (*Sylvia*, Lath.): *Campylorhynchus*, Spix (*Turdus*, Gm. et Licht.; *Cichla*, Wagl.; *Sphenura*, Licht.; *Opetiorhynchus*, Pr. Max.; *Picolaptes*, Lafr.; *Anumbius*, D'Orb. et Lafr.): *Rhamphocænus*, Vieill. (*Troglodytes*, Sw.; *Acontistes*, Sundev.; *Scolopacinus*, Bonap.): *Troglodytes*, Vieill. (*Motacilla*, Linn.; *Anorthura*, Renn.; *Regulus*, Briss.; *Luscinia*, Linn.).

Of these genera, Mr. G. R. Gray remarks that *Anthomyza* had been previously used in botany; *Plectorhyncha* and *Oxyrhynchus* in ichthyology; *Rhinomyza* in entomology; and that *Eremobius* is very like a word employed in that science; that *Dryocopus* had been previously used in *Picidæ* and *Stenorhynchus* for a crustaceous animal. *Stenorhynchus* has also been employed to designate a genus of SEALS. [Vol. xxi., p. 163.]

TENURE. The general nature of tenure and its origin and history in England are explained in the article FEUDAL LAW. A few remarks may be made here on tenure as at present existing by the law of England, for which purpose a short recapitulation is necessary.

All land was and is held of the king either mediately or immediately. All tenures were distributable under two general heads, according as the services were free or base; and consequently there was the general division of tenures into Franktenement or free-holding, and Villeinage. The act of Charles II. (12 Car. II., c. 24) abolished military tenures, which were one kind of free services, and changed them into the other species of free services, namely free and common socage. Thus one tenure in socage was established for all lands held by a free tenure, which comprehended all lands held of the king or others, and all tenures except tenures in frankalmoyne, copyhold, and the honorary services of grand-serjeanty; and it was enacted by the same act that all tenures which should be created by the king in future, should be in free and common socage. It is particularly provided in the act which abolishes military tenures, that it shall not alter or change any tenure by copy of court-roll, or any services incident thereto, nor take away the honorary services of grand-serjeanty, other than charges incident to tenure by knights' service.

Thus it appears that tenure is still a fundamental principle of the law relating to land in England.

All the land in England in the hands of any layman is held of some lord, to whom the holder or tenant owes some service. It is by doing this service that the tenant is entitled to hold the land: his duty is a service, and the right of the lord is a seignory. The word tenure comprehends the notion of this duty and of this right, and also land in respect of which the duty is due: the land is a tenement. As already observed, all land is held either mediately or immediately of the king; and ultimately all land is held of the king. The ownership of land in England is therefore never unlimited as to extent, for he who is the owner of land in fee, which is the largest estate that a man can have in land, is not absolute owner: he owes services in respect of his fee (or fief), and the seignory of the lord always subsists. This seignory is now of less value than it was, but still it subsists. The nature of the old feud was this: the tenant had the use of the land, but the ownership remained in the lord; and this is still the case. The owner of a fee has in fact a more profitable estate than he once had; but he still owes services, fealty at least, and the ownership of the land is really in the lord and ultimately in the king. For all practical purposes the owner's power of enjoyment is as complete as if his land were allodial, but the circumstance of its not being allodial has several important practical consequences.

No land in England can be without an owner. If the last owner of the fee has died without heirs, and without disposing of his fee by will, the lord takes the land by virtue of his seignory. If land is aliened to a person who has a capacity to acquire but not to hold land in England, the king takes the land; this happens in the case of lands being sold to an alien. The forfeiture of lands to the king for high treason and to the lord in cases of petty treason and murder are also consequences of tenure.

The case of church lands seems something peculiar. They are held by tenure, though no temporal services are due. This tenure was originally the tenure in frankalmoigne. By the tenure in frankalmoigne the tenant was bound 'to make orisons, prayers, masses, and other divine services for the soul of his grantor or feoffor,' &c. (Litt., s. 135); but he did no fealty. If land was given for 'certain divine service in certain to be done,' &c. (Litt., s. 137), the lord might distrain, and in this case it seemed the lord might have fealty; this tenure by certain service was not called tenure in frankalmoigne, but tenure by divine service. Coke, in his 'Commentary on Littleton' (96, *b*) observes, 'for this divine service certain the lord hath his remedy, as it here appears by our author, in *foro seculari;* for here it appears that if the lord distrain for not doing of divine service, which is certain, he shall upon his avowry recover damages at the common law, that is, in the king's temporal court, for the not doing of it.'

The Act which abolished military tenures could not from its terms affect tenure in frankalmoigne; but for greater caution it was declared that this act should not subject tenures in frankalmoigne to any greater or other services. Tenure in frankalmoigne therefore is now exactly what it was before the 12th of Charles II. was passed. Church lands then, which are held in frankalmoigne, still owe no services; but the lord of whom they are held must be considered the owner. And this conclusion is consistent with and part of the law of tenure, by which no land in England is ever without an owner. Church land differs from land held by laymen in this, that the beneficial ownership can never revert to the lord, for all spiritual persons are of the nature of corporations, and when a parson dies, the corporation sole (as he is termed by an odd contradiction in terms) is not extinct, and it is the duty and right of some definite person to name a successor. It is stated by Blackstone (i. 470) that 'the law has wisely ordained that the parson, *quatenus* parson, shall never die any more than the king, by making him and his successors a corporation; by which means all the original rights of the parsonage are preserved entire to the successor: for the present incumbent and his predecessors who lived seven centuries ago, are in law one and the same person.' But notwithstanding this ingenious attempt to make a man, together with others not ascertained, a corporation, the difficulty really is, that when a parson dies, there is no person who has a legal ownership of the land until a successor is appointed, if Blackstone's theory is true. The comparison of the case of a parson with that of the king is unapt, for the successor to a deceased king is ascertained by the death of his predecessor; but the successor of a parson is generally ascertained by the will of some other person being exercised, and till the person entitled to appoint a parson has named one, and he has been duly instituted, the lands of the church have no legal owner, unless the lord is the owner. This seignory may be worth nothing, but it still exists. The difficulty may indeed be solved without the supposition of a seignory still existing, and in the following manner. There is succession in the case of one parson succeeding another, for which the notion of a corporation is not necessary. The notion of succession is this: the right which is the object of the succession, continues the same; the subject, that is, the person, changes. In order to constitute strict succession, the new ownership or right must begin at the moment when the former ceases, and the new ownership or right is derived from and founded on a former ownership or right. This is the case of succession to the crown. In the case of a parson, when a new one is appointed, his right by a fiction of law commences at the time when his predecessor's right ceased, though an interval has elapsed between the time of his predecessor's death and his own appointment; and this was the doctrine which the Romans applied to the case of a heres who did not take possession of the hereditas till some time after the death of the testator or intestate. This subject is discussed by Savigny, *System des Römischen Rechts*, &c., vol. iii. When then the parson dies, the freehold may be considered to be in abeyance till the appointment of his successor, one of the few instances in the English law in which it is said that a freehold estate can be in abeyance.

No seignory, in the sense above explained, can now be created except by the king. It was enacted by the statute Quia Emptores (18 Edw. I.), that all feoffments of land in fee simple must be so made that the feoffee must hold of the chief, that is, the immediate lord of the aliening tenant, by the same services by which the tenant held. Therefore all seignories exist now which existed at the time when the statute of Quia Emptores was passed. A lord may release the services to a tenant; but it would be consistent that the king could not release the services due to him, for if that were the case land might become allodial, and on the death of a person without heirs there might be land without an owner, which is inconsistent with the fundamental principles of law relating to English land. Still it is said that the king can release to his tenant all services, and yet that the tenant holds of him: by this assumption of a still subsisting tenure the consequence above mentioned is avoided.

Tenure of an imperfect kind may be created at present. Wherever a particular estate is created, it is held of the reversioner by an imperfect tenure: this is the common case of landlord and tenant. If no rent or other services are reserved from the tenant of the particular estate for life or years, the tenure is by fealty only, and he may be required to take the oath of fealty. But the right of the reversioner to whom services are due is solely incident to the reversion, and is created at the same time with it. The perfect tenure originated in the pure feudal system, in which the seignory of the lord was the legal ownership of the land, and the tenant owed his services for the enjoyment of it. The only perfect tenure now existing is Socage tenure, the services of which are certain, and consist, besides fealty, of some certain annual rent. [SOCAGE.]

The right of wardship was one of the incidents to military tenures. The lord had a right to the wardship of his infant tenant until he was twenty-one years of age; and this right was in many respects prejudicial to the interests of the heir. This right was abolished with the abolition of military tenures. The right of guardianship to an infant tenant in socage only continues to the age of fourteen; but the act of Charles II. (12, c. 24) gave a farther power by deed or will, executed as the statute prescribes, to appoint a guardian to any of his children till their full age of twenty-one, or for any less time. The guardian in socage was the next of kin to the heir, and he was chosen from that line, whether paternal or maternal, from which the lands had not descended to the heir, and consequently such guardian could never be the heir of the infant. This wardship then had no relation to tenure.

If the services due in respect of a perfect tenure are not rendered by the tenant to the lord, he may distrain, that is, take any chattels that are on the land in respect of which the services are due; and an imperfect tenure so far resembles a perfect one, that a reversioner can distrain for the services due from the tenant of the particular estate.

A right still incident to a seignory such as a subject may have is that of escheat, which happens when the tenant in fee-simple dies without leaving any heir to the land, and without having incurred any forfeiture to the crown, as for high treason. It has been observed that the acquisition by escheat is not a purchase, because the escheated land descends as the seignory would have descended. When lands are forfeited to the king for treason, or to the lord for petty treason or murder, the tenure is extinguished; and generally, in whatever way lands come to the king or lord, the tenure is of necessity extinguished.

The nature of tenure as it exists at present will be better understood by consulting the following articles: [Copyhold; Distress; Feudal System; Manor; Rent; Tenant.]

TEOS (Τέως), now called Búdrúm, a town of Ionia, situated on the south-side of the peninsula between the gulf of Smyrna and the gulf of Clazomenæ, very near Cape Courco, in 38° 15′ N. lat., 26° 30′ E. long. It was originally colonized by Minyæ from Orchomenus, under Athamas, and afterwards strengthened by a colony from Athens, at the time of the Ionian migration, under Nauclus the son of Codrus, Apœcus and Damasus, and by one from Bœotia led by Geres. (Pausan., vii. 3.) Teos was one of the twelve cities which formed the confederacy of the Panionium (Herod., i. 142), and was recommended by Thales from its central position as the place of congress for all the Ionian states. It was also one of the four cities of Ionia which participated in the Hellenium at Naucratis in Egypt in the time of Amasis. (Herod., ii. 178.) On the conquest of Ionia by Cyrus the Teians retired to Abdera in Thrace, where they founded a colony which eclipsed the parent state. (Herod., i. 168.) At the battle of Lade seventeen Teian ships are mentioned among the forces of the Greeks. Teos still existed as an Ionian city during the Peloponnesian war. The Teians revolted after the failure of the Sicilian expedition from the Athenians, and destroyed the wall which they had built towards the continent (Thucyd., viii. 16, 19); but Teos submitted shortly afterwards to Diomedon, the Athenian general.

Teos was the birth-place of Apellicon, the preserver of the works of Aristotle, and of Anacreon, to whom a statue was erected there (Pausan., i. 25), and who is represented on the coins of the place playing on his lyre. It appears from Livy (xxxvii. 28) that it had two ports, one in front of the city, and the other, Geræ, not quite four miles to the north-west, the entrance to which was so narrow as hardly to admit two ships at a time; it is now the site of the castle of Sigah-jik, whence a Sanják receives its name.

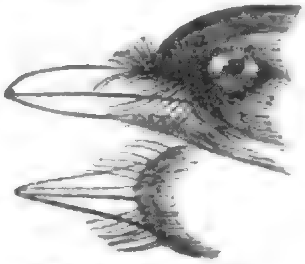
Chandler says of Teos, 'We found it almost as desolate as Erythræ and Clazomenæ. The walls, of which traces are extant, were, as we guessed, about 5 miles in circuit; the masonry handsome. It was with difficulty we discovered the temple of Bacchus; but a theatre in the side of the hill is more conspicuous. The vault only, on which the seats are ranged, remains, with two broken pedestals, in the area. The city port is partly dry, and sand-banks rise above the surface of the water. On the edge are vestiges of a wall, and before it are two small islets. On the left hand, or toward the continent, is a channel, which seemed artificial, the water not deep. The heap of the Temple of Bacchus, which was visible from the theatre beneath, on the right hand, lay in the middle of a corn-field, and is overrun with bushes and olive-trees. It was one of the most celebrated structures in Ionia. The remains of it have been engraved at the expense of the Society of Dilettanti, and published, with its history, in the "Ionian Antiquities" (i., ch. i.).' (*Travels in Asia Minor*, pp. 111-2; see also Choiseul Gouffier, *Voyage Pittoresque*, pl. 124.) This temple is an example of the eustylus of Vitruvius, who tells us that it was a monopterus hexastylus. It was the work of Hermogenes, the inventor of the eustylus, and is probably of the time of Alexander the Great. (Müller, *Archäologie der Kunst*, 109.) Leake (*Asia Minor*, p. 350) states the diameter of the columns to be 3 feet 8 inches at the base; he considers the whole length of the front to be about 64 feet on the upper step, with about 11 columns at the sides, as at Priene. According to Diodorus (iii. 65), the Teians believed that Bacchus was born there, and, on his account, their territory was asylus (ἄσυλος), that is, sacred or protected against violation. On the autonomous coins of Teos there are griffins, as on those of Abdera: perhaps this type is connected with the worship of Apollo. The imperial series extends from Augustus to Gallienus. (Mionnet, *Recueil des Médailles Antiques*.)

TEPHRODORNIS, Mr. Swainson's name for a genus of *Drongo Shrikes, Dicrurinæ*. [Shrikes, vol. xxi., p. 416.]

Generic Character.—Bill resembling *Prionops*; the base and the nostrils being partially covered with procumbent setaceous feathers and bristles. Wings moderate, rounded. Tail rather short, perfectly even. Tarsi and toes short; the lateral toes unequal; hinder toe longer than the tarsus. (Sw.)

Examples, *Tephrodornis superciliosus*, Sw., and *Tephrodornis Indica* (J. E. Gray). G. R. Gray (*Ind. Zool.*).

Locality.—Warm latitudes of the Old World.



Bill of Tephrodornis, Sw.

TEPHRO'SIA (from τεφρός, ash-coloured), the name of a genus of plants belonging to the papilionaceous division of the order Leguminosæ. The genus consists of shrubs or herbs, with usually unequally pinnated leaves, and lanceolate or subulate stipules distinct from the petiole. The flowers are white or purplish, arranged in racemes which are mostly axillary. The calyx is without bracts, 5-toothed, nearly equal; vexillum of corolla large, silky outside, and reflexed in a spreading manner; wings adherent to the keel; stamens separate or united in one or two parcels: legume mostly sessile, linear, compressed, many-seeded, with the valves flat; seeds compressed. This genus at present includes 84 species, but it is probable that a more accurate investigation will result in making several genera of the present one. The American and Asiatic species are in some measure distinguished by their properties. In the former a narcotic poison is more frequently secreted; in the latter a colouring-matter.

T. toxicaria, the poison Tephrosia, is a half-shrubby erect plant, with 18 to 20 pairs of oblong-lanceolate, obtuse leaflets, pubescent on the upper surface, silky beneath; legumes linear, velvety, mucronate. This plant is a native of the West Indies and of Cayenne, and is said by Tussac to have been first brought from Africa. The whole plant affords a narcotic poison, and if the leaves are taken and pounded, and then thrown into water where there are fish, they become intoxicated, and losing all power over their muscles, they float about as if dead, and may be easily caught. If placed in fresh water, or the fresh water be allowed to come in contact with them as in a stream, the fish soon recover. It is, however, generally fatal to the smaller fish.

T. Virginiana, the Virginian Tephrosia, is an erect herbaceous plant, with leaves containing from 8 to 11 pairs of oval-oblong acute leaflets, villous beneath; the calyx is also villous. It is a handsome plant with reddish flowers, and is covered with villi. It is found in woods on dry and sandy soils in North America from Canada to Florida. It is considered in America a powerful vermifuge. Several other species of Tephrosia are found in North America, and are abundant on dry and sandy soils, in Georgia, Florida, and the Carolinas.

T. emarginata is an arborescent plant, with tomentose branches, leaves with 14 pairs of linear-oblong deeply emarginated leaflets, and silky straightish legumes. It is a native of South America, and has been found about the mission-stations of the Orinoco. The root possesses the same properties as the T. toxicaria, and is also used for the purpose of poisoning fish.

T. tinctoria, the Ceylon Indigo, is a shrubby glabrous plant with five pairs of leaflets, silky and villous beneath; flowers purple or flesh-coloured, seated on axillary peduncles; straight, pendulous legumes. This plant is a native of Ceylon, where it is called *Anil*. Its tissue yields a blue colouring-matter, which has the same properties as the indigo, and is used in Ceylon for the same purposes. There are other plants used in Ceylon for dyeing, also called *Anil*.

T. piscatoria, the Fisher's Tephrosia, is a shrubby plant with five or six pairs of leaflets, which are pilose beneath, the peduncles are 2-edged, the legume straight, ascending, and rather villous. This plant is found in the East Indies, and also in the islands of the Pacific. It contains the narcotic principle of the genus, and is used in the East Indies for the same purpose as *T. toxicaria* is in the West Indies.

T. Apollinea is shrubby, and covered with a close pubescence; the leaflets are silky beneath, and in two or three pairs; the legume is 6- or 7-seeded, and rather pubescent. It is a native of Egypt, and yields a blue colouring-matter, which is used in dyeing.

T. Senna, Buga Senna, is a glabrous shrub, with leaves having six pairs of leaflets, and the legumes and calyxes covered with pubescence. It grows on the banks of the river Cauca, near Buga, in Popayan. Its leaves have a purgative quality like senna, and are used by the natives for the same purposes as that plant is used.

In the cultivation of these plants a mixture of loam and peat should be used. They may be easily propagated by seeds, or by young cuttings planted in sand, and covered with a bell-glass. Some of the species require the heat of a stove.

TEPIC. [MEXICAN STATES.]

TEPLITZ, TOEPLITZ, or TEPLICE, a town in the circle of Leitmeritz in the kingdom of Bohemia, celebrated for its warm sulphureous springs, is situated in 50° 38′ N. lat. and 13° 50′ E. long. The name is Slavonian, and given by the Bohemians and Croatians to warm springs in general. The tradition respecting the discovery of these springs is, that a servant of a Chevalier Kolastug, a vassal of Duke Przemysl, who resided in the neighbourhood, was one day driving the swine, when several of the animals perished in the hot springs. This is said to have happened in the year 792. This discovery induced the chevalier to build a castle, and many settlers were soon attracted by the salubrious properties of the water, so that a street (in Slavonian, *Alice*) was formed, which was called Tepla Alice, 'the warm street,' and by contraction Teplice, or Teplitz.

This small town, which has not above 2500 inhabitants, is situated on a stream called the Saubach, in a beautiful plain or valley four leagues in length and one in breadth, formed by the Erzgebirge and the Mittelgebirge. The town forms an irregular quadrangle, is about half a league in circuit, and has three gates. The principal buildings are —1, the palace of Prince Clary, to whom the town belongs, with an extensive garden and park open to the public, in which there is a ball-room and a pretty theatre; 2, the church of St. John the Baptist; 3, the townhall, built in 1806; 4, the chapel of the Cross, outside of one of the gates. The town is connected by a row of handsome houses with the village of Schönau. There are several springs both in the town and in Schönau, each of which supplies several public and private baths distributed in different establishments. 'The quantity of water which the principal spring yields,' says Dr. Granville, 'is truly marvellous, being not less than a thousand large pailfuls, or one million one hundred and eighty-nine thousand six hundred and seventy cubic inches in an hour.' The temperature of these springs is said to have increased within the last forty years from 117° to 122° Fahrenheit, which is the present temperature of the chief spring. The medicinal effects of the hot springs of Teplitz are allowed by all physicians acquainted with them to be very beneficial in cases of suppressed gout, chronic rheumatism, diseases of the joints, contracted limbs, old wounds, obstinate cutaneous eruptions, paralytic affections, to which Dr. Granville adds, 'that the specific virtue of these baths lies in the power they possess of restoring a cripple, it matters little from what cause, to perfect motion and elasticity.' The waters have been used almost exclusively for bathing; of late they have been recommended and used internally. Prince Clary has spared neither pains nor expense to render the place worthy of the patronage of the kings and princes who habitually visit it, some of whom have built palaces for themselves and public hospitals for their invalid soldiers. The number of visitors every year is from 4500 to 5000. Besides the attraction of its waters, it may be added that the expense of living at Teplitz is far less than in any other watering-place in Germany, that the private baths are fitted up in a manner unquestionably superior to those of any other Spa in that country, and that there are ample sources of recreation and amusement without gaming, which is wholly prohibited.

(Jenny, *Handbuch für Reisende in dem Oesterreichischen Kaiserstaate*; *Die Oesterreichische National Encyclopädie*; *Conversations Lexicon*; Dr. Granville, *The Spas of Germany*.)

TEPTIARES. [RUSSIAN EMPIRE.]

TEQUENDAMA. [GRANADA, NEW.]

TE'RAMO, PROVINCIA DI, called also Abruzzo Ultra I., is an administrative division of the Abruzzi in the kingdom of Naples, stretching east of the great Apennine ridge, and sloping down to the Adriatic sea. It is bounded on the east by the Adriatic, north by the Papal province of Fermo and Ascoli, west by the Neapolitan province of Aquila, and south by that of Chieti. The principal rivers are the Tronto, which marks the boundary between it and the Papal State, the Tordino, which flows by the town of Teramo, and the Vomano, whose several sources flow from the eastern slope of Monte Corno, called also the 'Gran Sasso d'Italia,' the highest group of the Apennines (9500 feet above the sea), which rises on the borders of the provinces of Teramo and Aquila, occupying great part of the area of both. The river Pescara, in its lower course, marks the boundary between the province of Teramo and that of Chieti.

The province of Teramo is divided into two administrative districts, Teramo and Penne, containing seventy-two communes: the whole population amounted in 1837 to 200,719 inhabitants. (Serristori, *Statistica d'Italia*.) The area is estimated at about 1000 square miles. Most of the population are employed in agriculture. There are some manufactories of silk, delft ware, liquorice, paper, cream of tartar, and leather; copper-ore is dug, and smelted and worked at Chiarino. The principal towns are, 1, Teramo, a bishop's see, the chief town of the province, and the residence of the intendente or king's lieutenant; it has a tribunale civile, or court of first instance, and a 'Gran Corte Criminale;' a royal college, a clerical seminary, several churches and convents, and about 8000 inhabitants. The surrounding country is productive in corn, fruit, and pulse. 2, Penne, or Cività di Penne, is a town with about 6000 inhabitants. 3, Civitella del Tronto, a small fortified town on the frontier of the Papal State. 4, Atri, a small town which gives the title of duke to the antient family of Acquaviva. (Petroni, *Censimento dei Reali dominj di qua del Faro*; Neigebaur, *Gemälde Italiens*.)

TE'RAPHIM (תְּרָפִים; Sept., εἴδωλα). This is a word of somewhat uncertain etymology and signification. That the teraphim were of human form seems evident from 1 *Sam.*, xix. 13. They appear to have been superstitiously, if not idolatrously, reverenced as penates, or household gods (*Gen.*, xxxi. 19, 34, 35; 1 *Sam.*, xix. 13-17; 2 *Kings*, xxiii. 24). In some shape or other they were used as domestic oracles (comp. *Zech.*, x. 2; *Judg.*, xvii. 5; xviii. 5, 6, 14-20; *Hos.*, iii. 4). This is confirmed by 1 *Sam.*, xv. 23, where teraphim are mentioned in connection with the arts of divination. With this the alleged Syriac etymology of the word coincides; for, according to Bar Bahlul, תרף means in that language, *an inquirer, one who asks.*

TERBURGH, GERARD, a very eminent painter of scenes of domestic life of the higher classes of society, was born at Zwoll, near Overyssel, in the year 1608, and was instructed in the rudiments of his art by his father, who is not much known as a painter, but appears to have passed some years at Rome. Some think that he perfected himself under another master at Haarlem; however this may be, he had acquired considerable reputation in the Netherlands as a painter of portraits of a small size, before he resolved to travel for his improvement. He first visited Italy; but whatever advantage he may have derived from the works of the great Italian masters, he never changed his style, and proceeding from Italy to France, practised with great success at Paris. From France he returned to Holland, where he was highly esteemed and fully employed. He visited Münster during the sitting of the celebrated congress at which the treaty that terminated the Thirty Years' War was concluded. Here he painted his most celebrated picture, containing the portraits of the sixty-nine plenipotentiaries assembled on that important occasion. Count Pigoranda, the Spanish ambassador at Münster, induced him to visit Spain, where he painted the portraits of king Philip IV. and all the royal family, and of many of the most distinguished nobility. His performances gave such satisfaction to the Spanish king, that he conferred on him the honour of knighthood, and presented him with a gold chain and medal, a sword, and silver spurs. After finally returning to his own country he married, and was made burgomaster of the town of Deventer, where he lived in affluence, and died in 1681, at the age of seventy-three years.

The subjects which Terburgh generally painted were portraits, conversations, persons engaged at different games, performers on musical instruments, ladies at their toilets. He finished his pictures highly, with a light and delicate touch, and is remarkable for introducing white satin in the dress of some figure in all his compositions: he always took care to throw the principal light upon it, and seems never to have painted a picture without satin drapery. Dr. Waagen says of him, 'Terburgh is the real founder of the art of painting conversation pieces, and at the same time the most eminent master in this style. In delicacy of execution he is inferior to none, and in a certain tender fusing of the colours he excels all others; but none can be compared with him in the enchanting harmony and silvery tone, and the observance of the aërial perspective. His figures, which are well drawn, have an uncommon ease of refinement, and are frequently very graceful.' Many of his capital works are in England, in the collections of Sir Robert Peel, the duke of Sutherland, Lord Ashburton, Mr. Hope, the marquess of Bute, and Her Majesty. (Pilkington; Fuseli; Dr. Waagen.)

TERCEIRA is considered the principal island of the Azores or Western Islands, though it is neither the largest nor the most fertile. It is situated nearly in the centre of the group, and it is the seat of government. It extends between 38° 36′ and 38° 50′ N. lat., and between 26° 58′ and 27° 22′ W. long., and is about 20 miles long from east to west, with an average width of about 13 miles. This gives an area of 260 square miles, or about 60 square miles more than the smallest of the English counties, Rutlandshire.

Terceira, and all the other Azores, with the exception of Santa Maria, has probably been produced by volcanic action, but its surface does not exhibit that extreme irregularity which occurs in the other islands, and in general in countries which owe their existence to that agency. The coasts indeed are rocky and precipitous, but the higher parts of the island are chiefly composed of beautiful and fertile plains, and entirely destitute of the numerous cones, craters, and peaks which distinguish the island of St. Michael. There is however, about 6 or 7 miles north-west of the town of Angra, a wide depression, from the crevices of which sulphuric vapours issue in abundance, and which is surrounded by hills composed of pumice-stone. It is called Furnas de Euxofre. It is stated that these crevices were formed by the earthquake of 1614, which was the last experienced in the island, up to 1841, when the town of Praya was completely destroyed by an earthquake, and the whole island suffered much. The interior of the island does not contain many steep or inaccessible rocks, which is mainly to be attributed to the earth-slips which have been very frequent, and still happen from time to time. The most elevated part of the island is in the middle, and extends from east to west, where it terminates with Punta Seretta. Near this cape, and north-east of it, the ground seems to attain its greatest elevation, which however probably does not exceed 3000 feet above the sea-level. The elevated rocky coast along the western and northern shores cannot be approached without great danger by large vessels, and the whole island has only three harbours, Praya on the east, Angra on the south, and Biscoitos on the north-west, but the anchorage is bad, and with certain winds vessels are obliged to seek the open sea. The soil is composed of volcanic ashes, pumice-stone, slags, decomposed lava, a quantity of ferruginous matter, a small portion of clay or sand, and a little limestone. But a large quantity of vegetable matter is mixed with these materials, which imparts to the soil a considerable degree of fertility. Grain is only cultivated on the more level and low tracts along the sea-coast. The interior is overgrown with trees.

No meteorological observations have been published, but the climate is known to be very moderate, as it is stated that the average range of the thermometer is only from 50° to 75°, and rarely exceeds these two extremes. But the weather is nevertheless subject to great changes, and is only settled between the summer solstice and the autumnal equinox. Showers of rain are frequent throughout the year, and in winter so violent as to cause constant changes in the face of the country, washing away enormous masses of pumice-stone from the mountains, throwing down projecting portions of the rocks composed of soft volcanic materials, and leaving the surface of the rocks and heights in many places quite destitute of soil. The number of fine days is estimated at about 200, and the wet ones at sixty. The sea which surrounds the Azores is remarkable for the incessant gusts and gales to which it is subject, on which account it is rather dreaded by seamen. This phenomenon is probably connected with the Gulf-stream, which reaches the most western islands (Flores and Corvo), and frequently extends over the whole group. All navigators have observed the frequency of these gusts and sudden squalls, especially along the northern edge of the Gulf-stream. The prevailing winds during the winter range between north-west and south-west; the south-west wind generally blows in strong gales, and is attended by heavy rains. During the summer the most frequent are northerly, north-easterly, and easterly winds; but at all seasons the changes of the winds are frequent and sudden, and render the navigation between the islands very tedious.

The soil being more suitable to agriculture and pasturage than to the cultivation of fruit, grain and cattle are the staple articles. The principal objects of cultivation are wheat, Indian corn, flax, French and broad beans, and a little barley. The yearly produce of the grain is stated to be 720,000 bushels, and some is exported to Lisbon, Oporto, and Madeira. The most common vegetables are yams, potatoes, sweet potatoes, onions, and capsicums. All the fruit-trees of southern Europe succeed, but their cultivation has been neglected until lately, when the inhabitants have begun to apply themselves to that of the orange-tree, and the oranges of Terceira are now hardly inferior to those of St. Michael, and are largely exported to England and Hamburg. The vineyards are extensive, and their annual produce exceeds 4000 pipes, but the wine is converted into brandy, and the wine consumed in the island is imported from Fayal. The apples, pears, figs, chestnuts, and wallnuts are tolerably good. On the declivities there are some pine-woods and beech, but the higher parts are covered with underwood and impenetrable bushes of briars, among which are many evergreens, such as myrtle, juniper, and box, with stunted cedars. Quantities of orchilla are collected from the rocks. Cattle are numerous, and of good size in the cultivated parts, and those parts which are not cultivated serve as pasture-grounds for sheep and goats. Goats are rather numerous. Only a few small horses are reared; the oxen and asses, which are numerous, are used as beasts of burden. Hogs are very numerous, and are fed on Indian corn and chestnuts. There are no wild animals, except rabbits, and no poisonous reptiles. Fowls and turkeys abound. There are thousands of blackbirds, woodcocks, and partridges, but no pheasants nor peacocks. Fish is said to be abundant. Sometimes whales are seen near the island.

In 1820 the population amounted to 40,717, and in 1832 it was estimated at 50,000 individuals, which gives more than 192 persons to each square mile, rather a large proportion when it is considered that much more than half the island is not cultivated and does not produce food for man. Lincolnshire has only 130 to each square mile, according to the census of 1841. This population is settled in three towns and fifteen villages. Angra is the capital. [ANGRA.] Praya, which has about 3000 inhabitants, is situated in the centre of a beautiful sandy, deep, indented bay, well defended by nature and art, and has some commerce with Portugal and Madeira: it exports grain and live-stock.

Very good linen and coarse woollen-cloth is made on the island for home consumption. Coarse earthenware is also manufactured to a considerable extent, the clay for which is imported from Santa Maria. The exports consist of grain and live-stock, which go to Portugal and Madeira, and of brandy, oranges, and orchilla, which go to foreign countries, chiefly England and Hamburg. The imports are principally coarse cotton fabrics, some woollen-cloth, hardware and cutlery, and cod, most of which articles are brought from England.

Terceira was discovered in 1445 by some Portuguese navigators who were returning to Europe from Cape Verde, and it then received its present appellation, being the third of the Azores in the order of discovery. It was then uninhabited, but it was immediately settled by several families from Portugal. In 1580, when Philip II. took possession of Portugal, the inhabitants declared against him, and repulsed his fleet from their shores; but in 1583 they were obliged to submit. In 1828, when Don Miguel had abolished the constitutional government of Portugal, and proclaimed himself absolute king, Terceira declared for Donna Maria; and, in 1829, a large fleet and army sent by Don Miguel for the conquest of the island were repulsed with great loss from the town of Praya. In 1831 the other islands of the group were recovered for Donna Maria by a small number of troops sent there from Terceira.

(Ashe's *History of the Azores* or *Western Islands;* Von Buch's *Physikalische Beschreibung der Canarischen Inseln;* Fowler's *Journal of a Tour in the State of New York, and Return to England by the Western Islands;* Boid's *Description of the Azores or Western Islands;* and Capt. Bartholomew, in *London Geographical Journal*, vol. iv.)

TEREBELLA. [Tubicolidæ.] (N.B. This comes too near to *Terebellum.*)

TEREBELLA'RIA, a genus of Polypiaria, included by Blainville in the family of Milleporæa.

TEREBELLUM, Lamarck's name for a genus of testaceous mollusks, placed by Cuvier among his Pectinibranchiate Gastropods, between *Ovula* and *Voluta;* by De Blainville among his *Angyostomata*, between *Conus* and *Oliva;* and by Rang between *Mitra* and *Ancillaria.*

The fossil *Terebellum convolutum* is the type of Montfort's genus *Seraphs.*

Generic Character.—Animal?

Shell delicate, polished, subcylindrical, rolled upon itself; the apex pointed; the aperture longitudinal and triangular, very narrow behind and notched before; edge of the right lip simple and trenchant; columellar border smooth, truncated, and slightly prolonged forwards.

There appears to be but one recent species known, *Terebellum subulatum.*

De Blainville divides the genus into two sections:—

A. Species whose spire is visible, and whose aperture is shorter than the shell. (*Terebellum.*)

B. Species whose spire is nearly entirely hid by the rolling up of the whorls of the spire, and whose aperture is nearly as long as the shell. (*Seraphs*, fossil.)

Example, *Terebellum subulatum.*

Description.—Shell subulate-cylindrical, rather thin, smooth, and polished; the spire distinct; the outer lip attached to the columella.

There are at least four varieties:—

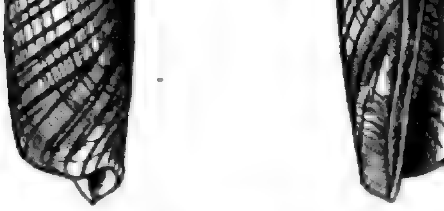
A. Clouded with chestnut, quadrifasciate, or with the colour in patches.

B. Ornamented with flexuous subspiral or transversely oblique chestnut lines.

C. Thickly dotted with rich chestnut.

D. Entirely white.

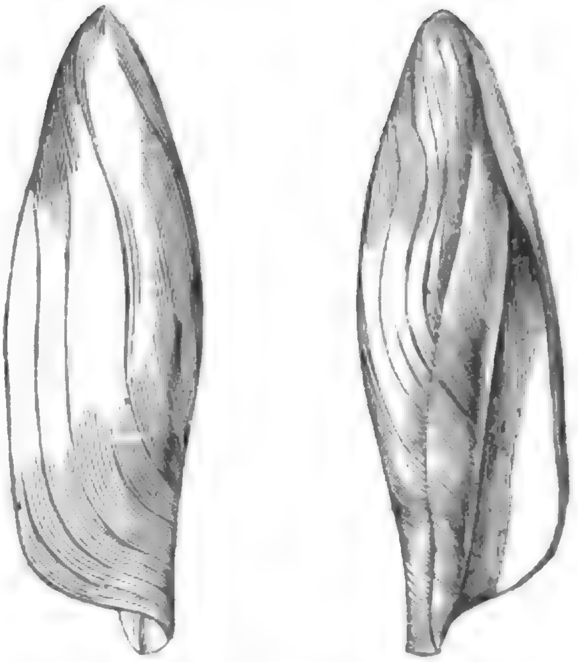
***Locality.*—The East Indies.**



Terebellum subulatum.

Fossil Terebella.

The fossil species appear to belong to the Tertiary formation, Eocene period of Lyell (Grignon, &c.). M. Deshayes, in his Tables, notices but two, *Terebella convolutum* and *fusiforme*, the same that are recorded by Lamarck.



Terebellum convolutum. (Genus *Seraphs* of Montfort.)

TEREBINTA'CEÆ, a natural order of dicotyledonous plants. They are trees or shrubs, abounding in a resinous gummy, caustic, poisonous, and sometimes milky juice. The leaves are alternate and simple, ternate, or pinnate. The flowers are terminal or axillary, mostly unisexual. The calyx is small. The petals and stamens are equal in number to the divisions of the calyx; sometimes the stamens are twice the number; the disk is fleshy; ovary simple; fruit indehiscent, with a single exalbuminous seed.

This order was constituted by Jussieu, and is adopted by De Candolle, Arnott, Don, and other writers on systematic botany. Brown has however constructed five orders from this, viz., Anacardiaceæ, Burseraceæ, Connaraceæ, Spondiaceæ, and Amyridaceæ. These orders have been recognised by Kunth, Lindley, and others; and their characters and properties are given in this work under their respective names. [Anacardiaceæ; Burseraceæ; Connaraceæ; Spondiaceæ; Amyrideæ.]

TE'REBRA. [Entomostomata, vol. ix., p. 453.]

TEREBRA'LIA, Mr. Swainson's name for a genus of testaceous Gastropods, arranged by him under the *Cerithinæ*, the fifth subfamily of his *Strombidæ*, and thus characterized:—

Outer lip much dilated, generally uniting at its base to the inner lip, leaving a round perforation at the base of the pillar; channel truncate, operculum round. (*Malacology.*)

Mr. Swainson places the genus between *Pirena* [Melanopsis] and *Rhinoclaris*, Sw.; and, among other species, refers to *Terebralia Telescopium*, *Cerithium Telescopium* of authors. [Entomostomata, vol. ix., p. 451.]

Whatever may be thought of this genus, the name, from its coming so near to *Terebra*, may produce confusion.

The reasons for not admitting *Pirena* as a genus will be found in the article Melanopsis.

TEREBRA'TULA. [Brachiopoda, vol. v., p. 311.]

TEREDI'NA, a testaceous mollusk of the family *Tubicolæ* of Lamarck, and belonging to the *Adesmacea* of De Blainville.

Generic Character.—Valves equal, but inequilateral; umbones prominent; when closed, orb-like with a wide angular opening in front and a subcircular aperture at the back. Tube testaceous, subcylindrical, with a terminal posterior extremity, without any septum, uniting to the posterior part of the two valves.

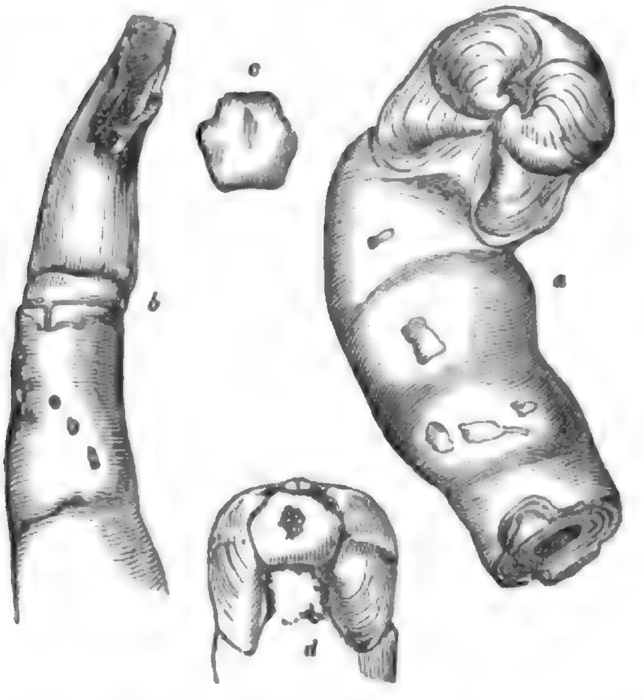
This genus is fossil only. Lamarck places it between *Septaria* [Teredo] and *Teredo;* Cuvier between Fistulana and Clavagella.

Mr. Swainson arranges it in his family *Pholidæ*, and makes it a subgenus of *Teredo.*

Mr. J. E. Gray places *Teredina* among the *Pholadæ* between *Jouannetia* and *Teredo.*

M. Deshayes, in the last edition of Lamarck, observes that this curious genus was not well known to that zoologist. The *Teredina*, M. Deshayes remarks, is a [illegible] globular **Pholas** fixed at the end of a tube, and has in fact the exterior characters of the *Pholades*. It carries an escutcheon on the umbones, and within it is provided with those appendages which so readily distinguish the *Teredines* and the *Pholades* from other genera. The shell is always external, and soldered by the posterior extremity of its valves to the anterior part of the tube, which is very thick and terminated by a blackish part of a horny appearance, whose internal surface is sometimes divided into eight regular carinations.

M. Deshayes, in his Tables, gives two species, *Teredina personata* and a new species, both from the tertiary beds (Eocene of Lyell). In the last edition of Lamarck no notice is taken of the new species, and to the second species, *Teredina bacillum*, recorded by Lamarck, is appended a note stating that this last does not belong to the genus *Teredina;* and that, according to the description and figure of Brocchi, it can only be a *Clavagella* or a *Fistulana;* but that it is not *Clavagella tibialis*, as M. de Blainville believed.



Teredina personata. (Courtagnon, &c.)

a, tube with valves; *b*, the other termination of the tube; *c*, accessory valve; *d*, valves with accessory valve in its place. (G. B. Sowerby.)

TERE'DO, the name given by Linnæus to a genus of testaceous mollusks, highly interesting on account of the ravages which one of the species commits upon submerged wood.

Linnæus, in the twelfth edition of the 'Systema Naturæ,' placed the genus among his *Vermes testacea*, between *Serpula* and *Sabella:* nor is this certainly inapt position to be wondered at when we consider the very infant state of malacology in his day.

Cuvier, in his last edition of the 'Règne Animal,' makes *Teredo* one of the genera of his *Enfermés*, the fifth family of his *Acephalous Testaceans*, arranging the genus between *Pholas* and *Fistulana*.

M. de Blainville arranges the genus in the tenth family (*Adesmacea*) of his *Pyloridians*, between *Teredina* and *Fistulana*, immediately after which comes *Septaria*.

Lamarck had placed the genus among his *Tubicolées*, and M. Rang adopts that arrangement, giving it a position however between *Jouannetia* and *Fistulana*, next to which, and immediately before **Teredina**, *Septaria* appears.

Lamarck ended with this genus his *Tubicolées*, which are immediately followed by the *Pholadaires*. *Teredo* is immediately preceded by *Teredina*, and this again by *Septaria*. In speaking of the last-named genus, M. Deshayes, in the last edition of Lamarck, observes that although the animal and the shell of *Septaria* are not known to him, the great portions of its testaceous tube or sheath, which he had seen, convinced him that the animal is analogous to that of the *Fistulanæ*, which differ from it principally in size only; and because its two anterior siphons are very long, and form for themselves each a particular testaceous sheath. The animal ought therefore to have posteriorily, he remarks, a bivalve shell, which had escaped those who have collected the great tube, or the portions of it which we see in cabinets. M. Deshayes goes on to state that he has only seen a few septa, unequally distant and entirely incomplete. Some *Fistulanæ*, he adds, have also vaulted septa in the posterior part of their sheath; but the diminished or anterior part of this offers only particular tubes projecting outwards (1835).

Again, when Lamarck concludes *his* observations by saying that, for the rest, the *Septaria* is hardly anything but an exaggerated *Fistulana*, and scarcely deserves to be distinguished as a genus, M. Deshayes declares that if we substitute for the word *Fistulana* that of *Teredo*, these remarks would be perfectly just. This genus, he adds (Lamarck's *Septaria*), which had been believed to be peculiar to the seas of India, has been found some years since in the Mediterranean; and he refers to the paper published on that animal in the 'Annales des Sciences et de l'Industrie du Midi de la France,' Marseille, 1832, by M. Mathéron, in which that naturalist proves the animal of *Septaria* to be similar to that of *Teredo;* and this resemblance, says M. Deshayes, in conclusion, confirms his own opinion of the necessity of uniting the *Septariæ* and the *Teredines*.

Mr. Swainson (*Malacology*, 1840) places *Teredo* with the subgenera *Teredo* and *Teredina*, at the end of the '*Pholidæ*.'

Mr. J. E. Gray arranges *Teredo* between *Teredina* and *Bankia*, under his *Pholadæ*, the first family of his second order (*Cladopoda*) of *Conchifera*. *Septaria* is introduced, with a query, into his second family, *Gastrochænidæ*.

Organization.

It is now 36 years since Sir Everard (then Mr.) Home laid before the Royal Society, with the assistance of Mr. Clift in making the drawings, and the aid of Sir Benjamin (then Mr.) Brodie, his *Observations on the Shell of the Sea-Worm found on the Coast of Sumatra, proving it to belong to a Species of Teredo, with an account of the Anatomy of the Teredo Navalis.* Sir Everard remarks that the internal structure and economy of *Teredines* were so little known, and so much of what was said of them by Sellius was so vague, that it became necessary to acquire an accurate knowledge of the common *Teredo navalis*, before any adequate idea could be formed of the new species, which he names *Teredo gigantea*.

On examining the shell of *Teredo navalis* while in the wood, Sir Everard found its external orifice very small, just large enough, in fact, to give a passage to the two small tubes. The greatest thickness observed was $\frac{1}{24}$ of an inch. The canal in the wood at its termination, and for an inch in length, was not lined with shell, but smeared over with a dirty green-coloured mucus, which was also spread upon the last-formed portion of shell. According to Mr. Hatchett's analysis, the shell of *Teredo navalis* was perfectly similar to that of *Teredo gigantea*, being devoid of phosphate of lime, and composed of 97 parts of carbonate of lime and 3 of animal matter.

While the animal was in the shell alive and undisturbed, what is termed the head was in contact with the end of the canal in the wood; but, on laying the head bare, it was drawn in for an inch into the shell. The body of the animal filled the area of the shell completely, but appeared much smaller when taken out, in consequence of the sea-water which it contained having escaped. The largest of the worms examined which were of different lengths measured 8 inches in length. Many of them were alive 24 hours after being removed from their shell, and in these the heart was seen to palpitate. The blood in the vessels going to the head was red, as also the parts near the liver; but this colour disappeared soon after death.

The head of the worm was enclosed between the two concave boring shells, so that what Sir Everard calls the face was the only part exposed. These shells were united together on what is termed the back part of the head by a very strong digastric muscle, having a middle tendon from which the fibres go off in a somewhat radiated direction, partly for insertion into the concave surface of each shell, and partly into a long semicircular process projecting from the posterior part of each shell. The two inclose the œsophagus and other parts surrounding it. The double muscle was inclosed in a smooth shining fascia. When first exposed it was of a bright red.

On the opposite side of the head the shells were united by a ligament from which they were readily separated; at this part were two small tooth-like processes, one from the narrow edge of each shell, where they were joined together.

From the middle of the exposed part of the head projected a kind of proboscis; which in the living animal had a vermicular motion: its extremity was covered by a cuticle not unlike the cornea of the eye. On removing this, the cavity immediately beneath it was found to contain a hard brown-coloured gelatinous substance, like a Florence flask, with the large end uppermost in form. Sir Everard remarks that as this proboscis has no orifice, there is reason to believe that it adheres to the wood, acting as a centre-bit, while the animal is at work with the shell, and thus the canal in the wood is perfectly cylindrical. The mouth was nearly concealed by the projection of the proboscis, but, when exposed, presented a very distinct round orifice between the proboscis and the large digastric muscle.

'The body of the worm,' proceeds Sir Everard, 'is inclosed in one general covering, extending from the base of the boring shell, with which it is firmly connected to the root of the two small tubes, which appear out of the wood. It terminates in a small double fold forming a cup, on the inside of which are fixed the long small stems of two opercula, which become broad and flat towards their other extremity. These, when brought together, shut up the shell, and inclose the two contracted tubes within it: not one operculum corresponding to each tube, but in a transverse direction. In the *Teredo gigantea*, the opercula are similarly situated, each shutting up one-half of the bifurcation. At the base of this cup the general covering is thick and ligamentous, for about one-fourth of an inch in length, where the stems of the opercula are connected with it; and at one spot of this thickened part there is an adhesion to the cylindrical shell, which is the only part of the animal connected with it. There is a depression in the shell pointing out this spot. The double fold of the outer covering, that forms the cup, contains the sphincter muscle, which closes the orifice by bringing the opercula together. The general covering is composed of two membranes, the outer the strongest, and made up of circular fibres, the inner much finer, having no fibrous structure. On the back of the animal, this covering is firmly connected to the parts underneath, and is there strongest. On the belly it forms a cavity, and is thinner. It is everywhere sufficiently transparent to show the different viscera through it.'

Sir Everard Home began his dissection by dividing this covering and exposing its cavity, into which there are two natural openings: one, that of the largest of the above-described tubes, by which it receives the water from the sea; the other, a transverse slit under the union of the boring shells, one-quarter of an inch long, opening into the space before the mouth. The author states that the smaller tube has no communication with this cavity, and that there is none between this cavity and that of the belly, the viscera having a proper covering of their own: the breathing organs however, which are attached on the posterior surface of this cavity, are described as having their fringed edge loose and exposed to the influence of the salt water; so that the larger tube is constantly applying salt water to them, and conveying it to the animal's mouth through the aperture for that purpose.

Digestive System.—The head and abdominal viscera were found to occupy about one-third of the animal's length, the breathing organs another third, and the space between their termination and the ends of the small tubes the remaining third. The œsophagus was very short, lying on the left side of the neck. On the right were two large approximated glands connected with its coat. The œsophagus gradually swelling out became stomach, which externally appeared as a large bag, extending the whole length of the abdomen; the intestine commenced close to the termination of the œsophagus; but when the stomach was laid open, a septum appeared dividing it into two distinct bags, except at the lower end, where they communicate. It may therefore be said, observes Sir Everard, to be doubled on itself. In those worms which were examined alive, the stomachs were quite empty; but in some preserved specimens the contents were a yellow-coloured pulp, of which we shall have to say more presently: the quantity in a specimen from the British Museum was about 10 grains.

The intestine was very small, and became dilated into a cavity, containing a hard, white, globular body, of the size of a large pin's head, and then made a turn upon itself. Here the liver is attached to the stomach, to which it firmly adheres. The gut passed forwards till it reached the central line of the stomach, opposite the septum and continued its course along that viscus, passing round its lower end and up again on the opposite side. It was then continued on one side of the œsophagus nearly as high as the mouth, where it was reflected over the middle tendon of the digastric muscle of the boring shells, and ran along the back of the animal, till it terminated in the small tube through which its contents are emptied.

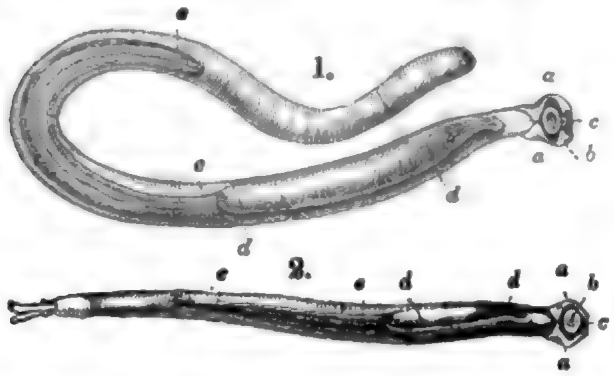
Circulating and Respiratory System.—The heart was found in the middle between the mouth and the lower end of the stomach, and was situated on the back of the animal. There were two auricles, composed of a thin dark-coloured membrane, which opened by contracted valvular orifices into two white strong tubes, which united to form the ventricle. This ventricle, Sir Everard observes, may be said to be continued into an artery, which supplies the viscera, and ascends to the muscles of the two boring shells. The heart was very loosely connected to the surrounding parts; its action was distinctly seen through the external covering, and was observed, in some instances, after it had been laid bare. The first contraction was in the two auricles, which shortened themselves in that action. A swelling of the ventricle, followed by a contraction, is thus produced. Sir Everard found that the artery from the ventricle could be traced up to the head, and the vessels from the auricles were seen very distinctly as far as the breathing organs. The auricles were lined with a black pigment, so that their contents could not be seen through them; and the coats of the ventricle were too thick for transparency: but the muscle of the boring-shells was of a red colour, as well as the liver, and most of the surrounding parts between the heart and the head.

Sir Everard observes, that this structure of the heart admits only of a single circulation, as in other animals which breathe through the medium of water, but that the mode of its being performed is different from that in fishes: in the *Teredines*, he remarks, the blood passes directly from the heart to the different parts of the body, and returns through the vessels of the breathing organs to the heart, while in fishes it goes first to the breathing organs, and then to the different parts of the body. This peculiar circulation, he adds, becomes a link in the gradation of the modes of exposing the blood to the air in different animals: it appears to be less perfect than in fishes, since the exposure to the air is carried on more slowly, but is more perfect than in caterpillars.

Brain and Nervous System.—Sir Everard doubts not the existence of the brain and nerves in animals so perfect in their organs as the *Teredines*, but he failed to detect them during his investigation.

Generative System.—Sir Everard Home describes the testicles as two long glandular substances, one on each side of the stomach, of a whitish colour and granulated structure. From each of them a duct passed to the ovaria, which lay between the two breathing organs. The ducts ran upon their outer edge, and terminated near the base of the small tube. In this way, he remarks, the eggs are impregnated before they pass out at that orifice. In the worms from Sheerness, examined in February, the testicles were small, and no appearance of ovaria could be seen; but in specimens from the Hunterian Museum the testicles were much fuller, and the ovaria formed two distinct longitudinal ridges: these, when examined under the microscope, were seen to contain innumerable small eggs. When the ovaria are empty, Sir Everard states that there is nothing to be found between the two breathing organs but the small seminal vessels. He then adverts to the statement of Sellius, who says that the *Teredo navalis* has its ovaria full of eggs in the spring and summer; that they are met with as late as December; but that those individuals which he examined in February had their ovaria flaccid and empty.

With regard to *Teredo gigantea*, the same author observes that, when arrived at its full growth, it closes up the end of its shell, and so does *Teredo navalis*. Sellius believed that the animal by this act formed its own tomb, since it could no longer destroy the wood in which it was contained. Sir Everard however remarks that in *Teredo gigantea* death is not a consequence of seclusion from the substance in which it is imbedded. In some of Mr. Griffiths's specimens the shell was just covered in, and the part close to the termination extremely thin, whilst in others it was increased twenty-fold in thickness. In others again the shell had not only become thick, but the animal had receded from its first inclosure, and had formed a second three inches up the tube, and afterwards a third two inches further on, and had made the sides thicker and thicker, so as to diminish the canal in proportion to the diminution of its own size.



Animal of Teredo navalis out of the shell.

1. the opercula are wanting, and the tubes retracted. 2 the opercula in their situation, and the tubes protruded. *a*, *a*, the boring shells; *b*, the proboscis; *c*, the mouth; *d*, *d*, the contents of the abdomen seen through the transparent external covering; *e*, *e*, breathing organs seen in the same way. (*Phil. Trans.*)

Sir Everard considers these facts as proving that *Teredo gigantea*, when arrived at its full growth, or whenever it is prevented from increasing in length, closes up the end of its shell, and lives a long time afterwards, furnished with food from the sea-water. *Teredo navalis*, he observes, closes up its shell in the same manner: it must therefore, after that period, be supplied with food entirely through the medium of sea-water. The *Teredines*, he adds, turn round in the shell, to which they are not attached, and with which their covering only has a slight connection at one particular spot, to prevent the external tubes from being disturbed. This motion, Sir Everard observes, is for the purpose of boring.

Generic Character.—Animal very much elongated, vermiform, with a very delicate mantle, open in front and at its lower part for the passage of a mammiliform foot; tubes separated, very short, especially that for the dejections; mouth small; labial appendages short; anus situated at the extremity of a small tube floating in the cavity of the mantle; branchiæ riband-like, united on the same line throughout their length, and a little prolonged in the siphon; a muscular ring at the point of junction of the mantle and the tubes, in which is implanted a pair of pediculated corneo-calcareous appendages or palmules, playing laterally one against the other.

Shell rather thick, very short, annular, equally open before and behind; equivalve, inequilateral, angular, with triangular valves, trenchant in front, and only touching each other by the two opposite edges; no hinge; an elongated, nearly straight, subfiliform, spoon-shaped process; a single slightly-marked muscular impression.

Tube cylindrical, straight or flexuous, closed with age at the buccal extremity, so as to envelope the animal and its shell, always open at the other, and lining the cavity into which the animal has introduced itself.

Such is M. Rang's definition of *Teredo*, excluding *Teredo gigantea* (*Septaria*), of which he gives the following definition, observing that it closely approximates to the *Teredines* and *Fistulanæ*:—

Animal unknown. (But see the paper of M. Mathéron above referred to.)

Shell unknown. (But see the descriptions of Mr. Griffiths and Sir Everard Home here noticed.)

Tube calcareous, thick, solid, in the shape of a very elongated cone, and irregularly flexuous, furnished internally with small, incomplete, annuliform septa; terminated at one of its extremities by a convexity, and at the other by two slender and separated tubes.

The number of species of *Teredo* (exclusive of *Septaria*) recorded by Lamarck in the 'Animaux sans Vertèbres' (1818) were two, *Teredo navalis* and *Teredo palmulatus*: of the latter Lamarck, who had seen neither its tube nor its shell, says that it probably only differs from *Teredo navalis* in its greater size, its longer palmules having been more easily observed.

M. Deshayes, in his Tables, makes the number five living and five fossil (tertiary), exclusive of *Septaria*; and, in the last edition of Lamarck, adds to the two species above noticed *Teredo corniformis* (*Fistulana corniformis*, Lam.), *Teredo gregatus* (*Fistulana gregata*. Lam.), and *Teredo arenarius* (*Septaria arenaria*, Lam.).

N.B. Lamarck had stated that the *Ropan* of Adanson (*Sénégal*, pl. 19, f. 2) belonged to the *Teredines*, remarking however that he (Lamarck) knew it not. But M. Deshayes points out that M. Rang, on his return from a voyage to Senegal, where he had an opportunity of observing the *Ropan*, found that this curious shell belonged neither to the *Teredines*, as Lamarck believed, nor to the *Pholades*, as Bosc says, and still less to the *Gastrochænæ*. as M. de Blainville supposes; but that it is a *Modiola* already known, *Modiola caudigera*.

Teredo Navalis.—This is sufficiently described above, and we therefore proceed to the consideration of its

Food, Habits, &c.—Some of the *Teredines* examined by Sir Everard Home were sent from Sheerness in the wood alive, and they lived in salt-water for three days after being brought to town. Sir Everard observed that when the surface of the wood was examined in a good light, while only an inch in depth in the water, the animal threw out sometimes one, at others two small tubes. When one only was protruded, the other almost immediately followed it. One of them was about three-quarters of an inch long; the other only half that size. When the largest was exposed to its full extent, there was a fringe on the inside of its external orifice of about twenty small tentacula, scarcely visible to the naked eye: these were never seen except in that state; for when the tube was retracted, the end was first drawn in, and so on, until the whole was completely inverted: and therefore in a half-protruded state it appeared to have a blunt termination with a rounded edge. The smaller tube was not inverted when drawn in. 'These tubes,' says Sir Everard Home, in continuation, 'while playing about in the water appeared at different times to vary in their directions, but usually remained at the greatest convenient distance from each other. The largest was always the most erect, and its orifice the most dilated; the smaller one was sometimes bent on itself with its point touching the wood. In one instance, where a small insect came across the larger one, the point of the smaller turned round and pushed it off, and then went back to its original situation. In several instances the smaller one appeared to be the most sensible; since by touching the larger one gently it did not retract; but on touching the smaller one they both were instantly drawn in. Indeed whenever they were retracted they always were drawn in together. When the worm was confined within the shell the orifice was not to be distinguished in the irregular surface of the wood, which was covered with small fuci. The worm appears commonly to bore in the direction of the grain of the wood, but occasionally it bores across the grain to avoid the track of any of the others; and in some instances there was only a semitransparent membrane as a partition between two of them.'

Sir Everard observes that as the *Teredo gigantea* bores in mud, on which it cannot be supposed to subsist, or even to receive any part of its nutriment from it, it becomes a question whether the *Teredo navalis*, an animal of much smaller size, derives support from the wood which it destroys, or is supplied wholly from the sea. The last opinion seems the most probable to Sir Everard, because the animal, having red blood and very perfect organs, necessarily requires a great deal of nourishment for the purposes of growth, and to supply the waste constantly going on; but if, he observes, the aggregate of shell and animal substance is taken, it will be found equal in bulk, and greater in specific gravity than the wood displaced in making the hole: hence, he remarks, it is obvious that the quantity of wood which the animal has taken into its body is wholly insufficient for its formation and subsistence. When once it is established that the *Teredo* can be supported independently of the wood which is eaten, and can afterwards subsist when the communication between it and the wood is cut off, a doubt, he adds, is created about the wood forming any part of its aliment, and it becomes pro-

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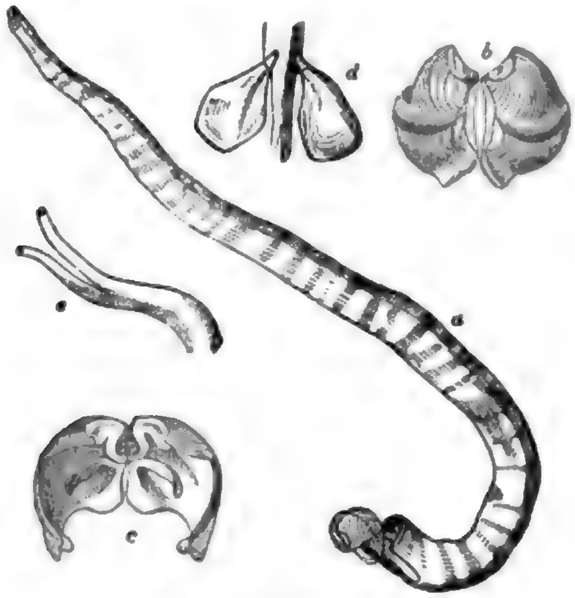
bable that the *Teredo navalis*, like the *Teredo gigantea*, forms its habitation in a substance from which it receives no part of its sustenance; and that the sawdust conveyed through the intestines is not digested, particularly as that examined by Mr. Hatchett had not undergone the slightest change.

Mr. Hatchett found the ten grains of pulp from the specimen above referred to to be an impalpable vegetable sawdust. When burnt the smoke had precisely the odour of wood; it formed a charcoal easily consumed, and was converted into white ashes, in every respect like vegetable charcoal. Solution of potash did not act upon it, as it would have done if it had been an animal substance.

Sir Everard Home suggests that the straight course of the intestine in the *Teredines* makes it probable that the sawdust retards the progress of the food, so as to render convolution unnecessary.

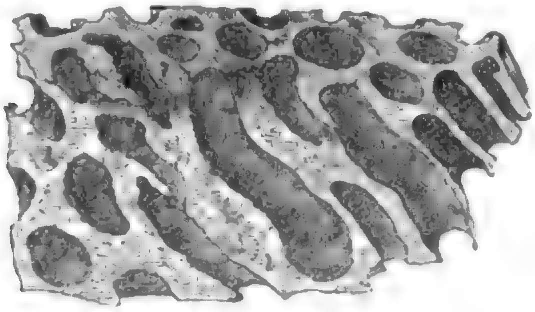
Teredo Navalis has been found at depths ranging from the surface to ten fathoms.



Shell and tube of Teredo navalis.

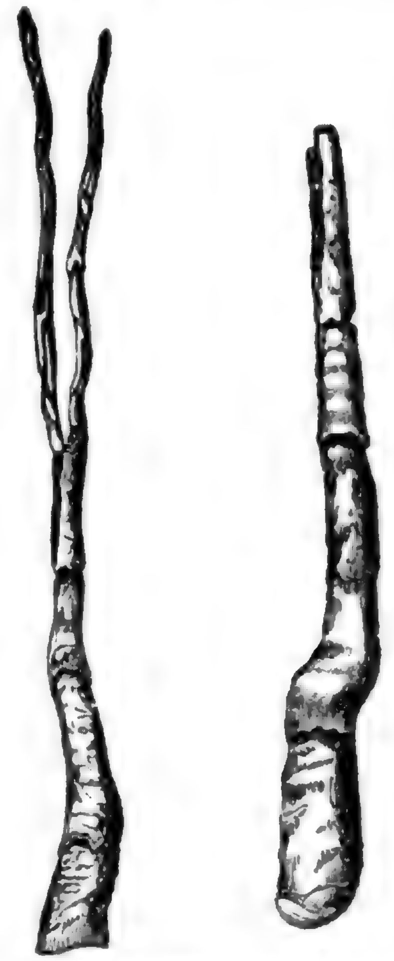
a, tubes with valves in their position at the end; *b*, *c*, two views of the valves; *d*, double operculum; *e*, representation of the protrusion of the two tubes of the animal. (*Phil. Trans.*) G. B. Sowerby.

It is said, probably with truth, that *Teredo navalis* was introduced into Europe from warmer climates. However that may be, it now unfortunately swarms in our seas. The ravages of this apparently insignificant animal are terrible. Ships, piles, all submarine wood-works, are ruinously affected by it: small as it is, it threatened the submersion of Holland by its destruction of the dykes. The living specimens which formed the subject of Sir Everard Home's observations were furnished from one of the royal dockyards. The rapidity of its growth and the destructive celerity with which it works are hardly credible. A piece of deal, after a submersion of forty days, was riddled by them, and some had attained considerable size. Those from the dockyard at Plymouth, examined by Montagu, were in piles which had been recently taken up to be replaced with new; they had not, according to the information given to Montagu, been under water above four or five years, but they were greatly perforated, though they were sound solid oak when they were driven. The only effectual way of preventing the attacks of this animal upon piles appears to be by covering all that part which is continually beneath the surface with short broad-headed nails. The action of the sea-water on the nails produces a strong coating of rust, said to be superior to a copper sheathing.



Wood perforated by Teredines navales.

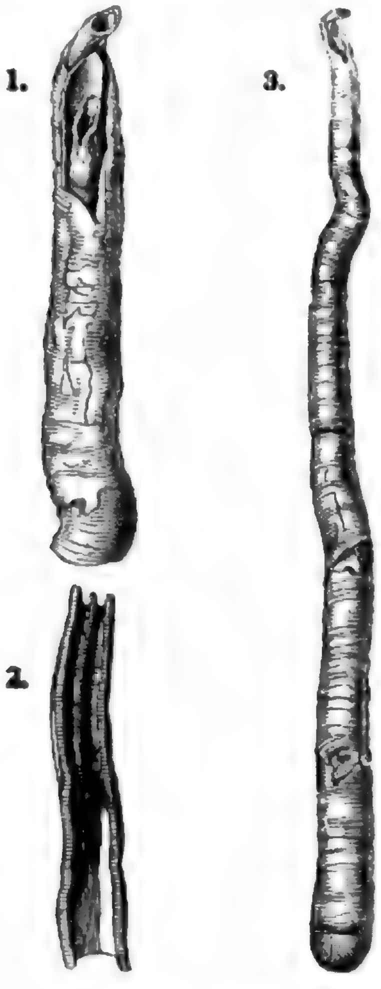
Teredo gigantea.—Rumphius, in his 'Amboinsche Rariteitkamer,' gives two figures, here copied, of a species of tubular shell found in shallow water among mangrove-trees. He describes the ground whence they were brought, and the mode in which the large end of the shell is closed, so as to leave little doubt that it was *Teredo gigantea*, though the separation of the two tubes through which the parts of the animal pass out is different from the specimens brought home by Mr. Griffiths. This difference however, as the latter observes, may have been connected with the situation in which the animal was found, namely, shallow water among the mangroves.



Teredo gigantea (Rumph.).

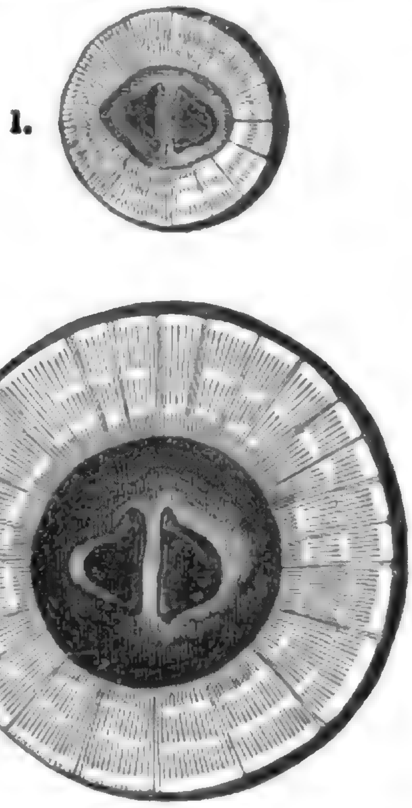
In 1805 Captain Maxwell of the Calcutta East Indiaman gave to Sir Everard (then Mr.) Home, a specimen of this shell, five feet long, but imperfect at both extremities. The captain said it was brought from Sumatra. Several of Mr. Home's friends considered it as a mineral substance, a hollow stalactite, being misled by its radiated structure. Sir Joseph Banks decided that it was a shell, and it was analysed by Mr. Hatchett, who found that it was composed of carbonate of lime and an animal gelatinous substance, which was greater in quantity than in *Chama gigas*, but less than in the common oyster. Mr. Home then applied to Mr. Marsden, who introduced him to Mr. Griffiths, and the paper of the last-mentioned gentleman immediately precedes that of Mr. Home in *Phil. Trans.* for 1806.

Mr. Griffiths relates that a short time after a very violent earthquake that occurred in Sumatra in the year 1797, which produced 'a most tremendous' inundation of the sea, did great damage, and caused the loss of many lives, these shells were procured in a small sheltered bay with a muddy bottom, surrounded by coral reefs, on the island of Battoo. When the sea receded from the bay after the inundation, they were seen protruding from a bank of slightly indurated mud, and two or three specimens were brought to Mr. Griffiths at Padang, by the master of a boat trading between that part and the island, for cocoa-nut oil, sea-slug, &c. Mr. Griffiths then sent one of his servants, a Papooa Coffree, who was very expert at diving, in a small praw. This servant stated that he had found the shells in the before-mentioned bay and in an inlet of the sea, sticking out of rather hard mud, mixed with small stones, sand, &c. from eight to ten inches or more, and from one to three fathoms under water. Both the master and crew assured Mr. Griffiths that the animal throws out tentacula from the two apertures of the apex of the shell, that resembled the small *actiniæ* adhering to the rocks about Padang, and that the body of the shell was filled with a soft gelatinous flesh, similar to that of the *Teredo navalis*, but this they had washed out on account of its putridity. They said that the shells were in considerable number, and, being gently shaken, easily taken up; but all of them were mutilated more or less, the effect probably of the earthquake, when many large fragments of madrepores, corals, &c. were torn from their seat by the agitation of the sea. More than twenty specimens were brought to Mr. Griffiths, but not one was complete: a portion of the shell with the apex nearly perfect, and another with the opposite closed extremity nearly so, were however procured. The length of the longest of Mr. Griffiths's shells was 5 feet 4 inches, and the circumference of the base 9 inches, tapering upwards to 2½ inches. There were other good ones of smaller size. The large specimen was nearly perfect, having a small part of the lower extremity entire. Most of the shells had adhering to them, about one foot or more from the top, the small cockscomb oyster, small serpulæ, &c.; consequently, Mr. Griffiths observes, they must have been protruded that distance from the hard mud; but the water being thick and discoloured, the people of Battoo had not taken notice of them antecedent to the earthquake. The specimens were milk-white on the outside and within were tinged with yellow. Mr. Griffiths remarks that the large end of the shell is completely closed, and has a rounded appearance; at this part it is very thin. The small end, or apex, is very brittle and divided by a longitudinal septum running down for eight or nine inches, forming it into two distinct tubes, inclosed within the outer one, from whence the animal throws out tentacula. Mr. Griffiths goes on to describe the substance of the shell as composed of layers having a fibrous and radiated appearance, covered externally with a pure white crust, and internally as having a yellow tinge; and the external surface as frequently interrupted in a transverse direction by a sudden increase of thickness, which, he observes, probably indicates different stages in the growth of the shell, although they are at unequal distances, sometimes at six inches, sometimes at four, in the same shell. Many of the shells, he adds, are nearly straight, others crooked and contorted.



Teredo gigantea.

1, the small or upper extremity of the shell, the external covering broken away and showing the termination of the tubes, one of which is broken. 2, a longitudinal section of that part of the shell where the double tubes are formed. 3, the shell complete, or nearly so, the exception being the imperfect state of the upper extremity. (*Phil. Trans.*)



Teredo gigantea.

1, transverse section of shell, giving a front view into the orifices of the double tube, and showing the thickness of the shell at that part. 2, transverse section of shell at the thickest part after it had been polished, showing the structure, and giving a front view of the orifices into the double tube. (*Phil. Trans.*)

FOSSIL TEREDINES.

M. Deshayes in his Tables notes five species of fossil *Teredines* in the tertiary formation, Eocene period of Lyell:—one from the English crag, one from Paris, and four from Belgium. Mr. Lea (*Contributions to Geology*) records a species, *Teredo simplex*, from the Claiborne Beds, Alabama (tertiary). Professor Sedgwick and Mr. Murchison notice the genus in their *Table of Fossils found in the Gosau Deposit and its Equivalents in the Alps*; and also '*Teredo* or *Pholas*,' in their *Table of Fossils of Lower Styria*, as belonging to the 'middle system.' Dr. Fitton, in his *Systematic and Stratigraphical List of Fossils in the Strata below the Chalk*, notes the genus, with a query, from the gault of Kent and Cambridge.

TERE'NTIA. [CICERO.]

TERENTIAN METRES. Few subjects connected with Latin literature have been treated with less success than the principles and laws which govern the metres of Latin comedy. The majority of readers seem to look upon the writings of Plautus and Terence as so much humble prose arbitrarily distributed so as to present to the eye the appearance of verse without its realities. For them it would be better if the whole were printed consecutively, and such an arrangement would in fact be supported by not a few of the existing manuscripts. On the other hand, there have been writers who have laboured to remove the difficulties that obscure the subject, among whom none but Bentley and Hermann appear to have had any success; and what they have done still leaves the subject in a very unsatisfactory position. Even the writer of the Life of Terence, in the 'Biographie Universelle' (published in 1826), has the following extraordinary criticism upon the metres of Terence:—'The sole rule which he observes with tolerable regularity is to end each verse with an iamb; and even this limitation he often disregards, as, for instance, in the terminations *hic consiste; si vis, nunc jam; audio violenter; huc adducam; hanc venturam*, &c. With regard to the other feet, he freely substitutes for the iamb or spondee, a trochee, anapest, dactyl, double pyrrhic, or four short syllables, and a cretic or short between two longs,' &c. This writer thus starts with the false impression that all the verses of Terence are reduced by critics to the single metre, called trimeter iambic; where-

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as, in fact, all who have dealt with the subject, except himself, are aware that the poet has at least three forms of verse which end trochaically; and his second exception is disposed of by the more correct orthography *nunc ĭam.* In England again, so late as the year 1837, we have a scheme of the Terentian meters, which for the commonest of those metres, the trimeter-iambic, gives us the following scale :—

∪ −	∪ −	∪ −	∪ −	∪ −	∪ −
− −	− −	− −	− −	− −	− −
− ∪ ∪	− ∪ ∪	− ∪ ∪	− ∪ ∪	− ∪ ∪	
∪ ∪ ∪	∪ ∪ ∪	∪ ∪ ∪	∪ ∪ ∪	∪ ∪ ∪	
∪ ∪ −	∪ ∪ −	∪ ∪ −	∪ ∪ −	∪ ∪ −	
	∪∪∪∪		∪∪∪∪		

with the additional remarks that *quo quid hunc* may be a dactyl, that *hic quidem est*, *studet par*, and the three first syllables of *voluptati*, may pass for anapests, &c. &c. All this is exceedingly unsatisfactory, and it would be better to abandon the problem as insoluble, than to give currency to extravagancies which would enable us to find in any given chapter of Cæsar a series of trimeter-iambics.

It must be admitted that the metres of the Greek dramatists, and more particularly of the tragedians, gratify the ear with rhythms which, comparatively speaking, are smooth and appreciable. But it should be recollected, in the first place, that the Greek language is distinguished from among other languages by its abundance of words which end in a short syllable, and the advantage to the poet is increased by the large number of instances where these short final syllables have a vowel ending. Compare, for instance, the accusatives singular μουσαν, δουλον, πολιν, δαιμονα, with the Latin *musam*, *servom*, *navim*, *leonem*; the nominative and accusative plural δαιμονες, δαιμονας, with the Latin *leonēs*; the numerals ἑπτα, δεκα, with the Latin *septem*, *decem*; the verbs τυπτετε, τυπτουσι, with the Latin *scribitis*, *scribunt*; the pronouns με, σε, ἑ, with *mē*, *tē*, *sē*. In fact, the Latin language exceeds the Greek in the number of long syllables, as much as the English and German languages exceed the Latin.

A still more important matter is the question whether and how far the written language of the Romans is an exact representative of the spoken language. It seems to be a condition of language in general that its pronunciation should always be passing through a series of changes, and that those changes should consist for the most part in the gradual omission of letters and even syllables. Thus the Roman phrase *mea domina* is in Italian *madonna*; in French *madame*; in English *madam*, *ma'am*, and even *mum* and *mim*. Meanwhile, for the most part, the changes in orthography are slow, and consequently nearly always in arrear of the orthoepy. Thus it will be found that the sounds of English and German words which appear to the eye so weighed down with consonants, are in the mouth of a native tolerably harmonious. Was such the case with the Roman also? We answer with little hesitation in the affirmative, partly because the laws which now govern language can scarcely have been wanting in antient Italy, and partly because we find the point established by several incidental remarks in Latin writers. Thus Suetonius says, in his Life of Augustus (c. 88), 'Orthography—that is, the laws and principles of writing laid down by grammarians—he was not very observant of, but seems rather to follow the opinion of those who hold that we should write as we speak. For as to his habit of changing or omitting not merely single letters, but even whole syllables, that is a common error.' It should be observed too, that Suetonius had himself seen the handwriting of the emperor. (Ibid., c. 87.) Again, Quintilian (*Inst.*, xi. 3, 33) says, 'As, on the one hand, it is essential that every word should be clearly articulated; so, on the other hand, to reckon up, if we may so speak, every separate letter, is painful and wearisome.' In the same chapter he further observes, 'Not only is a coalition of vowels very common, but *some* too of the consonants are disguised (*dissimulantur*), when a vowel follows;' where he must refer to some other letter than *m*, probably the final *s* generally and the final *d* of neuter pronouns. Moreover Priscian, who by the way appears to have written when the Latin language had ceased to be spoken as a living tongue, at times throws out such conjectures as the following:—'I think that *vigil*, *vigilis*, should rather be pronounced *per syncopam.*' We might appeal to Cicero's authority for the fact that a final *s* was frequently omitted in pronunciation. But there are still other arguments in support of the principle for which we are contending. Within the limits of the Latin language itself we find such changes actually in progress—as *magis*, *nisi*, *ipsus*, *neque*, *atque*, *sive*, *neve*, *videris*, *viderunt*, *providens*, *mihi*, *nihil*, *quibus*, *populus*, *tegumen*, *opera*, *potesse*, *mavolo*, *noverit*, *novisti*, *deabus*, becoming severally *mage*, *ni*, *ipse*, *nec*, *ac*, *seu*, *neu*, *vĭdēre*, *vidēre*, *prudens*, *mi*, *nil*, *quĭs*, *poplus* (compare also *poplicus*), *tegmen*, *opra*, *posse*, *malo*, *norit*, *nosti*, *deis* or *dis*. Principles of etymology would enable us to carry the list out to a vast extent, and this still more if we employed the analogies of the Greek tongue.

Again, the languages which are acknowledged to be derived from the Latin, such as that of the Troubadours, the Italian, French, Spanish, Portuguese, and one portion of the English, by their shortened forms, confirm our views. And this will be found to be specially the case with the French. To those who may express their surprise that the French should thus take precedence in our argument of the Italian, the answer is, that the French is probably derived from the Latin more completely than even the Italian. For the Celtic, Teutonic, and Iberic languages spoken in France before the Roman conquest of that country were of too foreign a character to mix with the language of the conquerors or to supply the place of it in the intercourse of the provincials with their masters; whereas in Italy there already existed dialects which were intelligible to those who came from Rome, and for that very reason was not supplanted by that particular form of the Italian language which happened to prevail in the metropolitan city. In the same way the authorised dialect of our own tongue is more likely to become the current language of Calcutta than of Yorkshire. Add to this that the language now called Italian belongs to Tuscany, not to Rome.

Lastly, we find much to strengthen our present argument in the abbreviated forms of writing which were in use among the Romans and are still found in manuscripts. Thus the word *consul* is written *cos*, because the *n* was not pronounced before *s*, as Diomedes expressly tells us. (Putsch., Again, the word *modo* not unfrequently occupies such a position in the verses of Terence as to seem to require a monosyllabic pronunciation, such indeed as seems the more consistent with its enclitic character. This very word enters into the composition of the Latin *quomodo*, which again in the languages derived from Latin assumes various forms: in the Romance, *com*; in Spanish, *como*; in Italian, *come*; and in French, *comme*. To this we may add the fact that the Romans themselves represented the simple word by the abbreviation *mō*. Again, ·*n*· is the manuscript mode of denoting the conjunction *enim*, a word which must often be pronounced like *en* to fulfil the conditions of Terence's metre. We may observe of this word as of *modo*, that an enclitic should not attract the attention of the ear. A third example shall be a third enclitic, *quidem*. Bentley himself observed the trouble caused by this word in the verses of Terence (*Andr.*, i. 3, 20), and his remedy is to drop the final *m*, which however still leaves the verse encumbered with a superabundance of syllables. We contend that this also is commonly a monosyllable, and on the following grounds. First, the metre of Terence requires it. Secondly, if *ĭtĭdem* has a reduced form *item*, analogy will give us *quem* for *quidem*. Thirdly, the Romans, like the French, did not pronounce the vowel *u* after *q* (otherwise such words, *aqua* for instance, would have had the first syllable long), and they also disguised the final *m*, as Quintilian implies in the passage to which we have already referred. Thus we have arrived at a sound *ke*. Now the Greek language has a word of precisely the same power and character, γε, which we strongly suspect to be the same word; so that if our suspicions be right, *equidem* and ἐγωγε are of one origin, as well as of one meaning. Lastly, there are reasons still remaining which demand a monosyllabic pronunciation for *quidem*. We have already called it an enclitic, and it appears beyond dispute in that character in the words *equidem*, *siquidem*, *quandoquidem*. Now an enclitic should in its nature sacrifice itself to give to the word which precedes it. Yet if we believe the ordinary teachers of Latin prosody, *equidem*, though a corruption from *egoquidem*, or *egquidem*, has the first syllable short. Again, *quando* by itself has the final *o* common to take the most unfavourable view, for in the poets of the Augustan age it would be difficult to find a single example where *o* is short; and in *quandoque*, *quandocunque*, the vowel is always long. But add *quidem*, and they say *quandoquidem* has the same vowel always short. So also *si* in *siquidem*, according to their views, loses its length the moment the enclitic attaches itself to it. If our views be right, the true pronunciation of these three words may be represented by something like *ēke*, *quandōke*, *sīke*; the last corresponding to the Greek ειγε. We will here observe in passing, that our pronunciation of *quidem* suggests a correction of a corrupt passage in Persius, Sat. i. 10:

> 'Littera. Per me quidem sint omnia protinus alba.'

The current reading is *equidem;* and relying upon one error the editors have allowed the same *equidem* to stand with *dubites* in Sat. v. 45, when the context, as well as grammar, requires *dubitem*.

But to return to the subject before us. It is not uncommon with critics to imagine to themselves that the laws of Greek and of Latin verse are based upon principles essentially different from those of modern languages; the former depending, they say, upon the length of syllables, the latter upon accent. This distinction we believe to be wholly without foundation. We rely little upon the fact that Priscian's treatise headed 'De Accentibus' is only a schoolboy-like scanning of the first lines in the 'Æneid,' because, as has been already said, that writer's authority is not of great weight in what concerns the spoken tongue; and in fact, for the same reason there is little dependence to be placed upon the dogmas of the other so-called grammarians, such as Diomedes. Our views upon this subject are rather derived from the perusal of Terence and Plautus themselves, and are confirmed to a considerable extent by the hexameters of Virgil and the lyrics of Horace. They also seem to be supported by the general principles of language. We will endeavour briefly to state the results at which we think we have fairly arrived.

I. In words of more than two syllables, if, according to the received prosodies, two or more short syllables, exclusive of the final syllable, occur together, the second of those short syllables was slurred over. For instance, in some cases the changing a vowel *i* or *e* into the sound of a *y*, or of a vowel *a*, *o*, or *u* into the sound of a *w*, would be the simplest mode of effecting such a result. Thus *adtrĭbŭĕre*, *pĕrĭĭmus*, *consĭlĭum*, would upon our theory be pronounced *adtribwere*, *peryimus*, *consilyum*, the last of which is confirmed by Horace's use of the same word in his odes, and the Italian *consiglio*, Fr. *conseil*, Sp. *consejo;* and at any rate our pronunciation of the two former is more consistent with the quantity of the vowels than the mode usually adopted, viz. *per-í-imus*, *adtribúere*. Bentley has himself observed (*Eun.*, ii. 2, 36) that the words *mulier*, *mulieris*, &c. are always so placed in Terence as to have the accent on the first syllable; which, by the way, is consistent with the Italian *moglie*, and the Spanish *muger*. We doubt however whether the dative plural would be found to obey the law laid down by Bentley. In those cases where the second short vowel is followed by a consonant, the abbreviation proposed becomes impracticable, if at least that consonant be really to be sounded. In such cases the right course is probably to drop the syllable altogether. Thus *miseria*, *familia*, and such words, Hermann (*De Re Metrica*) truly says, are to be pronounced with the accent on the first syllable, and this in defiance of the law laid down by all the grammarians, that the accent cannot be carried farther from the end of a word than the antepenult. Hermann has not attempted to reconcile the two assertions, but they fall at once into agreement if we are right in dropping the second syllable, for then the first becomes an antepenultimate; and we are only doing what is common in our own language, as in *évery*, *lóvely*. This principle moreover may be clearly traced in forms acknowledged to be Latin. Thus from *populus* should be formed *populicus*, but that becomes *poplicus* or *publicus*. If *pello* has a perfect *pepuli*, *cado* a perfect *cecidi;* the compounds with *re* should strictly give us *repepuli*, *rececidi;* but we find *reppuli*, *reccidi*. Again, in connection with *opifex* we ought to have *opificium* and *opificina;* but these have been supplanted by *officium*, *officina*. So too the Greek επιπεδον becomes in Latin *oppidum*, as opposed to the *arx*, or citadel; and the adverb επιπεδως takes the form of *oppido*, an equivalent in meaning to *plane*.

II. The accent of a Latin dissyllable or polysyllable will fall upon the penult if long. Where that penult is long by the nature of the vowel, and at the same time the final syllable is short, the accent upon the penult is called a circumflex; in other cases an acute accent. Secondly, if the penult be short, put an acute accent upon the antepenult, always performing the previously mentioned abbreviation, if need be; the necessary effect of which is to give us a long antepenult, if the penult itself be short.

III. The preceding rules dispose of every case except two classes of words, viz. dissyllables with a short penult, and monosyllables. The former are either to be pronounced as monosyllables, or else to be attached to the preceding or following word; and the double word thus formed to be accentuated as a polysyllable. When a word is attached in pronunciation to that which precedes, it has already received in common use the name of enclitic. Hermann, who first observed that there are also words which attach themselves to those which follow, has proposed to give them the name of proclitics. The Greek article, for instance, belongs to this class, as also not unfrequently the Latin hic, haec, &c. The same is true of prepositions, when really prepositions, that is, when they precede their noun; and the Latin *non* or *ne*, like the Greek ου, should perhaps in many cases be pronounced in immediate connection with the following verb, just as we, who are accustomed to place our *not* after a verb, write *cannot* as a single word. Many little conjunctions also may probably require such treatment, as *si*, *ut*, &c. Again, the list of enclitics should be extended so as to include most of the conjunctions which require to be placed second in a sentence, and even conjunctions in general, together with the relative itself when they are forced, if the word may be used, into a second place, as, for instance, in the first line of the 'Æneid,' which acquires additional power by the pronunciation *Troiaé-qui*. In the same way a postponed preposition becomes an enclitic, as in the phrase *altís-de montibus*. In this way many dissyllables and monosyllables will coalesce into polysyllables, and be accentuated accordingly. We even entertain a strong suspicion that a verb in the middle of a sentence must often be treated as an enclitic to give tone to some important word before it. But a statement of our grounds for this belief would require too much room.

IV. The principle of elision will often modify the accent of a word. Thus *cumprímum*, *scribéndum*, *arguménto*, would in ordinary circumstances have the accent as marked. But if elision take place, they sometimes have the accent displaced. In this way the first and eleventh lines of the Prologue to the 'Ándria' should be read: 'Poéta cúm-prim âm' adscríbend' ádpulit;' and 'Non yt' dissím'li sunt argúment' ét tamen.' It should also be observed that elision often destroys the initial vowel of the second word, instead of the final syllable of the preceding word, as *nunc tuámst officium*, rather than *nunc tu' ést officium*.

If now the principles we have assumed on the grounds above mentioned be applied to the plays of Terence, we arrive at the result, that the verses, with very few exceptions, acquire the desired rhythm; and that there should be exceptions must be expected where the text of an author is not yet established upon a careful comparison of manuscripts, and where even the transposition of two words will often alter the accent. Moreover it should always be recollected that in the comic drama it may be even desirable to avoid the purer rhythm of verse, and approach somewhat to the prose of natural conversation, as Cicero has himself remarked (*Orator.*, 55). That what we now say may be put to the test, we will give a list of those words requiring abbreviation which most commonly occur, observing at the same time that a word at the end of an iambic trimeter, or after a monosyllable, is often to be pronounced with all its syllables, though elsewhere liable to contraction. Of this an example may be seen in the tenth line of the prologue already referred to, which contains both *noverit* and *norit*.

senex = *sen*. Compare the genitive.
pater = *père*. Compare *parricida*.
soror = *soeur*, as in French.
voluntas = *vountas*. Compare *vis* = *vŏlis* and *invitus*.

sacruma = *larma*. Compare *serment*, from *sacramentum*.
hodie = *oggi*, as in Italian.
dies = *jes*. Compare *jour*, *journée*.
ego = *yo*. Compare Italian.
cave = *cau*. Compare Cicero's story about the word *cauneas*.
tace = *tai*, as in French.
quibus = *quis*. Compare the loss of *b* in the dat. pl. of the first and second declensions.
tibi = *ti*.
sibi = *si*. Compare the Romance, Ital., Fr., Sp., and
ibi = *i*. *mihi* = *mi*.
ubi = *ou*.
abi = *ai*.
jube = *ju*. Compare the perfect *jussi*.
inde = *in*. Compare the French *en*, and Latin *dein*, *exin*, &c.
redi = *rei*.
magis = *mais*. Compare *mai* It., *mais* Fr., *mas* Sp.
minus = *mins*.
alius = *alyus*. Compare Greek αλλος.
facere = *fare*. Compare Fr., Ital., Sp.
vigilare = *vigliare*. Compare Fr., Ital.
vide = *vi*. Compare Fr. *voi-ci*, *voi-la*.
novos = *nous*. Compare Greek νεος, English *new*.
sine = *sin*. Compare Fr., Ital., Sp.
duo = *do*. Compare Greek δω-δεκα, Fr., Eng.
ille, &c. = *il* or *le*, &c. Compare It., Fr., Sp.
bonus = *bon*, as in French.
sumus = *sommes*,
bene = *ben*.
male = *mal*.
homo = *homme*, as in French.
rei = *re*. Compare the forms of the fifth declension used by Cæsar, Virgil, &c.
puer = *pur* or *por*. Compare Greek παις, Spartan ποιρ, Latin *Lucipor*.
suus, &c. = *sus* or *sos*. Compare It., Fr., Sp., and also
meus, &c. = *mus*, &c. the forms used by Ennius, and
tuus = *tus*, &c. in Greek.
fuit = *fut*. Compare It., Fr., and Latin *fore*.
animus = *âmus*. Compare Ital., Fr.
asinus = *ânus*. Compare Fr.
edepol = *epol*. Compare *ecastor*, *ecere*, &c.
legere = *lere*. Compare Fr.
oculus = *oeilus*. Compare Fr.
generis = *genris*. Compare Fr.
aperire = *aprire*. Compare It., Fr., Sp.
opera = *opra*. Compare the form in Ennius, and Fr., Sp.
similis = *sim'lis*. Compare Fr. *semble*, Eng. *resemble*.
tamen = *ta'n*. Compare *tametsi* for *tamenetsi*, and *tandem* for *tamendem*.
aliquis = *alquis*. Compare It. *alcuno*, Fr. *aucun*, from *aliquis-unus*.
hujus = *his*. Compare the abbreviation of *nullīus* into *nullĭus* and *nulli*.
ejus = *is*.

For a more detailed exhibition of these words see *Journal of Education*, vol. ii., p. 344; and on the subject of Latin prosody generally, the same work, vol. iv., p. 336.

It should be added that of modern editors Hermann, Bothe, and Lindemann alone seem to have a distinct idea of the nature of the metres of Terence and Plautus, for all that has been said applies to Plautus as well as Terence. Among older writers, Bentley certainly possessed a clearer insight into the subject than some of his notes would lead one to suppose. That this is the case is proved by an anecdote in Bishop Monk's Life of that scholar. The reverend doctor, dining at a friend's house in London, kept the gentlemen longer over their wine than was thought proper by the ladies in the drawing-room, and added to the scandal when his voice was heard, even above stairs, in what was supposed to be a song to the tune of 'Unfortunate Miss Bailey.' The doctor was only reading to them some specimen of Terence's Comic Septenarius, or, to use a harder phrase, the Iambic Tetrameter Catalectic.

TERENTIA'NUS MAURUS. [MAURUS TERENTIANUS.]

TERENTIUS, or more fully P. TERENTIUS AFER, was one of the two comic poets of Rome whose works have come down to us. The facts of his life were matter of dispute even among the Romans themselves. If we may rely upon the biography attributed by some to Donatus, by others to Suetonius, he was born at Carthage, and became the slave of a Roman senator named Terentius Lucanus, who, pleased with his abilities and handsome person, first gave him a liberal education and afterwards his freedom at an early age. Some, on the other hand, stated that he originally fell into slavery as a prisoner of war. At Rome he lived on terms of intimacy with many men of family, more particularly the second Scipio Africanus and his friend Laelius, who were even said to have assisted in the composition of the six comedies which bear the name of Terence. There were even some who asserted that these two nobles merely borrowed the name of Terence for what was wholly their own. Before he had completed his thirty-fifth year he left Rome, either to avoid the odium which grew out of the suspicion that he had published the writings of others as his own, or to study the institutions and manners of the Greek nation, and thus qualify himself for fresh exertions in the field he had chosen. He never returned, but the accounts of his death were various. Some said that he embarked for Asia, and was never seen from the hour of his embarkation; others that he died on his way back from Greece, where he had translated one hundred and eight plays of Menander; while others again contended that having sent his translated plays in a separate ship, he received the news that this ship with his valued property was lost at sea, and died through grief, in the consulship of Cn. Cornelius Dolabella and M. Fulvius Nobilior, either at Stymphalus in Arcadia or at the Leucadian promontory. He was of moderate stature, slender figure, and dark complexion. He left a daughter, who married a Roman of equestrian rank, and a property of six jugers on the Appian road. But another authority reports that he died in the most abject poverty. Eusebius, or rather St. Jerome, places the death of Terence in the reign of Ptolemy Philometor, and this king died in the third year of the 158th Olympiad, or the close of 146 B.C.

The difficulties in the life of Terence are chiefly of a chronological character: the following table of ascertained dates bears upon it:—

218 B.C. Commencement of Second Punic War.
201 B.C. Peace granted to the Carthaginians.
185 B.C. Birth of Scipio Africanus the younger.
184 B.C. Death of Plautus.
169 B.C. Death of Ennius.
168 B.C. Death of Cæcilius (partly on the authority of St. Jerome).
166 B.C. The 'Andria' acted at the Megalensian games.
165 B.C. The 'Hecyra' acted at the same games.
163 B.C. The 'Hautontimorumenos' acted at the same games.
161 B.C. The 'Eunuchos' acted at the same games, and the 'Phormio' at the Roman games.
160 B.C. Death of Æmilius Paulus. The 'Adelphoe' acted at his funeral games, at the expence of his sons Fabius and Scipio.
159 B.C. Consulship of Cn. Cornelius Dolabella and M. Fulvius Nobilior.
149 B.C. Commencement of the Third Punic War.

Thus it appears that the whole period of Terence's life must have been included in the peace between the Second and the Third Punic wars; so that if taken prisoner in war, that war could not have been one between Rome and Carthage. Again, there is a chronological difficulty in the story that the poet, when he offered his 'Andria' to the ædiles, was directed to obtain the approval of Cæcilius; that he accordingly went to the house of the latter, and was coldly bidden to seat himself on a stool and commence reading while the other dined; but that after a few verses Cæcilius was so charmed that he invited Terence to take his seat at the table and dine with him, after which he read through the remainder of the play and filled Cæcilius with admiration. Now the death of Cæcilius, though the date, as we have observed, is in some measure founded upon the testimony of St. Jerome, occurred two years before the 'Andria' was acted. The assertion that Scipio and Lælius assisted the poet is not altogether rendered impossible by the youth of the parties, although Scipio was but nineteen when the 'Andria' was acted, and Lælius was of about the same age with his friend; but the difficulty becomes greater when we find in the prologue of the 'Adelphoe,' that the nobles who were said to give him their aid are spoken of in terms scarcely applicable to men so young.

Be the parties charged to have lent their aid to the poet who they may, it is clear that the poet gives no denial to the accusation, either in the words just alluded to, or in the prologue to the 'Hautontimorumenos.' Even Cicero (*Ad Atticum*, vii. 3) mentions the report that Lælius was the real author; and Cornelius Nepos, who by the way makes the three parties, Scipio, Lælius, and Terence, of the same age (aequales), tells us an anecdote which confirms the report. C. Lælius, says he, happening to pass the Matronalia (a festival on the first of March, when the husband for once in the year was bound to obey the lady) in his villa near Puteoli, was told that dinner was waiting, but still neglected the summons. At last, when he made his appearance, he excused himself by saying that he had been in a peculiar vein of composition, and quoted certain verses which occur in the 'Hautontimorumeros,' viz. those beginning *Satis pol proterve me Syri promissa huc induxerunt*.

The fact of the poet being called Terentius is perfectly in harmony with the circumstance of his alleged master having that name, as it was the ordinary practice of the manumitted slave to take the nomen and prænomen of his late master. On the other hand, it is altogether an error on the part of Orosius to confound the poet with the Q. Terentius Culleo, who, in the garb of a manumitted slave, accompanied the triumphal procession of Scipio after his destruction of Carthage in the year 146 B.C. The name of Afer seems to confirm his Carthaginian birth, unless indeed that assertion be only an inference from the name itself.

Terence acknowledges in the titles to his plays his obligations to the Greek comedians Menander and Apollodorus; but he was not a mere translator, for one of the charges brought against him was that he drew the materials of a single play from two or more of the Greek plays. He was much and deservedly admired by his countrymen, even by Cæsar himself, notwithstanding the phrase in which he speaks of him, as a 'dwarfed Menander' (dimidiate Menander). From Plautus, with whom alone we can now make any satisfactory comparison, he differs most widely. Though Plautus excelled in powerful but ludicrous expressions, he was altogether deficient in the formation and development of a plot. Terence, on the other hand, though even he occasionally introduces the buffoonery of the 'miles gloriosus,' the 'parasitus,' and the 'currens servus,' to gratify the prejudices of his more unpolished hearers, who were better able to appreciate the merits of a boxer or a rope-dancer, still deserves our admiration for his efforts to place before his countrymen the comedy of manners. If he was not always successful, the failure was due to the rude minds of his spectators and the magnitude of a Roman theatre, and perhaps also to the use of masks, which, if always used, must have been a serious obstacle to the best efforts of the comic actor. The best edition of Terence is that of Bentley, Amsterdam, 1727. The modern imitations of Terence may be seen in Dunlop's 'Roman Literature.' George Colman has translated the comedies of Terence into English. There are French translations by Madame Dacier and Le Monnier.

TEREZ. [MEXICAN STATES.]

TE'RGIPES. [NUDIBRANCHIATA, vol. XVI., p. 361.]

TERM (Algebra). A simple term in an algebraical expression means all that involves multiplication, division, and extraction of roots without addition or subtraction. Thus in the expression

$$a^2b^2x^2 - 2abx^3 + \sqrt{ab}\,.\,x^4,$$

the terms are $a^2b^2x^2$, $2abx^3$, and $\sqrt{ab}\,.\,x^4$. But compound quantities are also called terms when they are put in such a form that additions and subtractions are subordinate to subsequent multiplication, division, or extraction. Thus,

$$(a+b)\,x^{c+d} + \sqrt{(a^2-b^2)}\,.\,xy$$

has two terms, $(a+b)\,x^{c+d}$ and $\sqrt{(a^2-b^2)}\,.\,xy$. If the form be altered into

$$ax^{c+d} + bx^{c+d} + \sqrt{(a^2-b^2)}\,.\,xy,$$

the expression then has three terms. Most frequently however there is one letter in powers of which the whole expression is arranged, and then all that involves any one power of this principal letter is a term. Thus $a+bx+cx+ex^2$ has three terms, namely, a, $(b+c)\,x$, and ex^2.

When one quantity is said to be expressed in terms of another, it generally means merely that the first is to be an explicit FUNCTION of the second. Thus, in $x+y=a$, we have expressed $x+y$ in terms of a: deduce $y=a-x$, and we have y expressed in terms of a and x. This is the distinction between y being expressed in terms of x, and y being a function of x: if for instance $y=a-z$, $z=x^2+x$, y is a function of x, but it is not expressed in terms of x, but of z; substitute for z its value, and y is then expressed in terms of x. It is to be remembered that by saying that a quantity is expressed in terms of x, it is not meant that x is the only letter which enters, but that no other letter, if there be any, is a function of x. Thus, in the preceding, where we obtain $y=a-x-x^2$, y is expressed in terms of x if a be no function of x. But if a be a function of x, say x^3+x, then y is not expressed in terms of x, until the value of a has been substituted, giving $y=x^3-x^2$.

TERM. The law Terms are those portions of the year during which the courts of common law sit for the dispatch of business. They are four in number, and are called Hilary Term, Easter Term, Trinity Term, and Michaelmas Term they take their names from those festivals of the Church which immediately preceded the commencement of each. After the institution of Christianity, all days in the year, Sundays included, were among Christians for some time open for the purposes of litigation. This practice continued even after Christianity became the religion of the Roman empire. Eventually however the courts of law were closed during Sundays, and also during the times of the solemn fasts and festivals of the Church. This regulation was made by a canon of the Church, in the year A.D. 517, and also by a constitution of the younger Theodosius which appears in the Theodosian Code. By these means one vacation was created in the winter during the time of Advent and Christmas, another in the spring during Lent and Easter, and a third during Pentecost. The long vacation in the summer and autumn was also found necessary, and therefore appointed during the time required for collecting the harvest and vintage. The same arrangements were introduced with Christianity into this island. The laws of Edward the Confessor contain the same provisions as to the observance of a vacation from legal business during the fasts and festivals before mentioned. The necessities of a people at that time so universally agricultural seem to have compelled the observance of the long vacation. The Terms therefore consist of what remains of the whole year after the ecclesiastical and agricultural vacations had been taken out of it. It was the commencement of the Terms which was ascertained by the dates of the festivals from which they take their names. Various acts of parliament have been passed relative to the regulation of the Terms. The statute which now determines them is the 11 Geo. IV. and 1 Wm. IV., c. 70, amended by 1 Wm. IV., c. 3, which enacts that Hilary Term shall begin on the 11th and end on the 31st of January; Easter begin on the 15th of April and end on the 8th of May; Trinity begin on the 22nd of May and end on the 12th of June; Michaelmas begin on the 2nd and end on the 25th of November. The Monday being in all cases substituted for the Sunday when the first day of Term falls on the latter day. During Term four judges sit in each court, and are occupied in deciding pure matters of law only, without the intervention of a jury. The fifth judge in each court sometimes sits alone to determine matters of smaller importance or to try causes at Nisi Prius. By the statute 1 and 2 Vic., c. 32, the courts of common law are empowered, upon giving notice, to hold sittings out of Term for the purpose of disposing of the business then pending and undecided before them. These sittings are conducted in the same manner as those during the Term, except that no new business is introduced. The period during which they have the power to do this is restricted to 'such times as are now by law appointed for holding sittings at Nisi Prius in London and Westminster.' These times are appointed by 1 Wm. IV., c. 70, s. 7, and consist of 'not more than twenty-four days, exclusive of Sundays, after any Hilary, Trinity, and Michaelmas Term, nor more than six days, exclusive of Sundays, after any Easter Term, to be reckoned consecutively after such Terms.' The judges are also empowered by the same section to appoint such day or days as they shall think fit for any trial at bar (that is, a trial before four judges of the court) and the time so appointed, if in vacation, is for the purposes of the trial to be deemed a part of the preceding Term.

There is also a provision which enables the judges, with the consent of the parties, to appoint any time not within the twenty-four days for the trial of any cause at Nisi Prius. The sittings during these twenty-four and six days are called the sitting after Term, and are held for the trials for causes at Nisi Prius for London and Westminster, which places do not form part of any of the circuits. Sittings at Nisi Prius are also held for the same purpose before single judges during Term time, but no special jury cases are taken within the Term. (Spelman, *Of the Terms*; 3 Blackstone's *Com.*, 275.)

TERM (of years), in legal language, signifies the estate and interest which pass to the person to whom an estate for years is granted by the owner of the fee.

A term of years may be created by a conveyance at common law, but no estate is vested in the grantee, nor anything beyond a mere *interesse termini*, until an actual entry is made by him upon the land. The tenant for a term of years is not said to be seised of the land, and the possession is not given to him by livery of seisin. The delivery of a lease for years gives to the grantee a right of entry on the land; when he actually enters, he becomes possessed of the term; the seisin of the freehold still remains in the lessor, and the possession of the lessee for years is then considered as the possession of the person entitled to the freehold or reversion expectant on the determination of the term. (Co. Litt., 200 b.)

By the operation of the Statute of Uses an estate for a term of years may be created without an entry by the termor; as where a freehold estate is conveyed to A and his heirs to the use of B for 99 years, with remainder to the grantor in fee: there the use is immediately executed in B, and the statute instantly annexes to it the legal estate, without any actual entry by B.

A term of years may also be created by devise in a will.

A term of years may be limited to commence *in futuro*, which a freehold cannot; for the freehold is not put in abeyance by the creation of such a term, as it would be by the creation of a freehold estate to commence *in futuro*, but it continues in the grantor. (Co. Litt., 46 a.)

A term of years may be limited so as to cease by a proviso in the conveyance itself, upon the happening of any event, or the performance of any particular act (Co. Litt., 46 a.); and it is usual, when terms of years are created for the purposes of certain trusts, to insert a proviso for the cesser of the term upon the performance and satisfaction of the trusts of the term.

Long terms, as of 500 or 1000 years, are frequently created by way of mortgage, with a proviso for determining them upon payment of the money by a certain day. These are more advantageous than mortgages in fee in one respect, that there does not arise, as in the case of the latter, a separation of the legal estate and the interest in the debt upon the death of the mortgagee. Similar terms are also frequently granted to the trustees of marriage settlements for the purpose of enabling them by sale or mortgage of the terms to raise portions for children and for other purposes. It sometimes happens therefore that, though courts of equity interfere, as in case of mortgages in fee, to enlarge the period of redemption, long terms of years of the kind above mentioned become absolute property. Again, it frequently happens that when a redemption does take place after the time fixed in the original contract, when, according to the theory of mortgages, the estate has become absolute at law, the term may, instead of being surrendered to the owner of the inheritance, be assigned to a trustee for him and his heirs, and retained as an appendage to that inheritance under the name of an attendant term. The advantage of this practice is that it gives the power of defeating the claims of strangers upon the inheritance, by setting up the term as prior in creation, and therefore in right. The right to take advantage of such terms is limited by courts of equity to such incumbrances as the owner of the inheritance had no notice of at the time when he acquired it; otherwise it is obvious that great injustice might be occasioned by the use of them. A term of years attendant on the inheritance is governed by the same rules as the inheritance itself is subject to. The right to it does not go to executors, but follows the devolution of the inheritance. It will not be forfeited as a chattel by the felony of the owner of the inheritance; but if the inheritance escheat, the term will follow it. (3 *Cha. Rep.*, 19.) As to the assignment of attendant and outstanding terms to attend the inheritance, VENDOR AND PURCHASER.

Terms of years are considered in law not as real estate, but as chattel interests in real property, and they therefore do not descend to the heir of the person who dies possessed of them, but vest in his executor or administrator, like any other chattel; and the principle is the same whatever be the length of the term. (Co. Litt., 9 a.)

Marriage entitles the husband to the terms of years belonging to his wife, as well as to the rest of her personal estate. He may administer to the estate of his deceased wife, and is entitled for his own benefit to her chattels real, whether reduced into possession, or reversionary or contingent; and in case of the husband's death after the wife, his next of kin, and not hers, are entitled to the administration. (Co. Litt., 351 a.) The husband may, during the wife's life, dispose of her chattels real by assignment, but not by will; and if he dies without having assigned them, they will belong to the surviving wife. But if the husband be an alien, he cannot acquire by marriage any right to a term of years belonging to his wife. (*Anon.* 9; *Mod.* 43; *Id.* 104.)

The tenant for years is entitled to the same estovers as the tenant for life (Co. Litt., 41 b.); and, like the tenant for life, he is not entitled to commit waste by cutting down timber, building houses, opening mines, &c. (Co. Litt., 53 a.) He is also punishable for permissive waste, and therefore bound to keep all houses and other buildings on the land in good and tenantable repair. (Co. Litt., 57 a.) If a woman tenant for years commits waste and marries, the husband, having acquired the term by marriage, becomes answerable for the waste. (Co. Litt., 54 a.) A term of years may however, like an estate for life, be granted without impeachment of waste, and such a clause in the grant is construed in the same manner with respect to both estates. When the determination of a term is certain, as when lands are let for 21 years, the tenant is not entitled to emblements, for it was his own folly to sow where he knew that he could not reap. But when an estate for years depends upon an uncertain event, as when it is made determinable on the death of a particular person, the tenant will be entitled to emblements in the same manner as a tenant for life. (Co. Litt., 55 b.; 16 East, 71.)

Terms of years, being chattel interests, are subject to crown debts while they continue in the possession of the debtor, but not in the hands of a *bonâ fide* purchaser for valuable consideration without notice, who has bought before any execution awarded by the crown. (8 *Rep.*, 171.) They are in like manner assets in the hands of the executor or administrator for the payment of specialty and simple contract debts, but not after assignment by him to a purchaser for valuable consideration.

Terms of years, not being estates of inheritance, cannot be entailed, but they may be limited to any number of persons *in esse* successively for life, with limitations over so as to be inalienable for a life or lives in being, and 21 years after. [SETTLEMENT.]

Terms of years, like life estates, may be merged either by becoming vested in the owner of the freehold, or by surrender to the person in remainder or reversion. [MERGER; SURRENDER.] But a mere *interesse termini*, not being an actual estate, cannot be merged by surrender, though it may be extinguished by release. (Cro. Jac., 619.) It was formerly doubted whether one term could merge in another, but it is now settled that when two terms, granted out of the same estate, vest in the same person, there being no intervening estate, the first merges in the term in reversion. (6 Madd., 66.) Where a term has been created to answer trusts, a court of equity will sometimes relieve against a merger of it, so far as to make it answer the purposes of its creation. (3 Swanst., 603, 608.)

TERMES. [TERMITINA.]

TERMINAL. We cannot say that this term *is* used in mathematics to the extent to which we shall carry it; but the very great convenience which would arise from an extension of its use is sufficient justification for coining a few new meanings. Term is a word of geometry very little used, and signifying boundary or extremity; the words terminal value and terminal form are sometimes used to signify the last and most complete value or form. When a finite expression, added to a certain number of terms of a series, makes up the equivalent of the expression from which the series is deduced, or stands for all the subsequent terms of the series, this finite expression might be called the terminal expression. Thus in TAYLOR'S THEOREM we have one terminal expression in D'Alembert's form, another in that of Lagrange.

There is also another use of the word, which would convey a distinction much wanting words to express it: we allude to what might be called *terminal language*. All the use of the words infinitely small and infinitely great [INFINITE; LIMIT] is entitled to this name; as follows: When we say, for example, that a circle *is* a regular polygon with an infinitely great number of infinitely small sides, the language used is that of an end arrived at, a transformation actually made: the circle is described as actually consisting of straight lines; and the language is *terminal* (expressive of a boundary actually attained). But the meaning of this language is, or is generally held to be, false: no polygon is a circle, how great soever the number, or how small soever the magnitude, of the sides. The proposition which is really true, that is, over which all shake hands, whatever their notion of infinity may be, is that the terminal proposition, true or false, is one to which an interminable and unlimited degree of approximation may be made. An inscribed regular polygon may, with sides enough, be made to coincide with the circle within any degree of nearness we please to assign: or the following proposition—'the area of the inscribed polygon may be made to differ from that of the circle by less than the *n*th part of the latter'—may be made true for every value of *n* that can be named, however great. Terminal language, properly employed, may be made the means of abbreviation of all those truths whose announcement contains interminable approximation: the development of this sentence is the object of the article INFINITE.

TERMINA'LIA, the festival of Terminus [TERMINUS], celebrated at Rome every year on the 23rd of February. It was said to have been instituted by Numa with the worship of the god himself. The festival was of a twofold character, either public or private, according as it was held at the boundaries between the fields of private persons, or at the boundary of the Ager Romanus. In the former case persons possessing adjoining lands met with their families and servants at the stone which divided the properties, adorned it with garlands and offered sacrifices, and a feast in which the neighbours partook was intended to renew the friendly relations existing between them. (Ovid., *Fast.*, ii. 643, &c.) Dionysius states that down to his time the Romans did not offer any bloody sacrifices on this occasion, but only cakes and fruit. But we have the most authentic statements which show that the assertion of Dionysius can only apply to the early period of the republic, and that subsequently a lamb or a sucking pig was sacrificed. (Dionysius, ii. 74; Plutarch, *Numa*, 16; *Quaest. Rom.*, 15; Horatius, *Epod.*, ii. 59.) The public Terminalia were solemnised in a similar manner by the whole people on the boundary of the Ager Romanus. (Ovid., *Fast.*, ii. 679, &c.)

(Hartung, *Die Religion der Römer*, ii., p. 52; *Dictionary of Greek and Roman Antiquities*, v. 'Terminalia.')

TERMINA'LIA (from *terminus*) is the name of a genus of plants belonging to the natural order Combretaceæ. The species of this genus consist of trees and shrubs, with alternate leaves, which are usually crowded together at the ends of the branches. The flowers are destitute of petals, and are disposed in spikes, which are racemose and panicled: in the lower part of the spikes they contain both stamens and pistils, but in the upper part they contain only stamens. The limb of the calyx is campanulate, 5-cleft, with acute lobes. The stamens are ten in number, arranged in two series, and are longer than the calyx. The ovary contains two ovules, the style is acute, and the fruit is drupaceous, containing only one seed. All the species are inhabitants of the tropical parts of Asia and America: they are numerous, and many of them are used in medicine and the arts.

T. angustifolia, Narrow-leaved Terminalia: the leaves are linear-lanceolate, very thin at both ends, pubescent beneath; the petioles are also pubescent, and have two glands at their apex. This tree is a native of the East Indies, and was formerly called Terminalia Benzoin, as it yields on tapping a gum-resin very similar to benzoin, and possessing the same properties. This gum exudes from the tree in the form of a milky juice, which, on being dried, forms a light whitish substance, exceedingly friable. When gently dried it assumes the form of a white powder, which was in great repute as a cosmetic. It has an agreeable fragrance, resembling gum-benjamin, which in a great measure depends on the benzoic acid it contains.

T. vernix, Varnish Terminalia, has linear-lanceolate leaves, narrowed at each end, and glabrous beneath; the petioles are also glabrous. This plant is a native of the Moluccas, and abounds in a resinous juice, which is collected by the inhabitants, and used in the natural state as a varnish. It is also used for the same purpose in China.

T. Catappa has obovate leaves, tapering to the base, pubescent beneath, and glands on the under sides of the midrib. It is originally a native of the East Indies, but has now become naturalised in the West India Islands. Some botanists have described the West India species as distinct from the Asiatic, but there is no good distinctive character. The drupaceous fruit of this tree is about three inches long, and contains a large seed, which is used for eating and obtaining an oil, in the same manner as the almond. This tree, on account of its thick foliage, is much planted in the tropics for the purpose of forming avenues near houses. The bark and leaves yield a black pigment. Indian ink is manufactured from the juice of this tree. It yields a light durable timber, which is much used.

T. glabrata, smooth Terminalia, very much resembles the last, but the leaves are glabrous beneath and small. The fruit is also of a much less size, oval, and less furrowed. It is a native of the Society and Friendly Islands, and is cultivated by the inhabitants near their huts and in their burial-places. The wood is used in these islands for building boats, making benches, &c., and the seeds are eaten.

T. Bellerica, Belleric Terminalia, has glabrous, elliptic, entire, acute, alternate leaves, and bi-glandular petioles. It is a native of mountainous districts of the East Indies. Its flowers are very fetid. The fruit is reputed to possess tonic, astringent, and attenuant properties. When the bark is wounded a gum flows out, which is insipid, resembling gum-arabic.

T. Chebula is also an East Indian species, it is distinguished from the last by possessing opposite leaves which are pubescent beneath. The fruit of this species is more astringent than the last and is used for the purposes of dyeing. A durable ink is made by mixing the salts of iron with an infusion of the outer rind of the fruit. Both this species and the last are subject to the attacks of insects producing gall-nuts. These galls possess the astringent principle in abundance, and are also used for dyeing. They are called *Cadacay* by the Tamuls.

The genus *Bucida* is very nearly allied to *Terminalia*, and belongs to the same natural order. It is distinguished from the latter genus by its urceolately-campanulate calyx, its didymous anthers, baccate fruit, and angulated putamen. The most remarkable species is the *Bucida buceras*, the ox-horn olive-tree, known in Jamaica as the black olive, in Antigua as the French oak, and in the French Islands as *Grignon*. It has obtuse glabrous ovato-cuneiform leaves, and small yellowish flowers disposed in cylindrical spikes covered with a silky pubescence. It is a native of the West India Islands on clayey soils near the coast. It has obtained its name from the tendency of its branches to shoot out into monstrous spongy excrescences resembling in form the horns of an ox. These excrescences resemble galls in their nature, and are probably produced by insects puncturing the terminal bud of the branch. This tree is remarkable in appearance for its slender crooked branches and tufted leaves, but it attains a considerable size, and its timber is valuable. The bark of this tree contains an astringent principle which is extensively used in tanning.

In the cultivation of species of Terminalia and Bucida a soil composed of loam and peat should be preferred. Cuttings strike freely when placed in a pot of sand and covered with a hand-glass.

(Don's Miller's *Dictionary*; Burnett's *Outlines of Botany*; Bischoff, *Lehrbuch der Botanik*; Lindley, *Natural System*.)

TE'RMINUS, a Roman deity whose worship was said to have been introduced by king Numa Pompilius, when he ordered the fields of the citizens to be separated from one another, and the boundaries to be marked by stones which were to be considered as sacred to Terminus, or as Dionysius calls him, Ζεὺς ὅριος. (Festus, s. v. *Terminus*

Dionysius, ii. 74.) A careful examination of the worship of this god shows that Terminus was only a surname of Jupiter, who was worshipped under this name as the guardian of boundaries. The stone pillars themselves were regarded as symbolical representations of the god himself, and hence perhaps the severe law mentioned by Festus, that whoever displaced such a pillar should, together with his oxen, be devoted to the god. In the same manner in which the boundaries between the lands of private individuals were marked, the original territory of Rome (Ager Romanus) was separated by pillars from the territory of neighbouring tribes. In the direction of Laurentum there was such a pillar (terminus) between the fifth and sixth milestones from Rome on the Laurentine road. This was the public Terminus. The god had a temple on the Capitol, and the part of the roof just above the symbolical pillar was left open. (Festus; Servius, *Ad Aen.*, ix. 448.) A story to account for this peculiarity is related by Ovid (*Fasti*, ii. 671, &c.) and others.

TE'RMINUS, or TERM, signifies, in sculpture and architecture, a pillar statue, that is, either a half statue or bust, not placed upon, but incorporated with, and as it were immediately springing out of the square pillar which serves as its pedestal. If they be mere busts, figures of this kind are usually distinguished by the name of Hermæ ('Ερμαῖ); and busts which, instead of having a circular moulded base, resemble the upper part of a terminus, are called terminal busts. There are many such busts and also some termini in the Townley Collection at the British Museum; among others a double terminal bust of Bacchus and Libera; and a terminal statue of Pan, nearly a whole figure, with a deeply moulded base. The terminus or pillar part is frequently made to taper *downwards*, or made narrower at its base than above, which mode of diminution, the reverse of that employed for columns, was no doubt intended by way of similarity to the general outline of the human figure, whose greatest breadth is at the shoulders. It has been supposed that the earliest statues were merely terminal figures,—upright stones, erected as land-marks and boundaries, the upper end of which was rudely carved into the shape of a head, which form was afterwards retained for occasional purposes after sculpture had arrived at perfection. By modern artists the pedestal part is usually made tapering downwards or narrowest just above its base; when it is called the *gaine*, from its resemblance to the scabbard of a sword.

In architectural design *Terms* are employed in lieu of Caryatides, not however as insulated pillars, but as pilasters forming a small order or attic, or a decoration to gateways, doors, &c. They frequently occur in what is called the *cinquecento* and our own Elizabethan style.

TERMINUS is also now used to signify the buildings for offices, &c., at the extremity of a railroad, whereas those erected at intervals along its course are called *stations*. The establishment of railroads has therefore given rise to a new class of structures, which from their nature and extent admit of being rendered very striking in character and design. One of the most *monumental* architectural works of the kind as yet erected, is the Terminus of the London and Birmingham Railway, in Euston-square,—a Grecian Doric propylæum (distyle in antis, on both fronts) on a large scale, the columns being about 70 feet high. The Terminus at the Birmingham end, though by the same architect (Hardwick), is in the Italian style. (For views, &c. of both structures, see Companion to the 'Almanack' for 1839.) Other termini that may be mentioned for their pretensions to architecture, are—those of the London and Southampton Railway, the one at Nine Elms, Vauxhall, the other at Southampton, both handsome buildings in the Italian style, by Tite; that at Blackwall, by the same architect, and in a similar style; and those at Liverpool, York, and Brighton. The positive necessity for some covered gallery, either colonnade or arcade, and the obvious opportunity afforded for making a spacious portal, either propylæum or gateway, a marked feature in the general design, affords more than ordinary scope to the architect. Now that railroads (*Chemins de Fer*, and *Eisenbahnen*, as the French and Germans term them) have been introduced upon the Continent, they have there also given occasion to many architectural constructions for their termini. Some designs for *Abfahrtsgebäude* (Termini) may be seen in Stüler and Strack's 'Architectonisches Album.'

TERMITI'NÆ, a section of Neuropterous insects, in which Latreilla includes the genear *Mantispa*, *Raphidia*, *Termes*, and *Psocus*. These genera however are usually regarded as constituting three distinct families, and will be here treated as such, commencing with the *Raphidiidæ* of Leach, which contains the two first-mentioned genera. The insects of this family have the antennæ slender and composed of more than ten joints; the tarsi have from three to five joints; the wings are nearly equal in size and have numerous nervures inclosing small polygonal cells; the prothorax is long and slender.

The genus *Mantispa* is at once distinguished by the peculiar structure of the anterior pair of legs, which are large, have the tibiæ broad and compressed, and provided beneath with spines; the joints of the tarsi are indistinct, and also furnished beneath with spines: the tarsi of the other four legs are distinctly five-jointed. The antennæ are short, about equal to the head in length, and slender. The prothorax is elongated, slender, and broadest in front. The wings, when at rest, meet over the abdomen.

The *Mantispa pagana* (Fabricius) is rather less than three-quarters of an inch in length, and of a brownish-yellow colour; the wings are transparent, the superior pair have the upper margin yellow. It is found in France and Germany.

In Brazil are species closely allied to *Mantispa*, which differ in having the antennæ as long as the body: the wings are nearly horizontal; the body is depressed and terminated by two little appendices. They form the genus *Hoplophora* of Perty.

In the genus *Raphidia* the body is rather slender, the prothorax is long and almost cylindrical, the head broad and somewhat depressed, and the eyes are prominent; the antennæ are as long as the head and thorax, and composed of about thirty-seven joints. The abdomen is terminated in the female by a long ovipositor. The legs are slender, of moderate length, and the tarsi are four-jointed.

Raphidia ophiopsis is not an uncommon insect in this country: it is rather more than one-third of an inch in length, and the expanded wings measure ¾ of an inch; the head and body are black, the antennæ and legs are yellow, and the wings are transparent.

The larva of this insect lives in the bark of trees and is said to prey upon other insects. It is exceedingly active in its motions, which are somewhat like those of a snake. The body is soft, long, and slender, of a brown colour, striped, and variegated with yellow; the head and prothorax are corneous and of a black colour. In the pupa all the parts of a perfect insect are distinct, being enveloped in a thin membrane.

Family *Termitidæ*.—This family is distinguished by the following characters:—Wings with few transverse nervures, folding horizontally; tarsi four-jointed; antennæ short and moniliform; body depressed.

In the genus *Termes* the head is large and rounded, and besides the ordinary compound eyes, it has three ocelli, or simple eyes, situated on the upper surface; the antennæ are as long as the head and thorax, inserted in front of the eyes, and composed of about eighteen joints. The abdomen is terminated by two small jointed appendages.

The Termites, or white ants, as they are often called, though they have little affinity with the true ants, are chiefly confined to the tropics; some few species however extend into the temperate regions. Like the bees, wasps, and ants, which live in society, the Termites are composed of three kinds of individuals, males, females, and what are termed neuters or workers. Their ravages in the warmer parts of the globe are well known. They unite in societies composed each of an immense number of individuals, living in the ground and in trees, and often attacking the wood-work of houses; in which they form innumerable galleries, all of which lead to a central point. In forming these galleries they avoid piercing the surface of the wood-work, and hence it appears sound when the slightest touch is sometimes sufficient to cause it to fall to pieces.

The termites sometimes erect their domiciles on the ground in the form of pyramids or cones, sometimes with a roof, and these nests are often very numerous, and resemble the huts of savages.

The larvæ nearly resemble the perfect insect, excepting that they possess no wings. The pupæ have rudimentary wings. The neuters differ from the males and females in possessing no wings, in having the body stouter, the head much longer and provided with long jaws crossing at the extremity. They are said to defend the nests, and stationing themselves near the outer surface, they are the first to make their appearance when their habitation is disturbed: they will attack the party molesting them, and bite with considerable strength.

The negroes and Hottentots consider these insects a great delicacy. They are destroyed with quick-lime, or more readily with arsenic, which is thrown into their habitations.

The *Psocidæ* are very small insects, having soft and swollen bodies: the head is very large, nearly trigonal, and provided with three ocelli on the upper surface. The wings when folded meet at an angle above the abdomen, and are sparingly provided with nervures. The antennæ are setaceous, and composed of about ten joints. The tarsi are short, and usually two-jointed. They are very active in their motions, and live in the bark of old trees and in dwelling-houses. Nearly forty species are said to be found in this country.

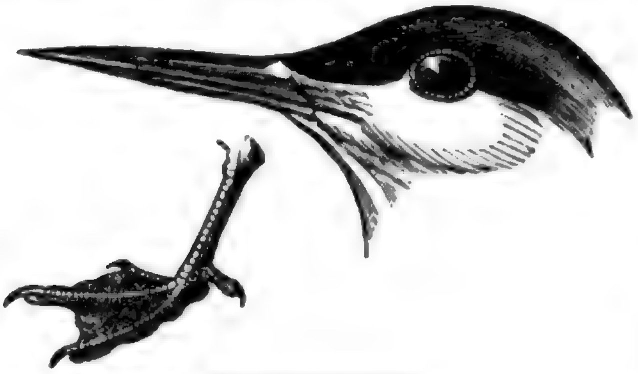
TE'RMOLI. [Sannio.]

TERMONDE. [Dendermonde.]

TERN, STERNA, the name of those web-footed long-winged birds which are vulgarly known as *Sea-Swallows.*

Linnæus, in his last edition of the *Systema Naturæ*, places the genus *Sterna* between *Larus* and *Rhynchops.*

Cuvier arranges the *Hirondelles de Mer* between the *Goelands* (*Larus*) and *Rhynchops.* He observes that these *Hirondelles de Mer* derive their names from their excessively long and pointed wings, their forked tail, and their short legs, which give them a port and flight analogous to those of the Swallows. Their bill, he adds, is pointed, compressed, straight, without curvature or projection; their nostrils, situated towards the base, are oblong and pierced through; the membranes which unite their toes are very much notched, they therefore swim but little. They fly in all directions, and with rapidity over the sea, uttering loud cries and cleverly picking up from its surface the mollusks and small fishes which form their food. They also advance inland to lakes and rivers.



Head and foot of Tern:

The same author states that the *Noddies* may be distinguished from the other Sea-Swallows. Their tail is not forked.

The views of Mr. Vigors, Mr. Swainson, and others, as to the position of the Terns, will be found in the article Laridæ.

Mr. Swainson makes the genus *Sterna* consist of the following subgenera:—*Sterna*, Linn.; *Thalassites*, Sw.; *Phaeton*, Linn.; *Rhynchops*, Linn.; *Gavia*, Briss.

The Prince of Canino places *Sterninæ*, the second subfamily of his *Laridæ*, between the subfamilies *Rhynchopsinæ* and *Larinæ.* The *Sterninæ* consist of the following genera:—

Sterna, Linn.; *Hydrochelidon*, Boie; *Megalopterus*, Boie (N.B. *Sterna Stolida* of authors); *Thalasseus*, Boie; *Gelochelidon*, Brehm; and *Stylochelidon*, Brehm. (*Birds of Europe and North America.*)

Mr. G. R. Gray (*Genera of Birds*) arranges the *Sterninæ* as the third and last subfamily of *Laridæ*, immediately after *Rhynchopinæ*, with the following genera:—

Phætusa, Wagl.; *Gelochelidon*, Brehm; *Thalasseus*, Boie; *Stylochelidon*, Brehm; *Gygis*, Wagl.; *Sterna*, Linn.; *Sternula*, Boie; *Hydrochelidon*, Boie; *Anoüs*, Leach (*Sterna stolida*, of authors); *Onychoprion*, Wagl.; and *Pelecanopus*, Wagl.

The *Pelecanidæ* immediately follow.

Geographical Distribution and Habits.—The habits of the Terns, which are widely diffused over the maritime parts of the globe, are noticed in the article Laridæ. The following have occurred, some occasionally only, in Europe:—

The Caspian Tern, *Sterna Caspia* (genus *Stylochelidon*, Brehm); The Sandwich Tern, *Sterna Cantiaca* (genus *Thalasseus*, Boie); the Gull-billed Tern, *Sterna Anglica* (genus *Gelochelidon*, Brehm); the common Tern, *Sterna Hirundo* (genus *Sterna* of authors); the Roseate Tern, *Sterna Dougallii* (genus *Sterna*); the Arctic Tern, *Sterna Arctica* (genus *Sterna*); the Little Tern, *Sterna minuta* (genus *Sternula*, Boie); the Noddy, *Sterna stolida* (genus *Anoüs*, Leach; *Megalopterus*, Boie); the Black Tern, *Sterna nigra* (genus *Hydrochelidon*, Boie; *Viralva*, Leach); the White-winged Tern, *Sterna leucoptera* (genus *Hydrochelidon ?* Boie); and the Moustache Tern, *Sterna leucopareïa* (genus *Hydrochelidon ?* Boie; *Viralva ?* Leach). Of these, the largest is the Caspian Tern.

Our limits will not allow us to give more than two examples, and we select the Common Tern and the Noddy. We should premise that all the Terns of the British Islands are strictly migratory: many species visit us regularly for the purpose of breeding; but those, the Noddy for instance, whose home is far away, are seen casually and rarely.

The Common Tern.—*Description.*—Forehead, top of the head, and long feathers of the occiput, deep black; posterior part of the neck, back, and wings, bluish ash; lower parts pure white, with the exception of the breast only, which is slightly clouded with ash-colour; quills whitish ash, terminated by ashy-brown; tail white, but the two lateral feathers blackish-brown on their external barbs; bill crimson-red, often blackish towards the point; iris reddish-brown; feet red. Length 13 to 14 inches. Such is M. Temminck's description of the *adult male and female.*

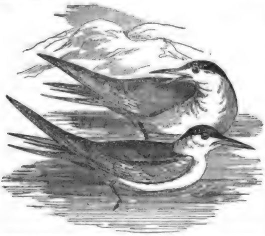
The same author describes *the young of the year before the autumnal moult* as having the front, and a part of the top of the head, of a dirty white, marked towards the occiput with blackish patches; the long occipital feathers brownish-black; upper parts of tarnished bluish-ash; all these feathers bordered and terminated with whitish and irregularly spotted with brown or bright reddish; the lower parts of a dirty tarnished white; tail-feathers ash-coloured, terminated with whitish; base of the bill faded orange; iris blackish-brown; feet orange.

This is the *Pierre Garin* of the French; *Fionco* and *Rondine di Mare* of the Italians; *Meerschwalbe* and *Rothfussiger Meerschwalbe* of the Germans; *Zee-zwaluw* of the Netherlanders; *Kria* of the Icelanders; *Tende, Tendelobe, Sand-Tolle*, and *Sand-Tærrne* of the Norwegians; *Tærne* of the Danes; *Sea-Swallow* of the modern British; and *Y fôr-wennol fwyaf* and *Yscraean* of the antient British.

Geographical Distribution, Habits, &c.—'The Common Tern,' says Mr. Gould, in his great work on *the Birds of Europe*, 'although not universally dispersed over our coasts, is nevertheless a very abundant species, being found in great numbers over the southern shores, but more sparingly over the northern, which are almost exclusively inhabited by its near ally, the Arctic Tern. It is now satisfactorily ascertained that the common Tern does not extend its range to the American continent, and that its place is there supplied by another species, to which the Prince of Musignano,' now Prince of Canino, 'has given the specific appellation of *Wilsoni*, in honour of the celebrated ornithologist by whom it was first described.' The Prince however gives both *Sterna Wilsoni* and *Sterna Hirundo* as American species, in his *Birds of Europe and North America;* and M. Temminck states that individuals killed in North America differ in nothing from those of Europe. In the fourth part of his *Manuel* (1840), though he adds to the synonyms and references, quoting among the rest Mr. Gould's work, he leaves his own observation above noticed uncontradicted. 'How far,' says Mr. Gould in continuation, 'the Common Tern is distributed over the Old Continent we have not satisfactorily ascertained, but we believe its range is extended from the Arctic Circle to the Mediterranean, and even to the coasts of Africa and India, to which southern and eastern countries it is supposed to retire during our winters. The Common Tern does not confine itself entirely to the sea, but frequently resorts to inland streams, &c.; and when thus ascending our creeks and rivers these little fairies of the ocean fearlessly fish around our boats, nothing can be more pleasing than to observe their poise and dip. When with their scrutinizing eyes they have observed a fish sufficiently near the surface, they precipitate themselves upon it with unerring certainty, and a rapidity that is truly astonishing: this mode of capture strongly reminds us of the fissirostral tribe among the land birds, and they may indeed be truly termed the swallows of the ocean, their long and pointed wings, and small but muscular bodies, being admirably adapted for rapid and sustained flight, and affording the means by which they are enabled to traverse the surface of the deep with never-tiring wings.'

We have seen them performing their graceful evolutions so far inland as near Oxford, where they were continually dipping in the Isis for bleak, as it appeared to us, which were abundant there.

Mr. Selby states that this tern breeds upon the sand or shingle beyond high-water mark, making no artificial nest, but scraping a slight concavity for the reception of two or three eggs, which vary much in colour, the ground in some being of a deep oil-green, in others of a cream-white, or pale wood-brown, but all blotched with blackish-brown and ash-grey. 'In warm and clear weather,' says Mr. Selby in continuation, 'this bird incubates but little during the day, in such situations the influence of the sun upon the eggs being sufficient; but it sits upon them in the night, and also through the day under a less favourable state of weather. The young, when excluded, are covered with a mottled grey and white down, and are assiduously attended by the parents, and well supplied with food until able to fly and accompany them to sea. During the time of incubation the old birds display great anxiety, and are very clamorous when any one approaches their station, in flying round and frequently descending so near as to strike the hat of the intruder.'



Common Tern: two adults; one in winter, the other in summer plumage. (Gould.)

The following notice respecting the Arctic Tern, from the 'Bristol Mirror' newspaper (1842), is deserving of attention. The time alluded to was that when we had very blowing weather:—'During the high winds that prevailed on Sunday last, our harbour and floating-docks were visited by large flights of a rare and beautiful species of bird, the *Sterna Arctica*, or Arctic Tern. The birds were assembled in such vast numbers, that two or three hundred were killed with stones and other missiles, whilst several were caught alive; and so tame were they, that many were observed to pitch on the backs of passers by. This tern, as its name indicates, is a native of the higher arctic regions, and has been met with in all the late expeditions to the polar seas. It is a summer visitant to the coasts of Scotland and the north of England, but is rarely met with more southerly, and until the present there was no instance on record of a specimen having been obtained in this neighbourhood. The appearance of such vast flights of arctic birds, rare as a species, in the very heart of a large city, is an occurrence as remarkable as it is interesting. Flocks of these birds were also observed the same day at Clevedon, Weston, and other places along the Channel Coast.

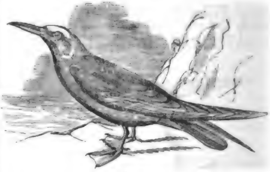
The Tern was formerly considered choice food. Thus, in the 'Household-book of the Earl of Northumberland' we find 'Ternes' among the delicacies for principal feasts or his lordship's own 'mees;' and they are charged at fourpence a dozen.

The Noddy.—Description.—In this form of tern the wings reach beyond the rounded tail. Forehead white, passing into grey-ash towards the top of the head, and into a deeper grey at the occiput, in front of the eyes a deep black patch; throat and cheeks grey-brown; all the upper and lower plumage chocolate or sooty-brown. Bill and feet black. (*Summer or nuptial dress.*) Length about a foot.

Geographical Distribution and Habits.—America principally, where its head-quarters appear to be the Gulf of Mexico, the coasts of Florida, and the Bahama Islands. Dr. Latham was told that they breed in great numbers on certain small rocky islands near St. Helena. Mr. Audubon observed numbers collected from the American coasts above mentioned in 1832, on one of the Tortugas, called, from the flocks that visit it, Noddy Key.

Mr. Gould remarks that the noddy, unlike the generality of terns, builds in bushes on low trees, making a large nest of twigs and dry grass, while hovering over or near which the old birds utter a low querulous murmur: the eggs, three in number, are reddish-yellow, with dull red and purple patches and spots, and the young are said to be very good eating. It does not take its prey like the other terns, but as it skims along the water; and, when full grown, seeks its food at much greater distances from the land than the rest of the group.

Two were shot off Wexford in Ireland in 1830. Temminck states that it has been seen in France, but he had never seen it on the coasts of Holland.



Noddy.

Mr. Nuttall gives a lively description of its habits.

'Familiar to mariners who navigate in the equatorial regions, the noddy, like the voyager, frequents the open seas to the distance of some hundreds of leagues from the land, and with many other birds of similar appetites and propensities, they are seen in great flights, assiduously following the shoals of their finny prey. They pursue them by flying near the surface of the water, and may now be seen continually dropping on the small fish, which approach the surface to shun the persecution of the greater kinds, by which they are also harassed. A rippling and silvery whiteness in the water marks the course of the timid and tumultuous shoals; and the whole air resounds with the clangor of these gluttonous and greedy birds, who, exulting or contending for success, fill the air with their varied but discordant cries. Where the strongest rippling appears, there the thickest swarm of noddies and sea-fowl are uniformly assembled. They frequently fly on board of ships at sea, and are so stupid or indolent on such occasions, as to suffer themselves to be taken by the hand from the yards on which they settle: they sometimes however, when seized, bite and scratch with great resolution, leading one to imagine that they are disabled often from flight by excessive fatigue or hunger. Some have imagined that the appearance of the noddy at sea indicates the proximity of land; but in the manner of the common tern, they adventure out to sea, and, like the mariner himself, the shelter of whose friendly vessel they seek, they often voyage at random for several days at a time, committing themselves to the mercy of the boundless ocean;

and having at certain seasons no predilection for places, where the climate suits, the roving flocks or stragglers find equally a home on every coast, shoal, or island.' (*Manual of Ornithology.*)

The vessel however is not always friendly. Bligh found the bird a seasonable supply to himself and his famished crew in his celebrated boat-voyage after the mutiny of the Bounty [Bligh]; and Byron has improved the incident in the terrible scene after the shipwreck in 'Don Juan.' [Booby, vol. v., p. 159.]

TERNATE, an island in the Indian Archipelago, is traversed by 50′ N. lat. and 127° 20′ E. long. It is 10 miles long and from four to five miles wide. It derives its reputation from the circumstance that its sovereign is in possession of a considerable portion of the islands of Gilolo and Celebes; and on this account the Dutch have thought it expedient to form a considerable establishment on the island at Fort Orange. The northern group of the Moluccas has been called the Ternate Islands, though this island is only one of the smaller ones which belong to them, some of which are of great extent, especially Gilolo.

The greater part of the island appears to be occupied by a volcano, which, according to Valentyn, attains an elevation of 367 ruths and 2 feet, or 4095 feet English, above the sea-level. The remainder of the island is very fertile, and affords rice and the other productions of the Indian Archipelago: but we have very little information on these points, as the Dutch have always excluded foreigners, and prevent the natives from trading with the neighbouring islands, lest the spices which grow on this and other islands of the group should be brought to other countries by any other channel than their own commerce; and although the English have been twice in possession of the Dutch settlement, their attention has been more directed to the great Dutch colonies than to this comparatively small establishment. We learn only from Forrest, that the inhabitants of the Sooloo Archipelago were permitted to trade with Ternate, and that they imported large quantities of different articles of Chinese manufacture, which they exchanged for rice, edible birds'-nests, trepang, sharks' fins, tortoise-shells, and small pearls: they exported also a great number of lories.

The inhabitants are Malays, who have embraced Islam. There are three mosques. The king, who possesses also the northern part of Gilolo, and the north-eastern limb of Celebes, where the Dutch have two settlements at Manado and Gurontalu, and several of the adjacent islands, lives in great state. These countries however are governed by separate chiefs, who in many respects resemble the feudal aristocracy of the middle ages: but the king and the chiefs are dependent on the Dutch governor of Amboyna, of which government Ternate forms a regency.

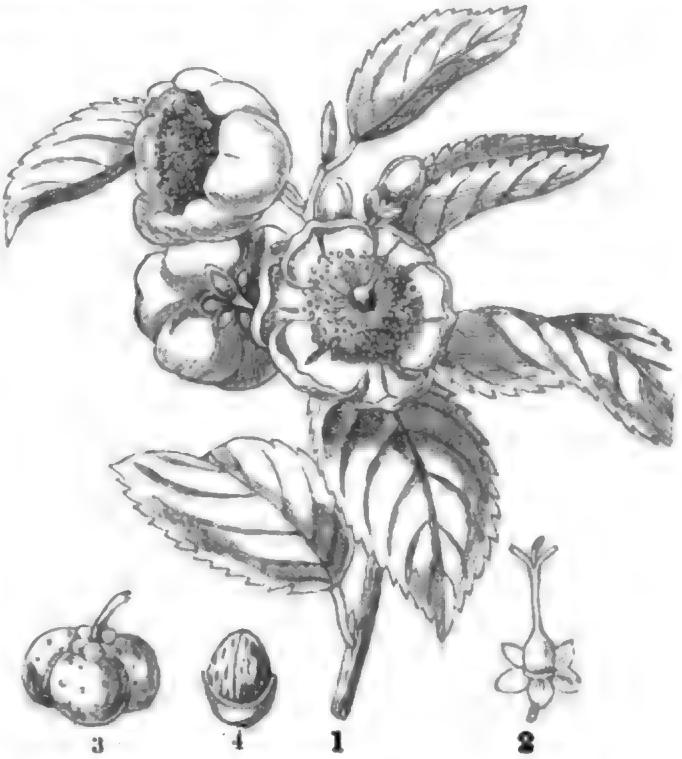
Ternate was first visited by the Portuguese in 1521, and some years afterwards they formed a settlement, which passed into the hands of the Dutch in 1606; who, in 1680, reduced the king to a state of dependence on them, and enlarged their establishment. In 1797 it was taken, together with Amboyna, by the English, who restored it at the peace in 1801: it was again taken in 1810, and again given up to Holland by the treaty of Paris in 1814.

(Forrest's *Voyage to New Guinea and the Moluccas, &c.*; Stavorinus's *Voyages to the East Indies*; Von Buch's *Physikalische Beschreibung der Canarischen Inseln, &c.*)

TERNI. [Spoleto.]

TERNSTRÖMIA'CEÆ, a natural order of plants belonging to the Calycose group of polypetalous Dicotyledons. As at present constituted, by Cambessedes, who is followed by Lindley, this order consists of trees or shrubs with alternate coriaceous leaves, without stipules, mostly undivided, and sometimes with pellucid dots. The flowers are generally white in colour, sometimes pink or red, and are arranged in axillary or terminal peduncles, articulated at the base. The calyx is composed of 5 or 7 sepals, imbricated in æstivation, the innermost the largest; petals 5, 6, or 9, often combined at the base; stamens indefinite with monadelphous or polyadelphous filaments, and versatile or adnate anthers; ovary superior; capsule 2-7 celled; seeds few, attached to a central axis, with little or no albumen, and a straight embryo, the cotyledons of which are very large, and often filled with oil. This order includes the Theaceæ of Mirbel and the Camelliæ of De Candolle. Their closest affinity is with the order Guttiferæ, from which they differ in their alternate leaves; in the parts of their flowers being 5 and its multiples; in the calyx being distinct from the corolla; in their twisted æstivation, and in their thin inadherent cotyledons. They have also relations with Hypericaceæ and Marcgraaviaceæ. The plants of this order are principally inhabitants of Asia and America; one species only is a native of Africa.

This order includes the genus Thea, and hence is one of great œconomical importance. [Thea.] It is supposed that the dried leaves brought to this country under the name of tea are not alone the produce of the genus Thea, but that the leaves of some species of Camellia are also mixed with them. [Camellia.] Independent of these two genera, little is known of the properties of this order. The Cochlospermum insigne is used as a medicine in internal bruises in Brazil, where it is called *Butua do curvo.* The C. tinctorium yields a yellow dye; and the seeds of C. Gossypium yield a gum resembling Tragacanth, for which it is substituted.



Thea Bohea.

1, branch with flowers and leaves; 2, superior ovary with trifid stigma; 3, fruit entire; 4, capsule dehiscent.

TERPA'NDER (Τερπανδρος), the earliest and the most important historical personage in the history of Greek music and its connection with poetry, for he was both a musician and a poet. He was a native of Antissa, in the island of Lesbos, and his best period falls in the latter half of the seventh century before Christ. There are few events in his life that can be chronologically established. In B.C. 676, at the first celebration of the musical contests during the festival of the Carneia near Sparta, Terpander was crowned as victor. (Athenæus, xiv., p. 635.) He afterwards gained four successive prizes in the musical contests at the Pythian games (Plutarch, *De Musica*, 4); and these victories probably fall between the years 672 and 645 B.C., since in the latter of these years he was at Sparta, and there introduced his nomes (νόμοι) for singing to the accompaniment of the cithara, and was engaged in reducing the music of the Greeks, such as it then was, to a regular system. (*Marmor. Parium, Epoch.* 34; Plutarch, *De Mus.*, 9.) At this time his fame must have reached its height. His descendants, or at least the musicians of his school (κιθαρῳδοί), continued for more than a century to obtain the prize at the Carneia every year without any interruption.

Numerous musical inventions are said to have been made by Terpander; many of them however may have been made by other persons, especially such as belonged to his school, and were subsequently ascribed to the father and founder of the art. Of many of his inventions we are unable to form any clear idea. The most important among them however is the seven-stringed cithara (heptachord).

Previous to his time songs, hymns, and rhapsodies had been accompanied with a cithara of only four strings (tetrachord), to which Terpander added three new strings, so as to make the cithara comprise a full octave, or, as the Greeks called it, a diapason. The heptachord soon came into general use, and remained the favourite instrument of the Greeks, especially the Dorians, notwithstanding the various alterations and improvements that were made. Another very important improvement which the antients unanimously assign to Terpander, is the reduction of the antient melodies to certain systems (νόμοι), which continued unaltered for several centuries. These nomes appear to have been of a twofold character: he either invented them himself, or he merely fixed those which had been used before his time. This fixing of certain tunes and melodies he is said to have effected by marks or notes which he made over the verses of a poem. In this manner he marked the tunes of his own poems, as well as of portions of the Homeric rhapsodies. His own poetical compositions, which, with the exceptions of a few fragments, are now lost, consisted of hymns, proœmia, and scolia.

(Müller, *History of the Literature of Antient Greece*, i., p. 149, &c.; Bode, *Geschichte der Lyrische Dichtkunst der Hellenen*, ii., p. 363, &c.)

TERPSI'CHORE. [Muses.]

TERRA DI LAVO'RO. [Lavoro, Terra di.]

TERRACI'NA, a town of the Papal State, in the administrative province of Frosinone, near the borders of the kingdom of Naples, and on the high road from Rome to Naples. The old town, which is built on the site of the antient Anxur, rises in the form of an amphitheatre on the slope of a calcareous rock which is a projection of the ridge called Monti Lepini, leaving but a narrow strip of land between it and the sea, along which runs the high road to Naples in the track of the antient Via Appia. Along the road are the modern buildings of Terracina, constructed by Pius VI., and consisting of the post-house and inns, custom-house, granaries, and other structures for public use. The old harbour, which was restored by the emperor Antoninus, has been long since filled up, but remains of the mole are still seen. The old town is an assemblage of poor-looking houses, perched one above another, surrounded and overtopped by white cliffs which are seen from afar (Horace, *Sat.* i. 5), and intermixed with myrtle, orange, and palm trees, and with plants of aloes and cactus. Above all rise the cathedral with its lofty steeple, an elegant palace built by Pius VI., the remains of the palace called that of Theodoric, which is a structure of the fifth century of our æra, and is situated on the summit of the hill, and about 600 feet above the sea, and an old castle raised in the middle ages. The cathedral is ornamented with some fine fluted Corinthian columns, which have been taken from a temple of Jupiter now ruined. Remains of a theatre are also seen. The climate of Terracina is very mild and genial in winter, but is unwholesome in summer.

The population of the town is 4000 inhabitants. Terracina is 56 miles south-east of Rome and 59 miles north-west of Naples. Beyond Terracina, on the side towards Naples, is a detached rock of a pyramidical form, nearly 200 feet high, one side of which was cut perpendicularly by C. Appius to make room for his road. About two miles farther is the frontier of Rome and Naples, where a military post is kept by each respective state. (Tournon, *Etudes Statistiques sur Rome*; Valéry, *Voyages en Italie*; Calindri, *Saggio Statistico dello Stato Pontificio*.)

Anxur was a thriving town of the Volsci long before the Roman conquest, was taken by the Romans in the year 403 B.C., was retaken by surprise in 399, and taken again by the Romans three years after. It afterwards became a Roman colony by the name of Tarracina. During the second Punic war the temple of Jupiter at Tarracina is mentioned by Livy as having been struck by lightning. (Livy, iv. 59; v. 10-13; xxviii. 11.)

TERRANO'VA. [Sicily.]

TERRAPE'NE. [Tortoises.]

TERRASSON, JEAN, a French writer of the last century. He was born at Lyon, A.D. 1670: his father was Pierre Terrasson, one of a family of considerable eminence and activity in that city, and a man whose devout temper led him to make all his four sons (of whom Jean was the eldest) members of the Congregation of the Oratory. They were all at Paris in the house of that Society when their father died; the three younger remained members of the Congregation, but Jean (now a sub-deacon) whose disposition disinclined him to the life of an ecclesiastic, quitted the Society, not however without having acquired considerable acquaintance with theology. The simplicity of character which ever distinguished him rendered him the dupe of men, by whom his small patrimony was soon wasted; but he found a shelter in the house of a friend, M. Rémond, to whose son he became tutor. He subsequently (A.D. 1714) undertook the education of the son of his cousin Mathieu Terrasson, a celebrated advocate in the parliament of Paris. He had become an associate of the Académie Royale des Sciences, A.D. 1707. In 1715 he made his first appearance as an author by taking part in the dispute then raging on the value of the Homeric Poems, and the comparative merits of the antients and moderns. His work was entitled 'Dissertation Critique sur Iliade d'Homère,' 2 vols. 12mo., Paris: it met with a favourable reception from those who joined in or approved of the attacks then made on Homer, who was severely criticized. Next year Terrasson published an addition to his dissertation on Homer, in 12mo., in reply to André Dacier, by whom he had been attacked. In A.D. 1719 the financial system of Law enabled Terrasson to obtain a large fortune, and induced him to form an establishment and set up his carriage: but wealth was to him rather a source of embarrassment than of pleasure; and when he lost his fortune the next year in the financial change which took place, he contentedly observed that it would be more convenient to him to live on a little. In A.D. 1720 he published a small work in defence of Law's financial schemes, entitled 'Trois Lettres sur le Nouveau Système des Finances,' 56 pp., 4to., Paris, and another small work in defence of the French India Company. He saved some small part of his fortune from the general wreck; and this, with the income of a professorship, which he obtained next year (A.D. 1721) in the Collège Royal, and a pension subsequently conferred by the crown, rendered his circumstances easy for the rest of his life. He became a member of the Académie Française A.D. 1732.

In 1731 Terrasson published a romance in imitation of the 'Telemaque' of Fénélon. It was entitled 'Séthos,' 3 vols. 12mo., Paris, and professed to be a translation of a Greek manuscript. The scene is laid chiefly in Egypt. This work obtained sufficient circulation to go through several editions, of which the last was in 1813, in 6 vols. 18mo., but never became popular. An English translation was published in London in 1732. In the years 1737-44 he published the seven successive volumes in 12mo. of a translation of Diodorus Siculus. This translation has been reprinted once or twice, but is very inaccurate. This was his last work of any extent. His memory and his bodily strength gradually failed, and he died A.D. 1750, aged 80.

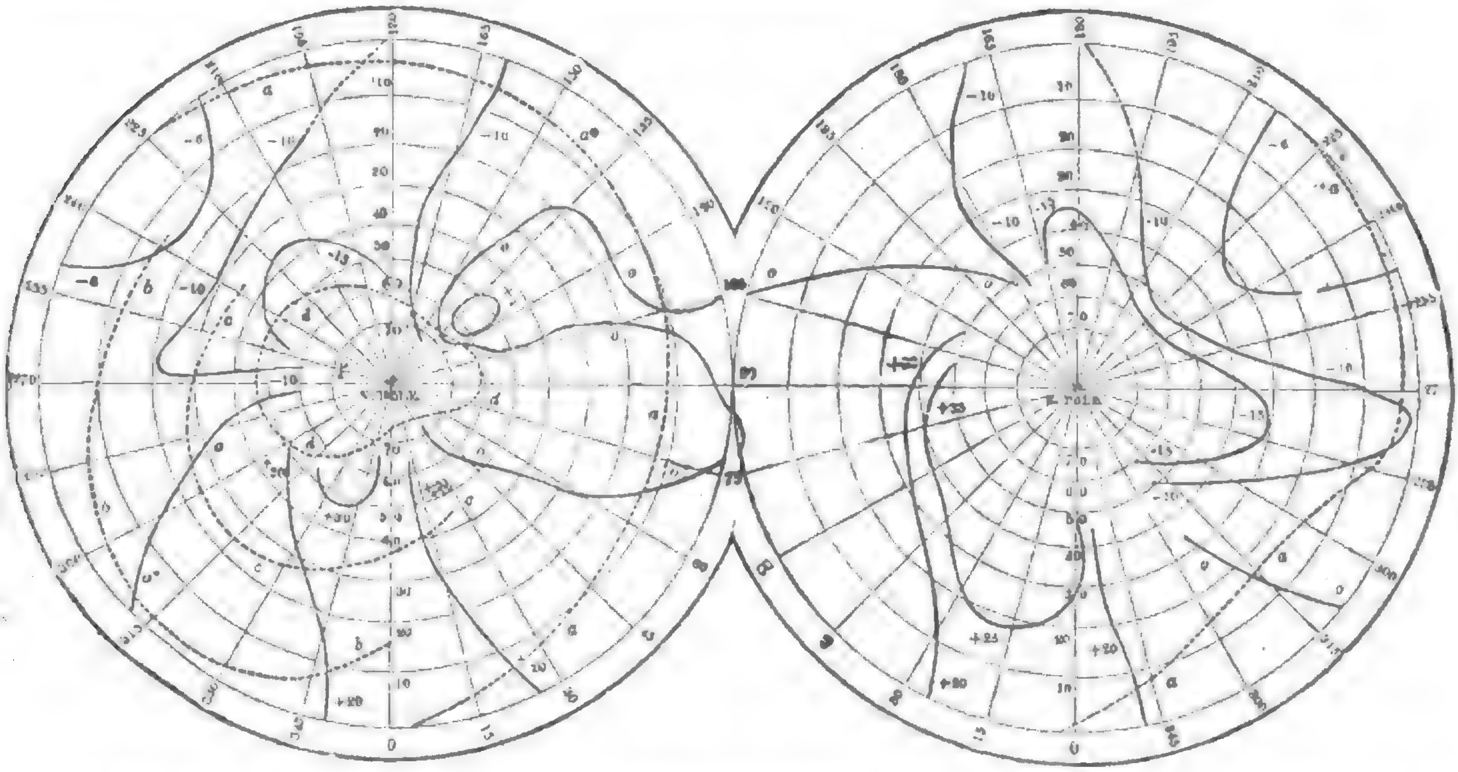
He wrote also a treatise entitled 'De l'Infini Créé,' of which he allowed one or two transcripts to be taken during his life; but it was never published, nor was the original manuscript found among his papers at his decease. He left also a small work, published after his decease, entitled 'La Philosophie applicable à tous les Objets de l'Esprit et de la Raison' (Paris, 8vo., 1754).

From an anonymous letter printed, with one or two other pieces, at the commencement of this small volume, and containing a biographical notice of Terrasson, we have derived the substance of this article. See also the *Eloge de Terrasson*, by D'Alembert; Quérard, *La France Littéraire*; *Biographie Universelle*.

TERRESTRIAL MAGNETISM. This term is used to denote the action of the magnetic fluid in or about the earth; the effects of that action being manifested in the phenomena presented by magnetized needles or bars.

The general polarity of a magnetized needle when supported or suspended in a balanced state, and its inclination to the horizon, with the slow variations to which those elements, as well as the intensity of the magnetic force, are subject, are phenomena which are conceived to arise from causes existing in the earth and pervading its whole mass: while the temporary effects, as the diurnal variations of the needle, are supposed to depend upon electrical currents produced by variations of temperature at the surface in consequence of the changes in the sun's position with respect to the horizon, and perhaps from other circumstances: finally, great temporary discharges of electricity in the upper regions of the atmosphere may be the causes of those occasional agitations in the needle, to which the name of magnetic storms has been lately applied, and which are now known to extend at the same moment over a great portion of the earth's surface.

The declination (variation) of the needle is that element of terrestrial magnetism which was first observed, and the difference of its amount in different regions, as well as the annual change at the same station, was early noticed. Dr. Halley, on his return to England after his second voyage, during which he had made many observations on the variation in different parts of the Atlantic and Pacific oceans, published, in 1701, a chart, on which were traced what have been since called *isogonal lines*, that is, lines passing through the points on the earth's surface where the variation was the same; and other charts of a like kind have since at different times been constructed. The expectation at first entertained, that such a chart might serve as a means of ascertaining the longitude of a ship at sea by an observed variation of the needle has not however been fulfilled, since as yet no formula has been discovered by which the variation at any given time and place may with sufficient accuracy be found: but though the changes of the variation have hitherto rendered such charts of little use for the purposes of navigation, yet a knowledge of the form of the lines of equal variation at different periods may be of great importance as a step to the discovery of the law of those changes. The latest variation chart is one which was published by Adolf Erman, after his journey, in company with Hansteen and Due, through the whole length of the Russian empire, and his return to Europe by sea. Erman determined the positions of the isogonal lines from his own observations, and from the most authentic of those which had been made by other observers between the years 1827 and 1830; and subjoined is a representation of the principal lines on the two hemispheres of the earth, projected stereographically on the plane of the equator. The lines marked *o o* pass through places where the variation is zero; the positive sign before a number indicates that the variation is westward, or that the needle deviates to the west of the astronomical meridian; and the negative sign indicates that the variation is eastward. On an inspection of the lines, it is manifest that on a sphere they must be curves of double curvature with bends in opposite directions; that most of them converge towards two points on the earth's surface, one in or near Baffin's Bay, and the other to the southward of New Holland; and that between the inflexions there are some which return into themselves.



The dip, or inclination of the needle to the horizon, which is another element of terrestrial magnetism, was first recorded by Robert Norman [INCLINATION], and numerous observations have been made to ascertain its value in different parts of the world, together with the variations to which it is subject in process of time; but a general chart exhibiting the forms of the isoclinal lines, as those of equal dip are called, is still wanting. On the above cut are represented by dotted curves some of the lines which are best known; and these have been taken chiefly from the partial chart given by Major (now Colonel) Sabine, in the 'Philosophical Transactions' for 1840. The data are stated to have been obtained from above 140 observations made on land between 1834 and 1839, and from many which were made at sea by Mr. Dunlop in 1831, and by Lieut. Sulivan in 1839. Some points have also been taken from the observations made by Erman in the Pacific Ocean, of which last observations a table is given in the 'Seventh Report of the British Association' (vol. vi.).

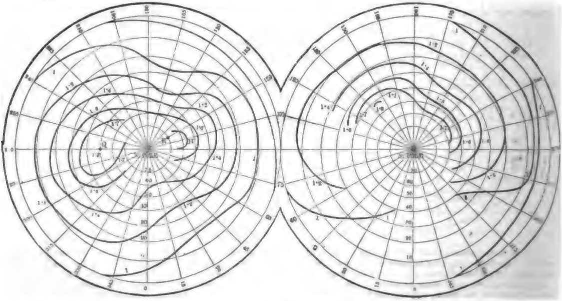
a, a, a, represents the line of no dip, which is evidently a curve of double curvature, and crosses the terrestrial equator in two points at least: *b, b, b,* is the known portion of the isoclinal line for a dip of 30 degrees below the northern part of the horizon: *c, c,* is the line for 60°; and *d, d,* the line for 75°.

An inspection of the cut will show that the oval lines of equal dip go on diminishing in magnitude northwards, and the pole of the dip, or place where that element is a maximum, may be fixed at a point (P in the diagram) in long. 263° (117° west), and in lat. 70° N.: at that place, by the observations of Captain James Ross, the dip in 1831 was found to be 89° 59′. Professor Hansteen, of Christiania, has deduced, from the observations which have been made in the polar regions, that the isogonal lines in the northern hemisphere tend to two points in the vicinity of the pole of the dip; those which are on the north side uniting in a point a little way to the north of the latter pole, and those on the south side a little way to the south of the same pole.

Till within the last fifty years it was the general opinion that the intensity of terrestrial magnetism was the same at all parts of the earth's surface; and to the Académie des Sciences, in France, is due the honour of having been the first learned body which proposed that observations should be made for the purpose of determining that element. In the instructions which its members drew up for the use of the unfortunate La Perouse, it was recommended that the intensity should be observed at places very distant from one another, in order to ascertain whether or not any differences existed in its value. The accounts of any observations which may have been made during the voyage perished; but between the years 1791 and 1794, M. Rossel, who sailed from France with the expedition in search of La Perouse, determined with a dipping-needle the inclination to the horizon, and the times of performing a vibration, at different places; and from the latter the fact of a difference of intensity was established. After that time extensive series of observations on the dip and intensity were made by Humboldt in South America, and in France, Italy, and Germany; by Hansteen, Due, and Erman in the north of Europe and in Siberia, and by the last-mentioned gentleman in the Pacific Ocean. Also by Colonel Sabine during his voyages to the polar seas and the equatorial regions of Africa and America; by the Russian admiral Lütke, in a circumnavigation of the globe; and by captains King and Fitzroy in the survey of the coasts of South America; and now, no observations on terrestrial magnetism are considered complete unless all the three elements, the declination, the inclination, and the intensity, are determined at the same time at every station.

Previously to the time when Humboldt made his magnetical observations in South America, the opinion that the intensity was a minimum at places where the dip of the needle was zero prevailed; and that philosopher, in consequence, assumed unity as the measure of the intensity at a certain station in Peru, where the dipping-needle assumed a horizontal position. From the times in which a certain number of vibrations were made by such needle at that station, and subsequently at Paris, Humboldt found that the intensity at the latter place was equal to 1·3842 (that in Peru being unity); and M. Arago and Col. Sabine afterwards, by a comparison of experiments made by themselves, ascertained that the intensity in London was (in 1827) expressed by 1·372. The scale of intensity which had been assumed by Humboldt continues to be used, though it is now known that the zero of dip does not correspond to the minimum of intensity, and it becomes necessary to employ terms less than unity to express the intensity at many places within and even beyond the tropics. The intensity is subject to a secular variation; but of the amount and the law of that variation as yet no certain knowledge has been obtained.

In the subjoined cut (No. 2), which, like the former, is a stereographical projection of the northern and southern hemispheres of the earth, are represented the principal isodynamical lines (lines of equal intensity) from the table and chart given by Col. Sabine in the 'Seventh Report of the British Association.' That chart was formed from all the authenticated experiments on the intensity which had been made between the years 1798 and 1836; but in the cut, in order to avoid confusion, there are given only the lines corresponding to the intensity represented by 1, 1·2, 1·4, 1·6, 1·7, and the points at which the intensity is known to be 1·8, which is the highest as yet observed. In all the tract between the curve lines marked 1, the magnetic intensity is less than unity: the breadth of this tract is very unequal; at points in long. 110° and 250° (110° W.) the lines approach within 3 or 4 degrees of one another, while near the meridian of Greenwich they are separated by an interval of about 50 degrees. In the middle of this band of low intensity which surrounds the earth, it might be expected that the intensity should be the lowest; and, in fact, M. Erman, in his return to Europe, found, at a few degrees westward of St. Helena, that the intensity was 0·743, which is the lowest yet obtained from observation.



Some of the isodynamic lines in both hemispheres are incomplete, because observations are still wanting at places through which the lines are supposed to pass, but no doubt can exist that all of them are curves which return into themselves. A simple inspection will show that in each hemisphere they constitute a system with two loops, or with two polar points: in the northern hemisphere, judging only by the forms, it may be perceived that the western pole, or point of maximum intensity, must be at a spot whose longitude is about 270° (90° W.), and latitude about 50°; that is, near Hudson's Bay. The eastern, or Siberian pole, appears to be in longitude 120°: its latitude is uncertain, but probably about 70°. The eye will readily detect also, that in the southern hemisphere the curves, as they are more distant from the equator, assume more perceptibly the form of loops about two points as poles whose positions are, by estimation, in long. 140°, lat. 60°, and in long. 240° (= 120° W.), lat. 60°; the former being to the south of New Holland, and the latter in the southern part of the Pacific Ocean. The nearest distance in longitude between the intensity-poles about Hudson's Bay and to the south of New Holland is about 130 degrees; and the nearest distance in longitude between the Siberian and the South American pole is about 120 degrees: the nearest distances in latitude are about 110° and about 130° respectively, so that those poles are not diametrically opposite to one another.

The intensity of magnetism at the New Holland pole appears to be nearly equal to that which has been observed at the North American pole, the observed intensity in Van Diemen's Land and at New York being 1·8; and the intensity at the Siberian pole is nearly equal to that at the South Pacific pole, the observed intensity at Viluisk in Siberia being 1·76, and the highest at present known in the South Pacific being 1·7. The fact that these last intensities are less than the former is indicated by the loops about them being smaller than those about the two western poles; and Erman thinks it probable that the centres of magnetic attraction, where the loops are small, may be at a less depth below the surface than they are where the loops contain greater areas.

Since there exists one pole of stronger and one of weaker intensity in each of the hemispheres on the north and south of the terrestrial equator, it may be inferred, as is observed by Col. Sabine, that the quantities of magnetism in the two hemispheres are nearly equal; but as all the four poles lie in one hemisphere of the earth, which would be formed if the latter were cut by the plane of a meridian passing through points whose longitudes are 100° and 280° (80° W.), it must follow that the hemisphere which contains the poles, that is, the hemisphere which contains America and the Pacific Ocean, must have a greater quantity than the other.

The isodynamic lines present the appearance of double flexures, like those of equal dip; and in both systems of curves there is a like tendency to form two foci, or centres of greatest attraction; and the bends gradually become less strongly marked as the lines approach the equatorial regions of the earth, but it is obvious that the lines in the two systems are far from being parallel to one another: in the southern hemisphere the isodynamical line 1 crosses the line of no dip in two places at least; and each of the dip-lines, *bb*, *cc*, *dd*, in No. 1, would pass through several of the intensity-lines in No. 2. Even within the limits of the British Isles the deviations of the two systems of lines from parallelism are very sensible ('Memoir,' by Maj. Sabine, in the *Eighth Report of the British Association*); and it may be inferred that, at least in the northern hemispere, the pole of maximum intensity is quite distinct from the pole of the dip, the distance between them in latitude being probably as much as 20 degrees. Q and R in the cut No. 2 are the presumed places of the two intensity-poles in the northern hemisphere. It is at present quite uncertain whether or not there is a corresponding difference between the poles of maximum intensity and of maximum dip in the southern hemisphere, but the circumstance is probable, from the fact that the highest observed intensities in both are equal at places (New York and Van Diemen's Land) where the dips are also equal, and where they want 20 degrees of being the greatest.

Professor Hansteen, in his treatise on the magnetism of the earth (1819), has shown, from a comparison of the observed places of the four poles of the dip at different times, that each of them has a slow movement about the axis of the earth. Not much dependence can be placed on the computed periods of the revolutions, but M. Hansteen assigns for that of the North American pole 1890 years, and for that of the Siberian pole 860 years.

The existence of two magnetic poles in each hemisphere is thus evident, and Gauss of Göttingen observes that there must also be a third point between each pair, which possesses the character of both, and therefore is a true pole. (*General Theory of Terrestrial Magnetism*, translated in Taylor's 'Scientific Memoirs,' pt. vi.) This is indeed obvious: for if a dipping-needle were carried from one pole towards the other, it would begin to deviate from the vertical direction towards the pole it had quitted; and, coming near the other, it would be found to deviate from the vertical towards the pole which it was approaching; and, as these deviations are in opposite directions, there must be an intermediate point at which the needle would assume a vertical position.

Almost as soon as a few observations on the phenomena of terrestrial magnetism were collected, Dr. Halley (1701) propounded a theory in order to account for them. He conceived that the earth itself might be a shell, containing within it a globe which revolved with it about the same centre of gravity and the same axis; the outer globe, or shell, being supposed to perform its rotation in twenty-four hours, and the other in a time rather greater or less. Each globe was supposed to have a magnetic axis passing through the common centre, but the two axes were supposed to be inclined to each other and to that of the diurnal rotation; and consequently there were supposed to be, in all, four magnetic poles.

The deviation of these magnetic axes from that of the earth's diurnal rotation was supposed to be the cause of the general variation (declination) of the compass-needle, and the slow deviation of the magnetic axes from each other was supposed to be the cause of that continual variation of the declination which is observed at every place on the earth's surface. The theory is highly ingenious, and resembles that of the epicycles, by which, in the infancy of astronomy, it was attempted to account for the variations in the movements of the planets: but when observations were multiplied, and the variations of the needle at considerable intervals of time were compared together, it was found to be incapable of representing the phenomena; and Mayer, of Göttingen, without gaining any advantage, modified the hypothesis by assuming that the centre of the small magnet was placed at a certain distance from that of the earth.

Subsequently (1805) M. Biot, assuming that there were two points in a supposed magnetic axis of the earth, by one of which the magnetized needle was attracted and by the other repelled, investigated a formula for expressing the dip and variation in terms of an indeterminate distance between those points. On comparing the result obtained by computation from the formula with the observed phenomena, he found that the latter were represented with tolerable accuracy when the points of attraction and repulsion were infinitely near to each other and to the centre of the earth. From the result of the investigation it follows that if a plane, supposed to pass through the centre of the earth perpendicularly to the magnetic axis, were considered as a magnetic equator, the tangent of the dip of the needle would be equal to twice the tangent of the magnetic latitude of the place on the earth's surface; and a like conclusion had been previously arrived at by Professor Kraft at St. Petersburgh, from such observations as then existed. It is here supposed that the curve of no dip is the circumference of a great circle of the sphere, and we have seen that this is far from being conformable to observation, yet the rule just mentioned may be advantageously employed when it is required, from any observed dips of small magnitude, to determine the situation of a point on the earth's surface where the dip is zero. The last attempt to account for the phenomena of terrestrial magnetism in this manner was made by M. Hansteen (1811), who assumed the existence of two small magnets of unequal strength at certain distances from the centre of the earth. He compared the results, with respect to variation, dip, and intensity, which he obtained by computation from that assumption, with the values of those elements observed at different places; and though, to a certain extent, the agreement was satisfactory, yet in several instances the differences were such as to show that the hypothesis was erroneous or incomplete. Professor Gauss of Göttingen, in his Treatise on the General Theory of Terrestrial Magnetism above quoted, has investigated the elements independently of all hypotheses concerning the distribution of the magnetic fluids in the earth, and assuming only that the terrestrial force is the collective action of all the magnetized particles in the earth's mass, he has exhibited the resulting formulæ in converging series; and has given, for ninety-one places on the globe, a table of the values of the declination and inclination of the needle, and of the intensity of magnetism, computed from his expressions for the horizontal and vertical components of the force, together with the observed elements at the same places; and the smallness of the differences between these last and the computed elements are satisfactory proofs of the correctness of the theory. For a supposed connection between the temperature of the earth's surface and terrestrial magnetism, see Isothermal Lines.

The want of complete success which has hitherto attended the different attempts to exhibit the laws of magnetical phenomena make it evident that the time has not arrived in which that can be done with respect to magnetism which Newton accomplished with respect to gravitation. But though the hypotheses formed, in order to account for the phenomena of terrestrial magnetism, have not brought out formulæ which will entirely satisfy the observed elements, it must not be understood that they are therefore without utility; since the approximative rules which have been obtained from them afford the means of computing small differences in the elements with sufficient accuracy to allow observations made at times or in places not very distant from one another to be reduced to what they would have been had they been made at one time or station; and thus several observations may be made to concur in the determination of a correct mean value of the element. This remark may be considered as applicable to most of the hypotheses which, in the physical sciences, have been proposed for the purpose of exhibiting the laws of the phenomena; and it may be further remarked, that the assumption of an hypothesis, by indicating the fittest place for observing, or the nature of the observations which are requisite for verifying it, is advantageous in leading the observer to select his stations or to vary the construction of his instruments, so as to put himself in the most favourable circumstances for determining the laws from observation.

In the year 1818 M. Arago, at the Observatory of Paris, made a series of observations on the irregular changes to which the declination of the needle is subject; and M. Kupffer having about the same time made similar observations at Kasan, a comparison of the results led to the discovery that the perturbations were simultaneous at those places, though they differed in longitude above 47 degrees. This remarkable circumstance immediately attracted the notice of philosophers, and a plan for making simultaneous observations in many different places was organized by M. de Humboldt in 1827. For this purpose magnetic stations were established at Berlin and Freyberg; and the Imperial Academy of Russia, entering with zeal into the project, caused a chain of stations to be extended from St. Petersburg to Pekin, at all which places simultaneous observations were appointed to be made seven times in the year, at intervals of one hour, during twenty-four hours.

In 1834 Professor Gauss discovered the fact that the synchronism of the perturbations was not confined to the declination of the needle, but that every deviation at one place of observation had its counterpart at another; and he was therefore induced to recommend a plan of simultaneous observations at intervals of five minutes during twenty-four hours, four times in the year. This suggestion was immediately adopted, and on the Continent magnetic stations were formed at more than twenty cities of Europe, from Dublin to St. Petersburg. The British Government and the East India Company also, besides the principal observatories of the former at Greenwich and Dublin, immediately sanctioned the formation of magnetic stations, under the direction of scientific officers, at St. Helena and the Cape of Good Hope, in Canada, the East Indies, and New South Wales; and in the present expedition to the antarctic regions under Captain J. C. Ross, one of the leading objects is the determination of the magnetic elements in that remote part of the world. The system of simultaneous observations at numerous and stated times of the year, which has been organized in Europe, is to be conformed to by all the British observers; and the Royal Society of London has caused an able Report of the objects of scientific inquiry in physics to be drawn up for the use of travellers in general, and particularly for the persons who have been appointed to take part in the observations respecting magnetism and meteorology.

The instruments employed for determining the elements of terrestrial magnetism, and the variations to which they are subject, are of three kinds: the declination magnetometer; and the horizontal and vertical force magnetometers. The first is a needle or bar, from twelve to fifteen inches in length, nearly one inch broad, and a quarter of an inch thick, suspended in a horizontal position in a stirrup by untwisted silk fibres about two feet long. The apparatus is contained in a box, to protect it from the agitation of the air, with two apertures in opposite positions; one of these is for illuminating the scale, and the other is used for the readings, which are taken by means of a telescope at a distance. For a description of such an instrument and its adjustments, see Taylor's 'Scientific Memoirs,' part v. By this instrument may be observed the absolute declination, or the angle which the axis of the needle makes with the astronomical meridian of the place, the variations of the declination, and the horizontal component of the earth's magnetic force. The latter is found by experiments of deflection and experiments of vibration; and the formulæ to be employed for the purpose are given in the work of Gauss, entitled 'Intensitas vis Magneticæ Terrestris' (1833). See also the Report of the Committee of the Royal Society, 1840. But Gauss considers that determinations of intensity by the vibrations of a needle are inaccurate on account of the changes which may take place in the intensity during the time in which the vibrations continue; and in 1837 he invented a new instrument, which is called a Bifilar magnetometer, for the purpose of determining the horizontal intensity alone. This consists of a magnetized needle or bar resting horizontally in a stirrup placed under a circular graduated plate, to the upper part of which are attached the two extremities of a fine steel thread or wire. The middle, or the bend, of the thread passes over two pulleys which are fixed in the upper part of the building; and the two parts of the thread hang in vertical positions, or parallel to one another, when the needle rests in the magnetic meridian. Then, on turning the whole apparatus horizontally so as to make the needle deviate from the magnetic meridian, the tendency of the needle to return to its former position causes the threads to assume directions oblique to each other; and there is some position of the needle in which its directive force is equal to the force by which the threads resist being made to cross each other's directions: it is easy to adjust the instrument so that, when this equilibrium takes place, the needle shall lie in a direction at right angles to the plane of the magnetic meridian. The torsion of the threads by which the needle is made to assume that position indicates the horizontal component of the magnetic force, and every change in the intensity of the latter affects in a direct manner the position of the needle. The magnetized bar in use at the Göttingen observatory weighs 25 lbs., and the length of the pair of suspending threads is 17 feet. (Taylor's *Scientific Memoirs*, parts vi., vii.) Instruments on the same principle, but of smaller dimensions, are made for ordinary occasions. See the Royal Society's Report.

The vertical force magnetometer consists of a magnetic needle resting on agate planes by what are called knife-edges, and it is made to assume a horizontal position by means of weights: the deviations of the needle from that position, when in the plane of the magnetic meridian, or in a vertical plane making any angle with that meridian, serve to determine the variations in the vertical component of the magnetic intensity.

Gauss observes that, on account of the simple relation that the horizontal and vertical components bear to one another, these are more proper to serve as the foundation of a theory, than the usual expression of the magnetic force by the total intensity, the inclination, and the declination; and he recommends that, in all observations, the intensity in the horizontal direction should be kept distinct from the other elements.

TERRIER (*Canis familiaris Terrarius*), a variety of the dog remarkable for the eagerness and courage with which it goes to earth, and attacks all those quadrupeds which come under the gamekeeper's denomination of *Vermin*, from the Fox to the Rat.

In the genealogical table of the different races of dogs we find the Hound immediately next in descent from the Shepherd dog, which is placed as the immediate descendant of the Lapland dog, the highest in the table, and collateral to the *Hound*, the *Terrier*, and *Harrier*.

Lieut.-Col. Hamilton Smith (*Naturalist's Library*, 1840), treating on the *Cur Dogs*, after stating that in Southern Africa we have a race of small Sacalian dogs; in Arabia, one of Thoan form; in India, the parent Pariah breed, apparently captured in the woods of the country;—that Southern China, all Persia, Natolia, and Russia have a similar predominant race of curs; and that in Europe there is everywhere evidence of an originally indigenous species of small dimensions, or at least of one, brought in by the earliest colonists of the west, extending from Lapland to Spain,—goes on to observe, that if we search for that kind which now seems to be the most typical, that possessing innate courage, sagacity, and prolific power, without training or care in breeding,—these qualities are found most unquestionably united in the terrier, and nowhere so fully marked, with all the tokens of antient originality, as in the rough-haired or Scottish breed. 'In the terrier,' says Col. Smith in continuation, 'we still see all the alacrity of innate confidence, all resources of spirit, all the willingness to remain familiar with subterraneous habitations, and all the daring and combination which makes him fearless in the presence of the most formidable animals; for it is often noticed in India, that when the bull-dog pauses, British terriers never hesitate to surround and grapple with the hyæna, the wolf, or even the panther. . . . If there be an original and indigenous dog of Britain, it is surely the species we have now under review: for if the Irish wolf-dog, or a questionable gaze-hound, were derived from the British wolf, such a conquest over a powerful and ferocious animal could scarcely have been achieved without the aid and intelligence of a previously domesticated and smaller species. But it is more likely the terrier of antiquity was of the same race with the hard-footed dogs of the Cymbers, and that the first were brought over from the north-west of Europe with the primitive inhabitants. Certain it is that the intermixture of terrier blood with other and later races has in no instance tended to diminish their courage, hardihood, and fidelity; and in no part of Europe has the rough-haired breed retained so completely as in Britain all the traits which constitute a typical species.’

Terriers may be divided into two sections, the one rough and wire-haired, the other smooth-haired and generally more delicate in appearance. In courage and sagacity there is little difference if the dogs be well bred, but the rough and wiry coat of the former is a greater protection from the attack of its adversary, and it is, if anything, the most severe biter of the two. They are of all colours, red, black, with tanned faces, flanks, legs, and feet, brindled, sandy, brown pied, white, and white pied. The Pepper and Mustard breeds, rendered famous by Sir Walter Scott, are highly valued.

Every pack of fox-hounds, to be complete, should be accompanied by a brace of terriers, and one should be smaller than the other, so that if one should be stopped by a small earth, the other may enter. For terriers going with hounds, any colour is better than all red, for a red terrier is sometimes mistaken for a fox, and hallooed off as one by inexperienced sportsmen.

Mr. Daniel, in his ‘Rural Sports,’ gives the following account of the ferocity and affection of a terrier bitch:—After a very severe burst of more than an hour, a fox was by Mr. Daniel's hounds run to earth at Heney Dovehouse, near Sudbury, in Suffolk; the terriers were lost, but as the fox went to ground in view of the headmost hounds, and it was the concluding day of the season, it was resolved to dig him. Two men from Sudbury brought two terriers for that purpose, and, after considerable labour, the hunted fox was got and given to the hounds. While they were breaking the fox, one of the terriers slipt back into the earth and again laid; after more digging a bitch-fox was taken out. The terrier had killed two cubs in the earth, but three others were saved from her fury. These the owner of the bitch begged to have, saying he should make her suckle them. This was laughed at as impossible; the man however was positive, and had the cubs: the bitch fox was carried away and turned into an earth in another country.

Mr. Daniel then relates that, as the terrier had behaved so well at earth, he some days afterwards bought her, with the cubs which she had fostered. The bitch continued to suckle them regularly, and reared them until they were able to shift for themselves: what adds to the singularity, Mr. Daniel observes, is that the terrier's whelp was nearly five weeks old, and the cubs could just see, when this exchange of progeny was made. He also states that a circumstance partly similar to the foregoing occurred in 1797, at the duke of Richmond's, at Goodwood, where five foxes were nurtured and suckled by two foxhound bitches.

The same author states, that in April, 1784, his hounds found at Bromfield-Hall wood. By some accident the whipper-in was thrown out, and after following the track two or three miles, gave up the pursuit. As he returned home, he came through the fields near the cover where the fox was found. A terrier that was with him whined and was very busy at the foot of a pollard oak, and he dismounted, supposing that there might be a hole at the bottom harbouring a polecat or some small vermin. No hole could he discern. The dog was eager to get up the tree, which was covered with twigs from the stem to the crown, and upon which was visible the dirt left by something that had gone up and down the boughs. The whipper-in lifted the dog as high as he could, and the terrier's eagerness increased. He then climbed the tree, putting up the dog before him. The instant the terrier reached the top the man heard him seize something, and, to his surprise, found him fast chapped with a bitch-fox, which he secured, as well as four cubs. The height of the tree was twenty-three feet; nor was there any mode for the fox to go to or from her young, except the outside boughs: the tree had no bend to render the path easy. Three of the cubs were bagged, and bred up tame to commemorate this extraordinary case: one of them belonged to Mr. Leigh, and used to run tame about the coffee-room at Wood's hotel, Covent Garden.

The breed of terriers recommended in the old times when the huntsman went on foot, was from a Beagle and Mongrel Mastiff, or from any small thick-skinned dog that had courage. Thus the coat and courage were supposed to come from the Cur, and the giving tongue from the Beagle. The time for entering the young terriers at a fox or badger was when their age was ten or twelve months, with an old terrier to lead them on. When entered at a fox, and the old one was taken, the young terriers were set to attack the cubs unassisted, and when they killed them, both young and old terriers were rewarded with the blood and livers fryed with cheese, with fox's or badger's grease: at the same time the dogs were shown the heads and skins to encourage them. There were other ceremonies recommended, too cruel to be repeated, and which could have been of little or no service. Honest Dandie Dinmont's mode of entering his Pepper and Mustard generations is as good as can be practised.

A cross of the terrier with the bull-dog for the purposes of badger-baiting, &c., was at one time much in vogue. Of this breed was the celebrated dog Billy, famous for his destruction of rats. He was often turned into a room with a hundred of those animals, and he frequently killed every one of them in less than seven minutes.

Of those inhuman practices—it is degrading the term to call them sports—badger-baiting, cat-killing, dog-fighting, and the like, we purposely say nothing here, except that they have been, most properly, put down by law in the metropolis and its vicinity.

TERRIER, from the French word *terrier*, a land-book, a register or survey of lands. Those best known in this country are the ecclesiastical terriers made under the provisions of the 87th canon. They consist of a detail of the temporal possessions of the church in the parish. They ought to be signed by the parson, and are sometimes also signed by the churchwardens and some of the substantial inhabitants of the parish. Their proper place of custody is the bishop's or archdeacon's registry: a copy also is frequently placed in the parish chest. If a terrier is proved to be produced from the proper custody, and therefore may be presumed to be genuine, it is in all instances evidence as against the parson. And in those instances where it has been signed by churchwardens elected by the parish or by the inhabitants, it is also evidence as against the inhabitants generally; even against those occupying lands other than the lands occupied by the inhabitants who signed it. The questions in respect of which a terrier is generally employed as evidence are those relating to the glebe, tithes, a modus, &c.

(Starkie, *On Evidence*.)

TERTIARY STRATA, the title given by almost universal consent of geologists to the uppermost great group of strata. Previous to the publication of the ‘Essay on the Geology of the Basin of Paris,’ by MM. Cuvier and Brongniart, in 1810, but little attention had been awakened to this great mass of deposits, though the familiar use of the terms primary and secondary, and the acknowledged dissimilitude between the latest of these strata and modern accumulations from water, in respect of mineral aggregation and organic exuviæ, seemed to be prophetic of the discovery of a newer type more in harmony with existing nature.

The extent to which, over great tracts in all quarters of the globe, this type has been found to prevail, is exceedingly great: most of the capital cities of Europe are built upon tertiary strata; many of the broadest plains and widest valleys in the New and the Old World are nothing but the dried beds of seas and lakes of the tertiary period: and some considerable mountain ranges bear on their high summits, and still more abundantly on their flanks, portions of the shelly tertiary strata which were uplifted from their original horizontality and subjected to the convulsive movements of which the mountain ranges are the result. In almost every part of the globe strata of this tertiary series prevail, and yield astonishing numbers of shells, corals, crustacea, and other remains of marine, fresh-water, and terrestrial invertebrata, and more locally abundant layers of fishes, and rich deposits of bones of mammalia, &c. Possessing so many attractions, and affording such unusual facilities for study, the tertiary strata of Italy, France, England, Northern Europe, the eastern states of North America, the great tracts of Brazil, Patagonia, &c., have been the theatre of great and laborious investigations, which have brought forward our knowledge of these deposits to at least an equal advance with that of the older strata.

More than this can hardly be said with justice; for though, in consequence of the great similitude between the agencies concerned in producing modern accumulations of sediments and organic exuviæ, and those which produced the tertiary strata, the *minute* history of particular portions of these is almost completely known, their *general* history is imperfectly comprehended, because the original formation of those strata was performed under as great a variety of *local* conditions as the accumulations of sands and shells on the actual sea-bed, and because, since their production and elevation from seas or lakes to form dry land, they have, from their surface position and inferior induration, been more subject to superficial waste and destruction than the older, more sheltered, and more consolidated strata. The incompleteness of our knowledge of the *general* history of the tertiary strata is evident by the incompleteness of the classification which represents that history, and on this point, the only one which it appears necessary here to discuss, we shall offer a few remarks. Among the primary and secondary strata [Geology] subdivisions corresponding to successive times of production have been found practicable and definable, and traceable over immense areas by means of a combination of mineral, structural, and organic characters. Limestones of certain kinds, as chalk, oolite, magnesian-limestone, accompanied with green, brown, or red arenaceous and argillaceous beds, and holding spatangi, apiocrinites, or palæonisci, mark and distinguish cretaceous, oolitic, and magnesian formations and systems of secondary strata corresponding to the carboniferous and other older systems of rocks. This has not been found so practicable in regard to the tertiary strata, which, though presenting many different sorts of strata, offer in the *manner of combination* amongst these too many general analogies, and too much of local difference, to be conveniently ranged into formations or systems having more than a local value, by means of mineral and structural characters.

Some assistance towards the desired classification appeared to be furnished by the alternation of marine and fresh-water sediments, as in the Isle of Wight, and in the basin of Paris, and hence the titles of Upper and Lower Marine, Upper and Lower Freshwater deposits acquired a considerable application. But the most successful and probably best-founded classification of tertiary strata rests upon a study of their organic contents.

It has been long remarked that in those strata, wherever they occur, the forms of animal and vegetable life make a near approach, even specifically, to living types. By careful examination, a certain number of species have been found in tertiary strata actually identical with or undistinguishable from living objects. The proportion in which these still living species are mixed with now extinct (or believed to be extinct) forms varies, so that in Sicily tertiary beds occur with above 90 per cent. of still living species of shells, but in the basins of London and Paris others are found containing only about 5 per cent.

There are reasons independent of these proportions which leave no doubt that the strata near London and Paris, which contain only 5 per cent. of living forms, are among the oldest of tertiary beds; while the Sicilian beds, which contain only about 5 per cent. of extinct species, are amongst the most recent.

Views of this kind generalized lead to a speculation which is strongly confirmed by the general current of geological discovery, that the relative antiquity of tertiary strata may be judged of by the relative proportion of extinct species of shells which are found in them. On this postulate M. Deshayes and Mr. Lyell have founded the most prevalent modern classification of tertiary strata, which may be thus briefly sketched:—

Recent Period.

Newer Pleiocene Period, the strata containing not above 10 extinct species in a hundred.

Older Pleiocene Period, the strata containing about 50 or 60 extinct species in a hundred.

Meiocene Period, the strata containing about 80 extinct species in a hundred.

Eocene Period, the strata containing about 95 extinct species in a hundred.

Secondary Period.

(These terms are taken from the Greek καινός, recent, combined with πλείων, more, μείων, less, and ἠώς, the dawn.)

The principle of *per centage* employed by Mr. Lyell in this classification should not be strongly objected to on account of its rigorous numerical results being sometimes found locally inapplicable. It is impossible that this should be otherwise, for the numerical proportions of organic life must always vary in proportion to local conditions as well as to the general succession of physical influences; but that the great cause of the systematic variations of the forms of plants and animals in successive geological periods, whether primary, secondary, or tertiary, is the successive and systematic change of physical circumstances influential on organic life, appears amply proved. There appears no good reason to doubt that the variations of individual organizations, and the numerical proportions of their combinations, are in harmony with and indicative of the successive physical conditions when they lived, and consequently of the successive periods to which these physical conditions belonged. The comparison of individual fossil and living forms is merely *one*, and that not the most general or important, mode of manifesting the *numerical constants* of organic life of the several geological periods. By some other less obvious arithmetical processes, the relative analogies of antient and modern nature may be made to appear numerically, independent of any such specific comparisons, and without limitation of geological age or geographical region. This has been attempted in regard to the Palæozoic fossils generally, and to the fossils of Devonshire specially, and the result affords remarkable encouragement to the application of rigorous calculations based on exact data representing the *numbers* of distinctly recognisable forms of different groups of organic remains, whether these be of living or extinct tribes.

We have only further to remark, that the tertiary strata are far more distinctly defined and separated from the uppermost secondary strata than from the recent deposits of water. In fact the most natural classification of tertiary volcanic products, tertiary strata, and tertiary organic remains, is with the living creation. In tertiary strata the phenomena of mineral accumulation seem to be such as are witnessed in daily operation: they contain marine, littoral, and pelagic deposits; æstuary and fluviatile sediments; lacustrine beds hardly distinguishable from such as are now in progress. In these sediments occur remains of a system of terrestrial and aquatic life as complete (if we except reasoning man) as that now in activity; and if the absence of man, and the animals which seem to be associated with him for his comfort and advantage in the actual creation, be thought a sufficient reason to remove from historic time the account of tertiary deposits, and to justify the adoption of a distinct quaternary or modern period in geological classifications, it is not the less true that the geological date of the epoch of this period, the line of separation between it and the tertiary æras, is entirely unknown by direct and positive facts, and appears incapable of determination by reasoning on any collateral phenomena at present ascertained.

(Lyell, *Principles of Geology*; De la Beche, *Geological Manual*; Phillips, *Palæozoic Fossils of Devon*.)

TERTULLIA'NUS, QUINTUS SEPTIMIUS FLORENS, the earliest of the Latin ecclesiastical writers, lived in the latter part of the second century and the beginning of the third. The exact date of his birth is unknown; Tillemont supposes that it was in 160 A.D., and others have fixed it as early as 135. He was born, according to Jerome (*De Vir. Illust.*, 53), at Carthage, where his father was a centurion in the service of the proconsul of Africa. He embraced the profession of an advocate or rhetorician, in which he appears to have attained to some eminence. During this period of his life he was a heathen, as he himself informs us (*Apolog.*, 18; *De Spectac.*, 19; *De Resurrect. Carn.*, 19, 59; *De Pœnitent.*, 1). He was converted to Christianity at Carthage in all probability, though an expression of Eusebius (*Hist. Ecc.*, ii. 2) has been thought to imply that his conversion took place at Rome. Immediately upon his conversion he was ordained a presbyter. About the end of the second century (several writers suppose about the year 200), he became a Montanist. [Montanists.] Jerome (*l. c.*) ascribes this change to his suffering from the envy and insults of the clergy of the Roman church, but a more adequate and more probable reason for it is found in the character of Tertullian himself. In his writings composed before his Montanism he shows many traces of that zeal and asceticism which formed the peculiar characteristic of the Montanists. It has been doubted whether he remained a Montanist to his death. Some have thought that he returned to the catholic church, and others suppose that he at last settled down into opinions intermediate between those of the Montanists and those of the orthodox. For neither of these suppositions is there any sufficient proof. There existed indeed at Carthage, in the fifth century, a sect called Tertullianists; but between them and Tertullian there appears to have been no historical connection.

Whether he remained a Montanist or not, he continued to be held in the greatest respect by the African churches. In fact it is to his influence that we must trace the characteristics which distinguished those churches from other Christians, and which at length, through Augustin, gave a tone to the Christianity of the West. His influence was especially great upon Cyprian, in whose writings there is much which closely resembles some of Tertullian's, and of whom Jerome says that in asking for the works of Tertullian he was wont to say, 'Da magistrum' ('Give me my master').

The date of Tertullian's death is unknown, but we are told by Jerome that he lived to a great age. One of his works ('Ad Scapulam') was written as late as 216 A.D.

A large portion of his works have come down to us, and these may be divided into three classes: (1) apologetic, (2) practical, and (3) doctrinal or controversial. The same classification is sometimes stated differently, as follows:—(1) writings against the heathen; (2) writings on the nature, morals, rites, &c. of the church; and (3) writings against heretics. It is important to distinguish, if possible, between the works which he wrote before he became a Montanist and those which he wrote afterwards. This distinction has been attempted by Neander and Bähr. On the other hand, a few writers have thought that all the works of Tertullian were composed after he adopted the opinions of Montanus. (J. G. Hoffmann, *Diss. omnia Tertull. in Montanismo scripta videri*, Wittenberg, 1738.)

I. Of Tertullian's Apologetic Works the following appear to belong to the earlier part of his life, and to have been written in the reign of Septimius Severus. They are free from the peculiar tenets of Montanism:—

(1.) 'Ad Martyres;' for the encouragement and vindication of those who suffered for being Christians.

(2.) 'De Spectaculis;' written about 198, against the Roman games and festivals, and to dissuade Christians from being present at them.

(3.) 'De Idololatria;' an exposure of the character and influence of idolatry, with an exhortation to Christians to avoid every approach to participation in it.

(4.) 'Apologeticus adversus Gentes pro Christianis;' his principal work of this class, and one of the best of all his works, is a powerful refutation of the accusations made against the early Christians, and a warm remonstrance against the persecutions they suffered, addressed to the Roman magistrates. It was written in the year 198, and has been deservedly held in very high esteem both in antient and modern times.

(5.) 'Ad Nationes Libri II.' These two books, which were discovered in manuscript by James Gothofred, and printed by him at Geneva, 1625, 4to., form a kind of supplement to the 'Apologeticus.' The first contains much the same matter as that book, sometimes expanded, sometimes abridged, and sometimes newly arranged; the second takes up the general subject of heathen theology. The date of these books appears to be about 199, if they were written after the 'Apologeticus;' but some writers of high authority, as Neander and Münter, suppose that they were written before the latter work, in the year 198.

(6.) The treatise 'De Testimonio Animae' may be regarded as another supplement to the 'Apologeticus,' the 17th chapter of which contains in fact the same argument in a shorter form. Its object is to prove that there exists originally in the human mind, to a certain extent, a knowledge of the true God, and that this knowledge of God confirms the Christian doctrine of his character.

The remainder of Tertullian's apologetic works appear to have been written after he became a Montanist. They are:

(7.) 'De Corona Militis;' a vindication of a Christian soldier, who refused to wear a crown which had been awarded to him, on the ground that it was a badge of heathenism, and who was imprisoned for his refusal. This work contains remarks on other questions relating to the duties of a Christian citizen under a heathen government.

(8.) 'De Fuga in Persecutione;' a statement of the Montanist opinion that Christians, when persecuted, might neither attempt to save their lives by flight nor by money. Written about 202.

(9.) 'Contra Gnosticos Scorpiace;' an answer to the slurs thrown upon the martyrs in the persecution of Septimius Severus, by those *scorpions* the Gnostics.

(10.) 'Liber ad Scapulam;' a defence of the Christians, addressed to Scapula, the proconsul of Africa, who persecuted them.

II. *Practical Works*, relating to Christian morals and discipline. The following were written before he became a Montanist:—

(11.) 'De Patientia;' on Christian patience.

(12.) 'De Oratione;' on prayer: one of Tertullian's earliest works.

(13.) 'De Baptismo;' on baptism: a defence and explanation of the rite.

(14.) 'De Poenitentia;' on repentance: a manual for Catechumens and newly-baptized Christians.

(15.) 'Libri Duo ad Uxorem;' exhorting his wife not to marry a second time, if he should die before her.

The two following works were, in Neander's opinion, most probably written after Tertullian became a Montanist:

(16.) 'De Cultu Feminarum;' on female attire: consisting of two books, the first of which is sometimes denoted by a separate title, namely, 'De Habitu Muliebri.'

(17.) 'De Virginibus Velandis;' on the veiling of virgins: in opposition to the custom then prevalent at Carthage, of virgins appearing in church with the face exposed.

The remaining works of this second class are undoubtedly Montanistic:—

(18.) 'De Exhortatione Castitatis;' dissuading a friend from marrying a second time. To the same purport are

(19.) 'De Monogamia;' and (20.) 'De Pudicitia.'

(21.) 'De Jejunitate,' or 'De Jejuniis;' recommending the severe practices of the Montanists, in preference to the milder doctrine of the orthodox respecting fasts. In this work, and others of his writings, he applies to the orthodox the term 'psychici' (ψυχικοί), *carnal*, which is used by Paul (1 *Cor.*, ii. 14) in opposition to 'spiritual.'

(22.) 'De Pallio,' composed in the year 208, is a treatise recommending the wearing of the Greek pallium in preference to the Roman toga. It contains much information respecting the form of these garments.

III. *Works on Christian Doctrine and Polemics*. The only one of this class which seems to have been written before his Montanism is

(23.) 'De Praescriptione (or Praescriptionibus) Haereticorum;' against heretics in general, and especially the Gnostics and Marcionites.

He continued his attacks upon the heretics, and especially the various sects of Gnostics, after he became a Montanist, in the following works:

(24.) 'Adversus Marcionem Libri V.'

(25.) 'Adversus Valentinianos;' which Semler supposes to be a close imitation of Irenaeus, 'Contra Haereses.'

(26.) 'De Carne Christi,' and (27.) 'De Resurrectione Carnis,' are treatises on the resurrection, in opposition to the Gnostics.

(28.) 'Adversus Hermogenem;' against the doctrine held by a Gnostic of that name, that matter is eternal, and that out of this eternal matter not only all sensible things, but also the souls of men are made, the latter being besides endowed with a divine principle of life (πνεῦμα). Against this doctrine concerning the soul Tertullian wrote another work, from which only some quotations have come down to us: 'De Censu Animæ.' Our loss is the less, as we have a fuller treatise by Tertullian on the same subject, (29.) 'De Anima;' in which he discusses the theories of heathen philosophers concerning the soul, and opposes to them all the doctrines of Christianity, that it is spiritual, immortal, and received direct from God.

There is also a work by him on the doctrine of the Trinity.

(30.) 'Adversus Praxean;' written about 204 or 205, against the doctrine of Praxeas, which was in fact essentially the same with that which afterwards became known as Sabellianism.

In the latter part of his life he wrote a work, (31.) 'Adversus Judaeos,' in answer to the Jewish objections against Christianity.

The above list contains all the extant works of Tertullian, but he must have written many more, since Jerome informs us that many of his works had been lost even before his time. (Hieronym., *De Vir. Illust.*, c. 53.) Among his lost works, of which the titles are known, besides that 'De Censu Animae,' already mentioned, are some which were especially designed to explain the opinions of the Montanists, namely, 'De Spe Fidelium,' one of the earliest works in which was put forth the doctrine now known as Millennarianism, of the personal reign of Christ on earth for a thousand years [MILLENNIUM], and 'De Paradiso.' He also composed a defence of the 'ecstasies' of the Montanists in six books, to which was added a seventh against a certain Apollonius. His treatise 'De Aaronis Vestibus' appears to have been lost before Jerome's time. (See Hieronym., *Epist.* lxiv., near the end.)

Two works which are sometimes erroneously ascribed to Tertullian are the 'Carmina Sibyllina,' and the 'Acta Perpetuae et Felicitatis.' Tertullian holds one of the first places, if not the very first, among the Latin fathers, for learning and intellectual power. Even those to whom his peculiar opinions were the least acceptable have eulogized him in the highest terms. Thus Jerome says (*Epist.* lxx., sec. 5), 'What more learned, what more acute than Tertullian? whose apology and books against the heathen embrace all the learning of the age.' Vincentius Lirinensis (*Commonitor.*, c. 24) adjudges to him 'by far the highest place among the Latin fathers,' and attributes to him 'the most extensive learning both in things divine and human, and a grasp of mind which comprehended all philosophy, all sects of philosophers, their authors and supporters, and every variety of historical and scientific knowledge.' Erasmus calls him 'by far the most learned of all the Latin theologians.' (*Prefat. ad Hilar.*) In short, the general judgment of the orthodox in antient and modern times may be summed up in the words of Jerome: 'His genius I praise, his heresy I condemn' (ejus ingenium laudo, haeresin damno). In fact, he appears from his writings to have become acquainted with all the learning then taught in the schools of the rhetoricians, while to this he added the results of careful observation, and then brought all his knowledge to the support of the opinions he embraced, first as a Christian and afterwards as a Montanist. Perhaps the most striking feature in his writings is his intimate acquaintance with all the ramifications of heathen theology and worship, and the powerful use he makes of this sort of learning in his controversies with the heretics.

His excellencies and defects are strangely mingled. We trace the skill of the rhetorician in his forcible reasonings and his eloquent style, but he has also the rhetorician's faults in arguing often with more sophistry than truth, and in taking liberties with language till his meaning becomes obscure. His warm and zealous temper gives life and impressiveness to his writings; but its excess made him an enthusiast and ascetic, perhaps we ought in truth to say, a fanatic. In his writings we may generally see a striving after words to express the warmth of his feelings and the depth of his convictions, and the result of this effort, combined with the rhetorical character of his style, is often to render his eloquence inflated and obscure. He indulges frequently in figures and hyperboles, and excels in satire and irony. His writings differ greatly both in argument and style. His polemical works are the clearest, but not the most elegant. His best works are his Apology (4), and those on the Prescription of the Heretics (23), on Repentance (14), on Baptism (13), on Prayer (12), on Patience (11), and his address to Martyrs (1).

The best editions of Tertullian are those of Rhenanus, Rigaltius, and Semler. A full account of editions and illustrative works is given at the end of the excellent small edition of Tertullian by Leopold, in Gersdorf's 'Bibliotheca Patrum Ecclesiasticorum Latinorum Selecta,' 4 vols. 12mo., Leips., 1839-41, Tauchnitz.

It is doubtful whether the Tertullianus, or Tertyllianus, from two of whose works there are excerpts in the 'Digest,' is this Tertullianus. The subject is briefly discussed by Zimmern ('Geschichte des Röm. Privatrechts'), with references to other remarks on this subject. Tertullian, in his theological works, shows that he was well acquainted with Roman law.

(The Church Histories of Mosheim, Neander, and Schröckh; Baehr's *Christlich-Römische Thelogie*; Neander, *Antignosticus Geist des Tertullianus*, &c., Berlin, 1825, 8vo.; Bishop Kaye, *The Ecclesiastical History of the Second and Third Centuries, illustrated from the Writings of Tertullian*, Camb., 1826, 8vo.; Münter, *Primordia Ecclesiae Africanae*, Hafn., 1829, 4to. Other works on the Life and Writings of Tertullian are mentioned in the Appendix to Leopold's edition.)

TERU'NCIUS. [As.]

TESCHEN, a circle of Austrian Silesia, is bounded on the north by Prussian Silesia, on the east by Galicia, on the south by Hungary, and on the west by Moravia. Its area is stated by most authors at about 720 or 740 square miles: Von Liechtenstern (alone, we believe) makes it 1360 square miles. The number of inhabitants is about 180,000. The country consists entirely of mountains and valleys, but especially in the south, where the Carpathian chain commences. The northern part is flatter, but marshy, with many small lakes or meres, so that it is not well adapted for tillage. The Oder forms for a short distance the north-western boundary towards Prussian Silesia, and the Ostravitza divides it on the west from Moravia. The Vistula rises in the Carpathians on the Hungarian frontier, from three springs, which unite near the mountain Tankow, flow to the village of Weichsel, and to the towns of Skotschau and Schwarzwasser, and then running along the northern frontier of the circle, pass into Galicia. The circle has many forests, and consequently timber in abundance; fine pasturage; and a good breed of horses, horned cattle, and swine. The inhabitants raise some oats and rye, and a great quantity of potatoes. There are mines of iron and coals, which are not so extensively worked as they might be. The inhabitants in general manufacture woollen cloth, linen, and wooden-wares. The circle contains the duchies of Teschen and Bielitz, and several inferior lordships. [BIELITZ.] The duchy of Teschen however constitutes by far the greater part of the circle, having a population of 140,000 inhabitants, who are mostly of Slavonian origin.

The duchy of Teschen formerly belonged to the emperors, as kings of Bohemia. In 1722 it was assigned to Leopold, duke of Lorraine, as an indemnity for the Italian duchy of Montferrat, to which he had some pretensions. Upon his death in 1729 it was inherited by his son, afterwards the emperor Francis I., whose daughter Maria Christina obtained it in 1776, and she having married Prince Albert of Saxony, he took the title of Duke of Saxe-Teschen. Prince Albert dying February 10, 1822, without lineal descendants, the duchy was inherited by the Archduke Charles, who governs it under the sovereignty of Austria.

TESCHEN, the capital of the circle and the duchy, is situated in 49° 40′ N. lat. and 18° 32′ E. long., at the foot of a gentle eminence, an offset of the Carpathians, on a peninsula, or tongue of land formed by the river Elsa or Olsa, and a small stream called the Bober or Bobreck. The town has three suburbs, which are not separated from it by walls or gates: the streets are in general broad and straight, a great fire in 1789, before which it resembled an irregular dirty Polish town, having given an opportunity to rebuild it in a better style; there are still however some narrow and steep streets. There are four Roman Catholic churches and one Lutheran church; the last is a very large and handsome edifice. The Oberring is a regular square, or rather parallelogram, in which is the town-house, a fine building with a lofty tower, at the back of which are a theatre and concert-room. Teschen is the seat of all the courts of justice and public offices of the circle and the duchy. There is a Roman Catholic gymnasium, with a library of 12,000 volumes, and collections of minerals, insects, and medals; and a Protestant gymnasium, and several schools. The inhabitants, now 7000, manufacture fine broadcloths, kerseymere, leather, and a kind of muskets known in Germany by the name of Teschinks. They have also a considerable trade in leather, wool, broadcloths, Hungarian wines, honey, and wax. The treaty between Frederick II. of Prussia and the empress Maria Theresa, which terminated what is called the war of the Bavarian succession, was concluded at Teschen in 1779.

(Hassel; Stein; Cannabich; *Oesterreichische National Encyclopädie.*)

TESI, MAURO ANTONIO, or, as he is sometimes called, after the name given him by his patron and admirer, Algarotti, Il Maurino, was born at Montalbano in the territory of Modena, January 15, 1730. Though in poor circumstances, his parents were so desirous of giving him a good education, that they removed for that purpose to Bologna, where he was admitted into the Scuole Pie. Manifesting a great taste for drawing, he was placed under Carlo Morettini, a mere heraldry painter. It is therefore not without reason that Algarotti calls him self-taught, for though he afterwards received some instruction from an engraver named Giovanni Fabbri, it could have contributed but little towards the excellence he displayed in that branch of art which he selected,—architectural design and painting. For this he was doubtless most of all indebted, after his own talent, to the instruction and assistance of Algarotti himself, who made him the companion of his journeys to various places, and treated him as a son. The attachment was reciprocal; and it was owing to his attentions to his patron during his last illness at Pisa, that he fell into ill health himself, and died two years afterwards at Bologna, July 18, 1766.

Algarotti has made frequent mention of Tesi in his letters, where he has described many of his works at considerable length, and speaks both of them and him in terms that would seem quite exaggerated, if they were expressed by a less intelligent critic, or were his praises not confirmed by the opinions of others. The encomium paid to his memory in the inscription on his monument in the church of St. Petronio, Bologna,—'Elegantiæ veteris in pingendo ornatu, et architectura restitutori,'—has not been considered more than is due to one who set an example of more refined and purer taste in architectural design and composition. His productions are highly esteemed, and though his pictures are few, he left a great number of drawings, and also a series of architectural plates engraved by himself.

(Tiraboschi, *Bibl. Modenese*; Lanzi, *Storia Pittorica.*)

TE'SSERA, a small cube or square resembling our dice, which was used by the antients for various purposes, and accordingly it consisted of different materials, as marble, precious stones, ivory, glass, wood, or mother-of-pearl. Such small tesserae of different colours were used to form the mosaic floors, or pavements in houses, which were hence called tesselata pavimenta. (Sueton., *Cæsar*, 46.) The same kinds of cubes, usually made of ivory, bone, or hard wood, and marked on all their six sides, were used by the antients as dice in games of hazard, just as in our times. In the earlier times three dice were used in a game, but afterwards only two.

The word tessera was also employed to signify any token which was given to persons by which they might recognise one another. In this case however the tesserae were probably not cubes, but were of an oblong form, or small tablets marked with certain signs. Thus we find mention of a *tessera hospitalis*, which strangers when forming a connection of hospitality gave to one another, that they or their children might afterwards recognise one another, and it appears that a tessera in this case was marked with the figure of Jupiter hospitalis. (Plautus, *Poenul.*, v. 1, 25; 2, 87, &c.) Tesserae frumentariae, or nummariae, were occasionally given at Rome to the poor to serve as a token or ticket, on the presentation of which they received a certain amount of corn or money. (Sueton., *Aug.*, 40; *Nero*, 11.) The Roman soldiers also, before they commenced a battle, received a tessera containing the watchword by which they recognised their comrades, and were enabled to distinguish them from strangers. (Virgil, *Æn.*, vii. 637, with the note of Servius.)

(*Dictionary of Greek and Roman Antiq.*, 'Tessera.')

TESSIN. There are three eminent Swedes of this name, father, son, and grandson. The first of them, Nicodemus the elder, or Nicodemus Valentinson Tessin, was born at Stralsund in 1619, and held the appointment of royal or crown architect, which was conferred upon him by Queen Christina in 1645, then vacant by the death of Simon de la Vallée. Very little more has been recorded of him, except that he visited Italy, that a patent of nobility was granted to him in 1674 by Charles XI., and that he filled the office of magistrate at Stockholm. Even the time of his death is not precisely stated, but it appears from collateral evidence to have been somewhere about 1688. As an architect one of his chief works is the palace of Drottningsholm, begun by him for the queen-dowager Hedwig Eleonora (widow of Charles Gustavus), but completed by his son. He also erected the royal villa of Strömsholm, and the mausoleum of Charles Gustavus. In fame he has been surpassed by his more eminent son,

Count Nicodemus Tessin, who was born at Nyköping in 1654, and had for one of his baptismal sponsors the queen Maria Eleonora, widow of Gustavus Adolphus. He was carefully educated by his father, expressly with a view to his future profession. As soon as he had completed his studies, first at Stockholm, afterwards at Upsala, he was sent at the age of eighteen to Italy, whither he accompanied the Marquis del Monte, a nobleman in the service of Christina of Sweden. He studied at Rome under Bernini, and acquired a taste for the fine arts generally. After four years thus spent, he visited Naples, Sicily, and Malta, and again returned to Rome, at which place he received from Sweden his appointment as future hof-architect in 1689. On his return he was allowed, by Charles XI., to prosecute his travels conformably with his earnest wish for further improvement, and this time he visited England and France, in which latter country he remained three years. On finally settling in his native country, he received, in addition to his former appointment, that of city-architect to the magistracy of Stockholm. The destruction of the royal palace by fire in 1697 afforded him an opportunity for displaying his ability far more favourable than might else have offered itself; and of which he so well availed himself as to render the new edifice one of the noblest of its kind in Europe, though not what it would have been had his ideas been fully carried out. He had also numerous opportunities of exhibiting his taste on a magnificent scale; but unfortunately they were only of a temporary nature—on occasions of splendid court pageants and festivals, in which his talent for architectural decoration was employed. One of them was at the solemnization of the public entry and coronation of Ulrica Eleonora, the wife of Charles XI., who was herself an artist, and displayed considerable proficiency in portrait-painting. By the queen-dowager Hedwig Eleonora he was employed not only to complete Drottningsholm, but to lay out the grounds and gardens both there and at Ulriksdal. Besides the cathedral at Calmar, and Oxenstiern's monument, he executed or designed a great number of other buildings, including a project for rebuilding the palace at Copenhagen, which was partly carried into effect, many years after his death, when it was curtailed, and by no means improved in other respects. Elevations of the original design were published by his son, under the title of 'Regiæ Hafniensis Facies,' &c. In addition to his professional occupations, the count (which title was conferred upon him in 1714) was engaged in many offices that he held at court, and he took a considerable share in public and political affairs. At the time of his death (1728) he was chancellor of the university of Lund. Count Nicodemus was twice married.

Count Charles Gustavus Tessin, the son of Count Nicodemus by his first marriage, was born at Stockholm in 1695. Though not without talent for architecture, which he had considerably improved by travelling, he did not exercise it professionally, except in completing the palace at Stockholm after his father's death. His claim to celebrity was of a very different kind; it was as a statesman and diplomatist that he chiefly distinguished himself. He was ambassador at the court of France from 1739 to 1742, and president of the chancery from 1747 to 1752. As tutor to the prince-royal, afterwards Gustavus III., he wrote for his instruction a series of letters on political and moral topics, which were published, and of which there is a French translation. Count Gustavus was a zealous promoter of every scheme for the advancement of his country; he did much for the encouragement of arts and manufactures, and first established the Swedish Academy for Painting and Sculpture in 1735. Some years before his death he withdrew from public business and affairs, and lived in retirement on his estate at Akeroe in Sudermania, where he died in 1771; and by his death the family became extinct.

(Weinwich, *Kunstner-Lexicon*; Nordin, *Minna ofver Namnkunniga Svenka Män*; Ehrenström, *B. Arts en Suede*; *Biogr. Univers.*)

TESTACELLUS, the name of a genus of testaceous pulmoniferous mollusks. For the views of authors as to its place in the system, see the article **Limax**. Mr. J. E. Gray arranges it between *Plectrophorus* and *Helix*, under the *Helicidæ*, his second family of *Pneumonobranchiata*.

Generic Character.—Animal elongated, cylindriform, acuminated at each extremity; no cuirass; head distinct, furnished with four retractile tentacles, of which the posterior are the longest and carry the eyes; foot long and rather indistinct; pulmonary cavity situated at the posterior fourth of the animal's length, its orifice placed entirely backwards, under the right side of the apex of the shell, the anal aperture is very near it; organs of generation united, and showing their orifice near and behind the great right tentacle.

Shell external, solid, auriform, depressed, with the spire more or less projecting, having a very large and oval aperture; the right lip simple and trenchant, the left convex and reflected: the shell covers the posterior part of the pulmonary cavity.

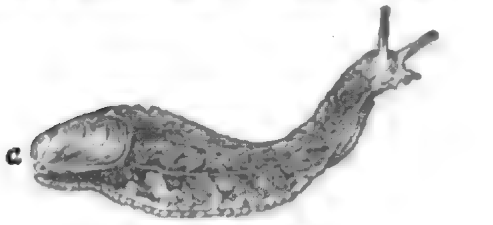
The number of species given by Lamarck is one only; and though M. Deshayes in his Tables makes the number two (both recent), one only is recorded in the last edition of Lamarck. Mr. G. B. Sowerby figures and describes three:—*Testacelli haliotideus*, *Scutulum*, and *Maugei*.

History, Habits, &c.—This form appears to have been first noticed by M. Dugué, in a garden at Dieppe in 1740: but it does not seem to have attracted much attention till M. Maugé, some years since, brought home specimens from the island of Teneriffe. 'It has also been found,' says Mr. Sowerby, 'in several parts of France, and in Spain, and more lately in a garden at Bristol. Some specimens from the last-mentioned place have been handed to us by Mr. Miller of that city. It feeds upon earthworms, having the power of elongating its body to such a degree that it is able to follow them in all their subterranean windings: we have observed them attentively, and were rather surprised that an animal generally so extremely sluggish in its motions, after discovering its prey by means of its tentacula, thrusting from its large mouth its white crenulated revolute tongue, should instantly seize upon with extraordinary rapidity, and firmly retain, an earth-worm of much greater size and apparent force than itself, but which by its utmost exertion is unable to escape.' Mr. Sowerby adds, that De Férussac and Cuvier consider this to be the only carnivorous terrestrial mollusk.

De Férussac remarked that the simple, gelatinous, contractile mantle of the animal, hidden habitually under the shell, is divided into many lobes capable of enveloping the whole body by an extraordinary development, when the animal finds it necessary to protect itself from the consequences of too great dryness.

Localities.—Testacellus haliotideus inhabits the South of France; *Test. Maugei* is an inhabitant of Teneriffe, but naturalized at Bristol; and *Test. Scutulum*, which was discovered by Mr. Sowerby in a garden at Lambeth, may, in the opinion of Mr. G. B. Sowerby, be considered as a native of this island.

Shell of Testacellus Maugei *a*, outside; *b*, inside.



Testacellus Maugei.
a, shell in situ. (G. B. Sowerby.)

TESTAMENT. [Will.]

TESTAMENT, OLD AND NEW. Some critical disputes have arisen respecting the meaning of the word *Testament*, as applied to the Canonical Scriptures. These, under the name of the two Testaments, comprise the revelations of God to man, which, being imparted under two principal conditions—the Law and the Gospel—are divided into two corresponding classes. The word thus translated by *covenant* is the Hebrew *berith*, so used in the first division of the sacred writings, and rendered in the latter by *diathece*. But a further notion than that conveyed by the Hebrew is contained in the Greek term (and which belongs also to the ecclesiastical Latin one, *Testamentum*, the original of the ordinary designation of the two portions of the Scriptures, the Old and New *Testaments*). No more appropriate designation than that of the New Testament can be applied to the second portion. Its application to the books of the Old was defended by St. Jerome (among other authorities of equal weight), on the ground that 'Testamentum non voluntatem defunctorum sonat, sed pactum viventium.'

This compact or covenant was originally entered into by the Almighty with Abraham (although, to speak strictly, the outline of it was given on the fall of man). The history of the religion of the Old Testament subsequently to the call of Abraham may be regarded as that of the progressive development of a belief in the One True God. It is most fitly contemplated under two principal points of view: 1, the knowledge of a Revelation from God as a connected work, and in its subject-matter; and 2, that of the attributes of God, so multiformously but at the same time so harmoniously manifested. 'Antient prophecy ended as it had begun. The first discovery of it in Paradise, and the conclusion of it in the book of Malachi, are directed to one point. In its course it had multiplied its disclosures, and furnished various succours to religion, and created an authentic record of God's providence and moral government to be committed to the world. But its earliest and its latest use was in the preparatory revelation of Christianity.' (Davison.) The other subject, by which the Old Testament is taken up, is, as we have observed, the progressive declaration of the attributes of God. There is observable throughout the books of the Old Testament a *moral* as well as a *Christian* revelation. In like manner with the latter, 'the divine law was unfolded. The Patriarchal and the Mosaic covenants do not express so full a model of the law of righteousness whereby man is to serve his Creator, as the later revelation given by the Prophets.' (Ibid.)

The leading use of the Old Testament was the preparatory revelation of Christianity. Its one great lesson, expressed or implied, was that of the indwelling guilt, depravity, and weakness of man. How deeply rooted in human conviction was this feeling, may be estimated from the universality of sacrifice for sin, and reliance on the mediatorial ministry of a priesthood. Their guilt and weakness, and consequent estrangement from God, were exhibited to the Jews by the sin offerings of their law which God deigned to receive, not at the guilty hands of ordinary men, but at those of his especially appointed servants. Nor were even these favoured servants regarded as free from the lurking infection of their race by Him, before whom the very heavens are not clean. Even to the priests the nearest access to God was forbidden: even to the high priest (that awful and mysterious functionary of Heaven) the Holy Place was closed, save on one day, and under certain restrictions. So clearly then did their divinely appointed law show forth to the Jews their guilt, and the necessity and difficulties of a reconciliation with God, which other nations saw but faintly, although none were destitute of some glimmerings of the truth. But the Jewish nation went a step beyond others. All recognised in practice the necessity of sacrifice and a priesthood, but the people of God stood alone in this,—that they looked hopefully forward to a time when the law which made high-priests of men having infirmity should cease, and a period be put to the daily ministering and offering the same sacrifices, which can never take away sin. A time was coming, when the words of God's messengers were to be fulfilled respecting a more copious diffusion of the knowledge of the Lord. And all this was wrought in Him who was at once offering and priest, God and man, namely, Jesus Christ.

This great doctrine of Christ's atonement, and its results to mankind, form the end of the types, the predictions, and the sacrifices of the Old Testament. But a total change was necessarily introduced by the absorption of all sacrifice and priesthood in the great and enduring ones of the Son of God. Christ entered in once into the Holy Place, having obtained eternal redemption for us, and leaving behind him, to the faithful, boldness to enter into the holiest by his blood, by a new and living way.

Christianity, or the religion of both Testaments, is that habitual course of life which rests upon a conviction of the necessity of the redemption of the world, and of the need of a personal redeemer—Jesus Christ. Hence the inadequacy of various terms employed occasionally as synonymous with Christianity (such as the religion of moral conduct; a practical belief in immortality and retribution; or the worship of God according to the *pattern* given by Jesus) to express its distinctive peculiarities. None of the religions to be found in the world at the birth of Christ can claim alliance with Christianity, save that one which alone has any pretensions to be regarded as historical and positive, and which was directly alluded to by our Lord in the words that 'Salvation cometh from the Jews.' Nor are the reasons of this difficult to be traced. The conviction of the need of redemption turns the mind upon the conviction of sin; sin leads it to the consideration of the law broken and violated; and this last conducts it up to the original destination and capability of man and his relation to God; and nowhere are these steps to be traced so clearly as in the Law and the Prophets—the writings which contain the fullest account of the existing disease and promised remedy.

It is true that heathenism served in some sort to prepare the way for Christianity. This is clear from two facts: the ease with which heathen converts adopted the tenets of Christianity; and the analogy instituted by the early Christian apologists between the relics of revealed truth, which formed the brightest gems of heathenism, and their own purer faith. But this preparation was merely *negative*. Heathenism did no more than point out contraries which it could not reconcile, doubts which it could not solve, and wishes which it could not gratify. All *positive* preparation for Christianity and the subject-matter of revelation belongs to the Old Testament exclusively.

The knowledge of the subject-matter of the Christian system is drawn from one source exclusively, apostolical tradition, as preserved to us in the sacred writings of the New Testament. From these alone authoritative instruction is deduced. An analytical outline of the system of faith contained in these writings is most properly divided into two portions, respectively comprising the periods of time anterior and subsequent to the coming of Our Lord.

In considering the ante-Christian period, the attention is divided between Judaism and heathenism, or in other words, between man under the law of God, and man without this law,—the two great classes into which the human race was divided subsequently to the publication of the Mosaic code. But although different in many particulars, both classes are included under one general point of resemblance, their wretchedness and want of a redeemer.

From this helpless condition of man the mind reverts to the point whence this dominion of sin and death, inseparably united, dates its commencement. But here a question arises, whence was derived the power of sin to extend itself among those who, like the Jews, possessed a knowledge of the will of God? The considerations arising from this, of the relation of sin and death to the law, lead to the conclusion that the commandment which was ordained unto life was unto death. The law, according to St. Paul, so far from affording deliverance from sin, or producing sanctification, was the means of aggravating both condemnation and guilt. This is still further illustrated by other facts laid down by St. Paul, that the law can never make man holy or happy in the sight of God. Being such, why was it given at all? The answer is, that it belonged to the plan by which God designed to make man capable of redemption through Christ. To establish the necessity of such redemption, to impress upon men a conviction of the need of it, and to kindle a longing for it in their hearts, is the object of the period anterior to Christ.

Accordingly a survey of the state of the human race antecedently to the coming of Christ leads to a conviction of the need of a redeemer. The heathens lived in vice, without knowledge of God, serving idols. Their standard of action was little higher than that afforded by earthly motives, few traces remaining of a higher knowledge. The condition of the Jews was very different. They were indeed in possession of the divine law, but they sought in vain to establish their righteousness before God by observance of its precepts.

Through redemption, the difficulties which characterized the ante-Christian period (and more especially the Jewish portion of it) were removed, and God and man reconciled. The statement of the conditions and accomplishment of this reconciliation leads to the consideration of the new and holy life arising from it.

The primary source and commencing point of the whole scheme of redemption is God. According to his eternal council, God decided on reconciling to himself a world which had become alienated from him, and on rescuing the race of Adam from the ruin to which they were hastening. This decree God had made known through his prophets. An evidence of his truth and faithfulness was supplied by its accomplishment. The instrument of this was the mission of his Son, according to the eternal purpose of his Father, 'that in the dispensation of the fulness of time he might gather together in one all things in Christ, both which are in Heaven and which are in earth.' This mission of the Son, from which the newer period, that of Christianity, dates, coincides with the time when heathenism and Judaism may be said to have filled their appropriate spheres of moral action. Although no dogmatic system, technically speaking, is to be found in the writings of the New Testament, two points immediately relating to the person of Christ are brought prominently forward throughout. The first of these is his *claim* to divine honours as the Son of God; the second, his meritorious course of action, of which the crowning point was his death, to which his resurrection was the glorious sequel, and the proof of the completeness with which his office had been discharged.

The object of our Lord's earthly life was rather a course of blameless and exemplary action than the delivery of a moral code for human guidance. Hence, although in the hortatory portions of St. Paul's Epistles allusion is made to the excellencies exhibited by Christ, the mode 'of becoming like him' was conceived in a spirit far deeper than that of mere moral imitation. It is described as a putting off the old man, and being clothed with Christ; as being buried with Christ, and as rising again with him. Such expressions arise necessarily from the inseparable connection, laid down in the New Testament scheme, between the death and resurrection of Christ, as the foundation of the justification of man in the sight of God.

The doctrines of repentance and a holy life implied in these characteristics of the new covenant are essential conditions on the side of the human party to the contract. This is the sum and substance of the Sermon on the Mount, which stands at the entrance of our Lord's earthly ministry, a fit entrance and portal to the temple which lies beyond, and an unfolding of the spirit and pure meaning of the law under which Christ came to live and suffer. A better observance of this would have obviated the Antinomian perversions which have risen up from the earliest times. One garment, and one only, will make man meet for Heaven (the wedding garment of Christ's parable), which is the imputed righteousness of Christ, the accepted sacrifice for the children of Adam. But while the human race exists, the essential rules of that law which Christ came to satisfy will be binding, and men will find their truest pleasure and profit in obedience to its spirit. Christ came to found a new kingdom. Accordingly he opens his first discourse by describing the members of it, their condition and prospects in the world. And yet his kingdom was not so much a new one, as a fulfilling and spiritualizing of the former dispensation; for which reason the second part of his sermon is taken up in expounding the law of Moses, and its real obligations, and, in the words of Robert Hall, 'in animating its spirit, and in filling up or directing its practice.' But essential to a due performance of the conditions of this law 'must be reckoned the assistance or guidance of God's holy spirit, as the chief of all aids, and which contains all others. And because this cannot be understood without admitting that the Holy Spirit is omnipresent, all-sufficient, and, in a word, strictly divine; therefore the divinity of the Holy Ghost is a fundamental article of the Christian covenant.' (Latham, *Harmonia Paulina.*)

Christian Society forms the second part of the theological system which may be extracted from the New Testament, as comprehending the origin of the Christian community, its gradual progress and necessary conditions, the relation of its members to each other, and their unity in the spirit. We cannot fail to observe, according to Hammond, 'from the interchangeable mixture of the graces described by Christ in the opening of the Sermon on the

Mount, that to God belongs the chief and first and last of our love and obedience, yet so as not to *exclude*, but *require* also in its subordination our care of duty and love towards man also; one intermixing lovingly and friendly with the other, and neither performed as it ought, if the other be neglected.' The common bond of all Christians is the faith and hope by which they become partakers of the benefits and salvation placed within their reach by the meritorious death and the resurrection of Christ. Accordingly, 'the partakers of this common faith and hope form collectively that spiritual body of which Christ is the head, namely, the Christian Church, in which, as in the natural body, various offices are distributed to the different members; but the most excellent endowment of any member is to walk in Christian love and purity under the guidance of the Holy Spirit. The two sacraments, which were typified to the Israelites in the wilderness, baptism and the Lord's Supper, are symbols of the Church's union with Christ. In baptism, the outward sign of our resurrection to a new life from the death of sin, and of our admission to the Church, we are joined by the Holy Spirit to Christ our Head; and the perpetual commemoration of Christ's death, according to his command in the Lord's Supper, is a means whereby we perpetually renew our spiritual strength, and draw more closely our union with him and with each other.' (Latham, *Harm. Paul.*)

The conclusion of the subject-matter of the New Testament is a sketch (by prophetic anticipation) of Christian society in its completeness of glory, which shall be accomplished by Christ at his second coming as the glorified Son of God, when he shall triumph over all opposition, and the redeemed be united with God in everlasting happiness. We have seen that Christ's obedience unto death was in order that many might live; and this will be accomplished at that resurrection which Christianity alone teaches clearly. Those who are now in the image of the earthly, will then be in that of the heavenly. The same spirit, which we learn from the New Testament dwelleth in our mortal bodies, shall quicken these that they shall be raised from the dead. When 'those that dwell in the dust shall awake,' then our mortal bodies will be changed, and made like unto the glorified one of Christ, by the power wherewith he is able to subdue all things unto himself.

TESTAMENT, OLD AND NEW. The view of the connection of the Old and New Testaments and the general theory of divine revelation given in the preceding article are by no means admitted by all Christians. They are departed from in various directions and degrees by different sects, but are most completely opposed by Unitarians. They deny that the doctrine of hereditary and total depravity is either consistent with reason and experience or at all sanctioned by Scripture. They hold the nature of the sacrifices, both in the patriarchal times and under the law, to be altogether misunderstood by those who consider them as referring to a corrupted nature and to an atonement. They endeavour to prove that the sacrificial language of the New Testament is founded on figurative allusions to the rites and ceremonies under the law, may be naturally traced to the circumstances of the writers, and has peculiarities which it could not have had if intended literally to express a great religious doctrine. They maintain that the whole system of types and antitypes in the Old and New Testament is without good Scriptural authority, and loaded with inconsistencies and false views both of the law and the gospel. They also reject the applications which are made of some real or supposed prophecies.

The view which prevails among modern Unitarians of the general theory of revelation and the connection of the various parts is, that the different divine interferences were adapted to different stages in the progress of mankind from infancy towards maturity; that each was best fitted for the time in which it was given, uniting the greatest amount of immediate good with the greatest power to promote the advancement of the race; that the Jewish system in particular was designed to preserve the great doctrine of the Unity of God at a time when the world in general was sinking fast into a degrading and corrupting idolatry, to exhibit to the nations around, and to all who should afterwards contemplate the history of the chosen people, a proof and illustration by example of the moral government of God, and to prepare the way for the establishment, when the world should be in a fit state for receiving it, of the more perfect dispensation of Christianity, which may be properly represented as a spiritualised and perfected Judaism, adding to it whatever important religious truths could not have been previously delivered with advantage, especially the grand doctrine of a future life, and opening the privileges of religious knowledge, faith, and hope to men of all nations without distinction, and without ritual observances. The knowledge of the paternal character of God and of his readiness to accept all his children who sincerely desire and endeavour to serve him; the doctrine of a future life distinctly taught and directly proved, and the enforcement of the purest moral principles, constitute, according to their view, the peculiarity and value of Christianity; and the whole system of God's holiness requiring human punishment, and of Christ's merits saving men from wrath, is rejected as unscriptural, unreasonable, and pernicious. It is enough for us here to state the opposite doctrines which form the grand subject of controversy in the Christian world. Any attempt to give an account of the evidence appealed to on each side would lead us far beyond the bounds which we are obliged to prescribe to ourselves.

TESTAMENTS OF THE TWELVE PATRIARCHS, a Greek work which professes to contain the last words of the twelve patriarchs, the sons of Jacob, but which is considered to be undoubtedly spurious by all writers except Whiston, who accepts it as a part of the canon of the Old Testament; but no weight can be attached to his judgment on the matter.

The age and authorship of this work are much disputed. It is once quoted by Origen, who flourished about A.D. 230. The most probable opinion is that of Cave and Lardner, who suppose it to have been written by a Jewish convert to Christianity about the end of the second century after Christ.

It appears to have been the writer's object to foist his work into the Canon, since, though he makes frequent quotations from the books of the Old Testament, he never mentions any of them by name. The only book which he quotes by name is 'the book of Enoch the Righteous.'

These testaments have been frequently published in Latin. They were first printed in Greek by Grabe in his *Spicileg. Patr.*, and afterwards by Fabricius in his *Cod. Pseudepigraph.*, and Whiston published an English translation of them in his *Authentic Records*.

(Lardner's *Credibility*, part ii., c. 29, § 3, and the authorities there quoted.)

TESTIMONY. [EVIDENCE.]

TESTIMONY, PERPETUATION OF. [PERPETUATION OF TESTIMONY.]

TESTONE, or TESTOON. [MONEY.]

TESTS, CHEMICAL, or Chemical Re-agents, are those substances which are employed to detect the presence of other bodies, by admixture with which they are known to produce certain changes in appearance and properties: thus, for example, as the blue colour of litmus is turned red by acids, it is considered as and used for a test to determine their presence when uncombined or in excess: so also litmus which has been reddened by an acid has its blue colour restored by the action of an alkali: reddened litmus is therefore used as a test of the presence of free or uncombined alkalis.

We give these examples from thousands which might have been selected, merely to explain the meaning of the term chemical test, observing that change of colour is one only of the many alterations adduced in proof of chemical action: thus the solubility of certain substances in some re-agents and not in others, constitutes another criterion or test of the nature of bodies.

We cannot enter particularly into this subject, for its extent is equalled only by its importance; and it is the less requisite that we should do so, since, in describing the various metals, &c., the tests of their presence are usually given with the properties of their salts.

We refer the reader who wishes for a complete view of the subject to two works which have appeared in France, viz. 'Traité élémentaire des Reactifs,' &c., by Payen and Chevallier, in 2 vols. 8vo., and 'Dictionnaire des Reactifs Chimiques,' by Lassaigne, in 1 vol. 8vo.

TESTUDINA'TA. [TORTOISES.]

TESTU'DO. [TORTOISES.]

TE'TANUS (*τέτανος*, derived from *τείνω*, *to stretch*) is both a generic and a specific term: generically, it may be defined to be a more or less violent and rigid spasm of many or all of the muscles of voluntary motion; the name is also particularly applied (as will be seen hereafter) to one of the species of this affection. Both the disease and also its name are as old as the time of Hippocrates; and, as it is proved by experience to be much more frequent in warm climates, the antient physicians probably had peculiar advantages in observing it, and accordingly seem to have paid particular attention to it. The following description by Aretaeus (*De Caus. et Sign. Morb. Acut.*, lib. i., cap. 6, p. 6, ed. Kühn) is written in his usual graphic style. (The translation by Dr. Reynolds has been chiefly followed.)

'Tetanic spasms,' says this author, 'are attended with severe pain, and prove rapidly fatal, and by no means readily admit of relief; they make their attack on the muscles and tendons of the jaws and neck, but impart the disease to every other spot, for all parts become sympathetically affected with those which were primarily assailed.

'There are three forms of the convulsions: the straight, the backward, and the forward. The straight one is true *Tetanus*, when the patient is stretched straight and inflexible; the backward or forward varieties have their name from the direction and locality of the tension; hence the deflexion of the patient backwards is termed *opisthotonos* (ὀπισθότονος), from the nerves being affected in this direction; while, if the bending be forward, by the nerves in front, it is termed *emprosthotonos* (ἐμπροσθότονος), for *tonos* (τόνος) is a term which signifies both *a nerve* and *tension*.

'The causes of these affections are numerous: they often follow a wound of a membranous part, or punctures in muscles or nerves, and in such cases the patients usually die, for (as Hippocrates says, *Aphor.*, sect. v., § 2, tom. iii., p. 735) "traumatic spasms are fatal." A woman may be convulsed after miscarrage, and she seldom recovers; some persons are seized with spasms from a violent blow on the neck; intense cold may prove a source, and hence these diseases are particularly liable to occur in the winter; they are less frequent in the spring and autumn, and least of all in the summer, unless they arise from a wound, or a visitation of foreign diseases. Women are more liable to convulsions than men, because they are of a colder temperament, but they more frequently recover, from the moisture of their temperaments.

'As respects the various periods of life, children are liable to this affection, but do not often die, for it is one they are used to, and familiar with; youths are less frequently affected, but more die; adults are least of all liable to be attacked; while the old have it, and die from it, more than any other class of persons: the cause is referrible to the frigidity and dryness of old age, which is also the nature of death, for, if the cold be attended with moisture, the spasms are less injurious and fraught with less danger.

'It may be said in general of all these affections, that they are attended with pain and tension, both of the tendons and spine, and of the maxillary and thoracic muscles; for they so clench the lower jaw to the upper, that it is not easy to separate them either by lever or wedge; and if, on forcibly separating the teeth, any liquid be introduced, it is not swallowed, but returned, or retained in the mouth, or ejected through the nostrils, for the passage of the fauces is closed, and the tonsils, being hard and tense, do not collapse so as to depress the food in swallowing. The face is red and mottled, the eyes nearly fixed, turned with difficulty round, there is a strong feeling of stifling, respiration laboured, the arms and legs on the stretch, the muscles quivering, the face distorted in all sorts of ways, the cheeks and lips tremulous, the chin in constant motion, the teeth grate, and sometimes the ears will move, as I have myself witnessed with amazement: the urine is either retained with violent pain, or flows off involuntarily from compression of the bladder. These appearances are common to all the species of spasms; each variety of this disease has however its pecularities.

'In *tetanus* the whole body is stretched in a right line, rigid and immovable, while the legs and arms are straight.

'In *opisthotonos* the patient is bent back, so that the head pulled in that direction lies between the shoulder-blades, while the throat projects; the lower jaw is usually open, and is rarely locked with the upper; the respiration is stertorous, the abdomen and thorax are prominent, and in this form especially there is incontinence of urine; the epigastrium is tense and resonant when struck, the arms are forcibly wrenched back in a state of tension, while the legs lie bent together, for the elbow bends in a manner the reverse of what the ham does.

'If *emprosthotonos* take place, the back is bent, the hips are forced on a level with the shoulders, the whole spine is on the stretch, the head is dependent and bent on the chest, the chin fixed upon the sternum, the arms cramped up, and the legs at full stretch. The pain is severe in all the forms, and wailing is the voice, deep are the sobs and groans, and if now the disorder has assailed the chest and respiration, it soon hurries the sufferer off—a boon indeed to him, as it relieves him from pain, distortion, and humiliation, and serving also to lighten the distress of those present, even if they be his own father or son; but if there be still respiration enough to support life, and although oppressed it be still performed, the patients are not merely bowed forward, but are even rolled up like a ball, so as to have their head on their knees, and their legs and back parts wrenched forward, so as to look as if the knee joint were thrust into the ham. It is an affliction more than man can bear, a sight revolting and painful to behold; and this cruel disease is irremediable, and from the distortion the sufferer is not recognised, even by his dearest friends, and the prayer of those around (which would have been heretofore impious, but hath become now righteous) is, that the wretched sufferer may depart out of life, and be released at the same time from his existence, pain, and horrible torment; and the physician, though present and looking on, is not merely unable to save his life, or to give relief to his pains, but he cannot even improve his shape; for to attempt to straighten the limbs would be like mangling and breaking the man in pieces while yet alive, and therefore, no longer offering his assistance, he is reduced to the sad necessity of merely contributing his sympathy.'

The three forms of the disease mentioned by Aretaeus are described by most of the antient writers: the species called *trismus*, or *locked-jaw* (which is the name applied to it when the spasms are confined to the muscles of the jaw or throat), forms a fourth in modern authors; and to these has been added a fifth, under the name *Pleurosthotonos* (πλευροσθότονος), which signifies that the body is drawn to one side. These different terms applied to tetanic affections do not imply so many particular diseases, but only the seat and various degrees of one and the same complaint. Trismus is invariably a part of each of the other varieties. This subdivision of the disease is of little or no practical importance; but a much more essential division is into *acute* or *chronic*, according to its greater or lesser intensity. The former kind is exceedingly dangerous and usually fatal; while the latter, on account of the more gradual progress of the symptoms, affords more opportunity of being successfully treated. (Larrey, in *Mém. de Chirurgie Militaire*, tome i., pp. 235, 236, quoted in Cooper's *Dict. of Pract. Surgery*.) Tetanus is also divided into *traumatic*, or that arising from a wound, which is also occasionally termed *symptomatic;* and into *idiopathic*, or that which proceeds from other causes.

Traumatic tetanus sometimes comes on in a surprisingly sudden manner, and quickly attains its most violent degree. The most rapidly fatal case that has ever been recorded is one that we have on the authority of the late Professor Robison of Edinburgh. It occurred in a negro, who scratched his thumb with a broken china plate, and died of tetanus a quarter of an hour after this slight injury. (Rees's *Cyclopædia*, art. 'Tetanus,' quoted by Cooper.) Most commonly however the approaches of the disorder are more gradual, and it slowly advances to its worst stage. In this sort of case the commencement of the disorder is announced by a sensation of stiffness about the neck, a symptom which, increasing by degrees, renders the motion of the head difficult and painful. In proportion as the rigidity of the neck becomes greater, the patient experiences in the throat a sense of dryness and soreness, and about the root of the tongue an uneasiness, soon changing into a difficulty of mastication and swallowing, which after a time become totally impossible. The attempt at deglutition is attended with convulsive efforts, especially when an endeavour is made to swallow liquids; and so great is the distress which accompanies these convulsions, that the patient becomes very reluctant to renew the trials, and occasionally refuses all nourishment: sometimes it even inspires him with a dread of the sight of water, and a great resemblance to hydrophobia is produced.

With respect to the causes of tetanus, 'it must ever be regarded,' says Dr. Gregory (*Theory and Practice of Med.*), 'as a very singular fact in pathology, that an affection of so peculiar a character as this should have its source in causes apparently so dissimilar; that the puncture of a nerve, the laceration of a tendon, or an extensive burn, should bring on the same *kind* of nervous affection as that which is the occasional consequence of *cold*.' Every description of wound, no matter how inflicted, or in what part, or in what stage, may be the occasion of tetanic symptoms which form the species denominated *traumatic*. Cases are on record (and are quoted by Dr. Symonds in the *Cyclopædia of Practical Medicine*, art. 'Tetanus'), wherein the patient was attacked with the disease in consequence of a bite on the finger from a tame sparrow; in which it supervened on the mere stroke of a whip-lash under the eyes, though the skin was not broken; in which it was occasioned by a small fish-bone sticking in the pharynx; by a slight solution of continuity in the external ear from a musket-shot; by the application of a seton to the thorax; by the stroke of a cane across the back of the neck; by a blow on the hand from the same instrument; by the extraction of a tooth, &c. In short, according to Sir James M'Grigor (quoted by Dr. Symonds), 'it occurs in every description and in every stage of wounds, from the slightest to the most formidable, from the healthy and the sloughing, from the incised and the lacerated, from the most simple and the most complicated.'

Next in frequency to wounds as an exciting cause of tetanus is exposure to cold and damp; indeed there are but very few cases of true idiopathic tetanus which are referrible to any other. The irritation of worms and other disordered states of the alimentary canal have been considered by some authors as the cause of tetanic affections. To generate this form of disease however, it would appear that a certain *predisposition* is also requisite, and it is doubtless the same with that which operates as an *accessory cause* of the traumatic tetanus. The predisposition to tetanic affections is given, in the first place, by warm climates and warm seasons. Within the tropics therefore it prevails to an extent unheard of in colder latitudes. Secondly, tetanus is chiefly observed to prevail when the atmosphere is much loaded with moisture, and particularly where this has suddenly succeeded to a long course of dry and sultry weather. Even in this country exposure to the cold and damp air of the night has occasionally been followed by an attack of tetanus. In tropical climates children are particularly subject to this complaint, and with a few peculiarities which, though producing no specific difference, have been thought sufficient to constitute a variety known by the name of *trismus nascentium*. The disease in this case is vulgarly known by the absurd name of *falling of the jaw*. It occurs chiefly between the ninth and fourteenth day after birth, and seldom after the latter period. Without any febrile accession, and often without any perceptible cause whatever, the infant sinks into an unnatural weariness and drowsiness, attended with frequent yawnings and with a slight difficulty of moving the lower jaw. This last symptom takes place in some instances sooner, in others later, and soon increases in intensity. Even while the infant is yet able to open its mouth, there is occasionally an inability to suck or swallow. By degrees the lower jaw becomes rigid, and totally resists the introduction of food. There is no painful sensation, but the skin assumes a yellow hue, the eyes appear dull, the spasms often extend over the body, and in two or three days the disease proves mortal.

The prognosis of this disease is mainly to be determined by the nature of the exciting cause, and by the type of the seizure. Tetanus of the idiopathic kind has certainly been cured in a larger proportion of cases than that which follows external injury, which 'is a fact well-known' (says an able writer in the 'Edinburgh Journal,' vol. xv., p. 292, quoted by Dr. Symonds) 'to every planter in the West Indies, who never considers his negroes as safe when the disease supervenes on a wound, but is frequently successful in alleviating the idiopathic species.' The type of the disease as acute or chronic is a no less important guide as to the probable termination. It may be said that recovery in a case of acute tetanus is almost, if not altogether, hopeless: the chronic form however is of a much milder character. The usual termination of the disease may be stated to occur on the third or fourth day; and if the patient survives that time, there are good hopes of his recovery: it is rarely protracted beyond the eighth day. Mr. Cooper however mentions (*Surg. Dict.*) that he had a patient (who had been wounded, and suffered amputation of the thigh) who lingered five weeks with chronic tetanus before he died.

The dissection of patients who have died of tetanus has thrown little or no light upon the real nature of the complaint, as is indeed the case in almost all spasmodic or neuralgic disorders. Sometimes slight effusions are found within the cranium, but in general no morbid appearance whatever can be detected within the head. There is always more or less of an inflammatory appearance in the œsophagus and in the villous coat of the stomach about the cardia. These appearances however are common to a great number of diseases, and are uniformly met with in every case of rapid or violent death. Besides the redness and increased vascularity of these parts, Baron Larrey found the pharynx and œsophagus much contracted, and covered with a viscid reddish mucus. He also found numerous lumbrici in the bowels of several of the patients who died; but this, as Mr. Cooper remarks, could only be an accidental complication, and not a cause. In several cases Dr. M'Arthur found the intestines much inflamed; and in two of them a yellow waxy fluid, of a peculiar offensive smell, covered their internal surface: but whether the inflammation was primary, or only a consequence of the pressure of the abdominal muscles, which contract so violently in this disease, he is unable to decide. (*Med. Chir. Trans.*, vol. vii., p. 475, quoted in Cooper's *Surg. Dict.*)

The treatment of Tetanus is confessedly a subject of infinite difficulty, as the disease frequently baffles every mode of practice, and, in certain instances, gets well under the employment of the very same remedies which decidedly fail in other similar cases. Upon the whole it will probably be universally admitted that no effectual remedy for Tetanus has yet been discovered, as every plan has occasionally succeeded, and every plan has still more frequently failed. The following is the abstract of the opinions of the antients on this point given by Mr. Adams in his Notes to 'Paulus Ægineta.'

Hippocrates (*Aphor.*, v. 70), Galen (*De Loc. Affect.*, lib. iii.; *De Meth. Med.*, lib. xii.), Octavius Horatianus (lib. ii., cap. 10), and Avicenna (lib. iii., fen. 2, cap. 5, 6, 7) agree in stating that a fever coming on tends to remove the tetanic affection. Cælius Aurelianus (*De Morb. Acut.*, lib. iii., c. 6) seems to question the truth of this antient aphorism. Hippocrates disapproves of the cold affusion in cases of traumatic Tetanus: Alexander Aphrodisiensis however speaks rather favourably of it (*Problem. Phys.*, i. 53). Aëtius (lib. vi., c. 38), Oribasius (*Synops.*, lib. viii., c. 16), and Nonnus (*De Medic.*, c. 38), like Paulus Ægineta (*De Re Med.*, lib. iii., c. 20), recommend bleeding, emollient fomentations, and the bath of oil. Archigenes (ap. Aëtium, *loco cit.*) directs to prepare the bath by adding a fifth part of oil to the water.

The treatment recommended by Celsus (*De Medic.*, lib. ii., c. 1) is judicious, and not unlike that of Paulus Ægineta. He expresses himself hesitatingly about venesection, and forbids the early use of wine; he approves of opening the belly. This practice is strongly recommended by Dr. Hamilton of Edinburgh.

The treatment of Aretæus (*De Cur. Morb. Acut.*, lib. i., c. 6) is altogether soothing and relaxant. He recommends to lay the patient upon a soft warm bed, and, from whatever cause the complaint arise, to begin with abstracting blood from the arm. Then soft liquid food is to be given, and the whole body wrapped in wool moistened with some calefacient oil; or bladders half filled with tepid oil are to be applied to the parts most affected. He directs to cup the back part of the neck, but cautions against exciting irritation by the application of heat. To the wound he recommends suppurative applications containing frankincense, turpentine, rosin, and the like; for he remarks (and the fact is confirmed by the experience of the late M. Larrey, who recommends a similar mode of practice) that, when tetanus supervenes, the sore becomes dry. He praises castor and assafœtida as anti-spasmodics; and, if these cannot be swallowed, they are to be given in an injection. He advises also to give hiera in an injection.

Cælius Aurelianus (*loco cit.*) enumerates nearly the same causes as Aretæus, and describes all the symptoms of the disease with the greatest precision. His treatment is also nearly the same as that of Aretæus, namely, emollient applications to the neck, venesection, and oily clysters. He even enjoins the bath of oil, which has fallen into disuse in modern practice, most probably solely on account of the expense with which it would be attended. He also permits sometimes to use the common bath, but not of cold water. He allows wine in certain cases. He condemns Hippocrates for giving both wine and emetics, and having recourse to venesection, without due discrimination. He blames him also for recommending the affusion of cold water, inasmuch as he himself had pronounced cold to be injurious to the nerves, bones, &c. Galen however remarks, in his Commentary upon this aphorism of Hippocrates (sect. v. § 21), that cold in this case is not the direct cause of the benefit derived from this remedy, but (if I understand him right) that the shock which it imparts to the system proves beneficial by rousing the vital heat and energies of the patient. Hippocrates however, as stated above, forbade the cold affusion in traumatic tetanus. Paulus Ægineta's opinion of this practice is just such as the profession in general now entertains, after it has received another trial upon the recommendation of the late Dr. Currie. (See *Medical Reports*, and Larrey's *Mémoires de Chirurgie*, t. 1.)

Octavius Horatianus (*loco cit.*) recommends bleeding, emollient applications, purgative clysters, the tepid bath, antispasmodics, and *soporifics*. The use of the last-mentioned class of remedies does not appear to have been sufficiently understood by the antients; at all events they were less partial to them in this case than the moderns.

The Arabians enjoin nearly the same treatment as the Greeks. Avicenna (*loco cit.*) and Mesue join the preceding authorities in recommending strongly the use of castor and assafœtida as antispasmodics; and yet it is deserving of remark that modern surgeons do not repose much confidence in these medicines. (See Sir James M'Grigor's communication in the *Medico-Chirurg. Transact.*, vol. vi.) Avicenna, like all the others, praises the bath of oil. Serapion (lib. i., c. 27) speaks of a bath prepared with emollient herbs. Haly Abbas (*Theor.*, lib. ix., cap. 10, 11; *Pract.*, lib. v., c. 31) describes minutely the two varieties as occasioned by repletion or inanition. For the former, he approves of purging with hot drastic purgatives, of rubbing the part affected with hot oils, and of using the warm bath with friction after it; he also approves of castor. For the other variety he praises the affusion of plain water in which lettuces, barley, &c. have been boiled. He recommends the internal use of milk and other demulcents, and the bath of oil, and rubbing the body with oil of violets. The treatment recommended by Alsaharavius (*Pract.*, lib. i., § 2, c. 21) is very similar. Rhazes mentions (*Divis.*, lib. i., c. 16; *Contin.*, lib. 1) Hippocrates' proposal of the cold affusion; but, like Paulus Ægineta, he rather disapproves of it. He himself recommends bleeding, when there are symptoms of repletion, emollient applications to the neck, the bath of oil, the application of leeches to the part affected, purging with aloes, &c., and the administration of antispasmodics, such as castor, assafœtida, and the like.

The general principle of cure, as Dr. Good remarks, is far more easily explained than acted upon: it is that of taking off the local irritation, wherever such exists, and of tranquillizing the nervous erethism of the entire system. The former of these two objects is of great importance in the locked-jaw, or trismus, of infants; for, by removing the viscid and acrimonious meconium, or whatever other irritant is lodged in the stomach or bowels, we can sometimes effect a speedy cure without any other medicine. Castor oil is by far the best aperient on this occasion, and it may be given both by the mouth and by injections. If this however do not succeed, we should have recourse to powerful anodynes: of these the best is opium, which should be administered in doses of from three to five drops of the tincture according to the age of the patient. Opium has also been more extensively resorted to in the cases of adults than almost any other remedy; and Dr. Good, Dr. Gregory, and others profess that it is that on which they place their chief, if not their only reliance. To give it a fair chance of success, we must begin its use from the earliest appearance of tetanic symptoms. It must be given in very large doses; and these doses must be repeated at such short intervals as to keep the system constantly under the influence of the remedy. It is astonishing to observe how the human body, when labouring under a tetanic disease, will resist the operation of this and other remedies, which, in its healthy state, would have been more than sufficient to overpower and destroy it. It is advisable to begin with fifty drops of laudanum, and to repeat this at intervals of two or three hours, or even oftener if the urgency of the symptoms require it, until some effect has been produced on the spasms. In the early stage of the disease we are to bear in mind the approaching closure of the jaw and difficulty of deglutition; and our remedies are accordingly to be pushed before such serious obstacles to their administration arise. When they have occurred, and are found to be insuperable, opiate enemata and frictions may be tried; but we must not anticipate much benefit from such feeble means. Such are Dr. Gregory's remarks; but Dr. Symonds considers that the employment of opium is recommended chiefly by systematic writers, and for theoretical, rather than for practical reasons; while most of those who give the results of their own experience express the greatest dissatisfaction with the remedy.

Probably a much more efficient class of remedies than the preceding is that of purgatives; both on account of the obstinate costiveness which attends the disease, and also because we have in daily practice such convincing proofs of their strong revulsive influence on diseases of the cerebro-spinal centre. The testimony of the army physicians, as we learn from the report of Sir James M'Grigor, is highly in favour of a rigid perseverance in the use of purgatives, given in adequate doses to produce daily a full effect. Dr. Forbes states that a solution of sulphate of magnesia in infusion of senna was found to answer better than any other purgative; and it was daily given in a sufficient quantity to produce a copious evacuation, which was always dark-coloured and highly offensive; and to this practice he chiefly attributes in one severe case the removal of the disease. (*Med. Chir. Trans.*, vol. vi., p. 452, quoted by Mr. Cooper.) Dr. Good condemns drastic purgatives, forgetting apparently that mild ones have no effect. Strong cathartics have indeed frequently proved of great service, and none has higher repute than croton oil.

The employment of the warm bath has been recommended by numerous writers, but it would be difficult to trace in their accounts any facts which decidedly show that its adoption was ever followed by unequivocal benefit. Cold bathing has also been advised, but it has generally been found to be worse than useless; and there are several cases upon record of almost instant death having followed its employment.

The practice of bleeding is another that has been tried but most frequently without effect. In some few cases amputation of the limb, from the injury of which the tetanus has arisen, has been successful; but as this extreme measure is also very uncertain, it is not likely to be ever extensively adopted.

Numerous other remedies have been tried, with no, or very imperfect, success; for instance, acupuncture, strychnia, mercury, caustics, blisters, tobacco, oil of turpentine, æther, camphor, musk, bark, wine, sesqui-oxide of iron, &c. &c. However, it must, after all these have been tried, be confessed that tetanus is one of the most formidable and unmanageable of disorders, and that recovery in the acute form still continues to be almost hopeless.

(Cooper's *Surgical Dict.*; Symonds, in the *Cyclop. of Pract. Med.*; Good's *Study of Med.*; Gregory's *Theory and Practice of Med.*; from which works most of the preceding remarks have been taken. A reference to numerous other works on the same subject will be found in Ploucquet's *Liter. Med. Digesta*; Cooper's *Surg. Dict.*, and Forbes's *Medical Bibliography*, in the *Cyclop. of Pract. Med.*)

TETBURY, an antient market-town in Gloucestershire, near the borders of Wiltshire, situated on elevated ground near the source of the Warwickshire Avon, 99 miles west by north from London, and 20 miles south-east of Gloucester. The parish, with four hamlets, contains a population of

2939, according to the census of 1831. The town consists of one long street intersected by two shorter ones, with the market-place and a spacious market-house in the centre. The streets are paved and lighted, and the houses built chiefly of stone. A bailiff and constable are annually appointed at the court-leet of the feoffees of the manor. There are fairs held three times a year, for cheese, cattle, sheep, horses, &c. The parish church, which was built soon after the Conquest, was taken down in 1784, with the exception of the tower, and rebuilt in the pointed style; and a modern spire was placed on the tower. The living is a vicarage, of the annual gross value of 903*l.* The Baptists and Independents have places of worship. In 1723 Elizabeth Hodges left a rent-charge of 30*l.* for the education of 15 children; and in the years 1783, 1795, and 1797, the sum of 100*l.* was left by three different persons for the support of a Sunday-school. In 1833 there were ten daily schools, attended by 173 children, and three Sunday-schools, at one of which, in connection with the Established Church, 174 children were instructed, and the other was a Baptist school, attended by 153 children. In the reign of James I., Sir William Romney, a native of the town, founded almshouses for eight poor persons, and left property for the endowment of a grammar-school. The traces of an antient encampment were visible on the south-eastern side of the town up to the middle of the last century; and at this spot fragments of British weapons and coins of the Lower Empire have been found.

TETE'. [SENNA.]

TETHYS. [NUDIBRANCHIATA, vol. xvi., p. 361.]

TETRABRANCHIA'TA, Professor Owen's second order of the class *Cephalopoda*. This order is equivalent to the 'Céphalopodes testacés polythalamés' of Lamarck; to the 'Polythalamacés' of De Blainville; the 'Siphonoides' of De Haan; and the 'Sifonifères' of D'Orbigny.

The following characters of the order are given by the Professor:—

Eyes, subpedunculate. *Mandibles*, calcareous at the apex. *Arms*, abbreviated, tubular, and furnished with retractile tentacles. *Mantle*, membranaceous, with two anterior apertures; a posterior membranaceous tubule running through the siphon of the multilocular shell. *Gills*, four. *Branchial heart*, null. *Excretory tube*, with the walls disconnected below. *Shell*, internal or external multilocular.

The genera comprised by Professor Owen under this order, in his *Memoir on the Pearly Nautilus* (1832), are—*Belemnites*, *Baculites*, *Lituola*, *Spirula* (?), *Ammonites*, *Orbulites*, *Nautilus*, *Cibicides*, *Rotalites*, &c.

In the *Cyclopædia of Anatomy and Physiology* (1836), Professor Owen modifies the views above given. In that work the *Tetrabranchiata* form the first order of the *Cephalopoda*, with the following synonyms: *Polythalamacés*, Blainville; *Siphonifera*, D'Orbigny; minus the *Spirulidæ* and *Belemnites*.

The *Tetrabranchiate Cephalopods* (of which the *Pearly Nautilus* may be regarded as the type) are described as provided with a large external univalve shell, symmetrical in form, like the body of the animal which it protects, straight or convoluted on a vertical plane, and divided by a series of partitions into numerous chambers, of which the last formed is the largest, and alone contains the body of the animal; a dilatable and contractile tube is continued from the posterior part of the animal through all the partitions and chambers of the shell; but the attachment of the shell to the body is effected by means of two strong lateral muscles which are inserted into the walls of the last chamber. The numerous hollow arms and retractile tentacles are peculiar to this order, and the head is further provided with a large ligamento-muscular plate or flattened disc, which, besides acting as a defence to the opening of the shell, serves also, in all probability, as an organ for creeping along the ground, like the foot of the Gastropods. There are no fins or analogous organs for swimming.

The following are the characters given in the *Cyclopædia of Anatomy* by the Professor:—

Jaws strengthened by a dense, exterior, calcareous coating, and with thick dentated margins. *Eyes* pedunculated and of a simple structure. No *organ of hearing*. *Gills* four in number and without branchial hearts. *Circulating system* provided with but one ventricle, which is systemic or propels arterial blood. No *ink-bag*. Inferior parietes of the funnel divided longitudinally.

The second order, *Dibranchiata*, has the following synonyms: *Cryptodibranches*, Blainv.; *Acetabulifera*, D'Orb. plus the *Spirulidæ* and *Belemnitidæ*.

The *Tetrabranchiata* are divided into two families:

1. *Nautilidæ*: Genera:—*Nautilus*, Lam.; *Clymene*, Münst.; *Campulites*, Deshayes; *Lituites*, Breyn; *Orthoceratites*, Breyn.

2. *Ammonitidæ*: Genera:—*Baculites*, Lam.; *Hamites*, Parkinson; *Scaphites*, Parkinson; *Ammonites*, Brug.; *Turrilites*, Lam.

Of the *Dibranchiata*, Professor Owen remarks, that this order also had its representative in the seas of the antient world, as the shells called *Belemnites*, or thunder-stones, the fossil shells of the *Sepiæ* discovered by Cuvier, and the horny rings of the acetabula found by Buckland in the coprolites, or fossil fæces, of *Ichthyosauri* testify; but, he remarks, our knowledge of this order is chiefly founded on observation of existing species. 'These,' says the Professor, 'are extremely numerous: they frequent the seas of every clime, from the ice-bound shores of *Boothia Felix* to the open main, and floating Sargasso or Gulf-weed of the Equator; they seem however to be most abundant in temperate latitudes. Many species frequent the coasts, creeping among the rocks and stones at the bottom; others are pelagic, swimming well, and are found in the ocean at a great distance from land.'

Professor Owen then adverts to the great variety of size presented by the *Dibranchiata*, remarking that although the bulk of the gigantic species has been undoubtedly exaggerated, yet the organization of this order is favourable to the attainment of dimensions beyond those presented by the individuals of any other group of invertebrate animals. He then alludes to the Uncinated Calamary caught by Banks and Solander in the southern ocean [SEPIADÆ, vol. xxi., p. 253], and to the fragment of the cephalopod weighing one hundred pounds obtained by the French naturalists in the Atlantic ocean under the line, and preserved in the Museum of the Garden of Plants at Paris.

The *Dibranchiate Cephalopods* are divided by Professor Owen into two tribes, the *Decapoda* and the *Octopoda*.

The *Decapoda*, besides the possession of ten arms, are characterised by having a pair of fins attached to the mantle; by having the funnel either adherent at the antero-lateral parts of its base, and without an internal valve, or articulated at the same part by two ball-and-socket joints to the mantle, and provided with a valve internally at its apex; by having fleshy appendages to the branchial hearts, and glandular appendages to the biliary ducts; by having generally a single oviduct with detached superadded glands; and lastly, by the shell or rudiment being single, mesial, and dorsal.

Professor Owen considers the Decapodous tribe to be that which is most nearly allied to the Tetrabranchiate order, and he regards *Spirula* as the type of the first family of the Decapodous tribe, or that which immediately succeeds the *Tetrabranchiata*.

The following are the families of the *Decapoda*:—

1. SPIRULIDÆ: genus *Spirula*.

2. *Belemnitidæ*: genera, *Belemnites*, Lam.; *Actinocomax*, Miller; *Pseudobelus*, Blainv.

3. *Sepiadæ* (Cuttle-fishes): genus *Sepia*.

4. *Teuthidæ* (Calamaries); thus divided:—

A. Funnel with an internal valve, and articulated at its base to two ventro-lateral cartilaginous prominences of the mantle.

Genera:—*Sepiotenthis*, Blainv.; *Loligo*, Cuv.; *Onychoteuthis*, Licht.; *Rossia*, Owen; *Sepiola*, Leach

B. Funnel unprovided with an internal valve, and adherent at the antero-lateral parts of its base to the mantle.

Genera:—*Loligopsis*, Lam.; *Cranchia*, Leach.

Of the tribe *Octopoda* the Professor observes, that besides wanting the long tentacles, they are also characterised by the want of mantle-fins, and consequently are limited to retrograde progression while swimming; their acetabula, he adds, are sessile and unarmed, and they have two oviducts, but without detached glands for secreting a nidamentum: the Decapods have a single oviduct and detached glands for secreting the nidamentum.

The Octopods are thus arranged by Professor Owen:—

1st Family, *Testacea*: genus *Argonauta*, Linn.

2nd Family, *Nuda*: genera *Octopus*, Leach; *Eledone*

Leach. [BELEMNITE: BELLEROPHON; CEPHALOPODA; CORNU AMMONIS; GONIATITES; NAUTILUS; PAPER NAUTILUS; POLYTHALAMACEA: SEPIADÆ; SPIRULIDÆ; TEUTHIDÆ.]

TETRACERATA. [POLYBRANCHIATA.]

TETRACHORD, the Greek name for any part of the scale consisting of four notes, the highest of which is a perfect fourth to the lowest. Thus in the common diatonic SCALE (we assume a knowledge of this article throughout) we have the following tetrachords:—

CDEF, DEFG, EFGA, GABC, ABCD, BCDE.

We despair of giving anything like a satisfactory account of the Greek music; not that we think the difficulty lies in the Greek writers, but in the manner in which they have been treated. It was an assumption that the nation which produced models such as the moderns could not surpass in architecture, sculpture, and perhaps in painting, was to be considered as necessarily possessed of a system of music approaching to perfection. Their writers on the subject were to be taken as having an agreement with each other, which was to be detected and established, any apparent discrepancy, however evident, notwithstanding. The numerical relations which were the objects of inquiry in the settlement of the parts of the scale gave the subject the air of an exact science; and explanations which required the assistance of the scholar, the mathematician, and the musician, were undertaken by persons who were deficient in one character, if not in two. The consequence has been such a mass of confusion as the world never saw in any other subject; writers whose undertakings required them to say something, copying absolute contradictions from different other writers; others glad to adopt anything intelligible, whether true or not; others again, unable or unwilling to state the simplest facts of their own premises, so that their readers are not even made aware which of the most remarkable opposite opinions they mean to adopt.

We intend in the present article, without looking into any modern writer, to draw from Ptolemy and Euclid, writers who are known to be trustworthy on other subjects, all concerning the tetrachord that we can find to bear the character of certainty and precision, and to be likely to aid an unbiassed reader in approaching, should it please him so to do, the mass of different accounts which have been given.

All parties seem agreed that the Greek scale, which at first consisted of only two or three leading consonances, was gradually enlarged until it comprehended two octaves, or fifteen notes. It is generally stated that this scale, when it was what we now call diatonic (a word which means the same with us as with the Greeks), was minor in its character, so that in fact it would be represented by

A B C D E F G A^1 B^1 C^1 D^1 E^1 F^1 G^1 A^1.

It is also known that the Greeks were early in possession of the mode of dividing a string so as to produce their several notes; and that, by the time of Ptolemy at least, they took the rapidity of the vibrations (on which they knew the pitch to depend) to be inversely as the lengths of the strings.

Their scales were numerous: three were considered classical, if we may use the word, and were called enharmonic, chromatic, and diatonic; the two first words not having the same meaning as with us. The remaining scales had names of locality attached to them, Lydian, Dorian, &c. The distinction between these lay in the different modes of dividing the octave, as seems to be now generally agreed, though there have been those who have thought that these terms, Lydian, &c., were the names, not of scales, but of single notes.

Of enharmonic, chromatic, and diatonic scales, Ptolemy lays down fifteen from his predecessors, and eight from himself. In each of them is an octave, and all of them agree in two particulars: first, each has the fourth and fifth of the fundamental note perfect; secondly, each has the tetrachord made by the fundamental note and its fourth divided in precisely the same manner as that of the fifth and the octave. That is, if we call the notes of this octave—

C P Q F G R S C^1;

then CF is a fourth, and CG a fifth, always; and the intervals CP, PQ, QF are severally equal to the intervals GR, RS, SC^1. Thus it appears that the fourth was to the Greeks what the octave is to us, the unit, as it were, of the scale, in the subdivision of which consisted the differences of their systems. We now give a tetrachord from each of these twenty-three scales, assigning the intervals first by the ratios of the vibrations, next by the number of mean semitones they contain, as in the article SCALE. We prefix the Latin rendering of Ptolemy's appellatives from Wallis.

And first as to enharmonic scales, which are mentioned first, and seem to have been antient, and regarded with high approbation.

	Ratio of Numbers of Vibrations in each Interval.			Mean Semitones in each Interval.		
	C P	P Q	Q F	C P	P Q	Q F
Archytas	5 : 4	36 : 35	28 : 27	3·86	·49	·63
Aristoxenus Eratosthenes	19 : 15	39 : 38	40 : 39	4·10	·44	·44
Didymus	5 : 4	31 : 30	32 : 31	3·86	·57	·55
Ptolemy	5 : 4	24 : 23	46 : 45	3·86	·74	·38

It seems then that the enharmonic system would allow only of the following notes in an octave—

C E P F G B Q C^1;

where P means a note about half way between E and F, and Q one half way between B and C. An odd scale truly for a modern musician to look at; but, it may be, not incapable of pleasing effects to ears not accustomed to music in parts.

The chromatic scales come next in order, as follows:

	Ratio of numbers of Vibrations in each Interval.			Mean Semitones in each Interval.		
	C P	P Q	Q F	C P	P Q	Q F
Archytas . .	32 : 27	243 : 224	28 : 27	2·94	1·41	·63
Aristoxenus, mollis Chromatica . . .	56 : 45	29 : 28	30 : 29	3·79	·61	·58
Do., Sesquialterius Chromatica .	37 : 30	77 : 74	80 : 77	3·63	·69	·66
Do., tonici Chromatica Eratosthenes . .	6 : 5	19 : 18	20 : 19	3·16	·94	·88
Didymus . . .	6 : 5	25 : 24	16 : 15	3·16	·71	1·12
Ptolemy, mollis Chromatica .	6 : 5	15 : 14	28 : 27	3·16	1·19	·63
Ptolemy, intensi Chromatica .	7 : 6	12 : 11	22 : 21	2·67	1·51	·80

To make something as like as we can to these scales, we should write down in modern music

C E♭ E♮ F G B♭ B♮ C^1

The diatonic scales, Ptolemy allows, are more agreeable to the ear, and his specimens are as follows: we shall now write the scale with the usual letters throughout.

	Ratio of numbers of Vibrations in each Interval.			Mean Semitones in each Interval.		
	C D	D E	E F	C D	D E	E F
Archytas . . .	9 : 8	8 : 7	28 : 27	2·04	2·31	·63
Aristoxenus, mollis diatonica	7 : 6	38 : 35	20 : 19	2·67	1·43	·88
Do., Intensi Diatonica . . .	17 : 15	19 : 17	20 : 19	2·17	1·93	·88
Eratosthenes* .	9 : 8	9 : 8	256 : 243	2·04	2·04	·90
Didymus . . .	9 : 8	10 : 9	16 : 15	2·04	1·82	1·12
Ptolemy, mollis Diatonica . .	8 : 7	10 : 9	21 : 20	2·31	1·82	·85
Do., tonici Diatonica . . .	9 : 8	8 : 7	28 : 27	2·04	2·31	·63
Do., intensi Diatonica . . .	10 : 9	9 : 8	16 : 15	1·82	2·04	1·12
Do., aequabilis Diatonica . .	10 : 9	11 : 10	12 : 11	1·82	1·65	1·51

These scales have all so far the diatonic character that they divide the tetrachord into two larger intervals followed by a smaller one: the scale of Didymus would have been exactly the modern untempered diatonic scale, if he had inverted the order of the two larger intervals in his second tetrachord. As to the other modes, the Dorians, &c., there is much confusion in Ptolemy respecting them, arising from the corruptness of the text, which Wallis has endeavoured to remedy. According to him, they are divisions of the octave, somewhat more fantastic than those which precede. In more recent times the idea has been started of their being simply different keys, or rather answering to different variations of the diatonic scale, by using intermediate semitones instead of some of the notes: it would be difficult, we think, to produce authority enough for this conjecture.

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* This is also Ptolemy's Ditonici Diatonica.

If it were true, as supposed, that the two octaves of the Greek scale, beginning, say with A, were minor, it would follow that Ptolemy, in his diatonic scales, exhibited the octave from C to C′, as we have supposed. Accordingly, the principal mode of exhibiting the formation of the octave from two tetrachords and a tone would be the one we have taken, namely,

(C D E F) (G A B C′)

But it is frequently supposed that it was the following:

C { D E F (G } A B C)

or the following—

A { B C D (E } F G A).

On this point we shall only say that there never was, we believe, so strong a union of the three characters of scholar, mathematician, and musician, as was seen in Dr. Smith, the author of the Harmonics. He had studied the Greek scale attentively, and to him the first of these methods was a matter of course. 'The Greek musicians' (*Harmonics*, 1749, p. 45), 'after dividing an octave into two-fourths, with the diazeuctic or major tone *in the middle between them*, and admitting many primes to the composition of musical ratios, subdivided the fourth into three intervals of various magnitudes placed in various orders, by which they distinguished their kinds of tetrachords.'

We do not, we confess, though admitting that it is exceedingly hard, and probably impossible, to reconcile the Greek writers with themselves and each other, find that sort of difficulty which Dr. Burney owned to, when he said that he neither understood those writers himself, nor had met with any one who did. He was a musician, and was looking out for an intelligible mode of arriving at and distributing the most agreeable concords, with a strong predetermination to arrive at musical truth or nothing. But the Greek writers were arithmeticians, with as strong a determination to find natural foundations in integer numbers: they did not ask how to find sounds which would best suit the ear, but how to discover triplets of fractions which multiplied together should produce four-thirds of a unit. Pleased with the simplicity of the ratios which give the fourth, fifth, and octave, their efforts at musical improvement were confined to the attempt at discovering magic numbers to fill up the intervals. It was not until one of these philosophers had laboured at his abacus, and tasked his metaphysics to find *à priori* confirmation of some question in arithmetic, that he strung his monochord and tried how his scale sounded: it would have been hard indeed if his ear had refused to sympathize with his brain. In all probability the musicians, whose object was simply to please, laughed at the arithmeticians, as Tycho Brahé did at Kepler, when the latter had discovered reason for the distances of the planets in the properties of solid bodies: they had motive enough, and, beyond all question, reason more than enough.

TETRACHORD (*τετράχορδον*, 'four-stringed'), in the music of the Greeks, was a system of four sounds,—as, for example, the diatonic tetrachord, C, D, E, F; the chromatic, C, C♯, D, F; and the enharmonic, C, C♯, D♭, F. The antients proceeded from the key-note to the octave by two conjoint tetrachords; and so far as the diatonic scale is concerned, they and the moderns agree. In what relates to the two other scales, so little is accurately known, and the subject is so unimportant, to either the general or the musical reader, that we should not further enter on it, even if the space allotted to our department allowed of extension. [GENERA; MUSIC, HISTORY OF.]

TETRADY'NAMOUS (from *τέτταρες*, *four*, and *δύναμις*, *power*), a botanical term employed by Linnæus to indicate the character of those flowers which, possessing six stamens, have two of them shorter than the other four. This peculiarity is found exclusively in the plants belonging to the natural order Cruciferæ. Hence the Linnæan class Tetradynamia, including only plants with the stamens arranged in this manner, is an exceedingly natural one, and is one of the few instances in which a peculiarity in the stamens prevails throughout a whole family. *Didynamous* is the term which expresses the existence of four stamens, two of which are short and two long. This character exists in a great number of natural families, as Labiatæ, Scrophulariaceæ, Bignoniaceæ, &c., and is always prevalent throughout a family where it exists. The Linnæan class Didynamia is founded on this peculiarity of the stamens.

TETRAGON (properly a four-angled figure), a term usually applied to the square only, when used, which it seldom is. [REGULAR FIGURES.]

TETRAGONIA'CEÆ, a natural order of plants, placed by Lindley in his Curvembryose group of incomplete Dicotyledons. It includes the genera Tetragonia, Aizoon, Sesuvium, and Miltus, which are generally placed in the order Ficoideæ or Mesembryaceæ. The reason given by Dr. Lindley for this separation is the want of petals in these genera, as he considers that the tendency to produce petals in the Mesembryaceæ is of too powerful a nature to admit exception. The relation of these apetalous Ficoideæ to Chenopodiaceæ is so strong, that Dr. Lindley says 'there is no character to distinguish them, except their ovary being formed of several carpels.'

Like Ficoideæ, this order possesses thick succulent leaves, which in many of the species might be used as a substitute for spinach. The *Tetragonia expansa* is a native of New Zealand and Japan, and is used by the natives of those countries as a remedy in those forms of cutaneous disease called scorbutic. It might be used in cookery instead of spinach. The *Aizoon canariense* and *A. hispanicum* grow on the sea-coasts of the Canary Isles and Spain, and are amongst the plants which yield soda after burning.

TETRAGONO'LOBUS (from *τέτταρες*, *four*, *γωνία*, *angle*, and *λόβος*, *lobe*), a genus of plants belonging to the papilionaceous division of the natural order Leguminosæ. It contains herbs with broad leafy stipules, trifoliate leaves, winged petioles, alternate leaflets and flowers seated on axillary peduncles, furnished with a bract. The calyx is tubular 5-cleft, the wings shorter than the vexillum; the stigma is funnel-shaped and beaked; the legume is cylindrical, furnished with four foliaceous wings which give it a 4-cornered appearance.

T. purpureus (purple winged-pea) is a pilose plant with decumbent stems, entire obovate leaflets, bracts longer than the calyx, and a glabrous legume, with globose seeds. It is a native of the south of Europe, and has dark purple flowers; a variety is, however, found with flowers of a dark yellow colour.

There is also a variety called *T. p. minor*, in which the stem, leaves, and legumes are much smaller. In southern regions, where this plant grows in perfection, the unripe legumes are cooked and eaten in the same manner as we eat French beans.

There are four other species of Tetragonolobus, all of them inhabitants of Europe. In general appearance they very much resemble the species of Bird's-foot trefoil (Lotus), and in gardens are well adapted for ornamenting rock-work. They are best propagated by seeds.

TETRAHEDRON (a solid of four faces), a term usually applied to the regular tetrahedron. [REGULAR FIGURES.]

TETRAO. [TETRAONIDÆ.]

TETRAOGA'LLUS, Mr. J. E. Gray's name for a genus of birds, placed by Mr. G. R. Gray in the subfamily *Lophophorinæ*, of the family *Phasianidæ*. Example, *Tetraogallus Nigellii*. (*Ill. Ind. Zool.*)

TETRAO'NIDÆ, Dr. Leach's name for the Grouse family.

Linnæus, in his last edition of the *Systema Naturæ*, places the genus *Tetrao* at the end of his fifth order, *Gallinæ*, next to the genus *Numida*. The *Gallinæ* come between the *Grallæ* and the *Passeres*. the genus *Struthio* is the last of the order *Grallæ*, and the genus *Columba* the first of the order *Passeres*.

The Linnean genus *Tetrao* is very extensive, comprising not only the true Grouse, but also the Francolins, Partridges, and Quails.

Cuvier, in his last edition of the *Règne Animal*, arranges the *Tétras* (*Tetrao*, Linn.) under his fourth order, *Gallinacés* (*Gallinæ*, Linn.), placing them between the Pheasants (*Phasianus* Linn.) and the Pigeons (*Columba* Linn.).

This great genus in the arrangement of Cuvier is more comprehensive even than that of Linnæus, for it includes the following subgenera:—1. *Les Coqs de Bruyère* (*Tetrao*, Lath.); 2. the *Lagopèdes*, or Snow Partridges (*Perdrix de neige*); 3. the *Ganga*, or *Attagen* (*Pterocles*, Temm.); 4. the *Partridges* (*Perdix*, Briss.); comprising the Francolins, the ordinary Partridges, the Quails, and the *Colins* or Partridges and Quails of America; 5. the *Tridactyls* (Lacép., *Hemipodius*, Temm.), including *Turnix* (Bonap., *Ortygis*, Ill.), and *Syrrhaptes*, Ill.; 6. The *Tinamous* (*Tinamus*, Lath., *Crypturus*, Ill., *Ynambus*, D'Azara). Of this last subgenus Cuvier remarks that some, the *Pezus* of Spix, have still a small tail hidden under the feathers of the rump; others, the *Tinamus* of Spix, have no tail at all, and their nostrils are placed a little farther backward; and he adds that one should distinguish *Rhynchotus* of Spix, which has the bill stronger, without any furrow, slightly arched and depressed, with the nostrils pierced towards its base.

Mr. Vigors places the *Tetraonidæ* among the RASORES, observing that the groups which form the family are chiefly distinguished in modern systems from those of the *Phasianidæ* by their more simple appearance; by the absence in fact of those ornaments to the plumage, and those naked or carunculated appendages to the cheeks and head, so conspicuous in the latter family, but which are reduced in the present to the mere space that encircles the eye. The still weaker conformation of the hinder toe tends, Mr. Vigors observes, further to separate them; for this member in the *Tetraonidæ* becomes shorter and gradually weaker, until it is completely lost in some of the groups. Thus viewed, Mr. Vigors is of opinion that the family under consideration holds an intermediate station between the *Phasianidæ*, where the hind toe, although articulated high on the tarsus, is yet comparatively strong, and the *Struthionidæ*, where it is generally, if not always, deficient. He further remarks that the groups which compose the *Tetraonidæ*, corresponding with those that form the genus *Tetrao* of Linnæus, seem to be immediately united to the preceding family by means of the genus *Cryptonyx*, Temm., which resembles them in the similar appendage of the plumage of the head. This group, he thinks, leads directly to *Coturnix*, Briss., and the true *Perdix*, where it has, he observes, been generally arranged, and from which it has been chiefly separated by the defalcation of a nail to the hinder toe. From *Perdix* Mr. Vigors proceeds to *Pterocles*, Temm., which, by its half-plumed tarsus, is intermediate between that genus and the true *Tetrao*. By means of *Lagopus*, Cuv., in which the toes as well as the legs are feathered, Mr. Vigors arrives at the singular genus *Syrrhaptes*, Ill., which is immediately connected with *Ortygis* of the same author by the entire deficiency of the hind toe. With these groups, in his opinion, the genus *Tinamus*, Lath., corresponds by the slight conformation of the same member, the joint of which is feeble and the nail scarcely developed. This group leads him back again to *Cryptonyx*, which has no nail to the joint of the hinder toe. The whole of these ast-mentioned groups, thus united, correspond also, Mr. Vigors observes, in the shortness or weakness of their tails. Those of the *Tetraonidæ* which exhibit a weakness or deficiency in the hinder toe, lead Mr. Vigors to the three-oed groups of the *Struthionidæ*, with the bills of which, more particularly that of *Rhea*, those of some species of *Tinamus*, he observes, correspond. (*Natural Affinities hat connect the Orders and Families of Birds*, in *Linn. Trans.*, vol. xiv.).

Mr. Swainson makes the *Tetraonidæ* form the third family of *Rasores*, and states that it is composed of the Partridges, Grouse, and Quails; all of which agree in the extreme shortness of their tails and of their hind-toe: hey are also, he observes, remarkable for a total want of hat brilliancy of plumage which so eminently characterises he *Pavonidæ*, between which family and the *Struthionidæ* he places the *Tetraonidæ*. The genus *Cryptonyx*, he observes (a small group of Oriental birds highly beauiful from their elegant form and the texture of their crests), has been thought to connect the two: a supposiion, he remarks, by no means improbable, yet requiring analogical proof. He then notices, as following these, the Grouse: those of the colder latitudes, he adds, constitute the genus *Tetrao*, while *Pterocles* includes such as inhabit the arid sands of Africa and Southern Europe. The northern parts of our empire, he observes, still furnish us with several species; but he laments the extermination in Britain* of the largest and most noble grouse of Europe, the cock of the rock (cock of the wood must be meant).

Mr. Swainson goes on to point out how sometimes the side feathers on the neck of the male grouse are developed in a singular manner, so as to resemble little wings—a character mostly confined to the American species (*Tetraones Umbellus* and *Cupido*). He also adverts to the several new additions to this group brought home by the expedition under Captain (now Sir John) Franklin. The African and Indian Grouse (*Pterocles*) have, he remarks, frequently very pointed tails, and the hind-toe is very small: heat with them, he observes, appears to be as essential as cold to the true grouse. But he notices one species, *Pt. setarius*, Temm., which extends its range to the South of France. He then proceeds to point out that nearly all the Grouse have the toes and legs more or less covered with soft feathers; but that this character disappears in the Partridges—an extensive group scattered over nearly all parts of the Old World, but unknown in the New, where they are represented by the genus *Odontophorus*, Vieill. In the Quails, he observes, we have the miniature resemblance of Partridges, but the tail is so short as to be nearly imperceptible. Closely approaching to the true quails, we have, he remarks, the genus *Hemipodius*, distinguished by the total absence of the hind-toe; and he adverts to the extreme pugnacity of these little birds, a disposition taken advantage of by the Javanese and other Indian nations with whom quail-fighting is even a more fascinating amusement than cock-fighting is, or rather was—for we are happy to say it is much on the decline—in Europe.

Mr. Swainson then calls attention to that singular race of birds in Tropical America called *Tinamous* by some of the Brazilians, and *Ynambus* by D'Azara. With scarcely any tail, their body is thick, and Mr. Swainson remarks that their whole appearance reminds the observer of a pigmy Bustard, which group, he thinks, they probably represent in the New World. 'As for their flesh,' says Mr. Swainson in conclusion, 'we have often tasted it, and consider it both in whiteness and flavour infinitely above that of the partridge or pheasant. We believe these birds never perch, as some suppose, but that they live entirely among herbage, principally in the more open tracts of the interior.' (*Classification of Birds.*)

In the Synopsis at the end of the volume, Mr. Swainson places the *Tetraonidæ* in the same relative position as that above assigned to them. He thus defines the '*Tetraonidæ*, Partridges and Grouse:'—'Bill and tail very short. Hallux elevated;' and he comprises under the family the following genera and subgenera:—

Cryptonyx, Temm.; *Odontophorus*, Vieill.; *Ortygis*, Ill.; *Tetrao*, with the subgenera *Tetrao*, Linn., *Lagopus* Willughby, *Lyrurus*, Sw., *Pterocles*, Temm., and *Centrocercus*, Sw.; *Perdix*, Briss., with the subgenera *Perdix*, *Chætopus*, Sw., *Coturnix*, Briss., *Ptilopachus*, Sw., and *Ortyx*, Steph.; *Crypturus*, Ill., with the subgenera *Crypturus* and *Nothurus*, Wagl.

The Prince of Canino, in his *Birds of Europe and North America*, makes the *Gallinæ* the third order of his second subclass, *Grallatores*; and this order comprises the families *Pteroclidæ*, *Phasianidæ*, *Tetraonidæ*, and *Crypturidæ*. The order next in succession to the *Gallinæ* is formed by the *Grallæ*.

The *Pteroclidæ* include the following subfamilies and genera:—

1. Syrrhaptinæ.

Genus, *Syrrhaptes*, Ill.

2. Pteroclinæ.

Genus, *Pterocles*, Temm.

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* See the article CAPERCAILZIE. The attempt at reintroduction has since been followed up with every prospect of success by the patriotic Marquis of Breadalbane. In 1838, and the early part of 1839, that nobleman received at his seat in Scotland forty-four of these magnificent Grouse: they were al. old-seasoned birds, and about two-thirds of them were hens. They were collected in Sweden with great pains and expense by Mr. L. Lloyd. Mr. Fowell Buxton presented them to Lord Breadalbane. His Lordship turned out part into the forest, and retained another portion in a large aviary. Both experiments succeeded, and it was ascertained that seventy-nine young birds had been hatched out in the season of 1839. Forty-nine were hatched out in the aviary by Grey Hens (females of Black Grouse).

In 1839 three were sent to the Duchess of Athol at Blair, and several were forwarded to the Earl of Derby at Knowle-ley, where five young birds were hatched in the aviary in the summer of 1839: four of these were doing well when last heard of.

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The *Tetraonidæ* comprehend the following subfamilies and genera:—

1. Perdicinæ.

Genera, *Lophortyx*, Bonap.; *Ortyx*, Steph.; *Francolinus*, Briss.; *Perdix*, Bonap.; *Starna*, Bonap.; *Coturnix*, Temm.; *Bonasia*, Bonap.; *Tetrao*, Linn.; and *Lagopus*, Vieill.

The *Crypturidæ* consist of the subfamily Ortyginæ and the genus *Ortygis*, Ill.

Mr. G. R. Gray, in his *List of the Genera of Birds*, arranges the *Tetraonidæ* between the *Phasianidæ* and the *Chionididæ*, with the following subfamilies and genera:—

1. Perdicinæ.

Genera, *Rhizothera*, G. R. Gray; *Ptilopachus*, Sw.; *Ithaginis*, Wagl.; *Lerwa*, Hodgs.; *Pternistes*, Wagl.; *Francolinus*, Briss.; *Chacura*, Hodgs.; *Perdix*, Antiq.; *Arborophila*, Hodgs.; *Coturnix*, Antiq.; *Rollulus*, Bonn.; *Odontophorus*, Vieill.; *Ortyx*, Steph.; *Lophortyx*, Bonap.; *Callipepla*, Wagl.

2. Tetraoninæ.

Genera, *Tetrao*, Linn.; *Lyrurus*, Sw.; *Bonasa*, Briss. (*Bonasia*, Bonap.); *Centrocercus*, Sw.; *Lagopus*, Briss.

3. Pteroclinæ.

Genera, *Pterocles*, Temm.; *Syrrhaptes*, Ill.

Mr. G. R. Gray gives the synonyms of all these genera, and sufficiently numerous they are. The same author, in his Appendix, states that *Chacura* should have before it *Caccabis*, Kaup; and directs the reader to add near the genus *Alectoris*, Kaup, *Tetrao*, Gm.; also to add the genus *Oreias*, Kaup. He further remarks that *Ocypetes* is synonymous with *Thinocorus*.

We shall endeavour to illustrate this article with examples of the natural history of the grouse properly so called: an account of some of the leading forms of the family, taken in its more extensive sense, will be found under the respective titles.

EUROPEAN GROUSE.

The following species are European:—*Tetrao Urogallus*, the *Capercailzie*, or Cock of the Wood; *Tetrao hybridus*, Sparrm. (*Tetrao medius*, Meyer), the *Hybrid Grouse*, generally considered by ornithologists to be a hybrid between the Capercailzie and the Black Cock; *Tetrao Tetrix* (genus *Lyrurus*, Sw.), the *Black Grouse* or *Black Cock*; *Bonasia Europæa*, the *Hazel Grouse* or *Gelinotte*; *Lagopus Scoticus*, the *Red Grouse*; *Lagopus mutus*, the *Common Ptarmigan*; *Lagopus terrestris*, the *Rock Ptarmigan*;* *Lagopus saliceti*, the *Willow Ptarmigan*; *Lagopus brachydactylus*, the *Short-toed Ptarmigan*; *Pterocles arenarius*, the *Sand-Grouse*; *Pterocles setarius*, the *Pin-tailed Sand-Grouse*.

Of these the *Black Cock*, the *Red Grouse*, and the *Common Ptarmigan* are British; to which we trust that we may now add the *Capercailzie*, restored by the praiseworthy care of the Marquis of Breadalbane and others.†

We select as an example the *Common Ptarmigan*, *Lagopus mutus*.

Description—Winter Plumage (Male).—Pure white; a black band proceeding from the angle of the bill and traversing the eyes; lateral tail-feathers black, terminated by a white border; feet and toes well covered with woolly feathers; above the eyes a naked space, which is terminated by a small dentilated membrane; these naked parts are red; claws hooked, subulate, and black; bill black; iris ash-coloured. Length about fifteen inches and a quarter.

Winter Plumage (Female).—Differing from that of the male in having the naked space above the eyes less, and no black eye-band. Smaller than the male; the length about fourteen inches and a half.

Perfect Summer Plumage (Old Male).—Top of the head, neck, back, scapulars, and the two middle tail-feathers, as well as the upper coverts, rusty ash crossed by numerous zigzags of deep black; breast and sides variegated with feathers of the same colour, among which are always found a great number of feathers of a deep black varied with some scattered zigzags of a bright rust-colour; black eye-band always distinctly marked; throat most frequently white, but often marked with blackish; the whole of the belly, abdomen, lower coverts of the tail, wings, wing-coverts, and feet pure white; eye-brows large, of a very lively red.

Female always distinguished by the total absence of the black eye-band, and to be recognised also by the tone of her plumage, which has less white; the head, all the upper parts of the body, the neck, the breast, the flanks, and the abdomen streaked with transverse bands of bright rusty and black, with a good deal of regularity; only the middle of the belly, the feet, and the wings are pure white.

The *Young* are marked with very fine, ash-coloured, black and rustyish streaks. (Temm., &c.)

N.B. The bird figured by Mr. Gould, in his great work *The Birds of Europe*, under the name of *Lagopus rupestris*, *The Rock Ptarmigan*, with great doubt by that acute ornithologist as to its identity with the North American species, appears, according to Temminck, to be the female Ptarmigan in her perfect summer plumage.

The *newly-hatched young*, according to Mr. Macgillivray, are covered with a light yellowish-grey down patched on the back with brown, and have, on the top of the head a light chestnut mark, edged with darker chestnut. When first fledged they are, he says, very similar to the young of the Red Grouse, but banded and spotted with brighter reddish-yellow: but this plumage, he adds, soon changes, so that in the beginning of August many of the yellow and brown feathers of the back are exchanged for others spotted and barred with pale grey and brown, and the under parts are white as well as the wings. In conclusion, he states that these young birds become white the first winter, like the old ones. (*History of British Birds.*)

This Ptarmigan is supposed by some, and with good reason, to be the *Lagopus* of Pliny (*Nat. Hist.*, lib. x. c. 48), who notices its excellent flavour, and states that its feet with their 'hare-like hair' gave the bird its name. It is the *Tetrao lagopus* of Linnæus; *Lagopus vulgaris* of Fleming; *Pernice de Montagna*, *Pernice alpestre*, and *Lagopo bianco* of the modern Italians; *Perdris blanche* and *Gelinote blanche* of the French; *Perdiz blanca* of the Spaniards; *Schneehuhn* and *Haasenfüssige Waldhuhn* of the Germans; *Rype* of the Norwegians; *Riupkarre* (male), *Rupa* (female) of the Icelanders; *Tarmachan* of the Northern Gael; and *Coriar yr Alban* of the Welsh.

Geographical Distribution.—North of Europe: Lapland, Norway, Sweden, Russia. The Alpine districts of the middle and south of Europe. North America: the islands lying in the south-west of Baffin's Bay (Sabine); high hills keeping near the snow-line; Churchill River (Franklin; Richardson).

In the British Islands it was formerly found in the North of England, and, as its Welsh name indicates, in Wales; but it no longer occurs in those localities, nor is it to be met with in Ireland.

Mr. Macgillivray (*History of British Birds*) states that it inhabits the bare and weather-beaten summits of the higher mountains of the middle and northern divisions of Scotland; but, he adds, that even in the transition range of the south of that part of the United Kingdom, many of the mountains of which, being more than two thousand feet high, seem well adapted for it, no individuals are ever met with. 'I have frequently,' says this observing out-door naturalist, 'chased it on Ronaval and other mountains in Harris; and it is said to occur on Eachdla in South Uist, on the Park and Uig hills in Lewis, on the Cullin and Strath mountains in Skye, as well as in Mull and Jura. On all the elevated summits of the north of Scotland it is not uncommon; and, on most of the Grampians, but especially the great granite and slaty masses from which issue the sources of the Dee, the Spey, and the Tay, it may be said to be even abundant. Great numbers are annually killed, but as the haunts of this Ptarmigan are not so easily accessible as those of the brown species (*Lagopus Scoticus*), it is not at all likely to be exterminated.'

Food, Habits, &c.—The summer food of the Ptarmigan consists principally of Alpine berries, and in winter of the shoots of young heath. Mr. Macgillivray found in their crops a large quantity of fresh green twigs of *Calluna vulgaris*, *Vaccinium Myrtillus*, and *Empetrum nigrum*, the largest fragments not exceeding five-twelfths of an inch in length. He adds, that leaves and twigs of *Vaccinium Vitis-idæa*, *Salix herbacea*, seeds of various *Junceæ* and *Cyperaceæ*, and other plants, with berries in autumn, also form part of their food, which is thus, he observes, for the most part the same as that of the Red Grouse, or, as he terms it, the Brown Ptarmigan.

The author last quoted gives the following description of the habits of this species from personal observation: 'These beautiful birds, while feeding, run and walk among the weather-beaten and lichen-crusted fragments of rock, from which it is very difficult to distinguish them when they remain motionless, as they invariably do should a person be in sight. Indeed, unless you are directed to a particular spot by their strange low croaking cry, which has been compared to the harsh scream of the missel-thrush, but which seems to me much more like the cry of a frog, you may pass through a flock of Ptarmigans without observing a single individual, although some of them may not be ten yards distant. When squatted however they utter no sound, their object being to conceal themselves; and, if you discover the one from which the cry has proceeded, you generally find him on the top of a stone, ready to spring off the moment you show an indication of hostility. If you throw a stone at him, he rises, utters his call, and is immediately joined by all the individuals around, which, to your surprise, if it be your first rencontre, you see spring up one by one from the bare ground. They generally fly off in a loose body, with a direct and moderately rapid flight, resembling, but lighter than, that of the Brown Ptarmigan, and settle on a distant part of the mountain, or betake themselves to one of the neighbouring summits, perhaps more than a mile distant.'

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* But see post.

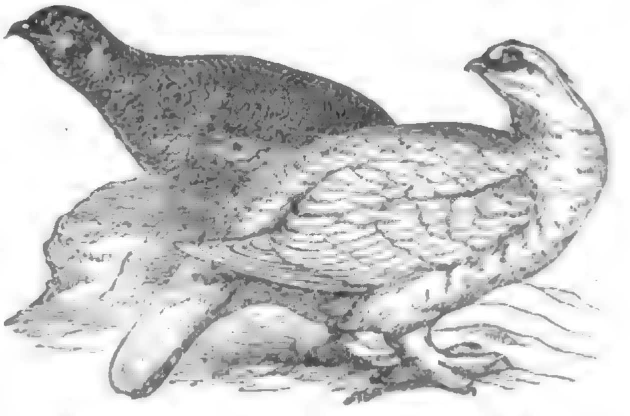
† Ante, p. 255 (note).

In winter it appears that these birds associate, forming flocks of fifty or more; and it is also stated that, during this season, they burrow under the snow, thus giving countenance to the statement and cut of Olaus Magnus, copied by Gesner, showing that the 'Urogalli minores' lie hid 'sub nive:' to be sure, this retirement is said to be of rather long duration—two or three months, and 'sine cibo.'

Mr. Macgillivray states that early in the spring the Ptarmigans separate and pair. He describes the nest as a slight hollow, scantily strewn with a few twigs, and stalks or blades of grass; the eggs, as regularly oval, about an inch and seven-twelfths in length, and an inch and from one to two twelfths across, white, yellowish-white, or reddish, blotched and spotted with dark brown, the markings being longer than those on the eggs of the red grouse. He states that the young run about as soon as they leave the shell, and are, from the first, so nimble and expert at concealing themselves, that a person who has accidentally fallen in with a brood very seldom succeeds in capturing one. The parent bird it seems has recourse to the same stratagems as the partridge and other gallinaceous birds to lead the intruder from her little ones. 'On the summit of the Harris mountains,' says Mr. Macgillivray, 'I once happened to stroll into the midst of a covey of very young ptarmigans, which instantly scattered, and in a few seconds disappeared among the stones, while the mother ran about within a few yards of me, manifesting the most intense anxiety and pretending to be unable to fly. She succeeded so effectually in drawing my attention to herself, that when I at last began to search for the young, not one of them could be found, although the place was so bare that one might have supposed it impossible for them to escape detection.'

This species has been reared in confinement without any great difficulty, and has bred in a tame state. (Selby.)

Every one must have observed the numbers of Ptarmigan which are sent to this country early in the spring. The shops of many of the London poulterers are then positively white with them. These are imported from the north of Europe, where they are principally taken in snares made of horsehair. Mr. Yarrell states that he has more than once found a hair noose round the neck of Norway Ptarmigan n the London market, and that others have found the same. The numbers taken are immense. According to Mr. Lloyd, whom we have so often had occasion to quote, one peasant will set from five hundred to a thousand of hese snares in the winter season. The captured birds are kept in a frozen state till the dealers come; and one of hese dealers will sometimes buy and sell fifty thousand ptarmigan in a season. According to the calculation of Sir Arthur de Capell Brooke, sixty thousand of these birds were killed during one winter in a single parish, which was however large. Mr. Grant informed Mr. Yarrell that he was assured, when in Norway, that the number of ptarmigan killed in that country every winter was beyond belief: two thousand dozen, if Mr. Grant remembered ight, was the quantity exported from Drammen in one ship or England in 1839, and great numbers, he adds, are sent to the Copenhagen market. Mr. Yarrell goes on to state that besides those brought to this country from Drammen, great quantities are also received in London, during the months of February, March, April, and May, from Bergen, Drontheim, and other ports on the west coast of Norway, from whence conveyance is obtained for them in the boats which bring constant supplies of lobsters to the London market. 'On one occasion,' says Mr. Yarrell, 'late in the spring of 1839, one party shipped six thousand ptarmigan for London, two thousand for Hull, and two thousand for Liverpool; and at the end of February or very early in March of the present year, 1840, one salesman in Leadenhall market received fifteen thousand ptarmigan that had been consigned to him; and, during the same week, another salesman received seven hundred capercaillies and five hundred and sixty black grouse.'



Common Ptarmigan in winter and summer plumage. (Gould.)

ASIATIC GROUSE.

We select the *Pin-tailed Sand-Grouse, Pterocles setarius, Ganga Cata*, as an example.

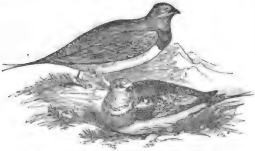
Description.—Old Male.—Throat black; sides of the head and front of the neck yellowish-ash; on the breast a large cincture, about two inches, of rusty orange, bordered above and below by a narrow black band; head, nape, rump, and tail-coverts streaked with black and yellowish; back and scapulars streaked in the same way, but towards the end of each feather there is a large band of bluish-ash, succeeded by another of a yellowish colour; lesser and middle wing-coverts marked obliquely with chestnut-red, and terminated by a white crescent; greater coverts olive-ash, terminated by black crescents; belly, sides, abdomen, thighs, and extremity of the lower coverts of the tail pure white; tail-feathers terminated with white, and the external one bordered with that colour; the two middle feathers, which are very long, slender, and of loose texture, are three inches longer than the others. Total length, without reckoning the long tail-feathers, 10 inches 6 lines.

Female differing much from the male; throat white; below this part a large black semicollar, which only extends to the sides of the neck; the cincture large and orange-coloured as in the male; upper parts nearly the same; middle, lesser, and greater wing-coverts bluish-ash, then an oblique reddish band, and all the feathers terminated by black crescents; the two long tail-feathers or filaments are longer than the others by an inch and six lines.

Young before their first moult.—Plumage less variegated; upper parts olive clouded with ash; the white of the sides, the thighs, and the abdomen is barred with yellowish and brown zigzags. (Temm.)

Geographical Distribution.—Very numerous on the arid plains of Persia. Not very numerous in France, on the sterile 'Landes' near the Pyrenees, and along the coasts of the Mediterranean; less common in Provence and Dauphiné, where they occasionally arrive; more common in Spain, Sicily, Naples, and throughout the Levant. Temminck, who gives these localities, states, in the fourth part of his *Manuel*, second edition, that it is common in Provence, in the uncultivated plains of Crau, and says that it avoids cultured tracts, and only inhabits the sterile Landes of the south; but he adds that it is abundant in the Pyrenees, and that it is to be found all the year round in the markets of Madrid. Mr. Gould states that the species is found in the North of Africa.

Food, Habits, &c.—Seeds, insects, and the young shoots or plants form the food of this sand-grouse: but its wild nature and the barren places which it frequents are adverse to observation; and little or nothing is known of its habits. The nest is a hollow in the earth, and, according to Temminck, the eggs, nearly of the same size at each end, of an Isabella grey, marked with small brown points and large black patches, are only two or three, a small number compared with those of the majority of the *Tetraonidæ*.



Pin-tailed Sand-Grouse, male and female. (Gould.)

AFRICAN GROUSE.

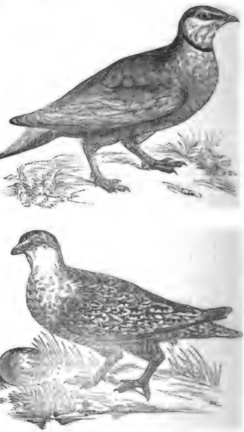
Dr. Andrew Smith remarks, that though we find species of *Pterocles* beyond the confines of Africa, yet the majority of those now known are peculiar to that quarter of the globe. The regions south of the equator, he observes, have furnished nearly as many species as those to the north of it; and he thinks that both will doubtless afford many additional ones when the yet unknown districts shall have been thoroughly explored. Each of the known species, as far as his observations go, has a limited range; and should the range of such as inhabit the unexplored tracts of the interior not be greater, he is of opinion that we may in time expect great additions to the following list of known species which he gives:—

Pterocles arenarius, Temm., Barbary and Senegal; *Pterocles guttatus*, Licht., Egypt; *Pterocles quadricinctus*, Temm., Senegal; *Pterocles coronatus*, Licht., Nubia; *Pterocles Lichtensteinii*, Temm., Nubia; *Pterocles tricinctus*, Swain., Senegal; *Pterocles exustus*, Temm., Egypt and Senegal; *Pterocles Tachypetes*, Temm., South Africa; *Pterocles bicinctus*, Temm., South Africa; *Pterocles simplex*, Roux, South Africa; *Pterocles maculosus*, Burchell, South Africa; *Pterocles gutturalis*, Smith, South Africa. It will be seen that *Pterocles setarius*, to which Mr. Gould assigns North Africa as a locality, is not in Dr. Smith's list.

We select as an example *Pterocles gutturalis*, Smith.

Description.—Male.—Top of the head dull green, faintly freckled with black; sides of the head and chin straw-yellow; eyebrows yellowish-white; space between the eye and bill black; neck, breast, and a portion of each shoulder intermediate between oil-green and sulphur-yellow; bases of all the feathers pearl-grey; immediately behind the yellow chin, the throat and sides of the neck are crossed by a deep brownish-black crescent. Interscapulars and scapulars clouded with pale reddish-brown, pearl-grey, and bluish-black or brownish-black, the latter generally prevailing towards the quills. Back and upper tail-coverts pearly grey, strongly tinged with brown, and when the feathers are separated, each is found with a yellowish tint at the base, and with a strong satin lustre. Secondary wing-coverts intermediate between Dutch and reddish orange, with the base and a considerable portion of the inner vane of each pearl-grey; primary wing-coverts and all the quill-feathers umber-brown; secondaries narrowly tipped with rusty-white; tail-feathers blackish-brown, the outer vanes edged with pearl-grey, and all, except the two middle ones, broadly tipped with the same colour as the secondary quill-coverts. Belly and under tail-coverts between chestnut and reddish-brown. Bill and claws dark horn-colour; eyes dark brown; toes greenish-brown. Wings when folded nearly reaching the tip of the tail; first quill-feather rather longer than the second; longest of the tertiaries intermediate between the sixth and seventh quill-feathers; tail wedge-shaped, the two middle feathers rather the longest and acuminated at their extremities; outer and inner toes of equal length. Total length 12 inches 6 lines.

Female.—Top of the head brownish-black, spotted with rusty-white; back of the neck dull cream-yellow, freely dashed with brown; sides of the neck and throat pale honey-yellow; back, shoulders, and breast brownish-black with large cream-coloured spots; belly deep black, barred with pale chestnut. Under tail-coverts bright chestnut towards their bases barred with black. Tail blackish-brown, with partial bars of light cream-yellow; and all except the two middle feathers, tipped with pale reddish orange. Length 11¾ inches. (Smith.)



Pterocles gutturalis: male and female. (Smith.)

Locality, Food, Habits, &c.—Dr. Smith states that this species was first discovered in lat. 25° 40′, about eighty miles to the eastward of Latakoo; and it was when he remarked its cry to differ from that uttered by *Pterocles Tachypetes*, Temm., that he was led to suspect that it was distinct. He says that, in common with the other South African species of this genus, it repairs in large flocks at regular and fixed periods to localities where water is, and that at such times specimens are most readily procured; but he warns the sportsman to be quick in his movements, as they scarcely reach the water before they are again on the wing. As they approach and recede from such spots, they almost incessantly utter cries resembling *tweet weet, tweet weet*.

Dr. Smith remarks, that from observing these birds when they are in quest of water, one would be disposed to consider them gregarious, a notion soon dissipated when their feeding-grounds are discovered, for there they are generally dispersed singly or in pairs, and the occasional congregation is only effected by solitary individuals successively joining others who are on their way from a greater distance. *Pterocles gutturalis* seeks the water about ten in the morning and three in the afternoon, resembling in this respect *Pterocles Tachypetes*, which inhabits a different part of the country. *Pterocles variegatus*, he tells us, drinks during the early part of the morning, and *Pterocles bicinctus* in the dusk of the evening and early part of the night. In such an arrangement, he observes, we must admit design; for if all the various species were to experience thirst at the same time, both delay and difficulty would occur in quenching it, since, owing to the general scarcity of water in the districts inhabited by these birds, hundreds of the same species, even as it is at present, are often to be seen fringing the brink of a pool for hours together, and occasionally disputing for the first sip. Dr. Smith found grass-seeds, ants, and abundance of gravel in the stomachs of most of the individuals which he procured. The female lays two or three eggs, which are nearly of the same size at each end, of a dirty-white or cream-colour, marked with irregular streaks and blotches of pale rusty and pale grey or ash-colour, upon the bare ground, without any care, once or oftener during the warm season; and it is only when level spots fitted for the reception of the eggs cannot be readily obtained, that the birds of this genus, according to Dr. Smith, bestow any labour on the preparation of nestling-places. Nothing, he adds, is ever interposed between the eggs and the soil; and indeed whatever is calculated to separate them is carefully avoided. Almost as soon as the young escape from the shell, they take to a wandering life, and remove from place to place with the parent-birds in search of food. (*Illustrations of the Zoology of South Africa.*)

AMERICAN GROUSE.

America possesses several species of grouse, consisting of the genera and subgenera *Bonasia*, or *Bonasa*, *Tetrao*, *Lagopus*, and *Centrocercus*. We have already noticed the *Ruffed Grouse* [BONASIA], and here select for example *Centrocercus urophasianus*.

Description.—Male.—General ground-colour of upper plumage light hair-brown, mottled and variegated with dark umber-brown and yellowish-white. Each feather of the back with three bands of yellowish-white at equal distances from each other, the lowest narrow, the middle one broad, and the outer one at the tip of the feather almost obsolete; between these the colour is hair-brown, prettily marked with small irregular zigzags of light hair-brown: these colours cross the shaft; but on the wing-covers and scapulars the shafts are all marked by a narrow conspicuous line of yellowish-white. On the tail there are about eight bands of this colour, the lower ones being tolerably defined, but those towards the ends obscure: the margins are zigzagged, and bordered by dark umber-brown, with irregular zigzag lines of the same, upon a light hair-brown ground, between each bar. Quills light, and almost unspotted; narrowed extremities of the tail almost black. Under plumage white, unspotted on the breast and part of the body; but dark umber-brown, approaching to black, on the lower half of the body and part of the flanks; the latter, towards the vent, marked as on the upper plumage. Under tail-coverts black, broadly tipped with white. Feathers of the thighs and tarsi light hair-brown, mottled with darker lines. Throat and region of the head varied with blackish on a white ground. Shafts of all the feathers on the breast black, rigid, and looking like hairs; scale-like feathers of the sides white and thicker. Bill, which is thick and strong, and toes blackish. On each side of the breast two prominent naked protuberances, destitute of hair and feathers, more forward than the analogous parts in *Tetrao Cupido*. On each side of the protuberances and higher up on the neck, a tuft of feathers, having their shafts considerably elongated and naked, gently curved and tipped with a pencil of a few black radii. These tufts occur at the same part as those of the Ruffed Grouse, but are placed much behind the naked protuberances in the specimen from which the description was taken,* so that they do not appear intended to cover them when not inflated. On the sides of the neck and across the breast, below the protuberances, the feathers are very short, rigid, and acute, overlying each other like the scales of a fish. Wings short in proportion; lesser quills ending in a small point. Tail rather lengthened, considerably rounded, each feather lanceolate and gradually attenuated to a fine point. Tarsi thickly clothed with feathers to the base of the toes. Length 31 inches 6 lines.

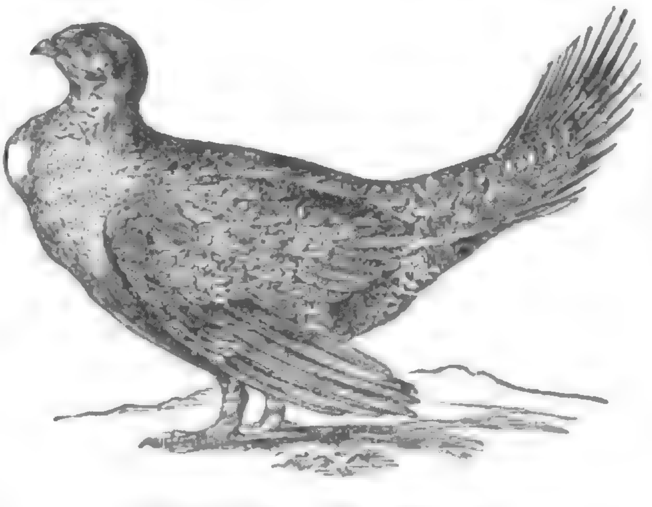
Female.—Whole upper plumage, tail, wing-covers, tertiaries, front of the neck, and sides of the breast, dark umber, or blackish-brown, and yellowish-white, irregularly barred and mottled in nearly equal quantities; but the dark colour forming larger blotches towards the base, and the lighter colour bars on the tips and stripes on the shafts. Fore part of the belly white, barred with black; hinder parts black. Plumage of breast and neck of ordinary form, there being no scale-like feathers nor projecting shafts as in the male. Length 22 inches 6 lines. (*Fauna Boreali-Americana.*)

This is the *Tetrao urophasianus* of the Prince of Canino, the *Cock of the Plains* of Lewis and Clark, and the *Pyämis* of the Kyuse Indians.

Food, Habits, &c.—The favourite food of this species is said to be the pulpy-leaved thorn, but it probably feeds also on buds and berries.

This grouse appears to have been first recorded by Lewis and Clark; and it has since become familiar to the fur-traders on the banks of the Columbia. Dr. Richardson gives the following interesting account of its habits by the late Mr. David Douglas:—

'The flight of these birds is slow, unsteady, and affords but little amusement to the sportsman. From the disproportionately small, convex, thin-quilled wing—so thin, that a vacant space half as broad as a quill appears between each—the flight may be said to be a sort of fluttering, more than anything else: the bird giving two or three claps of the wings in quick succession, at the same time hurriedly rising, then shooting or floating, swinging from side to side, gradually falling, and thus producing a clapping, whirring sound. When startled, the voice is "*Cuck, cuck, cuck,*" like the common Pheasant. They pair in March and April. Small eminences on the banks of streams are the places usually selected for celebrating the weddings, the time generally about sunrise. The wings of the male are lowered, buzzing on the ground; the tail spread like a fan, somewhat erect; the bare yellow œsophagus inflated to a prodigious size,—fully half as large as his body, and, from its soft membranous substance being well contrasted with the scale-like feathers below it on the breast, and the flexile silky feathers on the neck, which on these occasions stand erect. In this grotesque form he displays in the presence of his intended mate a variety of attitudes. His love-song is a confused, grating, but not offensively disagreeable tone,—something that we can imitate, but have a difficulty in expressing—"*Hurr-hurr hurr-r-r-r-hoo,*" ending in a deep hollow tone, not unlike the sound produced by blowing into a large reed. Nest on the ground, under the shade of *Purshia* and *Artemisia*, or near streams, among *Phalaris arundinacea*, carefully constructed of dry grass and slender twigs. Eggs, from thirteen to seventeen, about the size of those of the common fowl, of a wood-brown colour, with irregular chocolate blotches on the thick end. Period of incubation twenty-one to twenty-two days. The young leave the nests a few hours after they are hatched. In the summer and autumn months these birds are seen in small troops, and in winter and spring in flocks of several hundreds. Plentiful throughout the barren arid plains of the river Columbia; also in the interior of North California. They do not exist on the banks of the river Missouri, nor have they been seen in any place east of the Rocky Mountains.' (*Fauna Boreali-Americana.*)



Cock of the Plains. Male. (Swainson.)

Nuttall says that the flesh is dark and less palatable than that of other species.

TETRAPLA. [ORIGENES.]

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* Now in the British Museum.

TETRARCH (*τετράρχης*), from two Greek words, signifying *four* and *to govern*, a title used by the Greeks at a very early period to describe the ruler of each part of a country which was divided into four parts, either on account of its occupation by different tribes, or merely as a political division. Each of such four parts was called a tetrarchy (*τετραρχία* or *τετραδαρχία*). In process of time the title came to be applied to the rulers of different divisions of the same country, or to the chiefs of different tribes inhabiting the same country, without any reference to the number four. In this sense it was equivalent to the titles *ethnarch* and *phylarch*. Under the Roman government, in the later ages of the republic and under the emperors, there were several such petty princes, independent of each other, but tributary to Rome. These *tetrarchs*, *ethnarchs*, or *phylarchs*, were either the legitimate governors of their subjects, or persons who had received the title and government from Rome as a mark of honour. They ranked below those other subject princes who were permitted to retain the title of king.

The principal examples of tetrarchies are those of Thessaly, which was antiently so divided, and the division was again made by Philip, the father of Alexander the Great: of Galatia, which was peopled by three Gallic tribes, each of which was divided into four fetrarchies: of Syria, many of the petty princes of which bore the title of tetrarchs, especially certain princes of the family of Herod the Great. Concerning the tetrarchs of Syria, see Niebuhr's *History of Rome*, ii., pp. 134-5.

TETRAX, Dr. Leach's name for one of the BUSTARDS placed by Mr. G. R. Gray in the subfamily *Otodinæ* of the family STRUTHIONIDÆ.

Example, *Otis tetrax*, Linn.

TE'TRICUS, CAIUS PESUVVIUS, a Roman senator, one of the numerous usurpers of the Imperial purple in the third century A.D., who are distinguished in Roman history by the name of the Thirty Tyrants. He was governor of Aquitania, and, after the death of several pretenders in Gaul, was made emperor there, A.D. 268, by Victorina, said to be his kinswoman, and the widow of Victorinus. He reigned for a few years not unprosperously; but after the accession of Aurelian, finding himself unable to control the turbulent and licentious soldiery who sustained his power, and becoming weary of their crimes, he invited the new emperor into Gaul, and resigned his usurped dominion in the following manner. Dreading the resentment of his troops if he deserted them openly, he pretended to prepare for an engagement near Châlons in Champagne, and then betrayed his army into the hands of Aurelian. Gibbon places this event before the defeat of Zenobia; but Vopiscus ('Aurelianus,' *Historia Augusta*) says that it took place subsequently. The triumph of Aurelian, A.D. 274, was ennobled by the presence of the queen of the East, and of Tetricus and his son, in the train of captives. The deposed emperor was treated by his conqueror with every mark of distinction during the remainder of his life, and was made corrector of Lucania according to Vopiscus and other writers, or of all Italy, if we follow Trebellius Pollio. His son Tetricus, who had been made Cæsar by Victorina, met with not less favour than his father at the hands of Aurelian, and was honoured with senatorial dignity. On the coins of Tetricus, which are extant in gold, silver, and copper, we find the reading IMP.C.C.PESV.TETRICVS.AVG, and also IMP.TETRICVS.AVG; with, on the reverse, IMP.C.CLAVDIVS.AVG, which, as Eckhel (*Doct. Vet. Num.*) remarks, would imply an alliance between him and Claudius Gothicus. Spon (*Miscell.*, 274, Lugd., 1685) gives an inscription on a marble found at Rouen with the titles of Tetricus more at length: C.PESVBIO. TETRICO. NOBILISSIMO. CAES.P.F.AVG.L.I. Coins struck in the name of the younger Tetricus yet remain. (Trebellius Pollio, 'Trigint. Tyr.,' in the *Historia Augusta*; Eutropius, ix. 13; Gibbon., ii.)

TE'TRODON, a genus of fishes of the order *Plectognathi*. These fishes, instead of having distinct teeth as usual in the class, have the jaws provided with a substance resembling ivory, formed somewhat like the beak of a bird, and fitted for crushing crustaceous animals and fuci, upon which they live. Both the *Tetrodons* and *Diodons* (*Diodon*, Linn.), a very closely allied genus, have the power of inflating the body with wind, or rather a membrane which extends along the under side of the abdomen, which causes them to float on the surface of the water, without the power, it is said, of directing their course: the membrane when inflated, gives to the fish an almost spherical form, and is usually defended by spines and prickles. The pectoral fins are rather small; and besides these and the tail-fin, they have one dorsal and a ventral fin. The Diodons have but one large tooth above and below, and are usually protected by large strong spines. The Tetrodons are distinguished by the possession of four large teeth, the jaws being each divided by a central suture. These fishes are confined to the seas of warm climates: some of them are called Globe-fishes.

TETUAN. [MAROCCO.]

TETZEL, J. [TEZEL.]

TEU'CRIUM (from Teucer, son of Scamander, and father-in-law of Dardanus, king of Troy) is the name of a genus of plants belonging to the natural order Lamiaceæ or Labiatæ. It has a tubular 5-toothed, nearly equal, or 2-lipped calyx. The tube of the corolla is shorter than the calyx, the upper lip is abbreviated and bipartite; the lower lip is longer, spreading, and trifid. The stamens are much exserted, and the cells of the anthers are confluent and spreading. The species are herbs and shrubs inhabiting most parts of the earth, and having a variable habit and inflorescence. Upwards of seventy species are described in Don's Miller's Dictionary. Of these comparatively few are known in this country; some of them are cultivated in our gardens, and three are natives of the British Isles.

T. Scorodonia, Wood Germander, or Sage, has cordate, downy, petiolate, crenate leaves; the flowers are of a pale yellow colour, with violaceous stamens, and are arranged in lateral and terminal one-sided racemes; the stem is erect, hispid, pubescent, or nearly glabrous. It is a native of Europe in woody hilly situations, where the soil is dry and stony. It is not an uncommon plant in Great Britain. The smell and taste of this plant resemble very much the hop. In Jersey, where it is called *Ambroise*, the inhabitants use it as a substitute for hops in their beer; and by some persons the bitter given by the Germander is preferred to that of the hop.

T. Scordium, Water Germander, has oblong sessile downy serrated leaves; flowers purplish, arranged in axillary whorls, 2-6 flowers in each; the stem is procumbent and villous. It is a native of Europe and the temperate parts of Asia in boggy wet places. It is a rare plant in Britain. Its fresh leaves are very bitter and rather pungent, having a smell similar to garlic. It had once a great reputation in medicine, but is now seldom used: it might however be employed in cases where an aromatic bitter is desirable.

T. Chamædrys, Wall or Common Germander, has ovate inciso-serrate leaves, tapering into a footstalk; the flowers are reddish-purple, and arranged in axillary whorls of three flowers; the stem is ascending, and most frequently villous. It is a native of Europe and some parts of Asia, on walls and rocks and dry places. It is only rarely found in Great Britain. This plant was once much employed in medicine, and entered as an ingredient into the celebrated Portland powder. It has the tonic aromatic qualities of the family to which it belongs, which frequently render them valuable in diseases connected with depressed powers of the nervous system and digestive organs.

T. Marum, Cat-Thyme, has small ovate quite entire leaves, with 2-4 flowered whorls; stem erect, branched. It is a native of the region of the Mediterranean. When the leaves are rubbed between the fingers, they emit a volatile aromatic smell, which excites sneezing, and on this account it is used as an errhine, and forms an ingredient in the *pulvis asari compositus* of the 'Pharmacopœia.' It has been recommended as a stimulant and aromatic in various diseases, but is not much used. Cats are very fond of it, and destroy it when they get near it.

T. polium, Mountain Poly, has cuneated oblong or linear leaves with revolute edges; whorls few, condensed into globular terminal heads; stems procumbent, much branched. This plant is a native of Europe and Africa, on the shores of the Mediterranean. According to soil, situation, and other circumstances, it assumes a variety of forms, which have been recognised as species by many botanists. Mr. Bentham, in his monograph on Labiatæ, has placed six of these species under the present. There are other species of Teucrium, chiefly found on the shores of the Mediterranean, called Polies.

In the cultivation of the Germander a dry soil and shady situation are best. The annual kinds are best propagated by seeds sown in an open border. The perennial and shrubby kinds are readily increased by division and by cuttings of the young wood.

TEUTHIDÆ, Professor Owen's name for the *Calamaries*, his fourth family of Decapadous Cephalopods, derived from *Teuthos* (τεῦθος), applied by Aristotle to the ten-armed *Malakia* with an internal horny plate or *gladius*. An outline of the family will be found in the article TETRABRANCHIATA.

Family Character.—*Animal*, body sometimes oblong and depressed, generally elongated and cylindrical; with a pair of fins varying in their relative size and position, but generally broad, shorter than the body, and terminal.

Shell internal, rudimental, in the form of a thin, straight, elongated, horny lamina; encysted in the substance of the dorsal aspect of the mantle.—(Owen.)

Professor Owen divides the family into the following sections:

Section A.

Genus, *Sepioteuthis*, Blainville.

Generic Character.—Body oval, flattened, with narrow lateral fins, extending its whole length; anterior margin of the mantle unattached. Horny hoops of the acetabula with denticulated margins. *Gladius* or rudimental shell long and wide. (Owen.)

Example *Sepioteuthis loliginiformis*, Rüppel.

Genus, *Loligo*, Cuvier.

Generic Character.—Body elongated, cylindrical, provided with a pair of rhomboidal or triangular fins, shorter than the body, and terminal, their apices generally converging to a point, and united to the end of the mantle; anterior margin of the mantle free. Horny hoops of the acetabula denticulated. *Gladius* long and narrow. (Owen.)

Example, *Loligo vulgaris*. The common Calamary, or Pen-fish, abundant on our coasts.

Genus *Onychoteuthis*, Lichtenstein.

Generic Character.—Body and fins as in the genus *Loligo*; long and narrow; horny hoops of the tentacular, and sometimes of the brachial, acetabula produced into the form of hooks or claws. *Gladius* long, broadest in the middle. (Owen.)

Genus, *Rossia*, Owen. [SEPIADÆ, vol. xxi., p. 253.]

Genus, *Sepiola*, Leach.

Generic Character.—Body rounded, short; anterior margin of the mantle adherent to the back of the head; fins advanced, circular, short, subpedunculate, distant and subdorsal. *Gladius* short and narrow. (Owen.)

Example, *Sepiola Rondeletii*, Leach.

Section B.

Genus *Loligopsis*, Lamarck.

Generic Character.—Body long and cylindrical, terminated by a pair of conjoined, large, round fins, forming generally a circular disc; anterior border of the mantle adherent to the back of the head for a small extent. *Tentacula* very long and slender (frequently mutilated). *Gladius* long, narrowest in the middle, dilated posteriorly. (Owen.)

Example, *Loligopsis Veranii*, Férussac.

Genus *Cranchia*, Leach.

Generic Character.—Body elongated, sacciform; anterior margin of the mantle adherent to the back of the head. Fins short, rounded, subpedunculate, approximate, dorsal, and subterminal. *Gladius* long and narrow. (Owen.)

Example, *Cranchia scabra*, Leach.

Such are the arrangement and definitions given by Professor Owen in the *Cyclopædia of Anatomy and Physiology*. The family appears to us to be truly natural; and the definitions are very accurate. The views and definitions of other authors regarding the forms belonging to this family, and an illustration of the forms themselves, will be found in the article SEPIADÆ.

TEUTOBURGER WALD. [GERMANY.]

TEUTONIC NATIONS is the general name under which are comprised the different nations of the Teutonic race, which are divided into three branches. The first branch contains the High Germans, to whom belong the Teutonic inhabitants of Upper and Middle Germany, those of Switzerland, and the greater part of the Germans of Hungary; it is subdivided into the Suabian and the Franconian minor branches. The second is the Saxon branch, which is divided into three minor branches: the first of which contains the Frisians, the second contains the Old Saxons or Low Germans, with the Dutch, the Flemings, and the Saxons of Transylvania; and the third contains the English, the Scotch, and the greater part of the inhabitants of the United States of North America. The third branch is the Scandinavian, to which belong the Icelanders, the Norwegians, the Danes, and the Swedes. Upwards of eighty-two millions of individuals belong to the Teutonic race. The Germans amount to about forty-two millions, thirty-three of which live in Germany, the remaining eight or nine millions form a greater or less part of the population of East Prussia, of Switzerland, of Hungary, of Transylvania, of France (in Alsace and north-east Lorraine), of Russia (in the Baltic provinces, in the kingdom of Poland, in the Crimea, in Bessarabia, and in the German colonies in the environs of Saratov on the Volga), of the duchy of Sleswig, and of the United States of North America, especially Pennsylvania. The English amount to twenty-eight millions, there being about sixteen millions of English and Scotch in Great Britain and Ireland, two millions in the English colonies, and about ten millions of Anglo-Americans in the United States. The number of the Frisians is about one hundred and thirty thousand, in the province of West Friesland in Holland, in the islands in the German Ocean along the Dutch and the German shore, in the Saterland (near Oldenburg), and in the islands along the west coast of the duchy of Sleswig. There are about three millions of Dutchmen in Holland, and in her colonies and the Cape of Good Hope; and there are about two millions five hundred thousand Flemings in the north part of Belgium, in the south part of Holland, and in the north-east part of France. The number of individuals belonging to the Scandinavian branch amounts to about six millions, among whom there are nearly fifty thousand Icelanders; one million five hundred thousand Danes in Denmark, in her colonies and in the north part of the duchy of Sleswig; one million two hundred thousand Norwegians; and about three millions two hundred thousand Swedes in Sweden and in the present Russian province of Finland, especially along the coast of the Gulf of Bothnia, in the districts of Abo and Nyland, and on the Aland islands, which are entirely inhabited by Swedes.

Light hair and blue eyes in the northern countries, and brown hair and brown or blue eyes in some of the southern countries, are characteristics of the Teutonic race. Their stature is generally tall, although in those provinces where the Germans are mixed with Wends, Sorabians, and Bohemians, many of the people have the broad shoulders and the short square form of the north-western Slavonians. The straight black hair of some Slavonian tribes also sometimes appears. The mixture of Germans with the south-western Slavonians, such as Winds and Croatians, whose stature exceeds that of the Wends and Bohemians, is more difficult to be distinguished, the black straight hair and a darker complexion being almost the only indication of such a mixture. The mixture of Germans with Celts in Belgium and in the adjoining part of France has formed a tall race which differs from their Teutonic neighbours only in the dark colour of their hair and their black eyes. (Platé, *Scenen aus dem Volksleben in Belgien*.)

It is very difficult to distinguish the descendants of English and Irish parents as belonging either to the Teutonic or the Celtic race, though it appears that wherever aquiline noses are seen among the lower classes they are a proof of Celtic origin, the true Teutonic nose not being aquiline, but either straight or curved only in its upper part. In general also the Teutonic forehead is broader between the temples than the Celtic. (Clement, *Die Nordgermanische Welt*; Herder, *Ideen zur Philosophie der Geschichte*, vol. i.)

The moral and intellectual difference between the Teutonic nations is less remarkable than that which exists between other European nations of the same race with one another. Capable of strong and violent passions, they do not easily lose their self-control, the intellectual functions being more developed than in most other races. Southern nations, confounding liveliness of feeling with intensity, and nervous excitability with moral sensibility, have been deceived by the cool character of the Teutonic nations, and have accused them of indifference. But the most superficial examination will show their sensibility, a fact which is proved by their poetry. The Teutonic nations are less excitable than the Celtic, the Slavonian, and other races, but capable of deeper thought. Southern nations have accomplished great things by sudden efforts; the Teutonic nations have reserved their enterprise for vast plans, which it requires centuries to carry into effect. Thus they destroyed the Roman empire after a struggle of three centuries, and they formed new kingdoms in Europe upon new social principles, which have maintained their vigour to the present day. The Normans became powerful wherever the sea permitted them to effect a landing. The Germans, diminished in number after they had sent their swarms to western Europe, turned back towards the east part of their country, then occupied by Slavonian nations, which they conquered, and Germanised upon a plan of colonization which enabled them to civilise the east of Europe. And lastly, the English colonies have spread over the world: their dominion in the east and in the west is the result of plans which imply more boldness of conception, more prudence in execution, and more reflection, than the conquests of Alexander the Great and the ephemeral power of Napoleon.

The same character of deep and patient reflection exercised on great objects appears in German philosophy and in the inventions of the Teutonic nations. The watch, the gun, and the art of printing are Teutonic inventions. They have subjugated the power of steam; and the first model of the modern sea-vessel was constructed at the mouth of the Eider by the hands of an old Saxon or Frisian ship-builder (Clement, *ibid.*)

The name of the Teutones was made known to the antients by Pytheas of Massilia (Marseille), who, in the age of Alexander the Great, about 320 B.C., discovered a nation of that name in the Chersonesus Cimbrica, and on the adjacent islands, or in the present countries of Holstein, Sleswig, Denmark, and perhaps also in the southern extremity of Sweden. It seems that they had long been settled there, for they lived in houses, and were acquainted with agriculture and commerce. Other traces of the name appear later. Among the Celtic tribes which invaded Greece and besieged Delphi under the second Brennus (B.C. 278), there was a people called Teutobodiaci, who afterwards passed the Hellespont and settled with the Celts in Galatia, in Asia Minor. About a hundred and sixty years later, the Romans were attacked by the Cimbri and Teutones, who came from the same country, where they had been seen by Pytheas. The Teutonic origin of the Cimbri has been disputed: some historians consider them identical with the Celtic Cymri, but this error has been long since refuted, although it has been reproduced in our days by Thierry, in his 'Histoire des Gaulois.' It is said, and it is not improbable, that inundations of the sea compelled the Teutones and their neighbours the Cimbri to leave their country and to seek other abodes. The choice was soon made. The wealth of Rome and the arts of Greece were not unknown to them. From the most remote times adventurous merchants, starting from the shores of the Black Sea, followed the course of the Dniepr towards its sources, and reaching the Düna and the Niemen, descended these rivers to their mouths in the Baltic, where they exchanged the commodities of the south for amber, the electrum of the antients. The same trade, as it seems, was carried on by the merchants of Massilia along the Rhône and the Rhine, and therefore Schlözer, in his 'Nordische Geschichte,' says that but for the amber Germany would have remained unknown to the antients for five centuries more. Their acquaintance with Rome and Massilia was perhaps the principal cause which led the Cimbri and the Teutones to the south of France and to Italy (B.C. 113-99). Their destruction by Marius has been related. [MARIUS; CIMBRI.]

When the Romans first heard the name of the Teutones, they thought that they were a single tribe. They did not know that it was also the general and ethnographic name of all those nations to which they afterwards gave the vague designation of Germans.

Origin of the name Teutones.—The root of the word Teuton is *thu* or *do*, which originally represented the idea of 'activity,' of 'living, procreating, nourishing,' and also of 'taming, educating, and ruling.' From this root are formed the following words, some of which are still used in the popular dialects:—*Teut*, God, creator, ruler, father, nourisher (*Thor*, *Tuisco*); *thut* or *thiud*, earth; *toll*, *döte*, *dote*, godfather; *toda*, nurse; *thiod*, father of the people, lord, ruler, king, in Gothic *thiudans*, in old Bavarian *theodo; diet*, people, in old Swedish *thiaut* and *thyd*: *thiudinassus*, in Gothic, kingdom. (Fulda, *Wurzel-Wörterbuch.*) The names of king and of people being both derived from one root, which expresses the notion of ruling, is a fact which proves that they belong to the language of a nation in which there was neither absolute monarchical power, nor absolute submission to their chiefs. This corresponds exactly to the political state of the antient Teutonic nations, among whom the sovereignty was in the people, and the executive power of the chiefs or kings, although it was obeyed, was always regarded as derived from the people. The idea of ruling, expressed by the root *Teut*, explains why this word occurs so frequently in the names of the antient Teutonic kings, dukes, or chiefs, such as Teutoboch, Theudorix, Diorix, Theodorix, Theodoric, Theodomir, Theodimir, Teutagon, &c. It is likewise contained in the general name of all the Teutonic nations, and in those of various tribes, as the Teutones, the Teutonoarii, Thaifali, and the Dithmarses or Dietmarses. It is visible in 'Teutoburger Wald,' the name of that range of wooded mountains which stretches from Detmold westward beyond Osnabrück, in which is situated the Grotenburg, formerly 'Teut' or 'Teutoburg,' with the farm of 'Teutehof,' where Varus was overthrown by Arminius; in 'Detmold,' 'Doesburg,' 'Duisburg,' 'Deuz,' and in a great many other localities in Germany. (Hammerstein, *Ueber das Schlachtfeld des Varus*; Reichardt, *Germanica*, p. 73, &c.) *Teuton* is identical with *Deutsche* or *Teutsche* (in Low German *Dütsch*, in Dutch *Duitsch*, in Danish *Tysk*, in English *Dutch*), which from the remotest time has been and is still the general name of that part of the Teutonic nations which we now call Germans, who considered the god or hero Tuisco as their common ancestor. There are no direct proofs of the word Teuton having had this extensive meaning in the earliest German history, but this is perhaps the result of the political state of the Teutonic nations, which were originally divided into numerous tribes, each of which became separately known to the Romans. In the twelfth, eleventh, and even as early as the tenth century,* when the difference between Franks and Saxons was well marked in the German empire, these nations, each of which had its own language and laws, never objected to being called by the general name of Deutsche or Teutones. At present there is no German tribe which has the particular name of Teutones, but although the Germans are composed of two very distinct nations, the High Germans and the Low Germans, they call themselves Deutsche and their language Deutsch, though they do not understand each other. This is very different from the state of things in France. The true meaning of 'Français' is political, the name signifying a citizen of the kingdom of France, whether a Frenchman, a German, a Briton, or a Basque; in southern France the name of Français is given to the people north of the Loire; and, on the contrary, the name of French language is never given to any of the dialects of the south, nor to the Walloon dialect in Belgium. Similar facts may be observed in Spain. If however such ethnographic distinctions are the consequence of France and Spain having originally been inhabited by nations of different origin, the circumstance that the name 'Deutsch' has been spread over all Germany and applied to all her dialects from the remotest historical period proves that the name had a general signification long before the commencement of German history. Another circumstance corroborates this opinion. A nation has never changed its name for another except by some great political revolution. Thus the Tata were called Mongols, the Italians Romans, the Romans and Gauls Franks, when one man, or one city, or one tribe exercised a predominant influence over the remainder of the people; and these nations have preserved the memory of such revolutions. [TARTARS.] But no such revolution is recorded in the history of Germany. A further proof of this is, that the Dutch and the Flemings dislike to hear their language called 'de Hollandsche taal,' or 'de Vlaemsche tall,' and they prefer giving it the name of 'de Nederduitsche taal.'

Origin of the Teutonic Nations.—The Teutonic race is originally from Asia. The Teutones immigrated into Europe at different periods unknown to history, although it appears that the last of them entered Europe during the migration of nations in the fourth and fifth centuries. Some account of their Asiatic origin is given in their antient national songs, principally in the Sagas of the Scandinavians. The recollection of their antient homes was not entirely lost in Germany in the eleventh century, for we find the following verses in the 'Lobgesang auf den Heiligen Anno:'

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* As early as the beginning of the ninth century Louis, the son of Louis the Pious, who governed Germany, was called Louis the Teutonic.

> 'Deren Geschlechte dere quam wilin ere
> Von Armenie der herin.
> Man sagit, daz dar in Halvin noch sin
> Die der *Diutschin* sprechin,
> Ingegin India vili verro.'

'Their tribe (the Bavarians) came a long time ago from the noble Armenia. It is said that in the Alps, far off towards India, there are still people who speak Teutonic.' (Schilter, *Thesaurus. Antiq. Teuton.*, p. i., sect. ult., p. 15)

It is also said that Benedict Goesius (Goez), a Jesuit, found in 1603, in the mountains of the Hindu Kush, north-east of Cabul, a people with fair hair like the Dutch, and who are perhaps identical with that tribe of which Pliny speaks, and which was settled in the Montes Emodi. But all this is of little value, unless it is corroborated by other facts. Such facts have been furnished by the learned philologists of our age, especially by Friedrich von Schlegel, Adelung, Bopp, Grimm, and Hammer. A comparison of the Teutonic languages with the Persian, the Zend, and the Sanscrit, has shown the relationship which exists among these languages [LANGUAGE; GERMANY; SANSCRIT], and by means of these facts, the Mythes and Sagas become important for history. According to one of these mythes, Deut or Diuta were the names of antient Indian gods who led the tribes which emigrated from India to the west. (Hammer, in *Wiener Literatur-Zeitung*, October, 1816; Ritter, *Erdkunde*, vol. ii., p. 118, 898-900; Ritter, *Vorhalle*, p. 317, 460, 620; Grimm, *Deutsche Grammatik*, especially in the preface, p. xxvi., &c.; Rühs, *Ausführliche Erläuterung der zehn ersten Kapitel der Schrift des Tacitus über Deutschland*, p. 88, &c.; Herder, cited above, i., p. 400; Mathaeus Riccius, *De Christiana Expeditione apud Sinas suscepta à Societate Jesu*, 1684, p. 606.)

When the Teutonic nations appeared in history, they were divided into many bodies or confederations of tribes, such as, at a later period, the Franks, the Suevi, the Saxons, the Marcomanni, and the Alemanni. Long before these names were known, there was a similar confederation of tribes which came from the north-north-east and conquered the countries on the left bank of the Rhine, then inhabited by Celtic nations, which fled to their brethren in Central Gaul. The epoch of this invasion is not known, but the event happened long time before the age of Cæsar, who found those countries settled by a Teutonic population. Tribes of the Condrusi, the Eburones, the Caeraesi, and the Paemani, were united in a confederation, and had adopted the name of Germani, or 'war-like men.' This name was gradually used by the Romans to designate other nations which belonged to the Teutonic race (Tacitus, *Germ.*, c. 2), and subsequently it was adopted by the English as a name for the 'Deutsche,' while this very name, changed into Dutch, now designates the inhabitants of Holland. It has been pretended that the name of Germani was known long before the time of Cæsar, and this opinion is founded upon the following passage of the 'Fasti Capitolini:'—

> 'M. CLAUDIUS M. F. M. N. MARCELLUS-
> COS. DE. GALLEIS. INSUBRIBUS. ET. GERMANEIS.
> K. MART. ISQUE SPOLIA *opima* RETTULIT
> DUCE HOSTIUM VIRI*domaro ad clas*TIDI*um*
> *interfecto*.'

If the word 'Germaneis' is here right, and there is no good reason for putting 'Cenomaneis' in its place, the acquaintance of the Romans with the Teutonic nations commenced long before the invasion of the Cimbri and the Teutones. There is a passage in Livy (xxi. 38) which states that at the time of the invasion of Italy by Hannibal (B.C. 218) the country of the Alpes Penninae was inhabited by 'nationes semigermanae,' by which expression some writers have hastily concluded that a mixture of Germani and Celts is meant; but the passage admits of another interpretation.

The Teutonic Nations after Cæsar.—When Cæsar reached the Rhine, Northern Germany, Holland, Belgium, and a part of the countries on the Middle Rhine were inhabited by Teutonic nations which belonged to the northern, now Saxon branch. They had been settled in fixed habitations for several centuries, and they must be considered as the first of this race which settled in Germany. The southern part of this country was then inhabited by Celts and Rhaetians, except the tract between the Upper Rhine and the Upper Danube, which was conquered by the Suevi, who belonged to the Teutonic race. The word 'Suevi,' which comes from 'schweifen,' may be translated 'wanderers,' or people who rambled about for the purpose of settling in any convenient country. It was adopted by a great number of tribes, the majority of which belonged to the High Germans, and came from the countries on the Baltic between the Oder and the Niemen. Cæsar was obliged to fight with their leader Ariovistus (B.C. 58), who had invaded Gaul. Ariovistus was compelled to go back to Germany.

Tacitus divides the Germani into three great bodies: the Ingaevones, in the north; the Istaevones, in the west, from the mouths of the Rhine upwards to Basel; and the Hermiones, in Middle Germany and towards the north-east. This division seems to have an ethnographic and still more a political value. The position of the Ingaevones corresponds to that of the later Saxons, and both the names have one meaning, Saxon signifying a settled people, and In-gae-vones a people who live in a cultivated country divided into districts (In-gau-wohner or Inwohner). The Istaevones, or Western Germani (West-wohner), correspond to the later Franks, and the Hermiones to the Suevi, including the Alemanni. Further, the name of Hermiones is undoubtedly identical with Hermunduri, one of the greatest Suevian or High-German tribes, the name of which is generally supposed to be the same with Doringi or Thuringi, the present Thuringians.

From the time when Cæsar first met with the Suevi under Ariovistus, there was a deadly enmity between the Romans and the Germans. The Romans wished to make Germany into a province, and the Germans aimed at the possession of Gaul: on both sides there was the passion of conquest and the necessity of self-defence. Ambition pushed the Romans into Germany, and want of fertile lands, and perhaps some great revolution among the nations of Eastern Europe, led the Germans into Gaul and Italy. The Roman eagles were seen in the wilds of the Hercynian forest, but Arminius saved his nation from slavery in the forest of Teutoburg, where Varus was slain with three legions (A.D. 9). The campaign of Germanicus, who advanced as far as the Elbe, led to no results, though he gained a complete victory over the Germans on the field of Idistavisus near the Weser (A.D. 16); when he celebrated his triumph in Rome (A.D. 17), the Germans between the Rhine and the Weser were as free as before. These tribes made a confederation, and chose Arminius for their leader. A war arose between him and Maroboduus, king of the Marcomanni, who was defeated and obliged to implore the assistance of the Romans (A.D. 19). Being attacked by Catwald, or Catualdus, the chief of the Gothones, he lost his crown, and the confederation of the Marcomanni was broken. Arminius, the hero of Germany, fell by the hands of his jealous kinsmen, in his thirty-seventh year. (Tacitus, *Annal.*, ii. 88.)

Notwithstanding the civil wars in Germany, the Romans gave up the idea of conquering the country, and Tiberius ordered a defensive system to be observed on the frontiers, which were formed by the Rhine from its mouths to the Moselle, and from the junction of this river with the Rhine they followed the Lahn as far as the present district of Wetterau. The frontier then took a southern direction, passed the Main at Obernburg, the Jagst at Jagsthausen, the Kocher at Hall, and joined the Danube near Pföring, from which town it ran along the Danube as far as Pannonia. The rivers were defended by castles, and the tracts between them by a strong rampart with towers, the Vallum Romanum of Hadrianus, a considerable part of which, the Pfahlgraben, is still visible. The Germans west and south of this barrier became Roman subjects, but those who lived east and north of it enjoyed their antient liberty.

All the German tribes practised agriculture, but warfare being their favourite occupation, they abandoned their fields and their flocks to the care of bondsmen. Their agricultural system, which is still practised in some counties of Westphalia, and which is now called Dreifelder Wirthschaft, consisted in cultivating a field during three successive years, after which it was used as pasture-ground for three years. The fine arts were not exercised among the Germans, but they were acquainted with the art of writing [Runic Letters], although only for religious purposes. (Rhabanus Maurus, in Goldast, *Script. Rer. Alem.*, ii. 1, p. 67; Hickesius, *Thes. Ling. Septentr.*) The groundwork of their social and political constitution was the union of a certain number of families into a community, 'Marcha,' 'erd-marcha,' now 'Mark-Genossenschaft.' Several marchas formed a 'gow,' now 'gau,' a district which had its own administration. Twice a month, and sometimes every week, the members of a gow assembled and held the 'gowding:' the gowdings were civil and criminal courts, and also meetings for legislation, and war and peace were decided on in them. Besides the gowdings there were 'graven' or 'greven' (graviones, comites), or delegates of the gowding, who were assisted in their judiciary functions by a certain number of freemen. The magistrates were chosen from the nobles (edelings or adelings), the 'principes' of Tacitus, who had also the right of forming a kind of senate, where they deliberated on important affairs previously to their being brought before the gowding, and they dispatched matters of little importance, which did not come before the gowding. The nobles had also the privilege of keeping a 'dienst-gefolge,' or a band of freemen who served them in their feuds and wars; and they had individually the right of protecting unfree people in the gowding, a right which also belonged to the community as a body, but not to individual freemen. The privileges of the nobles were probably connected with the religious institutions, of which we have no positive knowledge, although it appears that priests and nobles formed only one class, an opinion which is corroborated by the fact that wherever Christianity was introduced into Germany, it met with no opposition from the common people as soon as the nobles were converted. Some of the earlier Teutonic nations had hereditary kings, the 'reges' of Tacitus, who however had a very limited authority. The greater part of them chose princes only as commanders of the army in time of war. The name of these commanders was 'herzog,' in low German 'hertog,' or 'hartog,' in Latin 'dux.'

Besides the freemen and the nobles, there were bondsmen, 'lazzi,' 'lati,' or 'liti,' now 'leute,' in low German 'lüde,' or 'lide,' who were either the primitive inhabitants of a conquered territory, or prisoners of war, or freemen who had lost or sold their liberty. Their condition was in no way like that of the Roman Servi, who, legally speaking, were not considered as persons, but in most respects things. Domestic and personal services, and especially agriculture, were their exclusive occupations.

The military organization of the Teutonic nations was founded on two principles. When a gow, or a confederation of several gows, determined on war, every freeman was obliged to take up arms for the defence of the commonwealth. These wars had rather a defensive character, and they occurred principally among the inhabitants of northern Germany between the Baltic and the Rhine. But war was sometimes made for the private interest of some powerful noble, who carried it on with his 'dienst-gefolge,' which was a numerous body when the military renown of the chiefs, or the hope of easy conquests, promised rich rewards to the adventurous band. These were generally offensive wars, and we find that they occurred chiefly among the Suevian nations.

We know little about the religion of the antient Teutonic nations. They worshipped a supreme being under the name of Wodan or Odin, but the true character of their religion was the worship of Nature in her different manifestations. Thor, Hertha, and Freya were personifications of the power of heaven, of earth, and of love and procreation.

Such was the moral, social, and political state of the Teutonic nations when they began their wars with Rome. The Vallum Romanum prevented them from invading the Roman empire during the first and second centuries. In the third century they often crossed it. In the fourth they conquered a considerable part of the countries on the Danube; and in the fifth they invaded and conquered all the European provinces of the Roman empire. Instead of following the chronological order, which would cause confusion, we shall give a view of all these invasions by referring them to their several heads, according to the people by which they were effected.

Alemanni. [Alemanni.] Towards the middle of the fourth century swarms of people belonging to the Suevi came from north-eastern Germany to the country between the Rhine and the Danube, where they settled, the Roman army and colonists having retired beyond these two rivers. They called themselves Alemanni. In the beginning of the fifth century the Alemanni conquered the country on the left bank of the Rhine, as well as parts of Noricum, Vindelicia, and Helvetia, and founded the kingdom of Alemannia. Clovis, king of the Franks, conquered the western part of it in 496: the eastern and larger part, which was protected by Theodoric, king of the Ostro-Goths, was acquired by the Franks in 536. (Cassiodorus, *Var.*, ii. 41.) The freemen lost a considerable part of their lands, almost all the nobles were deprived of their estates, many of them were killed, and the remainder became vassals of the Franks. Between 613 and 628 the laws of the Alemanni were collected by order of the Frankish king Clotarius, under the name of Lex Alemannorum. This collection is in Latin, like the laws of the other Teutonic nations of that period, except the laws of the Anglo-Saxons, which are written in their own language.

The Lex Alemannorum was revised in the time of Dagobert, king of the Franks, and again by Lantfried, the Frankish duke of Alemannia, in the beginning of the eighth century. There is no trace of the Roman law in it except in one single case (tit. 30). The Lex Alemannorum, as well as all the other earlier codes of the Teutonic nations, are contained in Ferdinand Walter's 'Corpus Juris Germanici.' Sichard published an edition of it in the 'Leges Ripuariorum, Bajuvariorum, et Alemannorum,' 1530, 8vo. Besides these collections, the Teutonic laws are in the collections of Herold, Lindenbrog, Eccard, Heineccius, Georgish, Canciani, and Baluzius.

Burgundians. [Burgundy.] The Burgundians came from north-east Germany, and first assisted the Alemanni against the Romans; but they left Germany as early as the beginning of the fifth century, penetrated into Gaul, and formed the powerful kingdom of Burgundy on both sides of the Jura, which was incorporated with the kingdom of the Franks in 534. The collection of the Burgundian laws, Lex Burgundionum, 'Gundobada,' 'Gundobarda,' 'Loi Gombette,' was made towards the end of the fifth century, under king Gundobald, who died in 516, and was augmented (517) by king Siegmund, who died in 523.

The legislation of Gundobald goes as far as title 42. The following titles, although they contain laws and regulations of Gundobald, were added by Siegmund, who completed the code by two 'additamenta,' containing his own laws. Charlemagne made a third additamentum, without altering the code itself. The Lex Burgundionum, which is written in much purer Latin than most of the other Teutonic codes, contains several of the rules of the Roman law concerning donations, and especially testaments (tit. 43 and 60). A separate edition was published at Lyon in 1611.

Franks. [France.] In the very countries which the Romans traversed on their way to the woods where Varus was slain, the Usipetes, the Tencteri, the Sicambri, the Bructeri, the Ansibarii, the Marsi, the Tubantes, the Chamavi, and the Chatti—all tribes belonging to the northern, now Saxon branch (Ingaevones) of the Germani—formed a confederation, and called themselves Franks, either because they were particularly 'free and bold,' or on account of their 'barbed lances' (frameae) Their name first appears in 242, when some of them made an expedition into Gaul during the reign of the emperor Gordianus, whose general, Aurelianus, defeated them. In the beginning of the fifth century they had conquered Belgium as far as the Somme, and in 487 their king Clovis put an end to the Roman power north of the Loire. The Franks subsequently conquered Southern Gaul, then divided between the Burgundians and the Visigoths; Germany, and the Slavonian countries as far as Poland; part of Pannonia; the Longobard kingdom in Italy; and Spain between the Ebro and the Pyrenees. Charlemagne was the lord of all the Teutonic nations, except the Scandinavians, the Anglo-Saxons in England, and the remainder of the Goths in the mountains of Asturias. The Frankish language, a dialect of the Low German, was spoken at the court of this emperor, among the nobles in France, and by many freemen. In Germany the Franks settled among the Suevian tribes on the Middle Rhine and the Main, and the mixture of these languages is the origin of the present Middle German or

Franconian dialects. Among the Teutonic nations which settled in Roman provinces, the Franks were the last who were converted to the Christian religion: their king Clovis was baptized after his victory over the Alemanni at Zülpich (Tolbiacum) in 496. They founded a mighty aristocracy in France, the political influence of which was broken by Louis XI. The personal and social influence of the Franks lasted till the Revolution of 1789, which is justly regarded by the best modern French historians as a reaction of the subjugated Celtic people against haughty and insolent Frankish invaders.

The Franks were divided into Franci Salici, who lived in the Low Countries between the Zuider Zee, the Maas, and the Somme; and Franci Ripuarii, who were settled along the Rhine between Nymegen and Bonn. Each of them had their code. The Lex Salica was written in very barbarous Latin, under Clovis, between 484 and 496, and was never revised, although it contains some laws by the sons of Clovis, which begin with the 62nd (63rd) title. Except one rule in title 14, about the rape of free persons, and another concerning marriage within the prohibited degrees, this code contains no trace of the Roman law. It is very important for the history of the laws of the Teutonic nations. The antient Lex Salica is often confounded with the present Salic Law, which regulates the right of succession in several sovereign and noble families in Europe. But this latter Salic law is only a single rule of the Lex Salica, and originally concerned the succession to the tax-free estates of free or noble Franks (terra Salica), which belonged to the male issue, to the exclusion of females. It is contained in title 62, 'De Alode,' l. 6: "De terra vero Salica nulla portio haereditatis mulieri veniat: sed ad virilem sexum tota terrae haereditas perveniat.'

This law was not peculiar to the Franci Salici: it occurs in the greater part of the other antient Teutonic laws.

(Wiarda, *Geschichte und Auslegung des Salischen Gesetzes*; Heineccius, *Ant. Germ.*, i., p. 265, 285; a separate edition of the Lex Salica was published by Pithou, Paris, 1602, 8vo.)

The Lex Ripuaria was collected by Theodoric, the son of Clovis, between 511 and 534. It was several times revised, especially by Dagobert. It resembles the Lex Salica, and contains no traces of the Roman law.

Goths.—While the Alemanni, the Burgundians, and the Franks invaded the Roman empire on the Danube and the Rhine, its eastern frontiers were attacked by the Goths. The Goths originally inhabited the countries on the Baltic between the Vistula and the Niemen; but as early as the close of the second century A.D. they appeared on the shore of the Pontus Euxinus and the Maeotis, where they founded two great kingdoms,—that of the Ostro-Goths, or Greuthungi, east of the Dnieper, and that of the Visi-Goths, or Thervingi, west of it. Their power was broken by the Huns, by whom they were partly subjugated, partly forced to take refuge in Dacia and in Moesia. The Visi-Goths then left the Danubian countries, traversed Italy as far as Reggio, opposite Sicily, and finally conquered the southern part of Gaul, and Spain. The Ostro-Goths, less fortunate in their attempt on Thrace, were forced to go back to Dacia, where they became subject to the Huns. After the death of Attila, in 453, they recovered their independence, and leaving the dangerous country of the eastern part of Dacia, they settled in the western part of this country, which the emperor Zeno was obliged to cede to them in 474. In 488 their king Theodoric, after having besieged Zeno in Constantinople, compelled him to cede his claims on Italy, then under the dominion of Odoacer, the chief of the Rugii, the Heruli, and other tribes, who had put an end to the Roman empire in Italy by deposing the last emperor, Romulus Augustulus, in 475. [THEODORIC.] Odoacer was deprived of his crown and his life by Theodoric in 493, who founded the kingdom of the Ostro-Goths in Italy and Illyricum, which lasted till 552, when Tejas, the last king, was defeated and killed by Narses.

The Code of the Ostro-Goths, 'the Edictum Theodorici,' which was composed by order of Theodoric in 500, is a collection of Roman laws. This king wished to form one people of the Romans and the Goths (*Edictum*, § 30), and he therefore adopted the laws of the most civilised of his subjects. Leaving the Gothic laws exclusively to the memory of the people, he knew that they would soon fall into oblivion without being formally abolished. In some cases, however, he supplanted Gothic customs by Roman laws. The *Wehrgeld*, or *Wehre*,—that is, the fine for crimes,—was entirely abolished, and in place of it the punishment of death was introduced in many cases, an innovation which seemed very hard to the Goths, who, like all the other Teutonic nations, inflicted the punishment of death only for high treason and a few such crimes. Pithou published a separate edition of the 'Edictum Theodorici' (Paris, 1579). Rhon, *Commentatio ad Edictum Theodorici, Reg. Ostrogoth.*, Halae, 1816, 4to.

The *Visi-Goths* settled in the southern part of Gaul in 412, and invaded Spain in 414. This country was then in the hands of the Suevi, the Alani, and the Vandals, who became subject to the Goths, or were forced to emigrate. In 451 the Visi-Goths, together with the Franks, defeated Attila and his 700,000 Huns, Goths, Gepidae, and other vassals, in the plain of Châlons-sur-Marne. Their king, Alaric II., lost Gaul, except the eastern part of Languedoc and Provence, in the battle of Vouglé against Clovis; king of the Franks, in 507. The kingdom of the Visi Goths lasted for three centuries, when it was overthrown by the Arabs in 712. [SPAIN.]

Among all the Teutonic nations the Visi-Goths were the first who had written laws. (Isidorus Hispalensis, 'Chron. ad annum Aer. Hisp. 504, A.D. 466.') A collection of them was made by their king Euric (466-484), which is written in Latin and has the title of 'Lex Visigothorum.' Its present form dates from King Egica, whose new code was translated into the Gothic language under King Receswind. It contains many traces of the Roman law, and is the only early Teutonic law which may be considered as a code in the modern signification of the word. The Lex Visigothorum must not be confounded with the Breviarium Alarici (Alaric II., in 506), or the Code for the Romans, who were subjects of the Visi-Goths, and continued to live under their own laws until they were abolished by the kings Chindaswind and Receswind, who declared the revised Lex Visigothorum obligatory on all the inhabitants of the kingdom of the Visi-Goths.

The Goths, the most civilized among the Teutonic nations, were the first who adopted the Christian religion. They had a literature from the time when Ulphilas translated the Bible. The Visi-Goths were at first Arians, and though they returned to the Roman Church, they distinguished themselves from the other Roman Catholics by their form of worship, or the Officium Gothicum, which was approved by the fourth Council of Toledo, A.D. 633. It is also called Officium Beati Isidori: Isidore presided over that council. It contains many customs and forms which have been used in the Spanish church from the earliest times of Christianity. It was written in Latin, but in old Gothic characters, which differ from the Scandinavian runes.

The Ostro-Goths soon disappeared among the Longobards, while the Visi-Goths preserved their language and nationality till the invasion of the Arabs; and another portion of them maintained their nationality until a very recent period.

These were the *Gothi-Tetraxitae*, who, after the emigration of their brethren to the western countries, retired to the eastern part of the Chersonesus Taurica, now the Crimea, and the opposite island of Taman. There they lived for eleven centuries under the successive dominion of Huns, Bulgarians, Greeks, Khazars, Tartars of Kiptshak, and Tartars of the Crimea, and, lastly, of Turks Osmanlis. Their part of the Crimea was called Gothia during the middle ages. Busbequius, who was the ambassador of the emperor Rudolph II. at Constantinople, towards the end of the sixteenth century, is the last writer who mentions them. It appears that they afterwards adopted the language, the customs, and the religion of the Tartars. Russian scholars have traced the Gothic language among the Tartars of the Crimea. (*Journal de St. Pétersbourg*, 31st January (12th February), 1829.)

Another part of the Goths invaded Sweden, and founded the kingdom of Gothland (Gautland), which was afterwards divided into East Gothland and West Gothland (Eystra-Gautland and Vestra-Gautland). They mixed with the Scandinavians, and it became a general opinion that they were originally the same people. But a comparison of the Gothic of Ulphilas and the old Scandinavian language shows that this opinion is unfounded. (Olaus Verelius, *Gothrici et Rolfi Westrogothiae Regum Historia*, Upsalis, 1664; Antonius, *Bibl. Hisp. Vet.*, i., p. 62; Michael Geddes, *Miscellaneous Tracts*, vol. ii., diss. 1; vol. iii., diss. 1; Manso, *Geschichte des Ostgothischen Reichs in Italien*; Mascov, cited below, ii., p. 553-566.)

Suevi.—From the country east of the Black Forest, between the Upper Danube and the Alps, the Suevi, by which name the Quadi and the Hermunduri were perhaps likewise meant, spread over Gaul and forced their way into Spain (406-409). Their king Hermanaric or Hermanrich became master of Portugal, Galicia, and the western parts of Asturias, and Leon: he resided at Bretonia, near the mouth of the Miño, now a small village named Bretaña. His successors were independent kings, but in 585 the Suevi became subjects of Leovigild, king of the Visi-Goths. Their laws have not been collected. They were at first Catholics, but king Remismund (461) professed Arianism; Theodemir (Ariamir) returned to the Catholic faith in 561.

Vandals.—This name, which was known to Tacitus, comprises various tribes of Teutonic and also of Slavonian origin, who lived in Eastern Prussia and Pomerania. The Slavonian tribes were subject to the Teutonic Vandals, who are often confounded with the Wends (Venedi), who afterwards occupied the country of the Vandals. The Vandals left their homes towards the end of the fourth century, and a part of them, after a sojourn in Pannonia, traversed Germany and Gaul, and founded the Vandal kingdom in Spain in 409. In 417 they subjugated the Alani, who had also settled in Spain. In 429 they were forced by the Visi-Goths to abandon this country, and they went over to Africa. Their king Genseric or Geiseric took Carthage (439), all Mauritania, and the islands of Sardinia, Corsica, the Baleares, and the western part of Sicily. On the 12th July, 455, they plundered Rome, and their name became proverbial as that of the most barbarous among the barbarians. Their kingdom lasted till 535, when it was destroyed by Belisarius, and became a part of the Byzantine empire. All the names of the Vandal kings are Teutonic, and resemble those of the Gothic kings, a fact which proves that however numerous the Slavonians were among them, the Teutonic tribes were the ruling nation. Their name is visible in that of the province of Andalusia or Vandalusia. (Papencordt, *Geschichte der Vandalen*.)

Longobards. [LOMBARDY.]—The Longobards lived on the right bank of the Lower Elbe, and afterwards on the left side of this river, near Lüneburg and Brunswick: in language and person they resembled their neighbours the Saxons, a strong body of whom appeared with them in Italy. Before they invaded Italy they had lived in the present country of Upper Hungary, in Pannonia, and in Noricum (494-568). Their king Alboin subjugated the Gepidae in Transylvania (563?), and in 568 he conquered the greater part of Italy. Their last national king, Desiderius, was deprived of his throne by Charlemagne (774), who assumed the title of king of the Longobards: but the Longobards neither lost their constitution nor their estates; the only change was in the reigning dynasty.

When the Longobards were subjugated by the Franks, they had possessed written laws for 130 years. The first collection was made by King Rotharis in 643. The laws of Grimoald were collected in 668, those of Luitprand between 713 and 724; those of Rachis in 746, and those of Aistulf in 754. They contain only a few heads of Roman law concerning prescription and succession. (Muratori, *Script. Rer. Ital.*, tom. i., p. 2; and especially Biener, *De Origine et Progressu Legum Jurumque Germanicorum*, i., p. 150, &c.)

These are the Teutonic nations that founded permanent kingdoms within the limits of the Roman empire. Except the Alemanni, they all came in contact with a population, the educated part of which was entirely Romanized, although, except Italy and some parts of the south of Spain and Gaul, the inhabitants of the villages were still Celts or Iberians when they were subjugated by the Teutonic invaders. (Fauriel, *Hist. de la Gaule Méridionale*, vol. i.) The political institutions of the new masters of the civilized world rested on two great principles.

The Teutonic laws were not territorial, as they now are, but personal: a Frank was judged after the Frankish law, a Burgundian after the Burgundian, wherever he lived. This principle being applied also to the Romans, gave rise to a double legislation, one for the ruling Teutonic nation, and the other for the subject Romans. The second principle was that the sovereignty belonged to the body of the conquerors, and not exclusively to their kings. This sovereignty not only comprised the supreme authority in legislation and administration, but it was considered as comprehending a right to the private landed property of the vanquished nation. Every free Frank or Goth became the master of a considerable portion of land which he took from the Romans. The rights and duties of the kings towards their Teutonic fellow-conquerors remained the same as before; the kings had no right to punish any freeman, unless in time of war and for neglect of military duties. The freemen also could not be forced to serve in any war to which they had not given their consent; and they did not pay any taxes to their kings, who were only the first among their equals. As to the subject Romans, the Teutonic kings became the lords of a numerous civilized nation: as successors to the rights of the Roman emperors, and with regard to the Romans, they had absolute power, and they became proprietors of the extensive private estates of the emperors. They maintained the provincial administration, which was established by Constantine the Great and his successors, but they often conferred various functions on one person in order to render that complicated administration more easy to manage. As the conquerors lived among the subject people, each province had a double administration, one for the ruling nation and the other for the subject nation. But there resulted so much confusion from this circumstance, that the kings were obliged, especially in Gaul, to sacrifice the principles of the Roman administration, and to govern in the Teutonic way, although the names of the higher public functions were Roman. The first functionary in each province of the Frankish kingdom was the Dux, who had the supreme military command, and sometimes also the authority of a judge. The second was the Comes, who was chief judge and director of all affairs concerning taxes and the revenue of the fiscus. From the eighth century the functions of the Dux and the Comes were conferred upon one person, who is sometimes styled Dux, and sometimes Comes.

The fate of the Romans in the Frankish empire was threefold. One part of the Romans entered into the private service of the king, and preserved a portion of their estates on condition of obedience to him. The great landowners belonged to this class, which had the name of 'Romani convivae regis.' A second part, the 'Romani possessores,' remained in possession of their lands, but they were obliged to pay taxes for them, a duty from which the conquerors were exempt: this class principally consisted of small landowners. The third class were the 'Romani tributarii,' who lost their liberty, although they did not become Servi in the Roman sense of the word: these were the antient 'coloni.' In many towns the Romans continued to enjoy their municipal institutions, while a Teutonic community gradually arose within the same walls and had its separate constitution. In other towns the richest among the Romans lost their liberty and became 'ministeriales,' a kind of privileged vassals; but the poor were treated as the Romani tributarii in the villages.

The Teutonic nations which became subject to the Frankish kings were treated with less severity. The Burgundians, the Longobards, and the Bavarians only changed their dynasty, but the greater part of the Thuringians and of the Alemanni lost a considerable portion of their lands, which were given to Frankish nobles, of whom they became vassals.

Besides those nations which founded permanent kingdoms within the Roman empire, many tribes maintained their independence there only for a short period, or came and went rapidly without leaving further traces, or were subjugated by others, and adopted the names of their vanquishers. Many among them were of Slavonian or other origin.

The *Alani* came from the Caucasus, traversed Europe, and lived independent in southern Spain under their King Respendial, from 409 to 417, when they were subjugated by the Visi-Goths and carried into the south of Gaul. Another part of them settled between Orleans and Nantes under their chief Goar (406), but in 452 they were defeated and dispersed by the Visi-Goths. The Alani were not of Teutonic origin; the names of their kings (Respendial, Utaces, Goar) have no resemblance to

Saxon, Frankish, or Gothic names. They are probably identical with the Ossetes or Iron, an old Persian tribe in the central part of the Caucasus. The country of Albania, north of the Caucasus, was known to the Greeks and Romans. The Byzantines called the tract between the Terek and Shirwan, Alania. (Procopius, *De Bello Goth.*, l. iv.; Stritter, *Memoriae Populor.* '*Alania*,' in tom. iv.; Suhm, *Geschichte der Dänen*, übersetzt von Gräter, i. 1; Zeuss, *Urgeschichte der Deutschen*, 'Alanen.')

The *Quadi*, who lived in Silesia and Moravia in 375, were a Suevian people. The *Gepidae* perhaps were of Gothic origin; their kingdom in Transylvania was destroyed by Alboin, who killed Kunimund, the last king of the Gepidae.

Odoacer, the commander of a band of *Scyrri*, or *Scirri*, *Rugii*, and *Heruli*, put an end to the Roman empire in Italy, and was acknowledged as emperor, but he was put to death by order of Theodoric the Great in 493.

The Rugii were Germani; the origin of the Scyrri and of the Heruli is uncertain. It has been pretended that the Heruli were a Lithuanian tribe.

Tribes within the limits of Germany which lost their Independence under the Franks.—The *Bojoarii*, *Bojobari*, *Bujuvarii*, or *Bavarians* [BAVARIA], whose name became known towards the year 480, were a confederation of Suevian tribes: they lived between the Danube, the Lech, and the Ens. In 540 they were forced to yield to the Frankish kings, and were governed by dukes of the dynasty of the Agilolfingians. Their laws, which were collected between 613 and 638, resemble the laws of the Alemanni, though they contain many traces of the Roman law. (Mederer, *Leges Bajuvariorum, oder ältestes Gesetzbuch der Bajuvarier*, &c., 1793-8.) The *Thuringians* occupied the country north of the Bavarians as far as the Unstrut, and even beyond that river. They were related to the Goths, and their name seems to resemble that of the Thervingi, the Hermunduri, and Hermiones. Their last king, Hermanfrid, was deprived of his crown by the Franks in 531. Charlemagne is said to have made the first collection of their laws, but there is no evidence in support of this statement. Their code is known under the title of 'Lex Angliorum et Werinorum, hoc est Thuringorum.' These Angles and Warini or Werini were settled in the northern part of Thuringia, but it does not appear why their names are mentioned before that of the Thuringians, who were the more numerous nation. This collection is brief and incomplete. (Leibnitz, *Script. Rer. Brunsvic.*, i., p. 81.)

The *Saxons* [SAXONS; SAXONY] dwelt north of the Thuringians. On the east their frontiers were the Elbe, the Stecknitz, and the Baltic; on the north, Denmark, the German Ocean, and Friesland; on the west, they corresponded to the western frontiers of the present province of Westphalia. When they had sent numerous settlers to Britain, their power became less formidable to their neighbours, the Wends in the east and the Franks in the west. The Franks were formerly united with them against the Romans, but when they had conquered Gaul, the Saxons were obliged to desist from their incursions into this country, and hence arose jealousy and hostility. The south-western parts were conquered by the Franks as early as 555; the rich landowners were compelled to give a considerable part of their lands to Frankish nobles, and the common freemen to bend under the yoke of servitude. The remaining and greater part of the population was free, though from time to time the Saxons paid tribute, until, after the memorable war with Duke Wittekind (772-803), Charlemagne became master of all Saxony. But the Saxons were not subjugated like the Romans. They promised to adopt Christianity, to acknowledge Charles as their king, and to obey his governors (greves) and bishops. On the other hand, Charles granted them equal 'Wehre' (value of their body and liberty in case of wounds, murder, &c.), and the same privileges which the Franks had, especially freedom from tribute, and the privilege of being tried in their own country, according to their own laws, and by their equals.

Charlemagne was the first king of the Saxons, who formed a great confederation of free communities; they appointed dukes for their wars, and only acknowledged obedience to the 'gowding' and to 'greves,' chosen by the freemen among the 'edelings' of the communities. The laws of the Saxons were collected by order of Charlemagne. They consist of nineteen titles, and are so short and incomplete as to justify the opinion that only a part of them has been preserved. Two 'Capitularia' of Charlemagne concern the political and ecclesiastical condition of those parts of Saxony which were conquered at the time of their publication, 788 and 797. This 'Lex Saxonum' must not be confounded with the 'Sachsen-Spiegel,' the 'Mirror of the Saxons,' a code of Saxon law which was written in Latin and afterwards translated into the Saxon language by Eicke van Rebgow, between 1215 and 1218. (Gaertner, *Saxonum Leges Tres. Accessit Lex Frisionum*, 1730-4.)

Frisians [FRISIANS].—The Frisians were brought under the Roman power by Drusus, the brother of the emperor Tiberius. Olennius, their governor in A.D. 28, oppressed them by fiscal measures, and they cast off the Roman yoke. In the war between the Romans and Claudius Civilis they joined the latter. When the Franks invaded Gaul, the Frisians occupied some countries which were abandoned by the Franks, the islands between the mouths of the Schelde and the Rhine, and the present provinces of Gelderland, Zutphen, and Overyssel; and after the emigration of the Anglo-Saxons they gradually took possession of the coast and the islands of the German Ocean as far as Jutland. In 689 they were attacked by the Franks and obliged to pay them tribute. After the establishment of the German kingdom, the Frisians obeyed the king (emperor) as their sovereign, but they chose their own judges and other authorities. During the middle ages they formed the powerful republic of the Seven Frisian Sealands, which was broken by the counts of Holland, of Oldenburg, and several other princes of the empire. The last independent Frisians were the Dithmarschen between the Elbe and the Eider, who were subjugated in 1559 by Christian III., king of Denmark, and Adolphus I., duke of Holstein.

The laws of the Frisians were collected by Charlemagne under the title of 'Lex Frisionum.' (Gaertner, *Saxonum Leges Tres. Accessit Lex Frisionum.*) The 'Statuta Opstalbomica,' the laws of the Seven Sealands, which are written in the Frisian language, are a different collection. The dialect of this language which most resembles the Anglo-Saxon language is that of the northern Frisian islands on the coast of Sleswig. (Clement, cited below.)

Anglo-Saxons.—An account of their history has been given under the heads SAXONS and ENGLAND. The first settlement of Teutonic tribes in Great Britain previous to the arrival of the Anglo-Saxons has been treated with great learning by Dr. Clement, in his work 'Die Nordgermanische Welt,' Copenhagen, 1840. The author, who has travelled in all parts of Great Britain where he supposes he could find traces of such settlers, has paid particular attention to Caithness and the eastern coast of Scotland. With this book the reader may compare Finn Magnusen, *Om Picternes og deres Navns Oprindelse*, in 'Det Skandinav. Litteratur-Selskabs Skrift,' 1816 and 1817.

The following works contain full information concerning the history of the Teutonic nations:—Mascov, *The History of the Antient Germans*, translated by Thomas Lediard; Gibbon, *Decline and Fall*; Eichhorn, *Deutsche Staats- und Rechts-Geschichte*; Savigny, *Geschichte des Römischen Rechtes im Mittelalter*; Grimm, *Deutsche Rechts-Alterthümer*, and his *Deutsche Grammatik*.

The Scandinavian branch of the Teutonic nations appears late in history. The Sagas tell us that in the fifth century B.C. Odin led the Scandinavians to Sweden and Norway; but this Odin is a god. Less fabulous is the history of a second Odin, who, in the beginning of our æra, came from Asia to Scandinavia, accompanied by his 'Asen,' or perhaps 'Ansen,' or fellow-warriors. The name of the Suiones or Swedes was known to Pliny and to Tacitus, and Pliny knew the name of Scandia, now Scania, the southern extremity of Sweden, which name gradually acquired its present general meaning. Goths came to Scandinavia at a very early period, and the second Odin was perhaps their chief. They mixed with the Scandinavians, and traces of their language have been found in the dialects of the provinces of East and West Gothland in Sweden, and

'Saxones patriis et libertatis honore
Hoc sunt postremo sociati foedere Francis,
Ut gens et populus fieret concorditer unus.'

Anonym., in Leibnitz, *Script. Rer. Brunsv.*, i. p. 153. Compare Möser, *Osnabrückische Geschichte*, i. 3-40, the best work which has been published about the old Saxons in Germany.

their name is still preserved in many localities. The aborigines of Sweden and Norway belonged to the Finnish race. They fled towards the north, but not without leaving their traces in the mountains of the Kjœlen and the Dovre Fjeld.

The Scandinavians, Northmen, or Normans, became known to the southern nations by their piracies, and they were often leagued with the Saxons. In the wars between Charlemagne and Wittekind, the Danes assisted Wittekind, who had married Gera, the daughter of their King Siegfried. As early as the beginning of the eighth century the Danes and Jutes appeared in the north of England; in the beginning of the ninth century the Danes settled on the south-east coast of Ireland. Normans or Norwegians occupied the Orkneys before the end of the ninth century: in 861 they came to the Farœ Islands, and they sent colonies to Iceland as early as 870. The northern parts of North America were known to these bold navigators four centuries before the time of Columbus. Other Normans conquered Normandy, Apulia, Sicily, and the opposite coast of Africa. From the eighth century the Waregians, who came from Norway and Sweden, penetrated into Russia and founded the Norman dynasty of the grand-dukes of Kiew: some of the first families of the Russian nobility are of Norman origin.

The Swedes conquered the coast of Finland as early as 850, and settled in great numbers in the districts of Abo and Nyland. Although Finland is chiefly inhabited by a nation of Finnish origin, and though it has become a Russian province, the Swedish language is the only language used for public acts and legal documents. [SCANDINAVIAN LANGUAGE.]

Suhm is one of the best authorities for the critical history of the Scandinavians. He has written in Danish on the origin of the Scandinavians, on their mythology, a critical history of Denmark, a history of Denmark, and several other works concerning this country.

(Müller, in his *Kritisches Examen der Dänischen und Norwegischen Sagengeschichte*, examines the historical truth of the Sagas; Peringskjöld, *Monumenta Sueo-Gothica*, Stockholm, 1710, fol.; Peringskjöld, *Wilkina Saga, sive Historia Wilkinensium*, contains an account of the exploits and conquests of the Scandinavians in Russia, Italy, &c.)

Table of the modern Teutonic Languages and their Dialects.

I. HIGH GERMAN LANGUAGES.

(The German language as it is written or spoken by the well-educated Germans, belongs to the High German languages, but is not a dialect.)

A. *Suabian* branch.

a. Suabian subordinate branch, containing the dialects of
  1, *Suabia*, that is, of the Black Forest, of the Neckar, and of the country between the Danube and the Lech.
  2, *Bavaria*, that is, of the Alps, of Salzburg, and of the Danube.
  3, *Tyrol*, that is, of Vorarlberg, of the Inn, of the Etsch (Adige), and of the Puster-Thal.
  4, *Austria*, that is, of the archduchy of Austria, of Styria, of Carinthia, of Carniola, of Southern Bohemia, and of Moravia.

b. Allemannic, subordinate branch.
  1, *Allemannic*, commonly so called in the south-west corner of the Black Forest.
  2, Dialects of *Switzerland*, that is, of Bern, of the Oberland of Bern, of Wallis, of the country of the Grisons, and of Appenzell, &c.
  3, Dialects of Elsass (Alsace) and of Baden.

c. Old Thüringian, subordinate branch, containing the dialects of the Thüringer Wald, of part of the Fichtelgebirge, and of the northern part of the Böhmerwald. These dialects are generally confounded with those of the adjacent flat countries of Thüringia and the Upper Palatinate, which belong to the Franconian branch.

B. *Franconian* branch.
  1, Dialects of Franconia, of the Palatinate, of the Middle Rhine, and of Southern Hesse.
  2, Dialects of Thüringia, except the Thüringer Wald, of Northern Hesse, and of the Eichsfeld.
  3, Dialects of Lorraine and Luxemburg, which are much mixed with Low German.
  4, Dialects of Upper Saxony, of Meissen, of the Erzgebirge, and of Lusatia.
  5, Dialects of Northern Bohemia, of Silesia, and of part of the German colonies in Hungary.
  6, Dialects of the nobles, the clergy, and the citizens in Curland, Livonia, and Esthonia.

II. SAXON Languages.

A. *Frisian* branch, which contains the dialects of West Friesland, of Saterland, of the islands along the Dutch and the German coast, and of the islands along the coast of Sleswig.

B. *Low German* branch, divided into six sections, viz.:
  1, Of *Lower Saxony*, containing the dialects of Sleswig, of Holstein, of Hamburg, of Bremen, of Brunswick, of Hanover, of the country between the Harz and the Weser, and of the Marshes with East Frisia.
  2, Of *Westphalia*, with the dialects of Upper Münsterland, of Lower Münsterland, of Osnabrück, of the Upper Weser, of Sauerland, of Mark, and of Eastern Berg.
  3, Of the *Lower Rhine* between Neuwied and Düsseldorf, especially the dialects of the Eifel, of Cologne, and of Aix-la-Chapelle.
  4, Of the *Netherlands*, containing the Dutch language, the Flemish language, and the dialects of Jülich, of Cleve, and of Geldern in Germany.
  5, The dialect of the Saxons in *Transylvania*.
  6, Of the antient *Wendish* countries, colonized by the Saxons, containing the dialects of Mecklenburg, of Pomerania, of Brandenburg, of the Marks, and of East Prussia.

C. *English* branch. [SAXONS; ENGLAND.]

III. SCANDINAVIAN languages.

A. *Old Norman* branch, containing the dialects of the mountaineers of Norway, the Icelandic language, and the idiom of the Farœ islands.

B. *Danish* branch, containing the Danish language, with the dialects of the islands, of Jutland, and of Northern Sleswig, and the modern Norwegian language.

C. *Swedish* branch, containing the Swedish language, with the dialects of Gothland, of Dalecarlia, of Stockholm and the adjacent country, of Finland, and of the Aland islands.

(Adelung und Vater, *Mithridates*; Balbi, *Atlas Ethnographique*; Ober-Müller, *Atlas Ethno-géographique de l'Europe*, Paris, 1841.)

TEVERO'NE. [PAPAL STATES.]

TEVIOTDALE. [ROXBURGHSHIRE.]

TEWKESBURY, an antient market-town and municipal and parliamentary borough in the north-western part of Gloucestershire, close to the borders of Worcestershire, 9 miles from Gloucester and 103 from London. It is situated on the eastern bank of the Avon, near its junction with the Severn; and the small rivers Carron and Swilgate, which are tributaries of the Avon, flow through the parish. The immediate neighbourhood of the town is subject to floods. Within half a mile of the town is a handsome iron bridge of one arch, 172 feet span, over the Severn; and there is an antient bridge of several arches over the Avon, with a causeway leading from it to the above-mentioned iron bridge. The Carron is crossed by a stone bridge, and the Swilgate by two. The parish extends about 4 miles from north to south, and its width varies from 200 yards in the northern part, to 2 miles, its extreme breadth. Immediately to the north of the town the width of the parish is only half a mile. Here the Avon has been diverted by an artificial cutting called New Avon, or Mill Avon. The parish contains 1830 acres, with the hamlets of Southwick in the southern part and that of Mythe in the northern part. Tewkesbury is a borough by prescription: it received its first charter of incorporation from Queen Elizabeth in 1574. By the charter of William III., granted in 1698, the jurisdiction of the borough magistrates was extended over the whole of the parish. It has returned two members to parliament since the 7 James I. Before the passing of the Reform Act, parts of the town, particularly on the eastward, were not comprised within the limits of the parliamentary borough, but the whole parish is now included. The right of voting was formerly in the freemen and burgage holders, and inhabitants paying scot and lot. The number of electors on the parliamentary register in 1840 was 409, including 89 who possessed double qualifications; and of the former number, 238 were occupiers of houses rated at 10*l*. and upwards. The town is not divided into municipal wards. The corporate body consists of a mayor, four aldermen, and twelve councillors. The old corporation was composed of a high-steward, twenty-four principal burgesses, including in that number two bailiffs and the recorder; and there were besides several minor officers, and four justices for the borough. The appointment of twenty-four assistant burgesses was directed by the governing charter of William III., but none had been elected for many years prior to the passing of the Municipal Corporation Reform Act. The twenty-four burgesses were elected by the bailiffs and burgesses out of the burgesses at large. The annual income of the old corporation did not exceed 22*l*., and in 1828 it was in debt to the amount of 6000*l*. The sum of 2000*l*. was advanced by the recorder, and the property of the corporation conveyed to him, on which the creditors were paid 6*s*. 8*d*. in the pound. Quarter-sessions for the borough are held, and there is a court for the recovery of debts under 50*l*.

Tewkesbury is said to be of Saxon origin, and to derive its name from Theot, a Saxon, who founded an hermitage here in the seventh century. Early in the eighth century two brothers, dukes of Mercia, founded a monastery, which, in the tenth century, became a cell to Cranbourn Abbey in Dorsetshire. In the twelfth century Robert FitzHaimon enlarged the buildings and liberally endowed the institution, in consequence of which the monks of Cranbourne made Tewkesbury the chief seat of their establishment. At the dissolution the abbey belonged to the Benedictines, and its annual revenue was 1598*l*. A great battle was fought on the 14th of May, 1471, within half a mile of Tewkesbury, when the Lancastrians sustained a most disastrous defeat, and both Queen Margaret and her son Prince Edward were taken. The town was successively in the hands of the royalists and parliamentarians at the commencement of the civil war; but in 1644 it was taken by the latter, and held until the close of the war.

The town principally consists of three good streets, well-built, with a number of smaller ones branching from them. According to the census of 1831, the population amounted to 5780. The principal manufacture is the cotton and lambs'-wool hosiery. In 1810 the number of stocking-frames in the town was 800; and in 1833 there were 600. The wages averaged 12*s*. in the former year, and 7*s*. in the latter. The number of men, aged 20 and upwards, employed in the stocking manufacture in 1831 was 300 (*Pop. Returns*), and 44 were engaged in the lace manufacture. Nail-making formerly employed a considerable number, but in 1833 there were only 50 persons so occupied. (*Mun. Corp. Reports.*) Tewkesbury was and is still the centre of an extensive carrying-trade on the Severn and Avon; but the improvement of the navigation of the Severn to Gloucester, by means of a ship-canal, is said to have been injurious to Tewkesbury, and to the improved means of intercourse with other towns in the same district is also ascribed some decline in the attendance at the corn-market. The iron bridge across the Severn, which opened a communication with Hereford and Wales, counterbalances on the other hand the effects of the above-mentioned improvements. There is a branch railway from Tewkesbury rather more than two miles in length, which joins the Birmingham and Gloucester Railway. The collegiate church of the antient monastery is now the parish church. It is a noble and venerable structure, in the early Norman style, and consists of a nave, choir, and transepts, with a tower rising from the centre, supported on massive and lofty piers with circular arches. The roof is finely groined and carved. There are several antient chantry chapels in the east end of the choir, which is hexagonal. Some of the monuments are in memory of persons who fell at the battle of Tewkesbury. The living is a vicarage, of the gross annual value of 376*l*. A new church was opened in 1837. All the principal denominations of dissenters have places of worship. There is a grammar-school with an endowment of 52*l*. a year. The master is appointed by the corporation. When the corporation commissioners visited Tewkesbury in 1833, the master was a clergyman and one of the borough justices, and for many years the school had not been attended by more than three or four pupils. In 1833 there were, besides the above, and two boarding-schools, 12 daily schools in the parish, attended by 607 children, and several Sunday-schools, at which 588 children were instructed. The national school is partly supported by an antient endowment for the instruction of 20 children, and a Lancasterian school is dependent on voluntary contributions. There are almshouses for 10 poor persons, and several medical and other charities of comparatively recent date. The town-hall was built in 1786: the upper part contains an assembly-room and a hall for meetings of the corporation; and the lower part is appropriated to the borough courts. A gaol, house of correction, and penitentiary were erected under a local act passed in 1812. The market-house is a handsome building, with Doric columns and pilasters supporting a pediment in front. There is a small theatre and public library and news-room. The town is paved, lighted, and watched under a local act passed in 1786. The market-days are Wednesday and Saturday: the former for corn, sheep, pigs, &c.; and the latter for poultry and provisions. There are fairs in March, April, May, June, September, October, December; and a statute fair at Michaelmas.

(Dyde's *Hist. of Tewkesbury; Pop. Returns*, 1831; *Reports of Ecclesiastical Commissioners* and of the *Municipal Corporation Commissioners*, &c. &c.)

TEXAS. Since the publication of the article on Mexico [MEXICAN STATES, THE UNITED], Texas, which was then merely an insurgent province of that republic, has been recognised as an independent state by the leading powers of Europe and America. A succinct statement of the revolution by which this change has been effected is necessary.

A decree of the Constituent Cortes of Mexico, dated 7th May, 1824, declares that Texas shall be annexed to Coahuila until it possess the elements necessary to the formation of a separate state; but that as soon as it shall possess these elements, the connection is to be dissolved, and a separate state-constitution given to Texas.

At the time when this decree was published, Texas probably did not contain 4000 inhabitants of the European race. The district of Bexar, which in 1806 contained 6400 colonists from Mexico, was found in 1835 to contain only 3400 of that class, scattered over the settlement of San Antonio, the missions, and frontier military posts; and this process of depopulation had reached its lowest ebb for some time before the latter date. In the districts of Brazos and Nacogdoches there were, in 1824, no inhabitants of European descent, except at the military posts.

The government of Mexico had made efforts, both while the country was a Spanish colony, and after the recognition of its independence, to promote the settlement of Texas by the Empressario system of colonization, *i.e.* by granting tracts of land to individuals, who were to forfeit the grant unless they settled a specific number of colonists on them within a limited period. In furtherance of this policy, permission was given by the supreme government of the eastern internal provinces, on the 17th of January, 1821, to Moses Austin, by birth a citizen of the United States, to introduce into Texas from Louisiana 300 families, 'being Catholics, or agreeing to become so on entering the Spanish territory,' and also agreeing to take the oath of allegiance to the crown of Spain; and a tract of land in the vicinity of the Brazos river was granted them to settle upon. Some difficulties arose from the disturbed political state of Mexico at that time; but in 1824 colonising operations were begun by Stephen, the son of Moses Austin (his father having died in the interim); and on the 24th of March, 1825, a colonization law for Coahuila and Texas was promulgated. In the course of 1825 and 1826, seven more Empressario grants were made, and the parties obtaining them became bound to introduce about 2000 foreign families, under the same conditions as had been prescribed to the Austins.

Under these grants the colonising of Texas from the United States proceeded with such rapidity, that in 1835 Colonel Almonte, a commissioner of the Mexican government, reported the population of the province to be as follows:—In Bexar, 4000 inhabitants of European origin, of whom 3400 were Spanish Mexicans and 600 Irish settlers; in Brazos, 8000, of whom 1000 were negroes, almost exclusively colonists from the United States; in Nacogdoches, 9000, of whom 1000 were negroes, also Anglo-American colonists. In addition to these, Texas contained about 15,000 Indians, of whom 4000 were friendly to the European race and 11,000 hostile. About 10,000 of the hostile Indians haunted the district of Brehar, the rest were scattered over the district of Brazos. The Mexican commissioner remarked in his report that the part of Texas which presented the greatest difficulties to travellers was that which lay between the frontiers of Coahuila and San Antonio de Bexar: the province was isolated from the rest of the Mexican provinces, and had an easy communication with New Orleans. The balance of commercial enterprise and wealth was also in favour of the two districts which lay nearest to the United States, and had been colonised from them. The whole trade of Texas in 1834 he valued at 1,400,000 dollars, of which 600,000 belonged to Brazos, 470,000 to Nacogdoches, 270,000 were invested in the smuggling trade of these two districts, and only 60,000 belonged to the Spanish Mexican district of Bexar.

Various incidents had concurred between 1824 and 1835 to excite repulsion and distrust between the Anglo-American colonists on the one hand, and the settlers of Spanish descent and the Mexican government on the other. It had been made one of the conditions of the Empressario grants that schools for teaching the Spanish language should be erected in all the new settlements. This had been entirely neglected. The wealthier settlers of Brazos and Nacogdoches sent their children to be educated at New Orleans, and the poorer gave theirs no education at all. The system of settling some hundreds of families of the new comers in the same neighbourhood, subject to a certain degree of control from the Empressario, further contributed to prevent their amalgamating with the Spaniards. They continued thoroughly English in their language and customs. Religion too became a means of increasing the mutual repulsion: the new-comers had no objection to call themselves Roman Catholics, but they were lax in their observance of religious duties, and this irritated the priests and brought the Spanish settlers to regard them as persons of indifferent character. On the other hand, the settlers from the United States were chafed by the stringent custom-house regulations and semi-military government of Mexico. The question of negro slavery, too, added to their sources of discontent. By the fifteenth article of the treaty of amity and commerce between Great Britain and Mexico, the government of the latter country engaged to prevent all its subjects from taking part in the external slave-trade. The rule was relaxed in favour of the colonists from the United States, so as to allow their bringing their slaves with them; but the restrictions under which this permission was granted occasioned constant collisions between them and the officers of the customs. The decree of 29th September, 1829, abolishing slavery throughout the Mexican dominions, occasioned great discontent in Texas.

The government viewed the increasing numbers and wealth of the Anglo-American colonists with jealousy, partly on account of their democratic propensities, partly on account of its suspicion that the government of the United States was bent upon acquiring Texas. The Scotch and New York masonic lodges at Mexico had become in a great measure mere instruments of the federal and centralising factions; and Poinsett, the American envoy at Mexico, had not only been instrumental in founding the New York lodge, but had persisted in taking a part in the internal political contests and intrigues of Mexico, which was quite inconsistent with his diplomatic character, and ultimately led the Mexican cabinet to insist upon his removal. The *Escoces*, the party attached to a centralised system of government, were then in the ascendant, and they not unnaturally regarded every American from the United States as a *Yorkino*, a democrat or adherent of a constitution which left each individual state more independent of the central authorities in Mexico. The settlers in Texas seem to have taken little concern in politics. When Heyden Edwards and his confederates made their mad attempt to establish an independent republic in Nacogdoches in 1826, Stephen Austin and his colonists rendered prompt and efficient assistance to the Mexican authorities. But on account of their origin they were viewed with the same suspicion as the rest of their countrymen.

The opinion that the United States were anxious to annex Texas to their territory had more appearance of foundation. Aaron Burr's project of revolutionising Spanish America in 1805 had not been forgotten. In 1825 the envoy of the United States at Mexico had been instructed to sound the government on the question of transferring the frontier between the two republics from the Sabine to the Rio Grande or the Colorado. In 1827 he had been authorised to offer the Mexican government a million of dollars for the frontier of the Rio Grande, and half that sum for the frontier of the Colorado. In 1829 he received directions to increase his offer to five millions for the frontier of the Colorado. This pertinacity on the part of the government of the United States naturally led the Mexican government to view with apprehension the growing strength of the Anglo-American settlers in Texas.

In 1830 the irritation on both sides was evidently bringing about a crisis. The military posts on the frontier were strengthened, and new posts were established in the settled districts and at the trading stations on the coast. The number of Mexican soldiers in Texas was increased to about 1300, and placed under the command of the political chiefs of Bexar, Brazos, and Nacogdoches, the first-mentioned being intrusted with the supreme command. On the 6th of April, 1830, Bustamente promulgated a decree prohibiting all citizens of countries adjoining the Mexican territories to settle as colonists in the territories of the republic immediately adjacent to these countries. By this edict the newly arrived settlers from the United States in Texas and those who were on their way were subjected to serious inconvenience and loss. On the remonstrance of Colonel Austin, the enforcement of the decree was mitigated by the local authorities: the colonists were allowed to take possession of their lands, but they received legal titles in only two of the seventeen settlements which were already established in Texas.

After the government had thus unsettled the property of the most numerous and wealthy portion of the population, a revolution was inevitable; but as is generally the case, the first hostile collision between the citizens and the government forces was occasioned by one of the minor grievances. An attempt made by the governor of Anahuac to arrest an Anglo-American colonist arrayed the military and the settlers of Nacogdoches in arms against each other in June, 1832. The insurgents besieged and captured the post at Velasco, intercepted the political chief of Nacogdoches on his way to relieve the garrison of Anahuac, and forced him to surrender, and obliged the governor of that fort to fly from the country. Santa Anna, who had a short time before promulgated what has been called 'the plan of Vera Cruz,' and thus by rallying the Federalist party around him obtained possession of the reins of government, had on the first intelligence of disturbances in Texas dispatched Colonel Mexia with 400 soldiers to that province, who was accompanied by Stephen Austin, representative of Texas in the Mexican legislature. Mexia was satisfied with the explanation that the victorious insurgents gave of their proceedings; and tranquillity being restored, the whole of Texas declared for 'the plan of Vera Cruz.'

In October, 1832, a convention assembled at San Felipe de Austin to frame a memorial to the Central Government for the separation of Texas from Coahuila and for the repeal of the law of 1830 which suspended the contracts of colonization. In 1833 another convention met at the same place to frame a state constitution to be submitted for the approbation of the Central Government. Colonel Austin was appointed commissioner for the province to present and support those memorials. At Mexico he found everything in confusion; and on the 2nd of October he wrote to his constituents, advising them to organize an *interim* government. The contents of this letter having come to the knowledge of Gomez Farias, the president, Austin was arrested on the 10th of December on his way home, and carried back to Mexico, where he was thrown into prison.

The Texans now attached themselves to the Federalists, who had quarrelled with Santa Anna and his party. A state convention of Coahuila and Texas was appointed to be held at San Antonio, in November, 1834, but owing to the apathy of the Spaniards of Coahuila nothing came of it. The more energetic Anglo-American population of Texas began to feel themselves impeded by their union with Coahuila, and a wish for separation gained ground. In April, 1835, a meeting of the joint legislature of Texas and Coahuila was brought about, and a petition in favour of a Federal constitution agreed to. Santa Anna soon after marched against Coahuila: the state authorities attempted to retreat with the archives into Texas; but the governor was taken prisoner, the government dissolved, and a military commission installed at Saltillo in its place. Texas was virtually left without any government.

The appeal to arms was precipitated by a custom-house brawl. An attack was made under some pretext or another on the custom-house at Anahuac. Captain Thompson, dispatched by the Central Government, in June, 1835, at the request of the Ayuntamiento of that place, in the Correo war-schooner, to inquire into the affair, precipitately attacked and captured a Texan trading-vessel. The proprietors of the prize armed another trading-ship, took the Correo, and sent the captain to New Orleans under a charge of piratically interrupting the trade between the United States and Texas. In the month of August Santa Anna requested the Texans to deliver up Zavala, a leader of the Federal party, who had been his friend and supporter while he remained faithful to 'the plan of Vera Cruz,' but latterly his enemy. The request was refused, and reports soon after reached Texas that Santa Anna was mustering troops to invade it.

While affairs were in this position, Stephen Austin was entertained at a public dinner in Brazoria, on his return from his long captivity. Austin had, as long as he could, done his utmost to prevent the discontents of the settlers assuming a political complexion, and when that was no longer possible, had steadily opposed any projects that seemed to point at a separation from Mexico. The advice therefore which he gave on this occasion, to organise committees of safety and vigilance throughout the province, was at once and implicitly followed. He was himself appointed chairman of the committee of his own colony, to which a degree of control over the other committees was tacitly conceded. Before the organisation of the country was completed hostilities were commenced between the colonists and the military in the province: in consequence of which Austin, in the begining of October, assumed the command of an army hastily collected at Gonsalez, and Zavala was appointed chairman of the Austin committee in his stead.

On the 3rd of October, 1835, General Barragon issued a decree abolishing the legislative powers of the several states and establishing a central republic in Mexico. A general consultation of Texan delegates was, in consequence of this measure, held at Austin, which, on the 7th of November, issued a declaration in favour of state-rights; summoned a convention of delegates to be held at Washington in Galveston, on the 1st of February next; and organized an interim government. Henry Smith was chosen governor and W. Robison lieutenant-governor; Samuel Houston was appointed major-general and commander-in-chief of the regular army of Texas; and Stephen Austin, B. T. Archer, and W. H. Wharton were appointed commissioners to the United States.

The new commander-in-chief immediately established his head-quarters at Washington. In January, 1836, Stephen Austin reported that he had concluded a loan at New Orleans of 200,000 dollars, and had hopes of raising another of 400,000. Volunteer troops in aid of the Texans were raising in Louisiana, Tennessee, Alabama, and Georgia. The Convention met at Washington on the 1st of February, and on the 2nd of March it published a declaration of independence, signed by fifty delegates, of whom Lorenzo de Zavala was one. In the election of officers of state which immediately followed, Zavala was chosen vice-president.

Santa Anna marched from Saltillo on the same day that the Convention met at Washington. He was successful in his first encounters; but on the 21st of April he was defeated and taken prisoner by General Houston. On the 14th of May he signed a convention for the evacuation of Texas, and soon after not a Mexican soldier remained in the state. The constitution adopted by the new state is a close imitation of the state government of the Northern Union; and, like its prototype, presents the anomaly of slavery existing under laws which profess to regard all men as equal.

Texas was recognised as an independent republic by the government of the United States on the 3rd of March, 1837. A motion was made in congress for receiving it into the Union, but after some discussion withdrawn. France recognised the independence of Texas and concluded a treaty with it on the 25th September, 1839. 'A treaty of amity and commerce between England and Texas was signed in London, on the 16th of November, 1840, and ratified by the Texan government in February, 1841. The Mexican government has expressed a determination to reconquer Texas; but it is not likely that in the distracted and impoverished state of that country it will be able to reduce a population almost inaccessible by land from Mexico, possessed of better harbours and more shipping, in a position to receive constant support from the United States even against the will of the government at Washington, and on terms of alliance and amity with England, France, and the United States. Nor is it to be desired that Texas should on any terms be re-annexed to Mexico: its Anglo-American population never could assimilate with the Spanish Mexicans.

(*Texas*, by William Kennedy, London, 1840; Colonel Almente's *Report on the Statistics of Texas*, Mexico, 1835; *Correspondence of the daily Papers of London and Paris*; *Debates in the British Parliament, the Congress of the United States*, and *French Chamber of Deputies*.)

TEXEIRA, or TEXERA, JOSEPH, was born of a good family in Portugal, about the beginning of 1543. After distinguishing himself at the University, he entered the order of St. Dominic in 1565, and obtained general respect for his learning and virtue. He was prior of the convent of Santarem in 1578, when King Sebastian undertook his expedition into Africa.

In the troubles which ensued, Texeira attached himself to the party of Don Antonio, and accompanied that prince to France in 1581, where he went to solicit assistance against Philip II. Texeira published at Paris, in the beginning of 1582, a compendium of the history of Portugal. The work is very scarce (it is described as a thin quarto of 70 pages), and appears to have been published for the purpose of supporting Don Antonio's claim to the throne of Portugal. The author was taken prisoner by the Spaniards in the naval battle off Terceira on the 26th of July, 1582, and carried to Lisbon, whence he contrived to make his escape and rejoin Don Antonio. Duard Nonius à Leone, a converted Jew, employed by Philip II. to refute the 'Compendium of Portuguese History,' asserts that Texeira, while a prisoner at Lisbon, denied to him that he was the author.

The partisans of the League having obliged Don Antonio to quit Paris, Texeira accompanied him as his confessor, first to Bretagne, and in 1586 to England. In 1588, having returned to France, he was introduced to Henri III. and the queen-mother: the former appointed him a court chaplain; the latter dispatched him on a confidential mission to Lyon, then in the possession of the League, believing that a Dominican friar was unlikely to be suspected of being an agent of the court. Texeira remained at Lyon from July, 1588, to January, 1589. During this interval he prepared for publication a reply to the attack upon his History by Nonius à Leone. This pamphlet, or some indiscreet expressions in conversation, having given umbrage to the Leaguers, he was obliged to fly; the papers left in his cell were seized, and the whole impression of his pamphlet (with the exception of one or two copies) destroyed.

He rejoined Henri III. at Tours, and after the murder of that prince, in August, 1589, was continued in his office of court-chaplain by Henri IV., to whose service he attached himself. After the entry of Henri into Paris, Don Antonio was enabled to return to that city, and Texeira appears to have resumed his office of confessor. In March, 1595, he published a new edition of the work which had been destroyed at Lyon, but his labour was in vain, for he was called, in the August following, to perform the last service of his church to the prince whose cause he had advocated with such fidelity.

In 1596 Texeira was a witness of the public abjuration of Calvinism by the dowager-princess of Condé at Rouen. The Papal legate selected him to instruct and confirm the princess in her new faith; and from that time till his death he continued attached to the service of the house of Condé. This engagement left him pretty much the command of his own time, and he employed it principally in his favourite study of genealogy. A list of his published works will be found at the end of this article: here it is only necessary to remark that to the second edition of his 'Genealogy of the House of Condé,' published in 1598, he added an account of the public ceremonial of the princess's reconciliation with the Roman Catholic church.

In 1601 he published a narrative of the adventures of Don Sebastian, 'from his expedition into Africa in 1578, till the 6th of January of this present year 1601.' We have not been able to procure this work; but the following passage from Etoile's 'Journal of the Reign of Henri IV.' throws some light upon the expression quoted from its title-page:—'Friday, the 1st of June, 1601, comes the intelligence that the false or true Don Sebastian (for as yet one knows not which to call him) has been sent to the galleys by order of the viceroy of Naples. . . . The Portuguese maintain that he is the true Don Sebastian: they have solicited various courts to obtain his liberty, and published several works in his favour. Among others Joseph Texeira, a Dominican, has undertaken several journeys to Bavaria, England, Venice, and Rome, where he has disseminated his writings; and finally, he has caused to be printed at Paris a collection of prophecies current among the Portuguese, which foretold all that has happened to their king Sebastian.' That Texeira, whose writings show him to have been an accomplished scholar, whose confidential employment by Catherine de' Medici is a strong testimony in favour of his abilities, and whose high moral character is acknowledged on all hands, should have believed the individual here mentioned to have been the real Don Sebastian appears upon first thoughts a strong testimony in his favour. But L'Etoile's account of the nature of the book weakens the presumption, and Texeira's inveteracy against the Spaniards renders it probable that the account is correct. He is said to have declared from the pulpit, when preaching on the duty of loving one's neighbour, that 'we are bound to love all men, of whatever religion, sect, or nation—even Castilians.'

Texeira died in the convent of the Jacobins at Paris, on the 29th or 30th of June, 1604. L'Etoile, who mentions his death, says, 'He had just returned from England, whither he had been sent by the king, who gave him a hundred crowns for the expenses of the journey. While there he had seen the king of England, to whom he presented his "Genealogy" which he had compiled, and which was well received. He was on the eve of returning to England when he was taken ill.' Texeira's frequent visits to England, both in the time of Elizabeth and James, gave rise to suspicions of his attachment to the Romish Church. For these there does not appear to have been any reasonable ground: he was opposed to the ultra-Romanist party of the League in France, because it was allied with Philip II., but his religious opinions never appear to have varied.

The published works of Texeira are—1, 'De Portugalliae Ortu, Regni Initiis, denique de Rebus à Regibus universoque regno praeclare gestis Compendium,' Parisiis, 1582, in 4to., 77 pp., very rare; 2, 'De Electionis Jure quod competit viris Portugallensibus in augurandis suis Regibus ac Principibus,' Parisiis, 1590, 8vo.: this is a reprint of the answer to Nonius à Leone, printed and destroyed at Lyon in 1589: a third edition was published at Paris in 1595, with the title, 'Speculum Tyrannidis Philippi, Regis Castillae, in usurpanda Portugallia;' 3, 'Exegesis Genealogica, sive Explicatio Arboris Gentilitiae invictissimi ac potentissimi Galliarum regis Henrici ejus nominis IV.' This work was published at Tours in 1590; at Leyden, with additions, in 1592; again at Leyden in 1617, with the title, 'Stemmata Franciae item Navarrae Regum à prima utriusque Gentis Origine;' all the three editions are in 4to.; 4, 'Explicatio Genealogiae Henrici II., Condeae Principis,' Paris, 1596. An edition in 4to., and another in 8vo., and a translation into French by Jean de Montlyard, all appeared in the same year. To the edition of 1598 was appended 'Narratio in qua tractatur de Apparitione, Abjuratione, Conversione, et Synaxi Illustrissimae Principis Charlottae Catharinae Trimolliae, Principissae Condeae;' 5, 'De Flammula, seu Vexillo S. Dionysii, vel de Orimphla aut Auriflamma Tractatus,' Paris, 1598, 8vo.; 6, 'Adventure admirable par devers toutes autres des Siècles passés et présents, qui contient un Discours touchant les Succès du Roi de Portugal, D. Sebastian, depuis son voyage d'Afrique, auquel il se perdit en la bataille qu'il eut contre les Infidèles en 1578, jusqu'au 6 de Janvier présent, an 1601;' traduit du Castillan, Paris, 8vo.

(This sketch has been compiled from the dictionaries of Bayle and Moreri, and Nicolaus Antonius; from the Prefaces to Texeira's 'Genealogy of Henri IV.,' and his Reply to Nonius à Leone; and from Pierre de l'Etoile's 'Journal of the Reign of Henri IV.,' vol. ii., pp. 559-61, and vol. iii., pp. 194-6, edition published at the Hague in 1761, in 4 vols. 8vo.)

TEXEIRA, or TEXERA, PEDRO, a native of Portugal, one of the earliest cultivators of modern Persian literature. The place and date of his birth and death are alike unknown. The author of the notice of his life in the 'Biographie Universelle,' says that he was born in 1570, but does not mention the authority on which he makes the statement.

Cotolendi, who translated Texeira's work into French, states that his author, 'instigated by a vehement desire to become acquainted with the history of Persia, passed several years in that country, and having made himself perfectly master of the language, devoted himself, by the advice of some able and enlightened Persians, to the study of Mirkhond. [See the account of this historian in the article PERSIA, under the head *Literature.*] Texeira himself has informed us that being at Malacca, in the beginning of 1600, he embarked in the month of May for the Philippine Islands, whence he took shipping for Mexico, and ultimately arrived at Lisbon on the 20th October, 1601. His correspondents in the East having failed to transmit to him some money which he had left in their charge, he was obliged to undertake a voyage to Goa to recover it. Disgusted with the sea, he resolved to return overland; and having in pursuance of his determination sailed from Goa, on the 9th of February, 1604, and arrived at Basrah on the 6th of August (being detained some time at Ormuz), he travelled by way of Meshed-Ali to Bagdad, and thence to Anna, Aleppo, and Scanderoon, where he took shipping for Venice. After a short stay in that city, he made the tour of Italy, crossed the Alps into France, and then retired to Antwerp, where he spent his time in compiling a book, which he published in 1610. After that event we again lose sight of him entirely.

His work, the first book of which, we are told by Antonio de Leon Pinelo, was composed in Portuguese, but translated into Spanish, and the rest written in that language with a view to publication, is entitled, 'Relacion de los Reyes de Persia y Ormuz: Viagi de la India Oriental hasta Italia por Tierra el año de 1604,' Antwerp, 1610. (N. Antonio says it was published in 4to.; Antonio de Leon that it was published in 8vo.) It consists of three parts: the first is a history of the kings of Persia, compiled from Mirkhond with a brief continuation, down to the age of the compiler; the second is an abridgment of the history of Ormuz, by Turan-shah, one of the kings of that district (a work which appears to be known in Europe only from Texeira's abstract), also with a continuation; the third, an account of Texeira's overland journey from India to Europe. Alfonso Lasor translated the work into Italian and inserted it in his *Orbe Universal* the same year in which it was published; Schikhart, in his 'Tarich, seu Series Regum Persiae,' published at Tübingen in 1628, speaks in the highest terms of Texeira's learning and diligence; Van Laet appended a Latin translation of Texeira's Itinerary from Ormuz to Basrah and Bagdad to his 'Persia,' published at Leyden in 1633; Cotolendi published a French translation of the entire book at Paris in 1681, which the writer in the 'Biographie Universelle' justly characterises as 'assez mauvaise.' In short, down to the time of Tavernier and Chardin, Texeira appears to have been regarded as the principal authority respecting Persia. The historical part of his work is now of little importance, but his voyage up the Persian Gulf, and his route from Basrah to Meshed-Ali, Bagdad, Anna, Aleppo, and Scanderoon, may still be studied with advantage.

Antonio and Leon Pinelo mention a book entitled 'Naufragio de Jorge Albuquerque e Prosopopeia a seu louvor,' published at Lisbon in 1601, by a Peter Texeira, but do not identify him with our author. A 'Certificacion del Discubrimiento de el Marañon,' by a Pedro Texeira, 'Capitan Maior del Pará,' is appended to the account of the discovery of that river, published at Madrid in 1641, by Christoval de Acuña: this was apparently a different person. A third geographer of the name of Pedro Texeira is mentioned by Antonio as alive at Madrid a few years previous to the publication of his dictionary (1672): this one compiled a map of Portugal and a 'Descripcion de la Costa de España,' neither of which appear to have been published.

(*Voyages de Texeira, ou l'Histoire des Rois de Perse,* traduite d'Espagnole en Française, à Paris, 1681, 12mo.; *Epitome de la Bibliotheca Oriental y Occidental, Nautica y Geografica,* de Don Antonio de Leon Pinelo, en Madrid

1738, fol.; *Bibliotheca Hispana Nova*, Auctore D. Nicolao Antonio, recognita, emendata, et aucta, Matriti, 1788, fol.; *Tarich: h. e. Series Regum Persiae ab Ardschir-Babekan, usque ad Jazdigerdem, a Chalifitiis expulsum*, authore Wilhelmo Schikard, Tubingae, 1628, 4to.; *Persia, seu Regni Persici Status, Variaque Itinera in atque per Persiam*, Lugd. Batav., 1633, 24mo.)

TEXEL, or TESSEL, is an island in the North Sea, at the northern extremity of the province of North Holland, from which it is divided by a channel called the Maas Diep. Including Eierland, it is 12 miles in length and 6 in breadth. It has a large and secure harbour, and a commodious roadstead on the east coast. The northern part of the island, called Eierland (*i.e.* Eggs-land, from the vast quantity of eggs laid by the sea-gulls), was a separate island till 1629, but is now joined to Texel by a sand-bank. Texel is celebrated for a breed of sheep (50,000) with a silky kind of wool, and many thousand lambs are annually exported to the different provinces of Holland. The inhabitants, 5000 in number, make great quantities of a green cheese from sheep's milk; many of them are engaged in the oyster fishery. Besides the petty town of Texel there are 6 villages in the island. Important naval battles have been fought off the coast of this island: in 1653, when Admiral Blake defeated the Dutch under Van Tromp; in 1673, between the Dutch and the combined English and French fleets, which was a drawn battle; and in 1799, between the English and Dutch fleets, when the latter, being disaffected to the republican government, surrendered without much resistance.

(Hassel, *Geography*; Stein's *Lexicon*; Cannabich, *Geography*.)

TEXTI'LIA, Mr. Swainson's name for a subgenus of Conus.—Ex., *Conus Ammiralis*. (*Malacology*.)

TEXTOR. [Weaver Birds.]

TEXTULA'RIA. [Foraminifera, vol. x., p. 348.]

TEZA, or TAZA. [Marocco.]

TEZCU'CO. [Mexican States.]

TEZEL, or TETZEL, JOHANN, a Dominican monk, who lived about the end of the fifteenth and the beginning of the sixteenth century. His name would have been forgotten but for the scandalous manner in which he carried on the traffic in indulgences, which roused the indignation of the better part of his contemporaries, and thus led to the reformation in Germany. He was a native of Leipzig, where he studied theology, and afterwards entered the order of the Dominicans in the Pauliner Kloster. In the year 1502 the pope appointed him preacher of indulgences for Germany. He converted this office into a most lucrative traffic, and is said to have made use of the basest means for the purpose of obtaining money. His conduct too was so bad, that he was condemned at Inspruck to be sewed up in a sack and to be drowned, having been convicted of adultery. But the interference of his superiors caused the sentence to be changed into imprisonment for life. He was accordingly conveyed to Leipzig, and confined in a tower which stood in that city near the Grimma-gate (Grimmaer-Thor) until the year 1834, when it was pulled down. He had however not been imprisoned long before he was set at liberty at the request of Albert, archbishop of Mainz, and other ecclesiastical dignitaries. Tezel now made a pilgrimage to Rome, and acted the part of a penitent so well, that Pope Leo X. not only absolved him of his sins, but appointed him commissarius apostolicus in Germany, in addition to which the archbishop of Mainz made him 'inquisitor haereticae pravitatis.' In his capacity of papal commissary he now carried on his traffic in indulgences more impudently than ever. He traversed Saxony in an open carriage, accompanied by attendants, and carrying with him two chests, one of which contained the indulgences, and the other the money raised from their sale. This latter chest is said to have had the following inscription:—

> 'Sobald das geld im kasten klingt,
> Sobald die seel' gen himmel springt.'
> (So soon as the gold in the chest rings,
> So soon the soul to heaven springs.)

His reputation for sanctity had become so great, that in several places the population of towns met him in solemn procession, and his entry was accompanied with the ringing of the church-bells. He sold indulgences for all crimes, murder, perjury, adultery, and not only for crimes already committed, but also for those which a person might commit. At last, in the year 1517, Luther openly opposed him, in the celebrated theses which he fixed on the church-door of Wittemberg. Tezel made a reply in another set of theses, which however were immediately burnt by the students in the market-place of Wittemberg. Tezel seems to have acted contrary to the intention of his superiors, and to have gone beyond his instructions, for Karl von Miltitz, who was sent by the pope to settle the disputes which had arisen out of his conduct, reprimanded him severely. In the year 1518 however Tezel, notwithstanding all this, obtained the degree of Doctor of Divinity at Frankfurt on the Oder. After this event, he returned to Leipzig to his convent, where he died, in August, 1519, of the plague, shortly after the celebrated theological disputation of Eck and Karlstadt. He was buried in the church of his convent (the present chapel of the university); but there is now no trace of his grave, as that part of the church which contained his remains was pulled down in the seventeenth century to make room for some fortifications. [Luther.] Compare P. Melanchthonius, *Historia Vitae M. Lutheri*, i., p. 153, &c.; Gieseler, *Lehrbuch der neuern Kirchengeschichte*, vol. iii., p. 20; Löscher *Vollständige Reformations-Acta*, ii., p. 324; and more especially Hechtius, *Vita Tezelii*.

THAARUP, THOMAS, a Danish poet and dramatist, highly esteemed by his countrymen as one of the classics in their literature, was the son of an ironmonger at Copenhagen. He was born 21st August, 1749, the very same day as Edward Storm, another poet. This coincidence would hardly deserve notice, if something of the marvellous had not been founded upon it, it being said that Thaarup's mother dreamed that the wife of a clergyman at Guldbrandsdalen was delivered just at the same time of a son, who would be the rival of her own. If not great, both of them were popular and national poets; and though neither very numerous nor of very great extent, their productions, especially their lyric pieces, earned for them a reputation which does not always fall to the lot of writers of more ambition and of higher pretension. This was more particularly the case with regard to Thaarup, whose three little musical dramas, 'Höstgildet,' 'Peters Bryllup,' and 'Hiemkomsten,' are esteemed chefs-d'œuvre of their kind, and the songs and airs were known by heart by every one, and repeated all over Denmark. Their celebrity was not at all less than that of the 'Beggars' Opera' in this country. After the death of Storm [Scandinavian Literature, p. 3], Thaarup succeeded him as one of the directors of the theatre at Copenhagen, in which situation he remained till 1800. But though he survived Storm a full quarter of a century, Thaarup's literary life did not extend much beyond that of Storm. If he did not entirely lay aside his pen at the commencement of the present century, all the productions by which he will be remembered had appeared in the preceding one. He continued to reside at Copenhagen, where he died in the summer of 1821. Some of his hymns have been translated into German by Voss.

(*Skilderic af Kiöbenhavn*, 1821; *Neue Bibliothek der Schönenwissenchaften*, vol. lv.)

THA'BET BEN KORRAH, an eminent physician, philosopher, and geometrician, whose complete names, as given by Ibn Abí 'Ossaibiah (*Fontes Relationum de Classibus Medicorum*, cap. 10, § 3), were Abú 'l-Hasan Thábet Ben Korrah. He was born at Harrán in Mesopotamia, A.H. 221 (A.D. 835-6), where he at first carried on the business of a money-changer; he afterwards however went to Bagdad to pursue his studies, which he carried on with so much zeal, that he became one of the most celebrated literary and scientific men of his age. He belonged to the sect of the Sabians, but got entangled in some religious disputes, and was expelled from their communion. In consequence of this he left Harrán, where he had been residing for some time, and went to Bagdad with the celebrated astronomer Mohammed Ben Músa. There he lived in his house, and was introduced by him to Mo'tadhed Billah, sixteenth of the 'Abbaside Khalifs (A.H. 279-289, A.D. 892-902), who appointed him one of his astrologers, and ever afterwards, on account of his acquirements and his pleasing manners, continued on terms of great intimacy with him. He died on the 26th of Safar, A.H. 288 (February 18, A.D. 901), aged sixty-seven lunar, or sixty-five solar years. His sons Senán and Ibrahím, and their descendants, practised physic with much reputation at Bagdad for more than a century after his death. Thábet himself appears to have been a very learned man, and also a good practical physician, as he tells a story of the way in which he restored to life a man that was supposed to be dead. (Casiri, *Biblioth. Arabico-Hisp. Escur.*, tom. i., p. 389.) He was also a very voluminous author, as the bare titles of his works, as given by the anonymous author of the 'Arabica Philosophorum Bibliotheca,' take up about two folio pages in Casiri's Catalogue. They consist of mathematical, medical, and zoological treatises, written in Arabic, besides translations into that language of several of the works of Galen, Ptolemy, Autolycus, Euclid, &c. He wrote also several in Syriac, on the religious rites and ceremonies of the Sabians; but none either of these or of his Arabic works have (as far as the writer is aware) been published or translated, though several of them still exist in manuscript in some of the European libraries. (Wüstenfeld, *Geschichte der Arabischen Aerzte*; Casiri, *loco cit.*; Nicoll and Pusey, *Catal. MSS. Arab. Biblioth. Bodl.*, pp. 257, 295; De Rossi, *Dizion. Stor. degli Autori Arabi*.)

THA'BET BEN SENA'N, the grandson of the preceding, whose names are given by Ibn Abí 'Ossaibiah (*Fontes Relationum de Classibus Medicorum*, cap. 10, § 5) as Abú 'l-Hasan Thábet Ben Senán Ben Thábet Ben Korrah. He was celebrated, like the other members of his family, as a physician, philosopher, and mathematician, and was superintendant of the hospital at Bagdad during the reign of Al-Motteia, the twenty-third of the 'Abbaside Khalifs, A.H. 334-363 (A.D. 946-974.) He expounded the writings of Hippocrates and Galen; but his principal work appears to have been a History of his Own Times, from the year A.H. 290 (A.D. 903) to the year of his own death, A.H. 363 (A.D. 973-4), which is highly praised by Abú 'l-Faraj (*Hist. Compend. Dynast.*, p. 208), and was continued after his death by his nephew Helál, and by other writers. Dr. Sprenger, in the notes to his translation of El-Mas'údí's 'Meadows of Gold and Mines of Gems,' vol. i., p. 24, Lond., 8vo., 1841, corrects an anachronism of Haji Khalfa, who ascribes this work to his grandfather Thábet Ben Korrah.

(Wüstenfeld, *Geschichte der Arabischen Aerzte*; Assemani, *Bibioth. Orient.*, vol. ii., p. 317.)

THALAMI'TA. [Portunidæ, vol. xviii., p. 446.]

THA'LAMUS (from θάλαμος, the bridal chamber), a botanical term which was applied by Linnæus to the calyx or outer whorl of floral envelopes. Tournefort applied the term to a receptacle that is not fleshy, but surrounded by an involucre. In this sense it is used in common with the terms Clinanthium and Phoranthium. By some writers, as De Candolle, the term is applied to the receptacle of all plants or that point of the rachis or stem around which the floral envelopes are seated. Thus those plants in which the petals and stamens are inserted into the receptacle constitute the first subclass, Thalamifloræ, of the Exogens, in De Candolle's natural arrangement of plants.

Thalamus is also used in Cryptogamic botany, in common with Thallus, to express the bed of fibres from which many fungi spring up. It is also improperly used by some writers to indicate the shields or apothecia of lichens. In fact it is a term that has been applied in so many cases where others are used, that it is desirable it should be altogether dispensed with, or only used in a very obvious sense.

THALA'SSEMA, Cuvier's name for a genus of footless Echinoderms (*Echinodermes sans pieds*), placed by him immediately after Bonellia, and thus defined by him:—

Body oval or oblong, with the proboscis in form of a reflected lamina or spoon, but not forked. The intestinal canal is similar to that of *Bonellia*. But one abdominal filament had been discovered.

The genus is divided by Cuvier into the following sections or subgenera:—

1. The Thalassemæ properly so called.

These have only two hooks placed very forward, and their posterior extremity has no bristle-like processes (soies).

Example, *Thalassema Neptuni*, *Lumbricus Thalassema* of Pallas, *Spicil. Zool.*, fasc. x., tab. 1, fig. 6.

2. The Echiuri,

whose posterior extremity is furnished with some transversal rows of bristle-like processes.

Example, *Echiurus Lumbricus*, *Lumbricus Echiurus*, Gm.,—Pall., *Miscell. Zool.*, xi. 1-6. Common on sandy bottoms on the French coasts, where the fishermen use it as a bait. It is also found on the coasts of Europe generally, and is said to form part of the food of the cod-fish.

3. Sternaspis. (Otto.)

These, besides the bristle-like processes of the *Echiuri*, have under their anterior part a slightly corneous disk surrounded with cilia.

Example, *Sternaspis thalassemoides*, Otto, *Monog.*

N.B.—Cuvier states that a new examination of the anatomy of the *Thalassemæ* had demonstrated to him that the place which he had assigned to them was the true one.

THALA'SSEUS, Boie's name for one of the Terns.

THALASSIANTHUS, M. Rüppel's name for a genus of *Actinidæ*, familiarly known as *animal-flowers*, with ramified *tentacula*. [Actinia; Zoantharia.]

THALASSI'DROMA. [Petrels, vol. xviii., p. 43.]

THALASSI'NA. [Thalassinians.] N.B.—The student should be careful not to confound the crustaceous genus *Thalassina* with the echinodermatous Thalassema.

THALASSINIANS. The genus *Thalassina* of Latreille consists of those macrurous decapods which have the four anterior feet terminated by two fingers; the foliations of the lateral fins of the end of the tail narrow and elongated, without ridges; and the last segment of the tail, or the intermediate piece, in the form of an elongated triangle. Sometimes the four anterior feet, or the two first feet and one of the second, are terminated by two elongated fingers, forming a claw perfectly. The two anterior feet are the longest; the lateral foliations of the fin terminating the tail are in the form of a reversed triangle, or widest at the posterior border; the intermediate piece, on the contrary, narrows from the base to the termination, and ends in a point.

M. Milne Edwards arranges the family of *Thalassinians* or *Burrowing Macrura*, between the *Scyllarians* and the *Astacians*.

The *Crustacea* of which this small but interesting family are composed resemble each other in appearance, and are remarkable for the extreme elongation of their abdomen and the small degree of consistence of their integuments.

Family Character.—*Carapace* small, and very much compressed laterally; terminated, generally, in front by a very short rostrum, but sometimes entirely without one. *Eyes* ordinarily very small. Internal *antennæ* terminated by two multi-articulate filaments; the external ones inserted externally and a little below the first; their peduncle slender, cylindrical, and without a spiniform lamina, carries at most only one very small moveable spine, which represents that appendage. Disposition of the parts of the *mouth* variable. *Sternum* nearly linear throughout its length, and not constituting a *plastron*. Anterior *feet* large, more or less completely didactylous and triangular; the next pair raised on each side of the thorax. *Abdomen* very long, and, in general, very narrow; rather depressed vertically than compressed laterally: the lateral borders of the dorsal arch of its various rings are but little prolonged, and do not incase the base of the false feet as in the Shrimps, nor does the abdomen itself diminish much in size towards its posterior part. The structure of its appendages varies. The disposition of the *respiratory apparatus* varies also; sometimes it only exists, as it ordinarily does in the Decapods, as thoracic branchiæ, enclosed under the carapace in special cavities; sometimes, on the contrary, there are, besides those thoracic branchiæ, accessory branchial appendages suspended under the abdomen and affixed to the false feet. Upon this important difference, M. Milne Edwards, who is the author of the character given above, founds his division of the family into two tribes, the *Cryptobranchids* and the *Gastrobranchids*.

1. Cryptobranchids.

Under this group M. Milne Edwards arranges all the *Thalassinians* which are without respiratory appendages suspended under the abdomen. Their *branchiæ* are in general composed of cylinders, united after the manner of a brush. All the species whose habits are known live in the sand, in which they burrow deeply. The following genera belong to this tribe:—*Glaucothöe*; *Callianassa*, *Axia*; *Gebia*; and *Thalassina*.

Glaucothöe. (Edwards.)

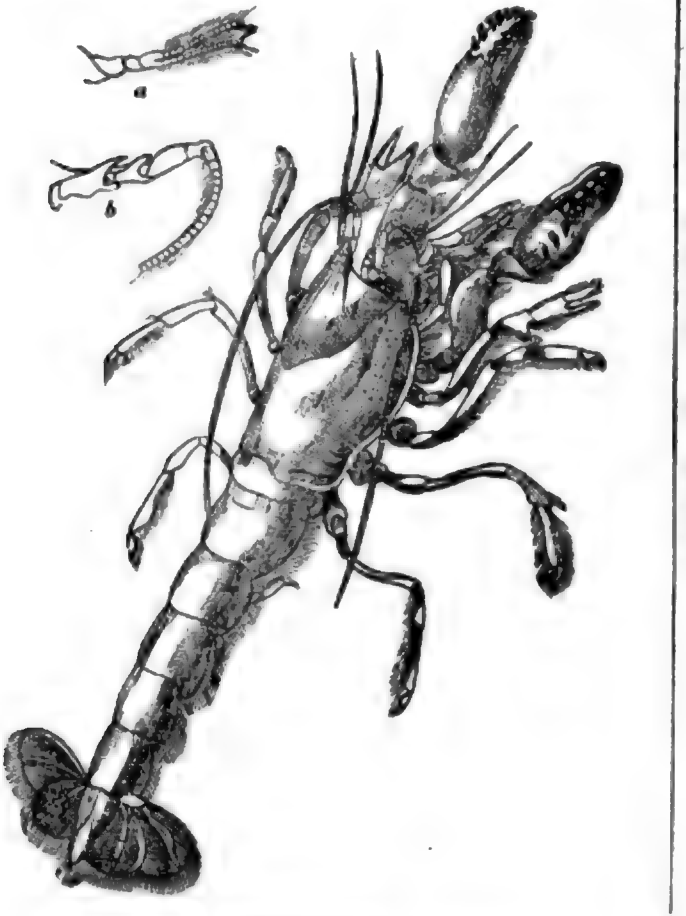
Generic Character.—*Carapace* nearly ovoid, and without any rostriform prolongation. *Eyes* projecting, large, and nearly pyriform. *Internal antennæ* short, cylindrical, and bent (coudées), as in *Pagurus:* the third joint of their peduncle the longest, and carrying at its extremity two small multiarticulate appendages, which are very short and rather stout, one of which is furnished with many long hairs. *External antennæ* inserted lower than the preceding, their peduncle bent, and presenting above a small scale, the vestige of a palp. External *jaw-feet* pediform. The last thoracic ring not anchylosed to the preceding. *Anterior feet* terminated by a stout, didactylous, well-formed hand: they are of very different sizes. Second and third pairs slender and very long: the two last pairs, on the contrary, short and elevated against the sides of the body, as in the *Paguri;* the fourth pair are flattened, rather large, and imperfectly didactylous, the immoveable finger of their hand being only formed by a slightly projecting tubercle; the posterior feet, still smaller than the last, are terminated by a small didactylous rather well-formed hand. The *abdomen* is narrow, elongated, and perfectly symmetrical: the first ring, much narrower than the succeeding ones, has no appendages; the four next segments, on the contrary, each give attachment to one pair of rather large false natatory feet, formed by a cylindrical basilary joint and two terminal blades, one of which is very small and obtuse, and the other large, pointed at the end, and bordered with long ciliary hairs. *Caudal fin* moderate in size; the middle blade, formed by the seventh abdominal segment, is rounded and ciliated, and the external blades are much longer than the middle ones. (M. E.)

M. Milne Edwards observes that this genus establishes the passage between the *Pagurians* and *Callianassa.*

Example, *Glaucothöe Peronii,* the only species known. Its integuments have little solidity, its carapace is smooth, and its length 8 lines. M. Milne Edwards states that it appears to inhabit the seas of Asia. He is of opinion that Latreille's genus *Prophylax* approximates closely to *Glaucothöe,* and ought not perhaps to be distinguished from it: if so Latreille's name has the priority. The latter placed his genus among the *Paguri,* but after the publication of M. Milne Edwards's *Glaucothöe,* was uncertain, according to M. Edwards, whether these two generic divisions should not be united.

Callianassa. (Leach.)

See the article: but the student should refer to the accurate and elaborate description and figures of M. Milne Edwards, who records two species:—*Callianassæ subterranea* and *uncinata;* and he adds that *Callianassa major* of Say seems to be distinguished from the two preceding species.



Axia Stirhynchus.

a, intermediate antenna; b, external antenna.

Axia. (Leach.)

Generic Character.—Carapace very much compressed, and terminated anteriorly by a small triangular rostrum. *Ocular peduncles* very small, cylindrical, and terminated by a hemispherical cornea. Terminal filaments of the *internal antennæ* nearly of the length of the carapace. Peduncle of the *external antennæ* having above a small moveable spine which represents the great lamellar palp observable in the *Shrimps. External jaw-feet* slender and pediform. *Anterior feet* compressed, and terminated by a well-formed claw; carpus small. Second pair of feet nearly lamellar, and equally didactylous. The three next pairs monodactylous. *Abdomen* slightly convex towards the middle, and terminating in a great fin, the five blades of which are nearly of the same length. First ring of the abdomen carrying a rudimentary pair of *false feet,* and the four succeeding rings provided each with a pair of very well-developed natatory false feet, each composed of a short and stout peduncle, which at its extremity carries a small styliform appendage within, and externally two great oval, very large blades, which are ciliated on the borders. (M. E.)

M. Milne Edwards observes that this genus much resembles *Callianassa* and *Gebia,* and he records the only known species, *Axia Stirhynchus.* Its length is about three inches, and it inhabits the coasts of France and England.

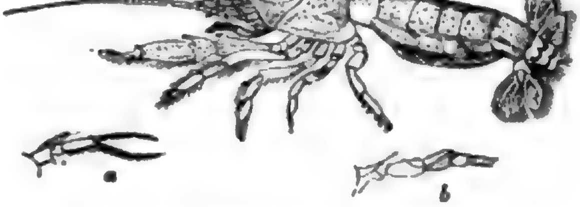
Gebia. (*Gebios* and *Thalassina,* Risso; *Gebia* and *Upogebia,* Leach.)

Generic Character.—Carapace terminating anteriorly by a triangular rostrum, and sufficiently large to cover the *eyes* almost entirely; on each side of its base is a tooth, which is continued with a crest, and forms the lateral border of the upper surface of the stomachal region. *Internal antennæ* very short, but nevertheless their terminal filaments are longer than their peduncle. *External antennæ* very slender, and presenting at their base no vestige of a moveable scale. *External jaw-feet* pediform. *Anterior feet* narrow, terminated by an elongated and imperfectly subcheliform hand: their moveable finger is very large, and in bending downwards its base is applied against the anterior border of the hand, the lower angle of which is prolonged so as to constitute a tooth performing the office of the immoveable finger. The feet next in succession are compressed and monodactyle; the second pair have their penultimate joint large, widened, and ciliated below; the succeeding pairs are more slender. *Abdomen* long and much narrower at its base than towards its middle, depressed and terminating by a large fin, whose four lateral blades are foliaceous and very wide. First abdominal ring with two pairs of very small filiform appendages; the four next segments giving origin to three pairs of false natatory feet, composed of a stout and short peduncle, and two oval blades with strongly ciliated borders: the external one very large, and the other very small. *Branchiæ* brush-like and fixed on two rows, namely, one above the second foot, and two above the four anterior feet and the external jaw-feet. (M. E.)

Example, *Gebia stellata.* Length 1¼ inch.

Locality.—Coasts of England. M. Milne Edwards states that this species comes very near to *Gebia littoralis.*

M. Milne Edwards observes that the *Gebiæ* establish the passage between the *Thalassinæ* and the *Axiæ,* which last they resemble in the general form of the body and disposition of the caudal fin, whilst they approach the first by the conformation of the feet.



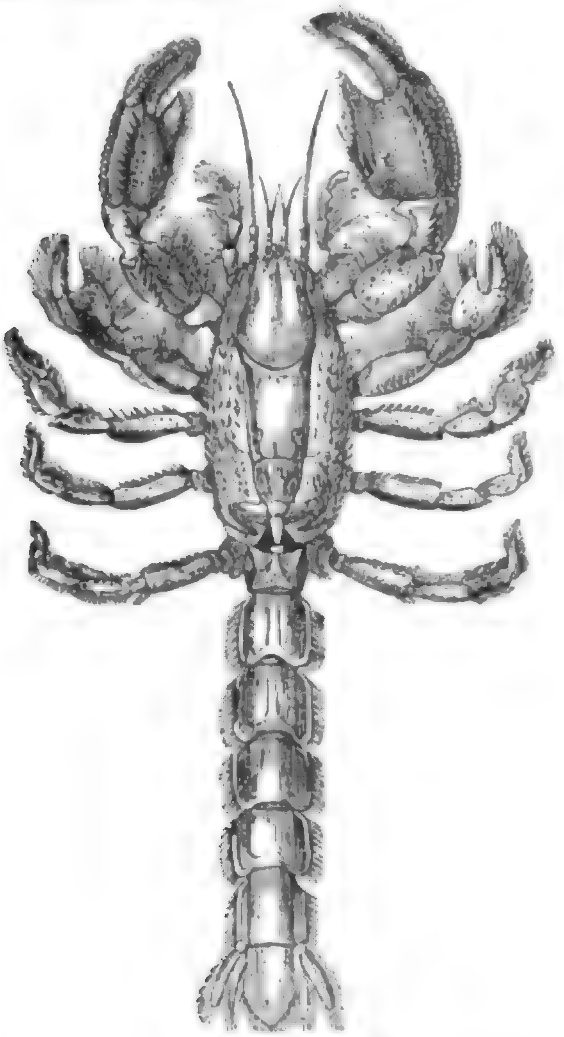
Gebia stellata.

a, intermediate antenna; b, base of an external antenna.

Thalassina. (Latreille.)

Generic Character.—Carapace short, narrow, and very much elevated. *Stomachal region* small and limited backwards by a deep furrow. *Cardial* and *intestinal regions* equally separated from the branchial regions, and representing by their junction a triangle, the apex of which is directed backwards. *Front* armed with a small triangular rostrum. *Eyes* small and cylindrical. *Internal antennæ* inserted above those organs; their peduncle of moderate size, and their terminal filaments slender and unequal, the longest about thrice the length of the peduncle. *External antennæ* very small, their peduncle cylindrical, hardly reaching beyond the rostrum, and presenting above no vestige of appendages. *External jaw-feet* moderate and pediform, their second joint armed with spiniform teeth on its internal surface, and nearly of the same form as the succeeding ones. First pair of *feet* narrow and moderately elongated, but rather robust; they are unequal, and the hand which terminates them presents at its anterior and lower angle a more or less strong tooth, which represents an immoveable finger, against which the base of the moveable finger, which is very large, is bent back. Second pair of feet very much compressed, and rather wide; their penultimate joint especially is large and ciliated below. The succeeding feet have nearly the same form, but they are narrower, and less and less compressed. *Abdomen* very long, narrow, semicylindrical, and nearly of the same size throughout its length. Terminal fin small; the two pairs of lateral blades, formed by members of the sixth ring, nearly linear. *False feet* fixed to the four middle rings of the abdomen; they are very slender, and composed of a cylindrical and elongated peduncle carrying two more or less ciliated multiarticulate filaments. (M. E.)

Example, *Thalassina scorpionides.* Length about six inches. Colour brownish.



Thalassina scorpionides.

Locality.—Coasts of Chili.

M. Milne Edwards remarks that the abdomen of this species reminds the observer of the body of a *Scolopendra.*

2, Gastrobranchids.

M. Milne Edwards observes that this small division of the *Thalassinians* is very remarkable, for it establishes the passage between the *Callianassæ* and the *Squillæ.* In the general form of the body, the crustaceans forming this division differ, he remarks, but very little from the first, and the conformation of their thoracic branchiæ does not permit their separation from the macrurous decapods, nor their distant removal from the Thalassinians; but they have respiratory appendages fixed to their abdominal false-feet, exhibiting the greatest analogy with the ramose branchiæ of the Stomapods.

The type of this group, according to M. Milne Edwards, is a small crustacean, to which he gives the generic name *Callianidea;* but he also arranges in this same division the genus *Isea* of M. Guerin, under the name of *Callianissea,* for he thinks that he perceives in this last an analogous mode of organization. If, he observes, the characters assigned to it by M. Guerin be exact, it would be difficult to place this new genus here, and it ought to be approximated to the *Pagurians;* but it appears very probable to M. Milne Edwards that there has been some error of observation, and that in reality the *Iseæ* and *Callianideæ* differ but very little.

These crustaceans, M. Milne Edwards observes, have all a very small oval thorax compressed laterally: their abdomen, on the contrary, is extremely long and slender. The disposition of the eyes and the antennæ is nearly the same as in *Callianassa.* The external jaw-feet are pediform, and carry externally a slender and multiarticulate palp. The two first pairs of feet are didactylous; the anterior pair are long, very unequal, and terminated by a stout compressed hand; the second are small and very delicate; the third are enlarged towards the end nearly as in *Callianassa,* and terminated by a very short tarsus, forming, with a tubercle of the preceding joint, an imperfect claw. The fourth pair of feet are slender and monodactyle; and the fifth pair, small in dimension, are thrown backwards. As in the *Crpytobranchids,* the abdomen is very long, sufficiently soft, and composed of nearly equal rings, of which the dorsal arch is not prolonged below so as to incase the base of the false feet. The caudal fin offers nothing remarkable; but the false feet, inserted at its lower surface, are furnished with a multitude of branched filaments, which have a structure very analogous to that of branchiæ, and which certainly must be destined to concur in the work of respiration.

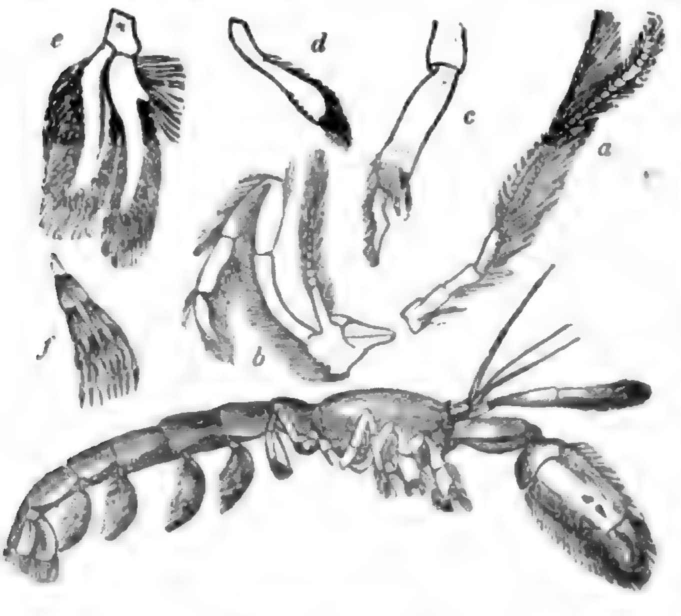
M. Milne Edwards concludes by observing that this tribe comprehends two genera, one of which appears to him to be too imperfectly known to be conveniently characterized.

Callianidea. (Edwards.)

Generic Character.—Body very delicate, slender, and elongated. *Carapace* hardly a third of the length of the abdomen, and not covering the last thoracic ring, compressed and rather elevated, its lower border applied exactly against the base of the four first pairs of feet. No rostrum, and the anterior border of the carapace notched on each side of the median line for the reception of the base of the *eyes,* whose peduncles are very short, and formed as in the *Callianassæ.* Four *antennæ,* slender and inserted nearly on the same transversal line; the first pair terminated by two filaments nearly equal in length, one of which however is the largest, and slightly convex towards the end. Appendages of the *mouth* very small, occupying but little space; *mandibles* hardly differing from those of *Callianassa;* valvular appendage of the second pair of *jaws* very small; external *jaw-feet* slender and pediform, their second joint furnished internally with a row of dentiform tubercles covered with hairs, and with their three last joints very much elongated. *Sternum* linear throughout its extent. First pair of *feet* long, and one of them very stout, with the terminating hand very large, and nearly of the same form as in *Callianassa,* except that the carpus is smaller. The two succeeding pairs of feet are small and flattened; the fourth pair nearly cylindrical, and their basilary joint very much enlarged. Fifth pair nearly as large as the fourth, and terminating in an imperfect rudimentary claw. *Abdomen* composed as ordinarily of seven segments, nearly of the same size throughout, and carrying beneath five pairs of *false-feet:* of these the first are reduced to a simple narrow blade slightly ciliated at the end, but the four succeeding pairs have a very remarkable conformation. A peduncle is to be distinguished and three terminal laminæ, two of which are very large and one very small on the edge of the preceding ones; all round the border of the great laminæ a kind of tufted fringe is found, composed of a row of cylinders, each of which gives origin to two smaller filaments, which again in their turn are bifurcated nearly in the same manner as the branchial filaments of the *Squillæ* are divided. The five blades of which the caudal fin is composed are wide and rounded. The thoracic *branchiæ* are enclosed as ordinarily in the carapace, and are each composed of cylinders ranged in parallel order on a stem, nearly as in the lobsters, only these organs and filaments are less numerous, and the branchiæ themselves very small. There are only ten on each side of the body. (M. E.)

Example, *Callianidea typa*. Length about 10 lines.

Locality.—Coasts of New Ireland, where it was found by MM. Quoy and Gaimard.



Callianidea typa, magnified.

a, antenna of the first pair; *b*, external jaw-foot; *c*, extremity of one of the posterior feet; *d*, abdominal false feet, first pair; *e*, false feet of one of the four succeeding pairs; *f*, marginal fringe of those false feet.

So much doubt exists relative to the genus *Isea*, Guerin, *Callianisea*, M. Edwards, that we think we should not be justified in occupying space with the very long and elaborate description of M. Guerin, and the acute criticisms of M. Milne Edwards, who observes that *Isea*, having been previously employed to designate another crustaceous animal, cannot be retained. M. Guerin's description will be found in the 'Annales de la Société Entomologique de France,' tom. i., p. 295; and also in M. Milne Edwards's 'Histoire Naturelle des Crustacés,' tom. ii., p. 322. But though our limits do not permit the insertion of the details, they should be carefully perused by the student, for they are highly interesting and instructive.

FOSSIL THALASSINIANS.

M. Milne Edwards states that the crustaceous fossil found in the chalk formation of Maastricht, and figured by M. Desmarest under the name of *Pagurus Faujasii*, belongs to the genus *Callianassa*.

THALASSIO'RNIS, Mr. Eyton's name for one of the ducks (*Clangula*, Smith), subfamily *Erismaturinæ*.

THALASSIOPHYTES (literally 'sea-plants,' from *θάλασσα* and *φύτον*) is the name given by Lamouroux to designate the vegetable productions of the ocean and of its rocks and shores. It is equivalent to the term Hydrophytes of Lingbye, and the plants described by Agardh as Marine Algæ. This division of the vegetable kingdom comprehends, in Lamouroux's system, six orders, viz., Fucaceæ, Florideæ, Dictyoteæ, Ulvaceæ, Aphlomideæ, and Phlonideæ. [SEA-WEEDS; ULVACEÆ.]

THALES (Θαλῆς) was a native of Miletus, one of the chief cities of Ionia, and descended from a Phœnician family. Apollodorus, as quoted by Diogenes Laertius, fixes the year of his birth in the first year of the 35th Olympiad, or B.C. 640. Herodotus (i. 74) says that Thales the Milesian predicted the year of the great eclipse which took place while the armies of Cyaxares and Alyattes king of Lydia were engaged in battle. Alyattes became king of Lydia in B.C. 617. Herodotus also says (i. 75) that Thales was in the army of Crœsus at the time of the battle of Pterie between Crœsus and Cyrus B.C. 547 or 546; at which time he would be ninety-four years old, if the date of his birth is correctly given by Apollodorus. There was a general tradition that he lived to a great age; and Lucian states that Solon, Thales, and Pittacus all lived to be a hundred years old. (On the subject of the eclipse see the article ALYATTES, and Oltmanns, *Abhandlungen der Akad. Berlin.* 1812-13.)

In the Life of Thales by Diogenes we find numerous traditions attached to his name, the value of which it is somewhat difficult to estimate. Thales is enumerated among the Seven Wise Men, whose wisdom was not the theoretical wisdom of philosophers, but the wisdom of actual life. [BIAS.] Accordingly we find that Thales took an active part in the political affairs of his native country. Before Ionia fell under the Persian yoke, he advised the Ionians to have one common council, and to establish it at Teos, for Teos was in the centre of Ionia; and he further suggested that all the other Ionian states should be reduced to the condition of parts dependent on the government at Teos. Such a scheme, if carried into effect, might have checked the progress of the Persian arms (Herod., i. 170.) Later writers say that he visited Egypt and Crete in order to improve his knowledge, and that he derived from Egypt his acquaintance with mathematics. There seems no reason for thinking that Thales left any writings. Aristotle at least was not acquainted with any philosophical writings by Thales. Various sayings of Thales are recorded: they are of that sententious character which belongs to the proverb, and they embody truths such as the general experience of mankind recognises; and for this reason they cannot safely be considered as the product of any one mind. Thales is generally considered the founder of the Ionian school; but it is perhaps hardly proper to consider him in any sense as the founder of a school. [IONIAN SCHOOL.] His traditional reputation rested on his physical discoveries and his philosophical speculations. He is said to have been the first astronomer (among the Greeks) who predicted eclipses; and to have discovered the passage (*πάροδος*) from tropic to tropic, or, in other words, to have laid down the sun's orbit; and to have fixed the length of the year at 365 days. He determined the magnitude of the sun to be 720 times that of the moon; which is apparently the true version of the corrupt passage in Diogenes. His knowledge of geometry was said to be derived from Egypt, and Pamphila attibutes to him the discovery of the right-angled triangle of the circle (*πρῶτον καταγράψαι κύκλου τὸ τρίγωνον ὀρθογώνιον*), which probably means the demonstration that the angle in a semicircle is a right angle, a discovery attributed also to Pythagoras. Hieronymus says that he measured the height of the pyramids of Egypt by observing the shadow which an object cast when it was of the same length as the height of the object.

The philosophical speculations of Thales, like the earliest efforts of philosophers in all countries, were an attempt to solve the problem that admits of no solution—the real nature of the universe. He is considered by modern writers as the originator of the dynamic philosophy, the nature of which, as opposed to the mechanical, is explained in the article IONIAN SCHOOL. Aristotle (*Metaph.*, i. 3) has explained in a short passage the general doctrine of Thales: 'There must be,' observes Aristotle, 'some Nature (*φύσις*), either one, or more than one, to which all other things owe their origin, this one still subsisting. The number however and the character of such a first principle are not conceived by all in the same way. Thales, the founder of this philosophy, says it is water, and accordingly he taught that even the earth reposes on water, founding this notion probably on the observation that the nourishment of all things is moist, and that heat itself proceeds from water, and that animals live by it: but that from which things come is the origin of all things. He was thus led to this notion, and also by observing that the seeds of all things have a moist nature, and that water is the origin of their nature to all moist things.' Thus the universe contained an active principle by the power of which all things were developed. He considered that the magnet had life, because it attracted iron. The universe then was pervaded by life, or, as Thales expressed it, 'full of gods' (*πάντα πλήρη θεῶν*).

The doctrine of Thales bears some resemblance to systems that have been promulgated in modern times, which have been viewed as atheistical. The assumption of an active power, such as gravitation for instance (though it is not here meant to affirm that gravitation has ever been viewed as a power sufficient for the production and conservation of all things), which is sufficient to maintain all things in a permanent condition (changes such as we observe in limited portions of time and being only continued developments), may be viewed as an hypothesis made for the purpose of getting rid of the necessity of admitting the existence of God. Those who propound such an hypothesis, without further explanation, certainly do not take much pains to avoid the imputation of atheism. It does not appear however that the doctrine of Thales was anything more than a pure physical theory; and the traditions recorded of him by Diogenes make him a believer in a Diety. 'The most antient of things existing is God, for he is uncreated; the most beautiful thing is the universe, for it is God's creation.'—It was one of the maxims of Thales, that death did not differ from life. 'Why don't you die then?' said an objector, more witty than wise. 'Because there is no difference,' was the reply.

(Diogenes Laertius, i. 'Thales;' Ritter, *Geschichte der Philosophie*, vol. i.)

THALICTRUM (from the Greek ϑάλικτρον), the name of a genus of plants belonging to the natural order Ranunculaceæ. It consists of herbs which have usually a fetid smell like rue, and hence are called meadow rues. The species have perennial roots with annual stems. The flowers are corymbose, panicled, and somewhat racemose, of a green, white, or yellow colour. They have no involucre and no petals. The calyx is composed of 4 or 5 petal-like sepals. Carpels 4-15 in number. Upwards of 50 species are enumerated, which are mostly natives of the temperate and colder parts of the world.

Th. aquilegifolium, the Feather Columbine, has ovate stipules, placed at the base of the ramifications of the petiole; and a corymbose panicle. It is a native of Europe, in woody districts of Germany, France, and Italy. The stems and stamens of this plant vary in colour, sometimes being greenish-white and sometimes purple. A variety is found in Austria with dark purple stems and stamens, and is called *Th. a. atropurpureum*. Another variety, *formosum*, has the stamens dilated at the apex; whilst another has the stems green and stamens quite white, and is named *Th. a. album*.

Th. minus, Lesser Meadow-Rue, has the stem round, mealy, the flowers panicled, drooping, leaflets smooth, roundish, toothed at apex, glaucous, pericarps acute furrowed. It is a native throughout Europe. In Britain it is found in chalky pastures, and on the sea-coast where shell-sand abounds. The greater meadow-rue, *Thalictrum majus*, is also a native of Great Britain, though rare.

Th. flavum, Yellow Meadow-Rue, has an erect, branched, furrowed stem, fibrous roots, a somewhat corymbose panicle of cream-coloured flowers, with wedge-shaped, trifid acute leaflets. It is a native of all districts in Europe. In Britain it occupies wet meadows, the banks of rivers and ditches. It has a root of a yellow colour, and is said to resemble, both in appearance and properties, rhubarb. It yields a yellow dye, which may be employed for dyeing wool, and was formerly used as a remedy in jaundice. Like many of the family to which it belongs, it is very acrid, and produces blisters upon the skin, when applied to it.

Th. fœtidum, Fœtid Meadow-Rue, has a simple stem, naked at the base, leafy in the middle, and panicled at top; the leaflets are obtuse, toothed, and covered with a clammy pubescence. It is a native of France, Switzerland, Russia, &c., and is found in valleys and on hill sides, and in the fissures of calcarous rocks. It smells more powerfully than any of the species—hence its specific name.

Th. Cornuti has diœcious or polygamous flowers, with club-shaped filaments, obovate roundish leaflets; glaucous beneath. This is a North American species, and is found on the banks of rivers and in woody districts throughout the whole continent.

The character of the leaves of these plants and their thickly-flowered panicles render them favourites in gardens. They are readily increased by parting their roots and planting them out in autumn. They flourish best in moist shady situations, but are not particular; they are free-growing plants and well adapted for borders.

THA'LLEPUS, Mr. Swainson's name for a genus which he places among the *Aplysians*, apparently upon the authority of one of the late Rev. Lansdown Guilding's drawings.—Ex., *Thallepus ornatus*. (*Malacology*.)

THALLI'CERA, M. Quoy's name for a genus of Gastropods, placed as the first subfamily (with a ?) of his *Turbidæ* (*Turbinidæ*, we suppose, is meant), by Mr. Swainson. It is immediately followed by the subfamily *Ampullarinæ*. (*Malacology*.)

THALLITE. [Epidote.]

THALLUS is a botanical term used exclusively in cryptogamic botany, and is generally applied to the part of the plant which bears the reproductive organs, and constitutes the principal part of its vegetation. In Jungermanniaceæ the thallus or frond is either a leafy branched tuft, as in mosses, with the cellular tissue particularly large and the leaves frequently furnished with lobes and appendages at the base, called stipulæ or amphigastria; or it is a flattened mass of vegetable matter seated upon the ground. In lichens the parts which bear the reproductive organs, and which constitute the great bulk of the plant, is called thallus or blastema. In the Algæ the term thallus is applied to the whole plant; whilst in the fungi it is used synonymously with thalamus, to express the mass of fibres from which many of the fungi arise. *Thallodes* is the adjective used to express anything arising from the thallus.

THAME. [Oxfordshire.]

THAMES, the most important river in Great Britain, rises in the central part of England, and flows eastward into the German Ocean. Our description will comprehend a notice of its basin, course, and affluents, and commercial importance.

Basin.—The limits assignable to the basin of the Thames will depend on the place at which the mouth is fixed. The opening between Sheerness in Kent and Shoebury Ness in Essex, between five and six miles wide, is commonly regarded as the mouth of the Thames; but it is preferable in some respects to consider as such the opening between Whitstable in Kent and the east extremity of Foulness Island in Essex, where the tideway has a breadth of eighteen miles. Here the Thames opens into a large bay separating Kent on the south from Essex and Suffolk on the north, and having for its extreme points the North Foreland in Kent and Orford Ness in Suffolk, fifty miles distant from each other. Into this bay several rivers, besides the Thames, open: as the Crouch, the Blackwater, and the Colne, from Essex; the Stour, which separates Essex from Suffolk; and the Orwell, the Deben, and the Alde, from Suffolk.

The basin of the Thames, commencing at Whitstable, is bounded by the high grounds which there run down to the coast, and form the cliffs east of that town. The boundary runs in a very irregular line across the county of Kent and the Weald district of Kent and Sussex to the high ground on the southern border of Ashdown Forest in the latter county. This part of the boundary is very irregular from the manner in which the basin of the Thames is complicated with the basins of the Kentish Stour, the Rother, and the Sussex Ouse.

From Ashdown Forest the boundary runs west-north-west across the high ground of Tilgate and St. Leonard's forests to Leith Hill in Surrey, and thence west-south-west, though in a very irregular line, past the head of the Wey in Woolmer Forest to the verge of the chalk downs near Alton, Hants. This boundary separates the basin of the Thames from the basins of the Sussex Ouse and the Arun. Nearly all the waters which rise along the boundary, from its commencement to Tilgate Forest, flow into the Medway; those from Tilgate Forest to Leith Hill, into the Mole; and those from Leith Hill to Alton, into the Wey.

From the neighbourhood of Alton, the boundary of the basin is formed by the chalk downs which extend across Hants and Wilts by Basingstoke, Kingsclere, Highclere, and Burbage near Great Bedwin; and from thence by the downs which run north-westward to the neighbourhood of East Kennet and Abury. These chalk downs separate the basin of the Thames from the basins of the Anton or Test and the Hampshire Avon: that part of the basin of the Thames which they bound is drained by the Loddon and the Kennet.

From near East Kennet the boundary turns north and north-north-east along the green-sand hills by Compton Basset, Clyffe Pipard, and Chadderton; and from thence west-north-west to the western extremity of the basin near the commonly reputed head of the Thames amid the Cotswold Hills between Cirencester and Tetbury. The boundary between East Kennet and the Cotswolds separates the basin of the Thames from that of the Bristol Avon, or more correctly of the Severn, of which the Avon is a tributary.

From the neighbourhood of Tetbury the boundary runs northward along the ridge of the Cotswolds, which here separate the basins of the Thames and the Severn, to the head of the Churn (or true Thames), about three miles south of Cheltenham; and from thence north-north-east along by the same hills to the head of the Windrush near Campden, and by Long Compton Hill and Edge Hill to the Arbury hills near Daventry at the northern extremity of the basin. Here the basin of the Thames is conterminous with that part of the basin of the Severn which is drained by its affluent the Warwickshire Avon.

From the Arbury hills the boundary of the basin runs south to the neighbourhood of Bicester, and thence eastward across Buckinghamshire, Bedfordshire, and Hertfordshire, along the Dunstable, Luton, and Royston downs, to the north-western corner of Essex; the basin of the Thames being throughout conterminous with that of the midland or Norfolk Ouse. This part of the basin of the Thames is drained by its affluents, the Charwell, the Thame, and the Lea. An irregular line drawn through the county of Essex from its north-western corner, first south-south-east by Dunmow and Brentwood, and then east by Rayleigh and Rochford to the coast, will complete the boundary.

The greatest extent of this basin from east to west is from the mouth of the Thames to the neighbourhood of Tetbury, about 136 miles; the greatest extent from north to south is from the neighbourhood of Daventry, Northamptonshire, to the neighbourhood of Alton, Hants, about 78 miles. The basin comprehends the whole or part of the following counties; its area may be estimated as follows:—

	Sq. Miles.
Kent (considerably more than half the county; the western part)	900
Surrey (the whole county with the exception of some small portions along the southern border)	700
Sussex (a small part along the northern border)	300
Hants (the northern and north-eastern part) .	350
Berks (the whole county)	750
Wilts (the northern and north-eastern part) .	450
Gloucester (the south-eastern and eastern part)	450
Warwickshire (a very small portion along the south-eastern border) . . .	50
Northamptonshire (a very small portion along the south-western border) . . .	50
Oxon (the whole county, with the exception of two small portions on the north-eastern and north-western borders)	650
Bucks (two-thirds of the county; the central and southern part)	500
Bedford (a small portion at the southern extremity)	50
Herts (the whole county except some portions along the north-eastern border) . . .	550
Middlesex (the whole county) . . .	300
Essex (about one-third of the county; the western and southern borders) . .	550
Total	6600

We have used round numbers, as in such an estimate an approximation to the truth is all that can be attempted.

The basin of the Thames is occupied wholly by the secondary and tertiary geological formations. The sources of the river and the course of its upper waters are in the oolitic beds of the Cotswold hills. The valley through which the Thames itself flows from above Cricklade to below Oxford is occupied by the Oxford clay, and between Oxford and Goring (a little below Wallingford) the river flows over the formations (the coral rag, Aylesbury stone, Tetsworth clay, and greensand and chalk marl) which intervene between the oolitic and cretaceous groups. It traverses he chalk range between Ilsley Downs and the Chiltern Hills by a winding valley, in which it flows from Goring to Maidenhead, below which it enters the chalk basin of London, and has the remainder of its course through it. The affluents which join the Thames above Oxford have their course chiefly n the oolitic district; the Thame and the Ock flow through he district occupied by the groups between the oolites and he chalk; and of the remaining affluents, those which oin it on the north bank chiefly rise in the chalk hills, and have their course in the chalk basin of London: while most of those which join it on the south bank rise in the istricts occupied by the subcretaceous formations, and nter the chalk basin of London by openings in the chalk ange of the North Downs. Owing to the entire absence of coal, the basin of the Thames has no manufactures except those of the metropolis; but it contains some of the richest agricultural districts in the whole kingdom.

Course and Affluents.—The spring which has commonly been regarded as the head of the Thames is about three miles south-west of Cirencester, near a bridge over the Thames and Severn canal which is called 'Thameshead bridge;' but that which is to be regarded as the true head of the Thames is about three or four miles south of Cheltenham. Two streams rise, one from fourteen springs at what is popularly called The Seven Wells, and the other from four springs near Ullen Farm, the westernmost of which springs is the real (*i.e.* the remotest) head of the river: both streams rise on the south-eastern slope of the Cotswolds, and form by their junction, about a mile from their respective sources, the river Churn (a name the element of which is embodied both in the antient and modern name of the town of Cirencester (the Corin-ium of the Romans), by which it flows; and in the name of two villages, North and South Cern-ey, which are near it. At Cricklade, 19 or 20 miles south-east from its source, the Churn joins the commonly reputed Isis or Thames, the length of which above the junction is only about 10 or 11 miles.

From Cricklade the river flows 9 or 10 miles east-north-east to Lechlade, receiving on the way the Ray (11 miles long) and the Cole (14 miles long), both on the south bank. Just above Lechlade it receives on the north bank a more important tributary, the Colne (23 miles long) from the Cotswold hills east of Cheltenham; and just below Lechlade it receives the Lech, or Leach (19 miles long), which also rises in the Cotswolds, and gives name to the towns of North Leach and Lechlade. From Lechlade the Thames flows 14 miles eastward to the junction of the Windrush, receiving accessions of small brooks on each side. The Windrush rises in the Cotswolds between Winchcomb and Campden, and has a course of 34 miles by Burford and Witney; it joins the Thames on the north bank. Below the junction of the Windrush the Thames makes a bend to the north and north-east, receiving on the north bank the Evenlode, which rises in the Cotswolds near Moreton in the Marsh, and has a course of 31 miles by Charlbury, and receives the Glyme which flows through Woodstock and Blenheim park. The Thames then turns south, and flows to Oxford, where it joins the Charwell. From the junction of the Windrush to that of the Charwell the length of the Thames is 13 miles. The Charwell rises in the Arbury hills near Daventry in Northamptonshire, and flows southward 44 miles by Banbury: it joins the Thames on the left bank.

From the junction of the Charwell the Thames flows 16 miles south-south-east to the junction of the Thame at Dorchester, making however a considerable bend westward to Abingdon, where it receives the Ock. This river rises at the foot of the chalk hills of Berkshire, between Compton Beauchamp and Ashbury, and flows eastward 18 miles into the Thames, which it joins on the right or south-west bank: the Thame rises near Stewkley in Buckinghamshire, between Winslow and Leighton Buzzard, and flows 39 miles south-west by the town of Thame into the Thames, which it joins on the left or north-east bank. From Dorchester the course of the Thames is south-east 22 miles in a winding channel by Wallingford to the junction of the Kennet near Reading. The Kennet rises near Broad Hinton, a village to the north of Marlborough Downs, flows south to East Kennet, and then turning eastward flows by Marlborough, Hungerford, Newbury, and Reading into the Thames, which it joins on the right bank: its whole course is 53 miles. It receives the Lambourn and the Embourn or Auborn.

From the junction of the Kennet the Thames flows eastward, though in a very winding channel, making first a considerable circuit to the north by Henley, Great Marlow, and Maidenhead to Windsor; and then a considerable circuit to the south by Staines, Chertsey, Kingston, and Richmond to Brentford, from whence it proceeds by Hammersmith, Putney, and Chelsea to the metropolis. The distance from the junction of the Kennet to London-bridge is 70 miles. In this part of its course the Thames receives several feeders. The Loddon, 24 miles long, rises in the chalk downs of North Hants near Basingstoke; the Coln, 38 miles long, rises, under the name of the Ver, in the chalk downs of Hertfordshire, and passes St. Albans, Watford, Rickmansworth, Uxbridge, and Colnbrook; the Wey, 36 miles long, rises near Alton, Hants, passes Farnham, Godalming, and Guildford, and joins the Thames at Weybridge; the Mole, 41 miles long, rises on St. Leonard's Forest, in Sussex, passes through Leatherhead, and joins the Thames at East Moulsey; the Cran and the Brent, two small streams, each about 18 miles long, rise on the borders of Middlesex and Herts, and join the Thames, the first at Isleworth, the second at Brentford; and the Wandle, a stream only 9 miles long, joins it at Wandsworth. Of these the Coln, the Cran, and the Brent fall into the Thames on the left or north bank; the others on the right bank. The name of the Ver appears as an element in the name of Ver-olamium, an antient Roman town close to St. Albans.

Below London, up to which sea-borne vessels ascend, the river flows eastward, but with various 'reaches' or bends, 56 miles to its mouth, or to the Nore Light (at the commonly reputed mouth) 48 miles. Between Deptford and Greenwich, about four miles below London-bridge, the Thames receives on the south or right bank the Ravensbourne, 10 miles long, from Keston, near Bromley in Kent; about two or three miles farther down, on the north or left bank, the Lea, 50 miles long, which rises in Bedfordshire, and passes Luton, Hertford, Ware, and Waltham Abbey: four or five miles lower, the Roding, 38 miles long, from near Dunmow, also on the north bank; and six miles lower, on the south bank, the Darent, 20 miles long, which passes Dartford, and receives the Cray. The only remaining feeder of the Thames which here requires notice is the Medway, above 60 miles long, which rises in Sussex, and flows by Tunbridge, Maidstone, Rochester, and Chatham. The principal arm of the Medway joins the Thames at Sheerness just above the Nore; but the smaller arm, called the Swale, which cuts off the Isle of Sheppy from the mainland of Kent, opens into the Thames just above Whitstable.

The whole course of the Thames, from its source to its mouth, is about 220 miles, which is the aggregate of the distances already given.

	Miles.
Length of the Churn	20
From the junction of the Churn and commonly reputed Thames at Cricklade to Lechlade	9
To the junction of the Windrush . .	14
To the junction of the Charwell . .	13
To the junction of the Thame . .	16
To the junction of the Kennet . .	22
To London-bridge	70
To the mouth	56
	220

The principal affluents of the Thames are more fully described elsewhere: the Colne under GLOUCESTERSHIRE; the Windrush, the Evenlode, the Charwell, and the Thame, under OXFORDSHIRE; the Kennet, the Loddon, and the Ock, under BERKSHIRE; the Colne, the Brent, and the Cran, under MIDDLESEX; the Wey, the Mole, and the Wandle, under SURREY; the Lea with its tributaries, under HERTFORDSHIRE, ESSEX, and MIDDLESEX; the Roding under ESSEX; and the Ravensborne, Darent, Cray, and Medway with its feeders, under KENT. The Thames, in the first part of its course, belongs wholly to Gloucestershire, but below Cricklade is almost entirely a border river, dividing Gloucestershire from Wiltshire, Oxfordshire and Buckinghamshire from Berkshire, Middlesex from Surrey, and Essex from Kent. Some part of its course is therefore described in the articles on those counties.

Commercial Importance.—The navigation of the Thames commences at Lechlade, where the river is about 258 feet above low-water mark at London-bridge. Its importance was early appreciated, and there are acts of Parliament relating to it as early as the 2nd Hen. VI. The Thames and Severn Canal, which follows the valley of the Churn and the Thames from near Cirencester, opens into the Thames at Lechlade, thus connecting it with the Severn and the western coast of the island. The navigation of the river formerly extended up to Cricklade, but since the opening of the canal the upper part, between Cricklade and Lechlade, has been abandoned. None of the tributaries above Oxford are navigable. At Oxford the Oxford Canal joins the Thames, and opens a communication with the great canal system of the central counties: it follows the course of the Charwell (which river is not navigable) from above Banbury. At Abingdon the Wilts and Berks Canal joins the Thames, and, as well as the Kennet and Avon Canal, which joins the Kennet at Newbury (where the navigation of that river commences, 20 miles above its junction with the Thames), opens a communication with the Somersetshire (or Bristol) Avon, and by it with the Severn. The Thame is navigable from the town of Thame, about 17 miles above its junction with the Thames; but neither the Loddon nor the Coln is navigable. The Wey is navigable from Godalming, about 15 miles from its junction; and is connected with the Wey and Arun Canal, and the Basingstoke Canal, the former of which opens a communication with the river Arun and the Sussex coast. No other feeder above London-bridge is navigable; but the Grand Junction Canal, which unites with the Oxford Canal at Braunston in Northamptonshire, opens into the Thames by the mouth of the Brent, the lower part of which is incorporated with the canal. Below London-bridge the Lea, which is navigable, chiefly by artificial cuts, for 25 miles, and has one of its feeders (the Stort) also navigable, opens into the Thames; and just above the Lea, the Regent's Canal, which encircles the north and east side of the metropolis, and communicates with the Paddington Canal, and so with the Grand Junction Canal, also opens into the river.

The Medway is navigable below Rochester bridge for sea-borne vessels, and from Penshurst, above 43 miles from its mouth, for river craft.

The navigation of the Thames, in its upper part, is kept up by locks and wears, the lowest of which is at Teddington, which is consequently the limit of the tide. Teddington is about 18 or 19 miles above London bridge. High-water mark at Teddington is about one foot and a half higher than at London-bridge, and the time of high-water is about two hours later. Low-water surface at Teddington is about sixteen feet and three-quarters higher than at London-bridge.

At ebb-tide there is a depth of from 12 to 13 feet water nearly or quite up to London-bridge, and the rise of the tide is about 17 feet, or at the extreme springs about 22 feet.

Vessels of 800 tons get up to the St. Catherine's Docks, and those of 1400 tons to Blackwall, about six miles below bridge. No river in the world equals the Thames in its commercial importance. The river for some two miles or more below bridge is crowded with vessels, chiefly coasters, steam-boats, and colliers, which moor alongside the quays or in tiers in the stream; others are moored lower down, though not in such numbers; and for larger vessels there are several docks excavated on the bank of the river. There is a dockyard for the navy (now little used) at Deptford, about four miles below London-bridge; one at Woolwich, nine miles below; one at Sheerness, in the Isle of Sheppy, at the junction of the Thames and Medway; and one at Chatham, the most important of the four, on the Medway. The fortifications at Sheerness defend the entrance to both rivers; the passage of the Thames is further protected by Tilbury Fort, and that of the Medway by Gillingham Fort.

The width of the river at London-bridge is nearly 700 feet. For nearly the whole way below London-bridge the river is embanked, and is almost throughout its lower course skirted with marsh-lands, which however have nowhere a great extent. The width of the river at Woolwich is about a quarter of a mile; at Gravesend, 26 miles below London-bridge, and opposite Tilbury Fort, it is more than half a mile; about four miles below Gravesend it is nearly a mile; and then gradually increases to the width of about six miles at the Nore, and to eighteen at the point where we have fixed the mouth.

It is a common opinion that this river in the upper part of its course is properly called Isis, and that it is only below the junction of the Thame that it is called Thames, which name is said to be formed by combining the two names Thame and Isis. But Camden observed long ago that this is a mistake; that the river was antiently called Thames in its upper as well as in its lower part; that the name Isis never occurs in antient records, and was never used by the common people, but only by scholars. Cæsar writes the name Tamesis (evidently Tames or Thames, with the addition of a Latin termination. Tacitus writes it Tamesa, and Dion Cassius Ταμίσα, which is the same name, with the appendage of a different termination. Ptolemy has it 'Ιάμησα, or in some MSS. 'Ιαμισαις, and in some editions 'Ιάμισσα; all which we suspect to be forms of the same name, 'I having been by the carelessness of some early transcriber substituted for T. In Richard of Cirencester it is Thamesis.

(*Ordnance Survey*; M'Culloch's *Statistical Account of he British Empire*; Camden's *Britannia*.)

THAMES, a certain jurisdiction, though not undisputedly exclusive, appears to have been immemorially exercised over both the fisheries and navigation of a large portion of the Thames by the mayor and corporation of London. In early times, when fisheries were probably of much greater importance than they are at present, the same kind of encroachments upon them by private individuals which were so often made the subject of complaint in other parts of the kingdom were also practised in this river. In 1405 an order was issued from Sir John Woodcock, then lord mayor, enjoining the destruction of wears and nets from Staines to the Medway, in consequence of the injury which they did to the fishery and their obstruction of the navigation. By 4 Hen. VII., c. 15 (1487), the mayor of London and his successors were invested with the same authority as conservator of the fish in 'all the issues, breaches, and ground overflown as far as the water ebbeth and floweth from out of the river Thames,' as he had within the river itself. Before the river was artificially embanked and the adjoining lands drained, this extension was probably of considerable importance. During the reign of Elizabeth, in 1584, an order was put forth by the mayor for the purpose of settling the proper times in which various kinds of fish were to be taken. It prohibited fishing in certain parts of the river, and forbade the taking of the white-bait or 'bloodbag.' The right of the corporation however to the conservation of the river about this time was disputed by the lord-high-admiral, and some litigation took place, in which the corporation were uniformly successful. James I. in the third year of his reign granted a charter to the city, in which the immemorial right of the city to the office of bailiff and conservator of the Thames is recited and confirmed. The same rights are also confirmed and settled by various other charters and acts of parliament. The result of them is to vest in the corporation the conservation of the river, the regulation of the port and harbour of London, and, as is said, the actual property in the soil of the river, subject only to the jus regium of the crown. By this is perhaps to be understood, that property with which the crown is held to be invested for the purpose of securing to the public the use of the river for the purposes of navigation, fishing, and other purposes. The portion of the river over which the jurisdiction of the city extended seems to have been always much the same. It is described in the following terms, in an article entitled 'Antient Prescriptive Jurisdictions over the Thames,' by Joseph Fletcher, Esq., in the Quarterly Journal of the Statistical Society of London,' vol. iv., p. 104:—'The charters of James I. here quoted are confirmed in one of the 14th of Charles I. They remain to the present day the great record of the city's rights over the river, and it is as such that they are recited in this statute. The offices of meter and conservator are asserted from Staines to the mouth of the Thames, the commencement of the city's jurisdiction being marked by a stone, with an apocryphal date, called London Stone, placed on the north bank of the river, a short distance above the present bridge of Staines, and its termination on the south shore, by the formerly navigable creek of Yantlet, separating the Isle of Grain from the mainland of Kent, and on the north shore by the village of Leigh, in Essex, placed directly opposite, and close to the lower extremity of Canvey Island. The shore of the Isle of Grain, which separates he mouths of the Thames and Medway, are thus wholly exempt from the city's jurisdiction; notwithstanding that he right of conservancy is still asserted in the waters of he Medway, from the southern mouth of Yantlet Creek, upwards towards Rochester, as far as Cockham Wood, which is on the northern shore, opposite the marshy point below Chatham. At all events, the corporation of Rochester deny the right of the city of London to conservatorial jurisdiction in the Medway below Yantlet Creek, ny more than in the Thames; a limitation which appears o have arisen from this creek having antiently been the ustomary channel of navigation between the two rivers, nd marked the mouths of both. But the passage through his creek being now completely stopped, so that the Isle f Grain is connected by a solid roadway with the parish f Stoke, the mouths of these rivers are properly at the lower extremity of this island, opposite the Nore, and Sheerness, while the city's jurisdiction, more antient than this geographical change, is completely cut by it into two separate portions. About twenty years ago it was attempted by the city officers, under the direction of a court of conservancy, to reunite these portions, by cutting through the bank which prevents the navigation of fishing-boats through Yantlet Creek; but the final decision of the Court of King's Bench, given July 8th, 1825, on the motion for a new trial, was against this proceeding. The conservancy jurisdiction in the Medway extends a distance of only eight miles, but has little more than a nominal existence. In the Thames it extends a distance of eighty miles, over nearly the entire course of that river through the metropolitan valley; and this distance appears to be divided into thirty-four miles of inland navigation from Staines to Vauxhall Bridge, the towing-path ceasing at Putney; three of town thoroughfare, from Vauxhall to London Bridge; and forty-three of seaport, from London Bridge to Yantlet Creek.'

In their character of conservators of the Thames the corporation have the control and regulation of the fisheries, and are empowered to seize prohibited nets, fish, &c. They have also the regulation and control of the watermen and of the shipping. They are entrusted with the cleansing of the river, the removal of obstructions, erection of stairs, licensing mills, and other such duties. The lord mayor, with the recorder and other civic officers, holds in person eight courts of conservancy in the year, two for each of the counties of Middlesex, Surrey, Kent, and Essex, and occasionally a court in London. The greater part of their functions are at the present time intrusted to a committee of the common council, called 'The Thames Navigation and Port of London Committee.' Various acts of parliament saving the jurisdiction of the city of London have been passed for the purpose of preventing and punishing offences committed on the river, and the maintaining of a police and magistrates to administer the law. The latest of these is 3 Wm. IV., c. 19.

(Griffiths' *Conservancy of the River Thames*; Pulling, *On the Laws, &c. of the City and Port of London*; Stow, *Survey of London*.)

THAMMUZ. [Adonis.]

THAMNO'BIA, Mr. Swainson's name for a genus of birds (*Sylvia*, Vieill.) placed by Mr. G. R. Gray in his subfamily *Saxicolinæ*, of his family *Luscinidæ*.

THAMNOPHILI'NÆ, a subfamily of Shrikes.

THAMNO'PHILUS, Vieillot's name for a genus of Shrikes.

THAMNO'SIA. [Sea Weeds.]

THANE, in Anglo-Saxon *Thegn*, from *thegnian*, or *thenian*, 'to serve,' the same word with the modern German *dienen*, is frequently, in conformity with this origin, translated *minister* in the Latin charters of the Anglo-Saxon period. In other cases its equivalent is *miles*, or *fidelis miles*. So king Alfred, in his translation of Bede's 'Ecclesiastical History,' renders the king's minister, the king's thane, and uses thane wherever Bede has *miles*. In this general sense it may be considered as nearly the same with the Norman term liege or liegeman; and so it seems to have been sometimes used. The exact meaning of the term when employed as a title of honour is involved in considerable obscurity: the rank or dignity which it denoted was possibly not the same at different times, and there were also thanes of more than one kind. The king's thanes, in particular, are distinguished from the *medeme* (in Latin *mediocres*), or inferior thanes, who are otherwise designated the thanes of aldermen (the highest order of the Saxon nobility), earls, and other thanes, and who appear to have been very numerous. After the Conquest thanes (*thaini* or *taini*) are frequently classed with barons (barones): in the laws of Henry I., the two words are apparently used as synonymous; and where the Saxon Chronicler has thanes (*thegenas*), the Latin annalists have commonly *barones*. These were, of course, the superior or king's thanes. The class of common or inferior thanes, again, seems to have answered nearly to that of the barones minores, or landed gentry. One of the few things that are tolerably certain with regard to the rank of a thane is, that it implied the possession of a certain amount of landed property. Such a qualification indeed seems in certain circumstances to have conferred the dignity of thane. One of the laws of Athelstane declares that if a ceorl (or commoner) shall have obtained five hides of land in full property, with a church, a kitchen, a bell-house, a burghate seat (or office of magistrate in a burgh), and a station in the king's hall (the meaning of which last expression is doubtful), he shall henceforth be a thane by right. Five hides of land was probably the amount demanded even for a thane of the highest order; although it appears from Domesday-Book that this was also the quantity which made the owner a miles, or liable to be called out on the king's military service. Many lands are mentioned in Domesday-Book as thane-lands (terræ tainorum); and it is probable that the dignity, like the oldest of the Norman baronies, was sometimes attached to a particular estate. Thanes were among the members of the Saxon Witenagemot, or parliament, but it is matter of dispute whether they sat in their own right or as elected representatives. The principal facts connected with this dignity in England have been collected by Mr. Sharon Turner, in his 'History of the Anglo-Saxons,' 8vo., London, 1823, vol. iii., pp. 81, 187-206, 227-231; and by Sir Francis Palgrave, in his 'Rise and Progress of the English Commonwealth,' 4to., 1832, i., 15, 577-579; and ii., ccclxxvi.-ccclxxxvi.

There is little mention of the thanes in England after the time of Henry II.; but Lord Hailes has shown (*Annals*, i. 28) that in Scotland thane was a recognised title down to the end of the fifteenth century: the 'Chartulary of Moray' mentions a thane of Cawdor in 1492. It appears from the first to have implied in Scotland a higher dignity than in England, and to have been for the most part synonymous with earl, which was a title generally annexed to the territory of a whole county. It has been commonly assumed that thane is the more antient title, and that it began to be exchanged for earl in the reign of Malcolm Canmore; but, according to Pinkerton (*History of the House of Stuart*, i. 161), the title of thane was not introduced into Scotland till after the time of Malcolm. 'Yet,' he adds, 'the difference between a thane and baron is unknown; and some doubts arise that ignorance may have blended the Saxon *thane* and the Irish *tanist*.'

THANET, ISLE OF. [KENT.]

THANN. [RHIN, HAUT.]

THA'PSACUS, or THA'PSACUM, was a very antient, populous, and commercial town in Syria, on the right bank of the Euphrates, about 24 miles west of the junction of the river Chaboras (the Araxes of Xenophon) with the Euphrates. Thapsacus, the Thiphsach of the Bible (1 *Kings*, iv. 24), the Taphsa of the Vulgate, and the Thapsa of Josephus (*Antiq.*, ix. 11), was the most eastern town of the kingdom of Solomon after David had conquered the country as far as the Euphrates. At an equal distance from Tyr by land and from Babylon by water, Thapsacus became an emporium, where the Gerrhaei kept stores of the commodities and spices of Arabia, which they carried there on floats, or probably barks, and which were afterwards transported by land to Syria and Phœnicia and their commercial towns on the Mediterranean. (Strabo, xvi., p. 766, Cas.) Its military position was also of great importance. At the time of the expedition of the younger Cyrus (B.C. 401), there was a ford at Thapsacus, but no bridge; subsequently there was a bridge. This town was the most southern passage by which an army could penetrate, either from Mesopotamia into Syria and Cilicia, or from these countries into Mesopotamia and Persia, without being obliged to traverse the deserts of Arabia, which occupy the whole tract between Palestine and Phœnicia in the west and the lower part of the Euphrates in the east. The younger Cyrus crossed the Euphrates at Thapsacus (Xenophon, *Cyropæd.*, i. 4); Darius also crossed the river at Thapsacus when he was advancing against Alexander in Cilicia; and Alexander, when he was pursuing Darius into Assyria. (Arrian, 2, 13; 3, 7.) In the age of Strabo the bridge at Thapsacus existed no longer, and the passage of the river was made by the bridge at Commagena. (Strabo, p. 747, Cas.) The circumstance of Thapsacus being a town from which military and commercial roads run in every direction, was probably the cause why Eratosthenes chose it as the centre of his geographical measurements in Asia Minor and the adjacent countries, of which Strabo gives an account (ii., p. 77-91, Cas.). It has been said that the antients did not agree on the situation of Thapsacus, Ptolemy (v. 19) putting it in Arabia Deserta, and Pliny (*Hist. Nat.*, v. 24) and Stephanus Byzantinus and Q. Curtius (x. 1) in Syria. But the town was too well known to allow any such doubts, and the only fact which follows from these different statements is that the antient geographers did not exactly agree as to the frontiers of Syria and Arabia Deserta which joined near Thapsacus. Pliny says that in his time this town was called Amphipolis, but this is very doubtful; nor is it true that Seleucus Nicator founded Thapsacus; he perhaps rebuilt it or adorned it with new buildings. According to Stephanus, the Syrians called it Turmeda; and D'Anville states that there is now a small town on the site of Thapsacus, which has the Arabic name of 'El-der,' or 'the door,' in the Lingua Franca 'Porta Catena.'

(D'Anville, *Géographie Ancienne*, vol. ii., 141; Cellarius, *Notitiae Orbis Antiqui*, vol. ii., p. 367, 368.)

THA'PSIA, the name of a genus of plants belonging to the natural order Umbelliferæ. The species are perennial herbs, with doubly or trebly pinnate leaves, large compound umbels of many rays without involucra or involucella, and yellow flowers. The margin of the calyx is 5-toothed; petals elliptic, entire; fruit compressed from the back; mericarps with 5 primary filiform ribs, 3 of which are dorsal, and 2 lateral ones in the commissure, and with 4 secondary ribs, of which the 2 dorsal are filiform and the 2 lateral ones membranous and winged; vittæ in each furrow underneath the secondary ribs.

The species are mostly natives of the countries of the Mediterranean, and are known under the generic name Deadly Carrot.

T. villosa, Velvety Deadly Carrot, has a square glabrous stem; tri-pinnate leaves, many-parted leaflets, villous on both surfaces, lower ones deflexed. This plant is found in Portugal, Spain, the south of France, in Italy, and the northern coasts of Africa. Poiret states that when fresh the root is acrid and corrosive. In Barbary it is used as a remedy for some forms of cutaneous disease, but it appears to be a severe application and attended with inflammation and vesication of the skin.

T. silphium, Silphium Deadly Carrot, has a square glabrous furrowed stem; pinnate leaves, many-parted leaflets, all linear, hairy on both surfaces, with revolute margins. It is a native of the north of Africa, on the mountains of Cyrenaica, and is supposed to be the plant that produced the juice called *Silphium*, and which was held in so high repute by the antients, that a district where it grew in abundance was called 'Silphifera.' [SILPHIUM.]

T. Garganica, Garganian or Greek Deadly Carrot, has a square glabrous stem; bi- or tri-pinnate shining leaves, segments linear, acute, elongated, quite entire along the margins; involucre with few leaves; fruit cordate at the base. This plant is a native of Calabria, Mauritania, Greece, Sicily, Sardinia, Spain, &c. Dr. Sibthorp found it common in Greece and the neighbouring islands, and concludes that it is the *θάψια* of Dioscorides, with whose description it agrees better than any of the rest. It is one of the most stately plants of the family, and was introduced into the gardens of this country as early as 1680. There are seven other species of this genus referred to by Don; they possess the active properties of the above, but are seldom employed at the present day.

In their cultivation the species of Thapsia require but little care, as they will grow in any common garden soil. They may be propagated by seeds, which should be sown in autumn as soon as they are ripe.

THASOS (Θάσος), now Thaso, or Tasso, an island situated off the coast of Thrace, at a short distance from the mouth of the river Nestus or Karasou, and a little to the south-east of the Gulf of Kavallo. Volgaro, which is nearly in the centre of the island, is in 41° 45′ N. lat. and 24° 40′ E. long.

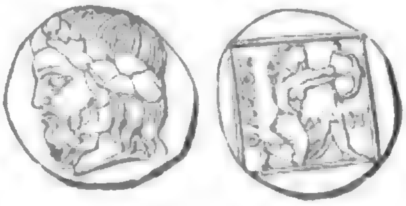
Five generations before the time of the Grecian Hercules, Thasos was peopled by Phœnicians, who came from Tyre in quest of Europa, led by Thasos, son of Agenor, from whom the island is said to have taken its name. (Herod., ii. 44; Pausan., v. 25.) It was also called Aeria and Æthria (Pliny, iv. 12); and Chryse, from its gold mines (Eustath., *Ad Dionys. Perieget.*, 517), and it is also distinguished by the epithet Ogygia. It was afterwards colonized by settlers from Paros (Thucyd., iv. 104), among whom was Archilochus the poet, in 708 or 720 B.C. (Clinton, *Fasti Hellen.*, a. 708, who does not decide the question.) Thasos was enriched in very early times by the possession of gold-mines in the island, and at Scapte Hyle, on the opposite coast of Thrace. According to Herodotus, who visited them, the most considerable were those which had been worked by the Phœnicians on the north-east side of the island, the excavations for which were very evident (vi. 47). Herodotus further states that from the proceeds of these mines, and of their continental territory, which must have extended for some distance along the Thracian coast, there accrued to the Thasians in his time from 200 to 300 talents yearly, of which sum the mines in Scapte Hyle produced 80 talents, and those in the island rather less. (See the remarks on this passage in Boeckh, *Public Œcon. of Athens*, ii. 21, Lewis's translat., who assigns the probable sources of the remainder of this revenue.)

Being unencumbered with any taxes on the produce of their lands, the Thasians were at this time very rich. About B.C. 492 they were besieged by Histiæus of Miletus for a short time, and employed their wealth in consequence in building ships of war and strengthening their fortifications. Their independence and growing power excited the jealousy of Persia: they were reduced by Mardonius; and shortly afterwards, B.C. 491, being suspected of meditating revolt, they were compelled by Darius to throw down their walls and surrender their ships of war. (Herodotus, vi. 46.) On the expedition of Xerxes into Greece, the burthensome honour of receiving his army in their continental territory was imposed upon them, and on this entertainment they expended 400 talents of silver. (Herodot., vii. 118.) After the Persian war they became subject to Athens, and having a dispute with that state about their Thracian possessions, revolted, B.C. 465. (Thucy., i. 100.) Cimon, after defeating them at sea, besieged their island, and took it in the third year of the siege, B.C. 463. The Thasians were compelled to destroy their fortifications, to surrender their ships, to pay a large sum of money at the time and tribute for the future, and to give up their mines and settlements on the continent, among which must have been Stryme (Herod., vii. 108), Galepsus and Œsyme (Thucy., iv. 107), and Datos (Eustat., *Ad Diony.*, 517).

On the ascendency of the party of Pisander at Athens at the close of the Peloponnesian war, Diotrephes was sent by him to Thasos, and established an oligarchy there. This injudicious policy furnished an immediate opportunity of revolting from Athens; the Thasians fortified their city, and communicating with an exiled party, called in the Spartans, B.C. 411. (Thucy., viii. 64.) Much internal dissension ensued; the Spartan harmost Eteonicus and his party were expelled shortly afterwards, and the island, reduced by famine and civil war, was finally restored to the Athenians by Thrasybulus, B.C. 407 (Xenophon, *Hellen.*, 1-4), with the assistance of a party of the inhabitants under Ecphantus (see Demosthenes, *Lept.*, 474, 25, Reiske, who further states that these Thasians received in reward from the Athenians exemption from taxes). Subsequently the Thasians appear to have regained some of their continental possessions, and B.C. 359 they fortified Crenides, probably as a frontier post for their Thracian territory: this was seized by Philip, son of Amyntas, king of Macedon, who placed a number of Macedonian settlers in it, and gave it the name Philippi; under his management its gold-mines were made much more productive than before. Little more mention of the Thasians occurs in antient history. When attacked by Philip V., king of Macedon, they submitted to him, with the stipulation that they should retain their own laws and be exempt from garrison, tribute, or other burthens, B.C. 202 (Polyb., xv. 24). They were shortly afterwards released from his rule by the Romans, B.C. 197. (Polyb., xviii. 31.) Under the emperors Thasos is styled Libera, or a free state. In the Synecdemus of Hierocles it forms part of the Provincia Illyrica I., and is placed by Constantine Porphyrogennetus in the Præfecture, and afterwards in the Theme of Thrace. ('De Them. II., Them I.,' Bandur., *Antiqui. Constantin.*)

Thasos was celebrated among the antients for its marble (Seneca, *Epist.*, 86), its wine (Virg., *Georg.*, ii. 91; Athenæus, i. 51), which was exported to the Pontus Euxinus, and for other productions mentioned by Athenæus.

The coins of Thasos are very numerous. The silver coins may be generally arranged under three classes: 1 those on which the type is a satyr carrying off a nymph; the execution of these is very archaic; the limbs have a knotty, the hair a globular appearance. But this peculiarity of treatment gradually disappears in the improved art of the later specimens. To this archaic class also belong some coins on which are two fish; 2, are a number of massive coins in a good but rather heavy style, with a head of Bacchus on the obverse, and Hercules kneeling, shooting an arrow on the reverse. The Thasians had a colossal statue of Hercules at Olympia, holding in one hand a bow. They originally worshipped the Tyrian Hercules, and afterwards the Grecian (Pausan., v. 25); 3, the broad tetradrachms of the Macedonian period, with the head of the young Bacchus, and Hercules on the reverse: the inscription ΗΡΑΚΛΗΣ ΣΩΤΗΡ. These coins are abundant, and many of them with letters and type ill executed are found in Transylvania, and were probably the work of barbarous Thracians in imitation of the originals. The head of Ceres occurs on these coins (Dionysius Perieg., 523, calls Thasos Δημήτερος ἀκτή, the shore of Demeter or Ceres). The inscription ΘΑΣΙΩΝ ΗΠΕΙΡΟ on a gold coin implies, according to Eckhel (*Doct. Vet. Num.*, 'Thasos'), that it was coined from a continental mine, probably Crenides, which would account for the identity of its design with that of a coin of Philippi, on the supposition that a Thasian type was retained by the Macedonians, when they occupied that settlement. No imperial coins are ascribed to this place in Mionnet, except those of Hadrian, Caracalla, and Geta. The type of Perseus mentioned by Pollux (*Onomast.*, ix. 6) has not been discovered on any Thasian coin.



Coin of Thasos.

British Museum. Actual size. Silver. Weight, $117\frac{3}{16}$ grs.

The antient town of Thasos is situated on the North coast of the island, and occupies three eminences. On the site are remains of the Greek walls, mingled in picturesque confusion with towers built by the Venetians during their occupation of the island after the taking of Constantinople by the Latins, and overgrown with various timber. Near it is a large statue of Pan in a niche in the rock, and upwards of 50 sarcophagi of white marble. Some inscriptions found in the island are given by Boeckh (*Corpus Inscript.*, ii. 183). The longest, No. 2161, is written in the Ionic dialect, and speaks of the theori and hieromnemon of the place. The antient harbour appears to have been used by the Venetians. No remains of Ænyra and Cœnyra, and of the gold-mines situated between them on the east coast, according to Herodotus, now exist.

Thasos is about 40 Italian miles in circumference. (Carpacchi, *Isole del Mondo*.) Its greatest length is from north to south. In the northern and highest part of the island three peaks extend in a north-west and south-east direction. The inhabitants, amounting to 5000 or 6000, are all Greeks, and live in nine villages, Volgaro, Cassawith, Sotiro, Kaikarahi, Moriess, Kastro, Potamia, Liman, or Panagia, and Theolog, the largest situated nearly in the centre of the island. These contain in all 1020 houses. The chief produce of this fertile country is oil, maize, honey, timber; the last grows in great abundance and in picturesque variety everywhere, particularly on the southern and western sides, and forms the chief article of export; much of it was used for shipbuilding by Mehemet Ali, by permission of the Porte, and much is wasted by the inhabitants in the fires kindled for clearing the land; the plane-trees in particular are of great size. Little wine is made here, and some is imported from Tenedos; the principal food of the inhabitants is maize. Large herds of cattle and flocks of sheep are kept in the island: asses and mules are more used than horses on account of the steepness of the roads. The inhabitants are hospitable, industrious, and simple in their manners. They are governed by a Turkish Aga, whom they expelled during the late Greek revolution, but whom they speedily restored. They suffer from the invasions of pirates, to whom they pay a tribute.

(*Denkwürdigkeiten aus dem Orient, von Prokesh von Osten*, Stuttgart, 1837, iii., pp. 611-32; Cousinery, *Voyage dans la Macédoine*, ii. 85, p. 108.) For the antient history of Thasos, besides the authorities already quoted, see Raoul Rochette, *Histoire des Colonies Grecques*, iii. 226.

THATCH is a covering of straw, rushes, or reeds, as a substitute for tiles or slates for houses, barns, and principally for sheds for cattle. The increase of agricultural produce on a farm makes the stacking of corn out-of-doors a matter of necessity as well as convenience. The temporary thatching of these stacks, as well as of hay-ricks, has made it necessary that some of the regular servants of the farm should be capable of thatching in a neat and substantial manner, that there may be no delay from want of a regular thatcher. We will first describe the mode of thatching hay-ricks and corn-stacks, as the simplest.

The rick or stack having been formed into a proper shape, either with a roof slanting from a ridge, or conical, ending in a central point, the straw is prepared by moistening it, that it may more easily bend without breaking. It is then forked up in a loose heap, the straws lying in every direction, and somewhat matted. Portions are now drawn out from this heap in handfuls, which lays the straws again in a more parallel order: these are placed in a forked stick, which will hold several of these bundles or handfuls, and are thus carried to the thatcher on the top of the rick or stack. He seizes a handful, and bending one end into a kind of a noose, he inserts this into the hay or straw near the bottom of the roof, at one end if it be a square roof, or at any convenient part if it be a round one. He presses down the straw which he has thus inserted to about half its length, in order to form the eaves, which extend a little beyond the lower part of the roof. When he has thus laid several handfuls side by side so as to cover about a yard in width, that is as far as he can conveniently reach without moving his ladder, he begins another row a little above the place where he began, so that the lower end of the straw now inserted may cover the upper part of the first row, as tiles do each other. Thus he proceeds upwards till he comes to the upper ridge of the roof, or to the point of the cone in a round stack. In the latter case the covering diminishes to a point so as to form a triangle. The ladder is now shifted a yard to one side, and the same operation is performed, care being taken that each fresh handful put on shall be interwoven with that which lies beside it, so that no water can possibly pass between them. Thus the work proceeds till the roof is completed, and it only remains to secure the upper ridge in a square stack, or the point of the cone in a round one. In the first case the highest layer of straw is made to extend beyond the ridge on both sides, and the ends are brought together and stand up like the bristles on a hog. A rope of straw has been prepared, and many small rods, about two feet long, and cut sharp at the point: these are inserted just below the ridge, in a line with it, and about a foot apart; one end of the straw rope is inserted into the stack, and twisted firmly round the projecting end of the first rod; it is then wound once round the next rod, and so on the whole length of the ridge: this is done on both sides. The straws which form the ridge are now cut with shears horizontally, to give it a neat finish, and at each end a kind of ornament is usually made by winding a straw rope round a handful of the projecting straw, forming a kind of knot or bow, according to the taste of the thatcher. Rods and straw ropes twisted round them are inserted near the edge of the slanting side and all along the eaves, which prevent the wind from blowing off the thatch.

The only difference in the thatch of a round rick is, that it is brought to one point, where it is tied with straw rope wound round it, and formed into a kind of bow; the rods are inserted a little below in a circle, and a straw rope twisted round them, and likewise around the circular eaves. Barley is generally put into square stacks, and wheat in round ones. When the outside is neatly trimmed and cut smooth, so that no birds can lodge in it, wheat may be kept for years, without danger of injury or loss, much better than in a barn, or even in a granary.

In thatching sheds and buildings which are to last many years, the straw is prepared in the same manner, but the ends of the handfuls, as they are put on a lathed roof, are kept down by means of long rods, which are tied to the laths of the roof by means of strong tar twine. A much thicker coat of straw is put on; and rye-straw, which has a solid stem, is preferred, as more lasting, and less liable to be filled with water than hollow straw. Instead of straw ropes, split willow is used, and the rods which are inserted are much nearer each other and more carefully secured. As this kind of thatching is a peculiar trade, it requires a regular apprenticeship to be master of it. The thatching of temporary ricks may be done from mere description, and a very little practice will enable any one to protect his stacks sufficiently by a thatched covering.

Thatching is usually paid by the square of 100 square feet. The thatcher takes a line and throws it over the stack; if it is square, the ends are pushed under the eaves on each side, to allow for the trimming, &c., and this length is multiplied by the length of the eaves, with the same allowance at the ends. The price varies from 2*s.* to 7*s.* or 8*s.* per square, according to the work. Round stacks are measured by taking the circumference at the eaves, multiplied by one-third of the slant of the cone, with a similar allowance.

THAUMA'NTIAS. [Pulmograda, vol. xix., p. 122.]

THAUMA'SIA. [Sea-Weeds.]

THAXTED. [Essex.]

THEA, a genus of plants of the tribe Camellieæ and natural family of Ternströmiaceæ, which has been so named from the slightly altered Chinese name of the dried herb which now forms the almost universal beverage of the British Isles. Though now so extensively employed, the introduction of tea into Europe is of comparatively recent origin. Macpherson, in his 'History of European Commerce with India,' states that 'tea (sah) is mentioned as the usual beverage of the Chinese by Soliman, an Arabian merchant, who wrote an account of his travels in the East about the year A.D. 850;' and that he had been unable to find any mention of it prior to the times of the Jesuit Missionaries, who entered China and Japan a little before the middle of the sixteenth century. Anderson, in his 'History of Commerce,' vol. ii., p. 178, quotes Botero as giving the earliest account in 1590, when he says that 'they,' that is, the Chinese, 'have also an herb, out of which they press a delicate juice, which serves them as drink instead of wine.' Texeira, a native of Portugal, about the year 1600, saw the dried leaves of tea at Malacca, and Olearius found them used in 1633 by the Persians, who obtained them from China by means of the Usbeck Tartars. Tulpius, in his *Observ. Medicæ*, 1641, celebrates the virtues of thea. Anderson says that no mention is as yet made (1660), in the new book of rates, of tea, coffee, or chocolate, though they are all mentioned in an act of parliament of the same year, whereby a duty of eight-pence is charged on every gallon of chocolate, sherbet, and tea made for sale. But the use of it at that time must have been new, for Pepys in his 'Diary,' writes, September 25, 1661, 'I sent for a cup of tea (a Chinese drink), of which I had never drank before.' The Dutch East India Company probably first introduced it into Europe, and from Amsterdam it was brought to London. In the year 1662 King Charles II. married a princess of Portugal, whence, Waller says, 'the best of queens and best of plants we owe to that bold nation,' &c. But tea must have continued to be brought in small quantities only, for in the year 1664 the East India Company purchased, for the purpose of presenting to the king, two pounds and two ounces of tea, and in the year 1678 they imported 4713 pounds of tea, which was then for the first time thought worth their attention as a branch of their trade. (Macpherson, p. 131.)

Tea must have been used in China from very early times. It is differently named in different parts of China, as tcha, or cha, also tha, whence we have tsia, the, and tea. In Persian works in use in India, tea is called cha-khutai, or tea of Cathay.

The genus Thea is characterised by having a calyx which is persistent, without bracts, five-leaved, leaflets imbricated, the outer ones smaller. Petals of the corol 6 to 9, hypogynous, imbricated, the inner ones the largest, all adhering together at the base. Stamens numerous, in several rows, adhering to the bottom of the petals; filaments filiform, anthers incumbent, 2-celled, oblong, with a thickish connectivum, cells opening longitudinally. Ovary free, 3-celled. Ovules 4 in each cell, inserted alternately into the central angle, the upper ones ascending, the lower pendulous. Style trifid, stigmas 3, acute. Capsule spheroidal, two to three lobed, three or by abortion 2-celled, with loculicidal dehiscence, or with the dissepiments formed from the turned-in edges of the valves. Seeds solitary or rarely two, in cells, shell-like testa, marked with the ventral umbilicus. Cotyledons thick, fleshy, oily. No albumen. Radicle very short, very near the umbilicus, centripetal.

The genus Camellia is usually considered to be very distinct from Thea; indeed by Cambessedes the two are separated from each other by several intervening genera: they are however too closely allied to allow of this separation. Distinctions have been made in the fruit of the two genera. That of Thea is three-lobed with obtuse corners and opening along the middle of the lobes, that is, having the dissepiments opposite to the valves, or, as expressed by modern botanists, having a loculicidal dehiscence. Camellia, on the contrary, is described as having its fruit obscurely triangular, without any tendency to become deeply three-lobed, with the margins of the valves turned inwards and forming the dissepiments, which thus alternate with the valves, and have what is now called a septicedal dehiscence. Mr. Griffith, on the contrary, who is well qualified to form a correct opinion, states, from examination of the Assamese tea-plant and of two species of Camellia from the Khosiya Hills, that there is no difference between Thea and Camellia. The dehiscence in both, he says, is of the same nature, that is, loculicidal, and the only difference that does really exist is simply of specific value, consisting in the fruits of the tea-plant being three-lobed, of the Camellia triangular.

The species of the genus Thea are few in number; some botanists are of opinion that even these are varieties of a single species. Before proceeding to discuss the question of the species which yield the teas of commerce, it is desirable to notice those which are usually described as distinct in systematic works.

T. viridis is a large, strong-growing, almost hardy plant, with spreading branches, its leaves three to five inches long, thin, almost membranous, very broadly lanceolate, light green and wavy, with large and irregular serratures, the flowers large, usually solitary, mostly confined to the upper axil, with 5 sepals and from 5 to 7 petals; fruit nodding. This species is figured by Dr. Lettsom in his account of the tea-plant, t. 1, and by Dr. (now Sir W.) Hooker, *Bot. Mag.*, t. 3148, and in Loddiges' *Bot. Cab.*, t. 227, all from plants which have flowered in this country. Kæmpfer supplies a very good figure, *Amœn. Exot.*, p. 607, from a Japanese plant. This species is found both in China and Japan, and is supposed to be the species which yields the green tea of commerce. It has been long introduced into this country; having been first sent from Japan in 1687 to the Cape of Good Hope, and thence into Europe. Lettsom, in 1772, states that within these few years a few genuine tea-plants had been introduced into England, that the largest tea-plant was then at Kew, and the first that ever flowered was at Sion House, but the seeds never germinated. Murray, *App. Medicam.* iv., p. 227, mentions that the green tea-plant was, in 1778, sold in London for ten shillings and sixpence, but the black or bohea tea-plant for one guinea. The green tea-plants are much more hardy than the black in this climate, being kept out in the open air with little protection during the winter, as at Kew, at Messrs. Loddiges, and even as far north as Forfar.

T. Bohea is a smaller plant than *T. viridis:* its branches are stiff and straight, its stem erect, the leaves not above half or two-thirds of the size of the former species, elliptical oblong, perfectly flat, more coriaceous, of a dark green colour, with small and even serratures; they are numerous, and have in their axils two or three flowers, of 5 sepals and 5 petals, these are smaller and have a slight fragrance, and flower later in the season than T. viridis. The plant is much more tender than the green tea-plant, and unable to stand the cold of an English climate. It is supposed by some to yield the leaves which are converted into black tea, and, notwithstanding contrary statements, leaves similar to those of this plant may be recognised on infusing and spreading out the leaves of some of the black teas of commerce. A variety of this is sometimes called *T. stricta.* It is figured by Lettsom, ed. 2, p. 41, who considers it only a variety of the former. It is also figured by Loddiges, *Bot. Cab.*, t. 226, who, as well as Sir W. Hooker and Dr. Royle, considers it to be a distinct species.

The Assam tea-plant, which has lately attracted so much attention, seems to partake of the characters of both the foregoing. The Calcutta Tea Committee say, in 1835, 'We are now enabled to state with certainty, that not only is it a genuine tea, but that no doubt can be entertained of its being the identical tea of China, which is the exclusive source of all the varieties and shades of the tea of commerce.' To this it may replied, that there are considerable doubts whether the teas of commerce are all derived from one species of plant. Mr. Griffith says, in the size both of the plant and of the leaves, as well as in the texture of these last, and in its stations, the Assamese plant approaches to the green tea-plant of China; in its geographical distribution, so far as latitude is concerned, it approaches to the black tea. The inflorescence of the Assamese plant varies, but perhaps its usual state is to have the flowers solitary in the axils of the leaves, but the number of flowers varies from one to five. The plants introduced into this country have their leaves much larger and thicker than those of the green tea-plant, and Messrs. Loddiges find that it requires a much greater degree of heat, in fact that of the hot-house, while the others are in the open air for a great part of the year.

Two other species, described by Loureiro, are little known, as *T. Cochinchinensis*, about eight feet high, having lanceolate leaves, flowers of 3 to 5 sepals and 5 petals, solitary, terminal; found wild in the north of Cochinchina, where it is also cultivated, being used medicinally by the natives as a diaphoretic. *T. oleosa* is also a shrub of eight feet high, found in the fields in the neighbourhood of Canton, and named from its seeds yielding a large quantity of oil, which is used for burning and as an article of diet. The leaves are lanceolate, the flowers of 6 sepals and 6 petals, peduncles 3-flowered axillary; fruit stated to be indehiscent, rather a berry than a capsule.

The species of Camellia, which are so closely allied to those of Thea, have already been mentioned under CAMELLIA, as *C. Japonica, maliflora, reticulata. C. Sasanqua*, and *Euryoides* are other Chinese species. *C. drupifera* is a native of Cochinchina; while C. Kissi and Caudata, with oleæfolia and Scottiana, two doubtful species, are found in the mountains near Munnipore, Pundua, and Silhet, and in those surrounding the valley of Nepaul. A third genuine species occurs on the Naga range, towards the eastern extremity of the valley of Assam. It is well known to the Assamese and Singphos by the name of Bun Fullup, or jungle tea, being used by them as a medicine. A fourth species was found by Dr. Wallich about Tingrei.

Besides the characters of the several species of Thea, we have to notice the parts of the country where the cultivated species are found, as many practical questions of considerable importance are connected with the subject. But here it is difficult to be precise in our statements, because we are without positive information from the tea districts of China, and also because it is still doubtful whether one or more species yield the teas of commerce in permanent varieties, or whether the differences in teas are owing solely to differences in manufacture. Tea is cultivated in China over a great extent of territory. Dr. Wallich mentions it as being cultivated in Cochin China, in 17° N. lat. We know it is cultivated in the southern provinces of Yunnan and of Canton. If we proceed north we find the principal cultivation of teas for the foreign trade is between 27° and 31° N. lat.: but tea is said to be produced in several places to the northward of 31°; even in 36°, and also in the Japanese Islands, which extend from 30° to 41° N. lat. It has been disputed whether the tea-plant is cultivated in plains or mountainous situations. It is generally stated to be cultivated in hilly situations. Grozier states that the songlo-tcha (our green tea) takes its name from the mountain Song-lo, situated in the province of Kiangnan, in 30° N. lat., while the bou-y tcha (bohea) takes its name also from a mountain called Bou-y, situated in the province of Fo-kien. Mr. Cunningham (when Chusan had formerly a British factory) collected specimens on the tops of mountains, where the tea-plant flourished along with pines. His specimens are still in the British Museum. The deputation sent into Assam to examine the sites of the tea, saw it growing in the valley of Assam, and were thus led to think that it must grow in similar situations in China: but even in Assam it is also found on hills; and there is no doubt it is found in both situations in China, and in many which must be moist. There is nothing improbable in a plant being so found which is so extensively diffused from north to south; but it is probable that the finest varieties of tea are cultivated in the drier soils, and in situations exposed to light and air: in fact, the Chinese tea-makers in Assam state that in China the teas from the sunny tracts are the best. Some soils in which the tea-plant is cultivated in China yielded, on analysis, in 200 parts—of silex, 135; alumina, 36; carbonate of magnesia, 6; carbonate of lime, 4; oxide of iron, 13; roots and fibres of plants, 2; water of absorption, 4. Dr. Abel thought that the débris of granitic rocks would yield a fitting soil, and that the Cape of Good Hope would afford a suitable climate. The climate varies, no doubt, to a considerable extent in different parts of China, being warm in the southern and cold in the northern provinces. Snow is said to lie upon the ground for days together upon the green teas, and the green tea-plant is in this country able to bear a greater degree of cold than the black, which, in China, seems to be confined to the more southern provinces; but even in the Fokien hills M. Callery has mentioned to the writer of this article that he has walked on snow in the midst of the tea-plants. The culture of the tea-plant in China seems simple enough: the plants are raised from seeds, sown in the places where they are to remain. Several are dropped into holes four or five inches deep and three or four feet apart, shortly after they ripen; or in November and December, as they do not preserve well, from their oiliness. The plants rise up in a cluster when the rain comes on, and require little further care, except that of removing weeds, till they are three years old, when they yield their first crop of leaves. They are seldom transplanted, but sometimes four to six plants are put close together, so as to form a fine bush. After growing seven or ten years they are cut down, in order that the numerous young shoots which then spring out may afford a more abundant supply of leaves. In some districts the bushes grow unrestrained, in others they are regularly pruned, to keep them low. The gathering of the leaves is performed with great care: they are usually gathered singly, first in March or May (according to the district), when the young leaves are scarcely expanded; the second about two months later, or May and June; and the third in August, or about six weeks after the second; but the times necessarily differ in different districts, as well as the number of crops which are obtained, some avoiding the third, for fear of injuring the bushes. When the leaves are gathered they are dried in houses which contain small furnaces, on each of which there is a flat iron pan, and upon this, when heated, the leaves, partially dried by exposure to the sun, are thrown; the leaves require frequent shifting and turning. When all are properly dried, they are quickly removed either by the hand or with a shovel, and either thrown upon a mat or into baskets which are kept ready to receive them. They are then removed to a table where they are rolled and cooled, and the process is repeated; after which they are sifted and sorted into several varieties. The process has been very minutely described as practised in Assam and Java by the Chinese tea-makers. We may therefore refer to the accounts published by Mr. Bruce, as well as to those of the superintendent in Java, translated by Dr. Horsfield.

The most difficult part of this question is to determine whether the green and black teas are produced by one or two distinct species of plants, as the statements of apparently equally well qualified judges are not only contradictory, but directly the reverse of each other. The difficulty is owing to no competent person having visited the tea districts of China, and also to the Chinese in the neighbourhood of Canton being able to prepare a tea which can be coloured and made up to imitate various qualities of green tea, and large quantities are thus yearly made up. The Chinese tea-makers in Assam and those in Java alike state that the black and green teas may be prepared from the same plant. But as there are plants of the genus Thea, of which the leaves resemble some of the black and green teas of commerce, and as these differ very considerably from each other in their powers of resisting cold, and as there are green tea and black tea districts (the former to the north of the latter), it seems probable that different plants are preferred for preparing the finer qualities of these different teas. Whether these plants are one species or well-established varieties can only be determined by botanists who have an opportunity of visiting China, or by experiments made in the tea nurseries of Assam and of the Himalayas, by sowing the seeds of each kind in different soils, aspects, and elevations, and comparing the plants which are produced with one another.

Tea having become so extensive an article of commerce, and a source of considerable revenue, various attempts have been made to introduce it into other countries, but the climates are very different in which the several experiments have been made, as in Rio Janeiro and the warm part of Brazil, and latterly in the hilly parts of Java and Brazil, in Penang, Assam, and the Himalayas. Dr. Abel recommended the Cape of Good Hope. It is requisite to have not only a suitable soil and climate, but also cheap and abundant labour. Many have been of opinion that tea could be cultivated in the Himalayas, but the first published opinions seem those of Dr. Royle (*Illustr. Himalayan Botany*, p. 5 and 107, and *Productive Resources of India*, p. 259), where, from a consideration of a similarity in latitude, climate, and vegetation, as far as any information could be procured on those subjects, he was of opinion that tea could be successfully cultivated in the Himalayan mountains, 'for the different elevations allow of every variety of climate being selected, and the geographical distribution of this plant is sufficiently extended, and the natural sites sufficiently varied, to warrant its being beneficially cultivated.' He recommended experiments being made in the tract of the Himalayas, extending from Almora nearly to the Sutledge, at various elevations from the valleys up to 7000 feet, and thought that about 5000 feet of elevation would afford a suitable climate. Dr. Falconer formed similar opinions at the same time in a report to government. The correctness of these opinions has been clearly proved by the lately received reports on the success of the tea plantations established in the Kumaon and Gurhwal districts of these mountains, which were formed when the tea nurseries were established in Assam, and the seeds and plants sent up which had been obtained from China. In this report, forwarded by the Indian government to the Agricultural Society of Calcutta, we find that at elevations of 5000 and 6000 feet there are some hundreds of strong and healthy-looking plants and seedlings, but none as yet of a growth to yield seed. At Almorah, elevated 5000 feet, there are two gardens, one of three and the other of eleven and a half acres in extent, with 1500 full-grown trees yielding seed, and 700 layers, and upwards of 20,000 seedlings. At Bheemtal, lower in elevation and nearer to the plains, the results are equally favourable: 'On the whole the experiment, in as far as the possibility of rearing the tea-plant in the provinces of Gurhwal and Kumaon is in question, may be safely pronounced to have completely succeeded. It is also said, 'Assam has doubtless a great advantage over Kumaon as to facility of export, but the latter province will probably be found to yield a produce of a superior quality.' The quality of the tea which can be prepared here can only be ascertained when China tea-preparers have been sent there, as they no doubt will be sent, as soon as the plantations are sufficiently extended.

The value of these facts can only be properly estimated in connection with the success of the tea-culture in Assam, which is several hundred miles distant from Kumaon and Gurhwal, and it is probable therefore that the whole of the intervening part of the Himalayas will be favourable to this culture: probably also some of the mountains of the peninsula, as in the Wynaad district and in Travancore, will be found favourable.

The Assam tea-plant first attracted public attention in 1834, in consequence of replies to the circulars which had been addressed to several gentlemen. Captains Jenkins and Charlton, in May of that year, wrote that a kind of tea-plant was undoubtedly indigenous in Assam. Since then it has appeared that several gentlemen were well aware of the fact, and also that Mr. David Scott had, in June, 1825, sent leaves and seeds of a plant discovered originally by Major Bruce, which he said the Burmese and Chinese concurred in stating to be wild tea. But the plant was thought to be a Camellia, and no further notice was taken of it. A scientific deputation, composed of Dr. Wallich and Messrs. Griffith and MacCleland, was sent for the proper investigation of Upper Assam. Some valuable information has been elicited, which was published in the 'Trans. of the Agric. Soc. of India,' and in the papers respecting tea cultivation in India, published by the House of Commons in 1839. Tea-plantations were subsequently established, and Mr. Bruce appointed their superintendent. At first only a few tea-tracts were discovered: Mr. Bruce in his latest account notices them as being no less than 120, some of them very extensive, both on the hills and on the plains. Mr. MacCleland states that they are found in Assam, first on the level plain and secondly on mounds or hillocks, and that the former situations have a porous structure which enables them to maintain a dry surface under exposure to excessive moisture. As tea-plants are capable of bearing considerable varieties of temperature, tea may no doubt be cultivated in a variety of situations, and in Assam as well as elsewhere, but it is probable that hilly situations and the more open and elevated parts of Assam itself will be best suited for the production of the finer-flavoured teas. The tea which has been prepared in Assam has now been sent for four years to market, and in each year the quantities have increased and the qualities have improved. For the teas first sold in 1839, from the excitement and competition created by the novelty of the sale, extravagant prices were paid, as from 16*s.* to 34*s.* a pound. In 1840 the prices realized were from 6*s.* 10*d.* to 10*s.* 10*d.* The probable value was however from 2*s.* 11*d.* to 3*s.* 3*d.* The produce of 1841 in the government plantations has been sold in Calcutta, and that from the Assam Tea Company sent to this country. Very favourable reports have been published by brokers of the quality of this tea, and of the probability, from its strength, that it may easily be improved as its nature is better understood. Experimental nurseries continue to be carried on by the East India Company, and much useful information of a practical nature will no doubt be obtained and promulgated. So many authors have written on the subject of tea, that it is impossible to quote them. Dr. Lettsom, in his account of the tea-plant, has given a list of them. More recent information may be found in the travels of Abel, Staunton, Ellis, Barrow—and for scientific information see Royle, 'Illustr. of Himalayan Botany,' and 'Essay on the Productive Resources of India,' also the papers of Messrs. Griffith and MacClelland, in the 'Trans. of the Agric. Soc. of Calcutta,' which likewise contain the report of the brokers. For practical information on the manufacture of tea, the papers of Mr. Bruce give much valuable information, derived from the China tea-makers; also the 'Essay on the Cultivation and Manufacture of Tea in Java,' translated from the Dutch by Dr. Horsfield.

THEA. *Medical and Dietetical Properties of Tea.* This article, the use of which was for a long time confined to two countries of the East, China and Japan, has within the last two hundred years become known and almost indispensable in every civilized country of the globe. It is therefore interesting to enquire what are the properties it possesses, which have induced so large a portion of the human race to forsake other articles of diet, and what are the effects of its extensive consumption.

Whether obtained from one species only of the genus Thea, or from several, all the tea of China is in commerce brought under two distinct terms, *green* tea and *black* tea, or rather brown tea. These are also distinguished as *hyson* and *bohea*. The European name *tea* is borrowed from the common language of the province Fu-kian (Fokien of D Anville), where this article is called Tiä in their patois: at Canton it is called Tscha or Tschai. Black tea is called He-tscha, green tea Lo-tscha. The best sort of the black kind has been long known in commerce under the corrupted name of Bou-u-Tscha; hence by a transposition of the syllables, the Thea bohea of Linnæus, the Vou-y-Tscha of the Chinese, that is, tea from Vou-y-Schan, which is in the province of Fu-kian, in 27° 47′ N. lat. Hyson is chiefly obtained from Song-lo, which lies in the province of Kiang-nan, in 29° 58′ N. lat.

The subvarieties owe their names to other circumstances, the number of which is endless. Thus there occur in the catalogues of the Chinese merchants at least one hundred and fifty names, many of which are synonymes of other sorts, or names invented to impose on foreigners and obtain a high price. The distinguished Oriental scholar Klaproth gives a list of about forty genuine varieties, with an explanation of the terms applied to them. (*Journal Asiatique*, 1824, p. 121, and Abel Remusat, a Supplement to it, p. 186 of the same journal; or Fée, *Cours d'Histoire Naturelle Pharmaceutique*, i., p. 507.) Thus Pak-ho, corrupted into Pekoe, or even Pekin, merely means a white down,' being the first sprouts, or yet hairy leaf-buds of young plants, three years old, after their first flowering. With us it is applied only to a black tea, but it is equally applicable to a green tea, and is by the Chinese applied to an expensive kind called *Loong-tsing*, literally *tea of the wells of the dragon*, 'which is never brought to Europe, as it is so delicate and slightly fired as to spoil by the least damp.' (Davis.) The true imperial tea, also called flos theæ, not that it is the flower-buds, as some suppose, but merely the perfection of tea, never reaches Europe, as the damp of the voyage and a northern climate would soon impair its qualities. That which is sold under the name of Imperial is Chulan, or Soulang, flavoured with the lan-hoa, which is the Chinese name for the Olea fragrans, Lin.

Though it is stated that black tea may be cured as green tea, and green tea as black, certain it is that the preparation of the respective kinds is carried on in different parts of the empire, and different practices pursued with the leaves from the first stage. In the green teas the leaves only are taken, being nipped off above the foot-stalk or petiole, while of the black teas the foot-stalk is always collected. 'Thus black tea contains much of the woody fibre, while the green is exclusively the fleshy part of the leaf itself; which is one good reason why it should be dearer.' (Davis, ii., p. 351.) Besides this, the constant removal of the young leaf-buds, by which the plant is prevented from being clothed with full-grown leaves, which alone can elaborate the sap, and contribute to the further growth of the shrub, causes it to perish earlier, and compels a more frequent renewal of the plantations. Indeed some cultivators restrict the gathering of the leaves to two harvests, instead of three, to save their plants.

Those of the third gathering are large and coarse, and often so rigid that they cannot be rolled. This yields a tea so inferior in quality that it is consumed only by the poorest of the natives, or, when very bad, is, as are some of the finer kinds when spoiled, used for dyeing.

Such are the pains taken to ensure the excellence of the finest sorts, that for two or three weeks before the harvest commences the collectors, who are trained to this business from a very early age, are prohibited from eating fish or other kinds of food reckoned unclean, lest by their breath they should contaminate the leaves. They are also made to take a bath two or three times a day, and not allowed to gather the leaves with the naked fingers, but always with gloves. The finest tea may, if the proper time for gathering it be neglected, be changed into an inferior tea in one night. It is necessary to roast the leaves the same evening that they are collected, for if kept till the following day they become black and lose much of their virtue. Previous to putting them into the iron pans or furnaces, which are heated by charcoal, some writers say that they are dipped for about half a minute into boiling water; others do not mention this. About half a pound or three-quarters of leaves are put into the pan at once, and diligently stirred, to prevent them from being burnt. They are then removed with a shovel and thrown on mats or into baskets, and while yet hot the soft leaves are rolled between the palms of the hands, during which operation a quantity of yellowish green juice exudes from them. This process of roasting and rolling is often repeated even to the sixth or seventh time. This method is called the *dry way*; but by the *wet way* the leaves are first exposed to the vapour of boiling water, after which they are rolled and dried on the iron pans like the others. Leaves prepared in the wet way have a bright green colour; those by the dry, a dark green verging to brown. From the green tea, when prepared in the dry way, less of the above-mentioned juice exudes, a circumstance to which the greater power of green tea is in some degree owing. The larger leaves are generally selected to be prepared in the wet way. By the process of roasting the leaves lose two-thirds of their weight; so that three pounds of fresh leaves dry into one pound of tea fit for preservation. It is by the process of roasting that the flavour is first developed, the leaves when fresh being as insipid as the bean of coffee before heat is applied. Siebold is of opinion that the agreeable violet-like flavour of tea is inherent in the leaves themselves, but most writers ascribe the different flavours of the choicer kinds of tea to the admixture of the flowers, leaves, or oils of a variety of different plants. The chief of these are the *Olea fragrans*, *Chloranthus inconspicuus*, *Gardenia florida*, *Aglaia odorata*, *Mogorium* (*Jasminum*) *Sambac*, *Vitex spicata*, *Camellia Sasanqua*, and *C. oleifera*, *Illicium anisatum*, *Magnolia Yulan*, and the *Rosa Indica odoratissima*, as well as with the root of the *Iris florentina*, and *Curcuma longa* or turmeric, and oil of *Bixa Orellana*. A variety of tea called Sonchi is often found to contain a large quantity of ferruginous dust, but whether by accident, as Mr. Davis thinks (*Chinese*, ii., p. 462), or a fraud to increase the weight, is doubtful. Its presence may easily be detected by passing a magnet into a suspected sample, when some of the particles of iron will adhere to it.

The Chinese annually dry many millions of pounds of the leaves of different plants, to mingle with the genuine, such as those of ash, plum, &c., as the name Mei-Pian, applied to one of the varieties of tea from the province of Kiang-nan, imports; so that all the spurious leaves found in parcels of bad tea must not be supposed to be introduced into them by the dealers in this country. While the tea-trade was entirely in the hands of the East-India Company, few of these adulterated teas were shipped for this country, as experienced and competent inspectors with large salaries were kept at Canton, to prevent the exportation of such in the Company's ships; but since the trade has been opened, all kinds find a ready outlet, and, as the demand often exceeds the supply, a manufactured article is furnished to the rival crews.

The object of the drying and rolling is both to diminish the bulk and to enable the leaves to preserve their flavour. No tea is thought fit for use till it is a twelvemonth old; and the rich and luxurious Chinese keep the fine tea in jars, made of the finest porcelain, some of which are thought to communicate an additional aroma to the tea, and all of which have very narrow mouths (as may be observed in those brought to Europe, and sold at a high price), to retain the peculiar odour. If the tea contracts damp, it is taken out and roasted again.

The taste of tea is more or less astringent, and, before it is infused, unpleasantly acrid. To make the infusion, the Chinese pour boiling-water on a small portion of the leaves, but do not allow it to stand or macerate, as is done in England, but instantly pour it off again, by which they obtain only the more volatile and stimulating portion of its principles. The poorer Chinese indeed boil the very inferior and coarse leaves, which alone are within their reach, and drink the decoction repeatedly during the day. This is done not only to extract such virtues as the tea possesses, but to qualify the water, as little good drinking water is met with in China. Travellers find a supply of tea a very valuable accompaniment on long journeys, as it improves the most brackish waters. The exciting effects of fresh tea are such that it is rarely used till it has been kept twelve months, as already stated; and where indulged in, it produces great disturbance of the mind, almost resembling inebriation, like the action of the Erythroxylon Coca among the Peruvians, and inducing a tremulous motion of the limbs. This property is diminished by repeated roastings, but as green tea is less exposed to heat than black, it retains more of this power. Besides, the green tea for exportation undergoes some process, which changes its colour, giving it a bluish-green hue. The Chinese themselves do not consume those kinds of green tea which are prepared for exportation. (Davis, *Chinese*, ii. 468.) It is altogether a mistake to suppose that the colour of green tea is owing to its being dried on copper pans, as none such are used, and the most searching chemical analysis is unable to detect a trace of copper unless as a constituent of the vegetable. The chemical analysis of tea does not shed much light on its action on the human system. Frank and Sir H. Davy found more tannin in black than in green tea; but the results of Mr. Brande's researches, conducted on a more extensive scale, give a different result. 'Some years ago I examined the varieties of tea in common use (*Quarterly Journal*, xii. 201), and found that the quantity of astringent matter precipitable by gelatine is somewhat greater in green than in black tea, though the excess is by no means so great as the comparative flavours of the two would lead one to expect. The entire quantity of soluble matter is also greater in green than in black tea, but the extractive, not precipitable by gelatine, is greater in the latter.'

The following table shows the respective quantities of soluble matter in water and in alcohol, the weight of the precipitate by isinglass, and the proportion of inert woody fibre in green and black tea of various prices. It is given, not as throwing any important light upon the cause of the different qualities and effects of tea, but as containing the results of actual experiments. It will be remarked that when tea-leaves have been exhausted by water repeatedly affused, alcohol is still capable of extracting a considerable quantity of soluble matter: the alcoholic extract infused in boiling water, furnishes a liquid which smells and tastes strongly of tea, and which, were it not for the expense of the solvent, and the trouble attending its separation, might perhaps be profitably employed.

100 parts of Tea.	per lb.	Soluble in Water.	Soluble in Alcohol.	Precipit. with Jelly.	Inert Residue.
Green Hyson .	14s.	41	44	31	56
.. .	12	34	43	29	57
.. .	10	36	43	26	59
.. .	8	36	42	25	58
.. .	7	31	41	24	57
Black Souchong	12	35	36	28	64
.. .	10	34	37	28	63
.. .	8	37	35	28	63
.. .	7	36	35	24	64
.. .	6	35	31	23	65

(Brande's *Manual of Pharmacy*, 5th ed., p. 124.)

The fall in the prices of tea does not much affect these results, as the same relative proportions are preserved.

The alkaloid-like principle of tea can scarcely be considered the cause of the peculiar action of tea; but it is very interesting from the circumstance of the identity of its composition with that of coffee, and of the guarana officinalis, as shown by Liebig:—

	Caffeine. Pfaff and Liebig.	Theine. Jobst.	Guaranine. Martius.	Calculated. C 8, H 5, N 2, O 2.
Carbon .	49·77	50·101	49·679	49·798
Hydrogen .	5·33	5·214	5·139	5·082
Nitrogen .	28·78	29·009	29·180	28·832
Oxygen .	16·12	15·676	16·002	16·288

Bergma obtained an oil, but this, as well as the distilled water, he found to have little peculiar effect on several animals: which is in opposition to the experiments of Lettsom, who represents the distilled water of tea as a very powerful narcotic, paralysing the limbs of frogs, and even causing their death when applied to the exposed nerves.

Before attempting to estimate the action of tea on the human system, it is necessary to call to mind that some of the effects are due to the plants mixed with the real tea, several of which, such as the Chloranthus inconspicuus, are stimulants of the highest order; and in other instances deleterious chemical compounds are used by the Chinese to convert damaged black teas into saleable green teas (Davis, *Chinese*, ii. 466.) For the effects of these, tea is not justly chargeable. A correct estimate of the action of tea is not easily formed; yet the most dispassionate inquirers regard it as a narcotic, the stimulating period of which is the most conspicuous and of longest duration. Tea has been preposterously praised by some writers, and unjustly accused by others as being productive of numerous diseases: above all it has been charged with causing an increase of nervous diseases. It would perhaps be more just to attribute the increase of such complaints to the more complicated state of our social relations, arising from an augmented population, and an advance in luxury, with the more frequent infringement of the natural laws, particularly turning night into day, and not seldom day into night, as is the practice of the votaries of fashion. That the universal employment of tea has displaced some other kinds of food is certain, but if a diminution in the number of inflammatory diseases be one of the consequences, it is much to its credit, as however distressing nervous diseases may be, they are by no means so fatal as those of an inflammatory kind. That tea should not suit all constitutions or all ages is not remarkable. It is less suited for young children than for adults; indeed for very young children it is extremely improper, producing, like all narcotics, a morbid state of the brain and nervous system. It is also unsuited for those of an irritable nature, and likewise for those of a leucophlegmatic constitution. Such persons can ill bear much liquid of any kind, particularly in the evening, and prosper best on a very dry diet, to which growing children of this constitution should be strictly confined. [DILUENTS.] It may not be true that the use of tea, as alleged by Dr. Lettsom, has been a main cause of the increase of scrophulous diseases, still as diseases of this class are the only diseases which are proved by the reports of the registrar-general to be stationary, or perhaps more frequent than others, whatever impairs the nervous power and ultimately the digestive function in strumous children should be avoided. His advice is sound where he says, 'It ought by no means to be the common diet of boarding-schools; if it be allowed sometimes as a treat, they should be at the same time informed that the constant use of it would be injurious to their health, strength, and constitution.' Those to whom it is most suited are the plethoric and sanguine. Upon the same principle it is a proper article of diet and perhaps the best common drink at the beginning of fevers and inflammatory complaints. In a peculiar state of brain, termed by Mr. Newnham (*Observations on Medical and Dietetical Properties of Green Tea*) *sthenic excitement*, a state clearly bordering on inflammation, especially if produced by alcoholic stimulants, or by intense and long-continued application of mind to any particular object of literary research, green tea acts as a salutary remedy. On the contrary, in states of diminished excitement, morbid vigilance and nervous disturbance follow its use. It is not an uncommon practice with ardent students, when pushing their studies far into the night, to resist the claims of nature for repose, and keep themselves awake by the frequent use of tea. That it answers the purpose at the time cannot be denied, but the object is often attained at a fearful price, the destruction of health and vigour both of mind and body being the penalty. Less injury results in these cases from the use of coffee. There is this difference between the morbid states of the nervous system produced by coffee and those resulting from tea: that the former generally subside or disappear entirely on relinquishing its use; those from the latter are more permanent, and often incapable of being eradicated. Nevertheless many persons have immediately found their health improved by entirely relinquishing the use of tea, or even omitting it only at breakfast, for which meal it is certainly less proper than for the evening beverage. Those for whom tea is unsuited will generally find weak cocoa the most proper substitute.

Persons of a gouty and rheumatic nature, above all, those prone to calculous diseases of the lithic acid diathesis, find weak tea the least objectionable article of common drink. They should take it without sugar, and with very little milk. (Prout, *On the Stomach*, p. 217.) Where the water is hard, the addition of a little carbonate of soda not only improves the tea, but renders it a more proper beverage for such persons. Tea should not be used till about four hours after any solid meal.

The medical uses of tea are not many. In fevers it is not only an excellent diluent at the commencement, but a tincture of tea made by macerating tea in proof-spirit, and adding a tea-spoonful of this to a small cup of water, and given at short intervals during the night, after the acute symptoms have subsided, is often of great service. For this purpose, in hospitals and workhouses, the leaves which have been used for the ordinary infusion may be macerated in alcohol (as suggested above by Mr. Brande), and a spirit of sufficient strength for this purpose obtained at a cheap rate.

In some forms of diseased heart tea proves a useful sedative. It is nearly as valuable an antidote to poisoning by opium as coffee is. Some cases of poisoning by arsenic and tartarized antimony have been prevented proving fatal by the immediate administration of tea in the form of a very strong infusion. Here its power as an antidote depends upon its tannin decomposing the poisonous substances. [ASTRINGENTS.] But in poisoning by opium it is useful only in combating the secondary symptoms, and should not be administered till the stomach-pump or other means have removed the opium from the stomach. (*Lancet*, 9th November, 1833.) Some cases of severe nervous headache are relieved by a cup of strong green-tea, taken without milk or sugar. But this should be sparingly resorted to; it is a wiser plan to avoid the causes of such headaches. Tea has been looked upon as the great means by which intoxication was to be banished, but it is certain that to relieve the tremblings and other unpleasant effects of the abuse of tea, a little brandy or other alcoholic stimulant is occasionally added to the cup of tea, and so a habit is acquired which can never afterwards be relinquished.

Tea has frequently been denounced as a useless article of diet to the poor, as it is assumed to be devoid of nutriment, and the milk and sugar which are added supposed to be the only beneficial ingredients. Dr. Lettsom has given a calculation, partly his own, and partly taken from 'Essays on Husbandry,' to show how much is, in his view, unnecessarily expended by them in this way. But the observations of Liebig, if correct, and in all probability they are so, offer a satisfactory explanation of the cause of the great partiality of the poor not only for tea, but for tea of an expensive and therefore superior kind. 'We shall never certainly be able to discover how men were led to the use of the hot infusion of the leaves of a certain shrub (tea), or of a decoction of certain roasted seeds (coffee). Some cause there must be which would explain how the practice has become a necessary of life to whole nations. But it is still more remarkable that the beneficial effects of both plants on the health must be ascribed to one and the same substance, the presence of which in two vegetables belonging to natural families, and the produce of different quarters of the globe, could hardly have presented itself to the boldest imagination. Yet recent researches have shown, in such a manner as to exclude all doubt, that caffeine and theine are, in all respects, identical.

'Without entering minutely into the medical action of caffeine (theine), it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield taurine, the nitrogenized compound peculiar to bile:—

1 atom caffeine or theine = $C_8\ N_2\ H_5\ O_2$
9 atoms water . . = $H_9\ O_9$
9 atoms oxygen . . = O_9
$C_8\ N_2\ H_{14}\ O_{20}$
= 2 atoms taurine . = 2 ($C_4\ NH_9\ O_{10}$)

To see how the action of caffeine, asparagine, theobromine, &c. may be explained, we must call to mind that the chief constituent of the bile contains only 3·8 per cent. of nitrogen, of which only the half, or 1·9 per cent., belongs to the taurine. Bile contains in its natural state water and solid matter, in the proportion of 90 parts by weight of the former to 10 of the latter. If we suppose these 10 parts by weight of solid matter to be choleic acid, with 3·87 per cent. of nitrogen, then 100 parts of fresh bile will contain 0·171 parts of nitrogen in the shape of taurine. Now this quantity is contained in 0·6 parts of caffeine; or $2\frac{8}{10}$ths grains of caffeine can give to an ounce of bile the nitrogen it contains in the form of taurine. If an infusion of tea contain no more than the $\frac{1}{10}$th of a grain of caffeine, still, if it contribute in point of fact to the formation of bile, the action, even of such a quantity, cannot be looked upon as a nullity. Neither can it be denied, that in the case of an excess of non-azotized food and a deficiency of motion, which is required to cause the change of matter of the tissues, and thus to yield the nitrogenized product which enters into the composition of the bile; that in such a condition the health may be benefited by the use of compounds which are capable of supplying the place of the nitrogenized substance produced in the healthy state of the body, and essential to the production of an important element of respiration. In a chemical sense—and it is this alone which the preceding remarks are intended to show—caffeine, or theine, asparagine, and theobromine, are, in virtue of their composition, better adapted to this purpose than all other nitrogenized vegetable principles. The action of these substances, in ordinary circumstances, is not obvious, but it unquestionably exists. Tea and coffee were originally met with among nations whose diet is chiefly vegetable.' (Liebig's *Animal Chemistry*, p. 178.) These facts show in what way tea proves to the poor a substitute for animal food, and why females and literary persons who take little exercise manifest such partiality for it. They also explain why the attempts, and they have been numerous, to find among other plants a substitute for tea have invariably failed of success. The first tea-leaves were procured from the Chinese in exchange for those of the Salvia officinalis, or garden sage, but they, like others, soon found out its inferiority, and refused to part with their own precious leaf except in exchange for solid coin. The poor Chinese make use of the leaves of a fern, and also of those of the Sagaretia (Rhamnus) theezans; but to this their poverty, not their will, consents.

Tea Trade.—The period when tea was first introduced into this country has already been noticed. How little was it possible at the time to have foreseen that it would one day become one of the most important articles of foreign production consumed in England. The first importation by the English East India Company took place in 1669 from the Company's factory at Bantam. The directors ordered their servants to 'send home by their ships one hundred pounds weight of the best *tey* they could get.' In 1678, as already noticed, 4713 lbs. were imported, but in the six following years the entire imports amounted to no more than 410 lbs. The continuous official accounts of the trade do not commence before 1725; but according to Milburn (*Oriental Commerce*), the consumption in 1711 was 141,995 lbs.; 120,695 lbs. in 1715; and 237,904 lbs. in 1720. The following is a

Table showing the Quantity of Tea retained for Consumption, and the Rate of Duty in each Year, from 1725 to 1834:—

		Rate of Duty.	
Year.	lbs.	Customs.—Per Cent.	Excise.
1725	370,323	13*l*. 18*s*. 7½*d*.	4*s*. per lb.
1726	360,377	"	"
1727	486,888	"	"
1728	543,024	"	"
1729	685,387	"	"
1730	810,110	"	"
1731	787,434	"	"
1732	647,551	"	"
1733	565,895	"	"
1734	632,374	"	"
1735	636,033	"	"
1736	752,745	"	"
1737	1 160,054	"	"
1738	1 142,637	"	"
1739	1,113,361	"	"
1740	1,002,929	"	"
1741	890,191	"	"
1742	870,420	"	"
1743	764,320	"	"
1744	751,800	"	"
1745	730,729	"	1*s*. per lb. and 25 per cent. on the price.
1746	2,358.589	"	"
1747	2,382,775	18*l*. 18*s*. 7½*d*.	"
1748	2,493,811	"	"
1749	2,768,807	"	"
1750	2,568,338	"	"
1751	2,774,809	"	"
1752	2,976,626	"	"
1753	3,131,885	"	"
1754	3,447,017	"	"
1755	3,556,146	"	"
1756	3,728,533	"	"
1757	3,961,799	"	"
1758	4,205,394	"	"
1759	3,957,744	23*l*. 18*s*. 7½*d*.	"
1760	4,072,148	"	"
1761	4,434,194	"	"
1762	4,236,408	"	"
1763	4,529,432	"	"
1764	4,719,473	"	"
1765	4,636,940	"	"
1766	4,606,513	"	"
1767	3.762,820	"	"
1768	6,892,075	"	25 p. ct. on gross price.
1769	6,965,899	"	"
1770	7,149,245	"	"
1771	5,912,245	"	"
1772	7,838,341	"	"
1773	4,427,646	"	1*s*. a lb. and 25 p. ct. on the gross price.
1774	6,285,113	"	"
1775	5,648,188	"	"
1776	5,138,218	"	"
1777	4,741,434	"	"
1778	4,642,086	"	"
1779	5,285,054	25*l*. 2*s*. 6½*d*.	5 per ct. additional on former duties.
1780	5,152,399	"	"
1781	4,915,472	25*l*. 16*s*. 3*d*.	5 per cent. additional
1782	4,691,060	27*l*. 0*s*. 10*d*.	5 per cent. additional
1783	5,282,209	"	"
1784	4,948,983	"	"
1785	10,856,578	12½ per cent.	Excise duty repealed.
1786	12,539,389	5 p. ct. on gross price.	7½ per cent. on gross price.
1787	17,047,054	5 p. ct. on gross price.	7½ per cent on gross price.
1788	13,218,665	"	"
1789	14,534,601	"	"
1790	14,693,299	"	"
1791	15,096,840	"	"
1792	15,822,045	"	"
1793	15,244,931	"	"
1794	16,647,963	"	"
1795	18,394,232	"	"
1796	18,009,992	"	"
1797	16,368,041	5 pr. ct. on gross price	15 per ct. under 2*s*. 6*d*. per lb., 25 per ct. above
1798	19,566,934	"	15 per ct. under 2*s*. 6*d*. per lb., 30 per ct. above
1799	19,906,510	"	"
1800	20,358,702	"	15 per ct. under 2*s*. 6*d*. per lb., 35 per ct. above
1801	20,237,753	"	15 per ct. under 2*s*. 6*d*. per lb., 45 per ct. above
1802	21,848,245	"	"
1803	21,647,922	"	60 per ct. under 2*s*. 6*d*. per lb., 90 per ct. above
1804	18,501,904	"	"
1805	21,025,380	5*l*. 2*s*. 6*d*. on gross price.	"
1806	20,355,038	6*l*.	90 per cent. on all.
1807	19,239,312	"	"
1808	20,859,929	"	"
1809	19,869,134	"	"
1810	19,093,244	"	"
1811	20,702,809	"	"
1812	20,018,251	"	"
1813	20,443,236	"	"
1814	19,224,154	"	"
1815	22,378,345	"	"
1816	20,246,144	"	"
1817	20,822,926	"	"
1818	22,660,177	"	"
1819	22,631,467	Customs' duty repealed.	Under 2*s*. a lb. 96 p. ct. above 2*s*. 100 per ct.
1820	22,452,050	"	"
1821	22,892,913	"	"
1822	23,911,884	"	"
1823	23.762,470	"	"
1824	23,784,838	"	"
1825	24,830,015	"	"
1826	25,238,067	"	"
1827	26.043.223	"	"
1828	26,790,336	"	"
1829	29,495,199	"	"
1830	30,047,079	"	"
1831	29,997,101	"	"
1832	31,548,409	"	"
1833	31,829,619	"	"
1834	34,969,651	Bohea, 1*s*. 6*d*.; Congou, Twankay &c., 2*s*. 6*d*.; Hyson, &c. 3*s*. per lb.	Excise duty repealed.
1835	36,574,004	"	"
1836	49,142,236	After 1st July, all sorts 2*s*. 1*d*. per lb.	"
1837	30,625,206	"	"
1838	32,351,593	"	"
1839	35,127,287	"	"
1840	32,252,628	Addl. 5 per ct.	"
1841	36,681,877	"	"

For above a century and a half the sole object of the East India Company's trade with China was to provide tea for the consumption of the United Kingdom. The Company enjoyed this trade to the exclusion of all other parties and were bound from time to time to send orders for tea, and to provide ships to import the same, and always to have a year's consumption in their warehouses. The teas were disposed of in London, where only they could be imported at quarterly sales, and the Company was bound to sell them to the highest bidder, provided an advance of one penny per lb. was made on the price at which each lot was put up, which price was determined by adding together the prime cost at Canton and the bare charges of freight, insurance, interest on capital, and certain charges on importation; but by the mode of calculating these items, and the heavier expenses which always attend every department of a trade monopoly, the upset prices were greatly enhanced. The prices realised at the Company's sales were however in still greater proportion beyond the upset prices, a result easily produced by a body who monopolized the sole supply, as it was only necessary that the quantity offered for sale should not be augmented in proportion to the growing demand of a rapidly increasing population. The 18 Geo. II., c. 26, passed immediately after a large reduction of the duty had taken place, provided for such a contingency as this, by enacting that if the East India Company failed to import a quantity sufficient to render the prices as low as in other parts of Europe, it should be lawful to grant licences to other persons to import tea. This would have constituted a very efficient check if it had been acted upon; but eventually the mode of levying the duty gave the government almost the same interest in a restricted supply as the East India Company, the duties being collected *ad valorem* on the amount realised at the Company's sales; and thus the very circumstance which enhanced the price raised the total amount of duty. The duty was nominally 90 and 100 per cent. *ad valorem*, but being charged on a monopoly price, the difference on the cheaper teas consumed by the working and middle classes amounted to above 300 per cent. on the cost price of the same teas at Hamburg; and in 1830 the difference between the prices realised at the Company's sales and the Hamburg prices amounted to a sum of 1,889,975*l*. The sales in the last year of the East India Company's monopoly are shown in the following table:—

An Account of the Quantity and Prices of several sorts of Tea sold in England from May 1st, 1833, to May 1st, 1834:—

	lbs.	*s.*	*d.*
Bohea	6,170,963	1	10
Congou	18,653,835	2	1
Campoi	1,603	2	4
Souchong	354,515	2	9
Pekoe	514,811	2	10
Twankay	4,339,672	2	1
Hyson Skin	141,610	2	2
Hyson	987,052	3	6
Total	31,164.065		

The Company's sales were in March, June, September, and December, the latter being the largest. About 2,000,000 lbs. were offered belonging to the officers of the Company, who were allowed to import a certain quantity of tea on their own account. In 1839 there were only 122,312 lbs. offered for sale by the East India Company; and the change effected by the 3 & 4 Wm. IV., c. 93, which, on the 22nd of April, 1834, opened the trade to China, is now complete. The importation of tea is no longer confined to the port of London. In 1839 eighteen ships arrived inwards from China at different outports, ten of which were entered at Liverpool. In the four years ending 1834 the average annual number of ships entered inwards from China at the ports of the United Kingdom was 23, in the four following years the average was 66, and other commodities besides tea have been extensively imported, and a corresponding increase in the quantity and variety of the exports to China has taken place. The exports of tea from the United Kingdom, which formerly did not exceed a quarter of a million lbs. annually, amounted to 4,347,432 lbs. in 1841, and have averaged above three million lbs. a year since the opening of the trade, a fact which shows that prices here are no longer so much above those of the principal continental ports. The quantity retained for consumption has also considerably increased, although accompanied by an extraordinary increase in the use of coffee.

The tea-duty produces about one-thirteenth of the total revenue; and only three articles, spirits, malt, and sugar, yield a larger sum. The tariff of 1842 has made no alteration in the tea-duty. As it was foreseen that on the opening of the tea trade there would be a considerable reduction of price, and that an *ad valorem* duty would not, even with the increased consumption, be so productive as formerly, a fixed duty per lb. was imposed, which, from 1834, to July, 1836, varied according to the different kinds of tea; but as this mode of collection was attended with considerable trouble and difficulty, it was altered to an unvarying duty of 2*s.* 1*d.* per lb. on all kinds without distinction. Since March, 1836, the tea-dealers have been relieved from the vexatious interference of the excise, the duty being collected entirely as an import duty by the officers of the customs. Previously, each of the hundred thousand tea-dealers in the United Kingdom were visited once a month by the officers of excise, who took an account of their stock; and no quantity exceeding six pounds could be sent from their premises without a permit, of which above 800,000 were required in a year. In short, this system of supervision was very troublesome, costly, and answered no useful purpose. The number of tea-dealers in 1839 was 82,794 in England; 13,611 in Scotland; 12,774 in Ireland: total, 109,179. Tea is now sold by the importing merchants by public auction and private sales.

The following table shows the revenue which the tea duty has yielded in each year during the present century, and, to some extent, it is an index of the prices in each year:—

Net Amount of Duty collected upon Tea in the United Kingdom in each year from 1800 to 1841 inclusive:—

1801	£1,423,660	1822	£3,941,484
1802	1,632,467	1823	3,848,122
1803	1,929,613	1824	3,865.477
1804	2,599,738	1825	4,031,018
1805	3,336,523	1826	3,738,042
1806	3,446.670	1827	3,705.588
1807	3,525,173	1828	3,177,179
1808	3,905,295	1829	3,321,722
1809	3,592,705	1830	3,387,097
1810	3.647,737	1831	3,344.918
1811	3,752,111	1832	3.509,835
1812	3,822,979	1833	3,444,102
1813	Records burnt.	1834	3,589,361
1814	3,958,054	1835	3,832,432
1815	4,058,091	1836	4,674,535
1816	4,362,496	1837	3,223,840
1817	3,431,364	1838	3,362,035
1818	3,872,693	1839	3,658,803
1819	3,689,805	1840	3,473,964
1820	3,484,226	1841	3,978,198
1821	3,707,270		

Between 1831 and 1841 the population increased 14 per cent., and the increase in the consumption of tea was 16½ per cent. The low prices of 1836, and the general prosperous condition of the country, raised the quantity which paid duty for consumption to nearly 50,000,000 lbs. In 1840 prices were about 25 per cent. higher, large classes of consumers were in a distressed state, and the consumption fell to 32,000,000 lbs. In 1841 the distress still continued, but prices were lower, and the consumption rose to above 36,000,000 lbs. On the 5th of Jan., 1840, the stock of tea in London, Liverpool, Bristol, Glasgow, and Leith was 35,478,490 lbs.; and at the corresponding period in 1841 the quantity was 46,545,610 lbs. The proportion of black to green teas consumed in England is about as 5 to 1; but in the United States the use of green tea is greatest. (*Papers issued by the Chinese and East India Association*; *Parl. Papers*, &c.)

The total export of tea from Canton to Europe and America exceeds 50,000,000 lbs. Russia is supplied with 6,500,000 lbs. *via* Kiakhta; the United States of America require about 8,000,000 lbs.; France about 2,000,000 lbs.; and Holland imports about 2,800,000 lbs. The green tea districts are about 700 miles, and those where the black tea is made about 200 miles from Canton. The article is brought from Canton by land carriage, chiefly by porters and by the canals; and the number of tea merchants who resort to Canton in the season when the trade is most active, that is, from October to March, is said to be about 700. The functions of the Hong merchants, through whom Europeans make their purchases, have been already explained. [CANTON.] The trade has not been interrupted in consequence of the present dispute between England and China, nor is it likely to be, as it is one of the greatest importance to the Chinese; and whenever, in former disputes, it has been temporarily suspended, no difficulty has occurred in obtaining the usual supply through the traders of other nations at Canton.

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THEATINS, or **TEATINS**, an order of monks founded at Rome in 1524, principally by Gianpietro Caraffa, who was then archbishop of Chieti, in Naples, the Latin name of which is Teate, and who afterwards became pope under the title of Paul IV. The institution was confirmed at the time of its foundation by the reigning pope, Clement VII.; and a final rule, or code of regulations, drawn up by a general chapter of the order, was authorised by Clement VIII. in 1604. The Theatins were principally established in Italy and in France, into which latter country, where they subsisted till the Revolution of 1789, they were brought in 1644 by Cardinal Mazarin, who bought them their house at Paris, near the Louvre, and at his death left them 800,000 crowns, with which they built a church. Their dress was a black cloak and cassock with white sleeves; and the principal peculiarity of their institution was that they affected to subsist not only upon alms, but upon alms bestowed upon them without being asked for. They procured however considerable support in this way, and they were at one time enabled to maintain missions in Georgia, Circassia, Mingrelia, and other parts of Asia. Their history has been written by John Baptist Tuffins, under the title of 'Annales Theatinorum.' There were also Theatin nuns (in French, *Theatines*), so called from having been placed by Pope Gregory XV. under the direction of the Theatin monks, their original and proper designation having been Sisters of the Immaculate Conception. They were divided into two classes: the one called Theatin nuns of the congregation, founded at Naples by Ursula Benincasa in 1583; the other, of later institution, called Theatin Nuns of the Hermitage. The latter were bound by vows of peculiar solemnity and strictness, professing to spend their whole time in solitude and prayer. The two societies however were intimately connected; their houses adjoined and communicated with one another, and the temporal concerns of those of the Hermitage were managed by those of the Congregation. In 1624 Urban VIII. withdrew these nuns from the jurisdiction or superintendence of the Theatin monks, and placed them under that of the Neapolitan nuncio; but the former state of things was restored by Gregory IX. in 1668. A notice of a controversy between the Theatins and the Jesuits, which was kept up for a great part of the seventeenth century, is given by Bayle, in a note to his article on 'Ignatius Loyola.'

THEATRE (from the Latin *theātrum*, which is from the Greek θέατρον, 'a place for seeing'), a word adopted in all modern languages to signify a building appropriated to dramatic representations. The oldest edifices of this class are those of the Greeks and Romans, for it was with them that the European drama originated, and, in point of magnitude, they surpassed the most spacious of their temples. The enormous extent of many of them, and the prodigious solidity of their construction, are attested by the numerous remains of such edifices, which have been explored not only in Greece and Italy, but also in Asia Minor. Of some of them indeed little can now be traced, but others are sufficiently perfect to convey a clear idea of the arrangement and general appearance of the structure in its original state; that is, however, merely as regards the space appropriated to the spectators, for scarcely anything remains to explain what is most difficult, and, as regards the dramatic exhibitions, most important of all to understand, namely, the stage itself, including under that term the whole space requisite for the accommodation of the performers, and for the preparation of the exhibition before the audience. Owing to the want of any evidence of the kind afforded by the buildings themselves, and to the very little that can now be gathered from the scanty notices of antient writers, we are ignorant of many things which can only be conjectured.

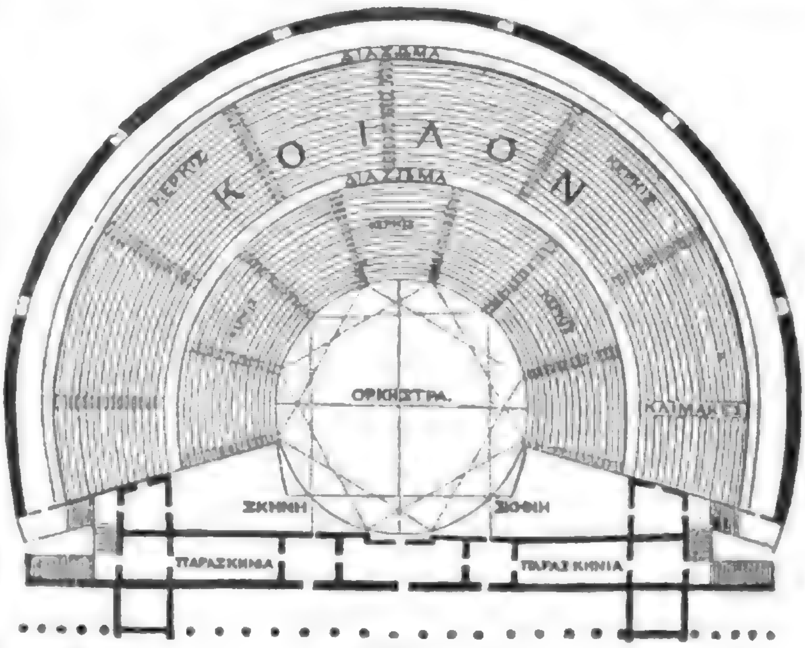
The very circumstances that are mentioned for our admiration, and in proof of the magnificence and sumptuousness of some of the antient theatres, also prove how destitute of anything approaching to scenic illusion and stage effect the performances must have been. Whether it be at all exaggerated or not, it is evident from what Pliny (*Nat. Hist.*, xxxvi., c. 15) says of the theatre of Scaurus at Rome, that the *scena* was a mere architectural façade, unmeaning in itself, though lavishly embellished with marble columns and statues, with no fewer than 360 of the former, arranged in three tiers, and 3000 of the latter, a most incredible number, surpassing that of a modern audience; for it is difficult to conceive how they could all have possibly been introduced. Pliny puzzles us still more when he says that the middle of the scena (meaning the second of the three orders) was of glass. Without stopping to inquire what can be meant by 'glass,' perhaps mosaic, we may remark, that such a background to the stage could have been no better than an extravagant absurdity, and that the actors must have appeared mere pigmies upon a stage of such enormous extent, with a number of statues behind them. This must always have been in some degree the case, since even in moderate-sized antient theatres the stage was enormously wide in comparison with what it is in the very largest modern theatres. The scena too was always a permanent architectural erection, incapable of change, and instead of having reference to the particular performance, it must frequently have been at variance with it. It has been supposed that, besides the permanent scena, the antients employed, occasionally at least, moveable painted scenes, capable of being let down before it. Yet while this can be only vaguely inferred, the presumption against it is founded both on its impracticability and its extreme improbability. How is it possible to have had painted moveable scenes on canvas, which on the average must have been 200 feet in width, especially where the stage itself was so shallow and confined at its sides, and without any space for apparatus or machinery over it? If again there was any such scenery, it would have given rise to a branch of painting of which the antients appear to have been nearly altogether ignorant. They seem to have had no idea of other than figure-painting, with scarcely any attempt at expressing background, whereas scene-painting entirely excludes figures, consists entirely of background, either landscape or architecture, and sky, and requires more than a moderate proficiency in linear and aërial perspective, in regard to both of which the antients appear to have been deficient. If we may judge from those specimens of their painting which have come down to us, they seem scarcely to have aimed at general pictorial effect, or at more than representing figures alone, without any scenic background to them. If, too, there had been anything resembling our modern scenery, more explicit mention would probably have been made of it, if only on account of the enormous magnitude of such paintings, whose surfaces must sometimes have contained a much greater number of square feet than the sides of the largest temples. Vitruvius does indeed make mention, in the proem to his seventh book, of Agatharchus as a scene-painter, and of Democritus and Anaxagoras as writers on scenography and perspective; but it is with his usual dryness and obscurity, and with such vagueness of expression, that it is difficult to draw any conclusion from his words. Of the former he merely says 'scenam fecit,' which probably means no more than that he was one of the first who introduced some sort of decoration on the scena, or back wall of the stage, where, if there was at any time painting at all, it could only have been very partial, and as accessory embellishment to that general façade,—perhaps in such pieces as the 'Philoctetes' something was done to give to the centre doorway of the scena the appearance of an entrance to a cavern,—just sufficient to indicate the locality intended to be expressed. The fixed arrangement of the scena itself, with three distinct entrances assigned to the performers according to their rank in the piece, the centre one being for the principal characters, the others for those supposed to arrive on one side from the port, on the other from the country, was not only a puerile and awkward conventionalism in itself, but an expedient which shows how imperfect the antient stage must have been, how destitute of all contrivance, notwithstanding its alleged magnificence. What there was of painted scenery at all must have been confined entirely to two *Versuræ* (περίακτοι) at the sides or ends of the stage, which served as 'wings,' and which were upright triangular frames made to revolve upon a central pivot, so that any of the three sides could be turned towards the audience; a very scanty change of scenery at the best, and exceedingly limited in effect, it being no more than sufficient to *hint* where the action was supposed to take place; whereas the scena itself bore no more resemblance to the intended locality of the piece, than do the proscenium and stage-doors in those modern playhouses where the latter are sometimes made use of by the performers.

From the use of the term *Aulæa* it has been generally concluded that the whole stage was concealed by a curtain both previous to the commencement of the performance and whenever it was requisite to make any change in the decorations. But we agree with Winckelmann, that such could not possibly have been the case, because in the first place it could hardly have been practicable, and in the next it was quite unnecessary as regarded the permanent scena or architectural façade. Whatever changes, says that writer, were made at all could have been only in the side-scenes or *versuræ*, and it was merely before them that curtains or aulæa were drawn at such times; which circumstance says nothing in favour of what little stage machinery there was. The notion of there being painted moveable scenes like ours, capable of being let down or drawn up at pleasure, is completely contradicted not only by one, but by every circumstance that can be mentioned. Admitting the possibility of having scenes of such prodigious size, how are we to reconcile with the use of them the bestowing so much decoration upon the scena, or wall at the back of the stage, behind them?—to what purpose would have been the entrances through that wall, for the performers to come upon the stage, if there had been a separate painted scene before it? The stage itself again was so exceedingly shallow, that it would hardly have borne to be further contracted in depth, by other scenes being let down before the permanent one; nor would there have been space for them and the *versuræ* also. There would also have been more explicit mention made of such scenes, and there would have been some particular term to distinguish them from what is now called the *scena*, if they had ever been used. What Vitruvius says upon the subject of stage decoration is not only very brief, but exceedingly obscure, and only proves his carelessness in omitting to describe or even mention much that is of real importance, while he goes altogether out of his way to give us a chapter De Harmonica, and to speak of many matters that have no connection whatever with theatres as a distinct class of buildings.

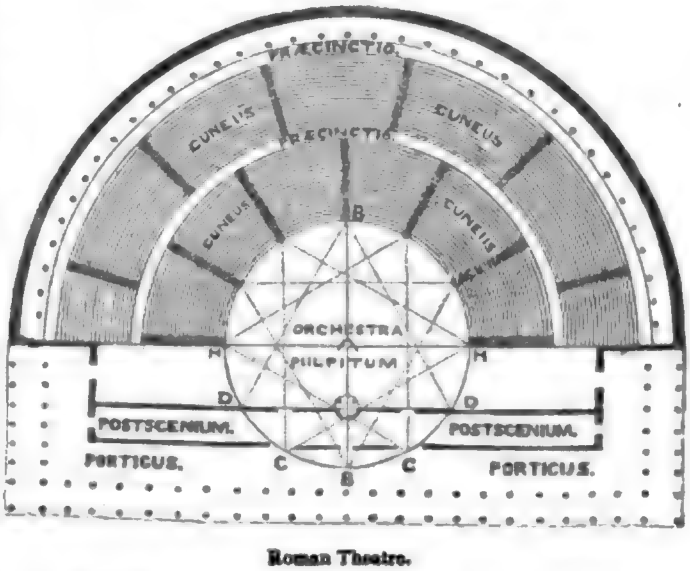
Even admitting that there was painted scenery, and that it was not at all inferior to that of our own theatres either in regard to truth of perspective or anything else, it still must have fallen very far short of the latter in effect, if only for the reason that the performances took place by daylight. At the best the illusion could have been but exceedingly imperfect—a strange mixture of the artificial with the real; and even what degree of effect there else might have been, must have been more or less counteracted by the sun shining on some part of the stage and scene, while shadows would be thrown upon them, in others, by the wall at either end or side. Or if the stage itself was at any time roofed in, all the upper part of the scene must have been thrown into shadow. The natural lights and shadows and the painted ones must frequently have been in strange contradiction to each other; nor was it possible to manage any effects of light, as in our theatres, by either increasing or diminishing it, or by concentrating it on any particular part of the scenery. The only thing in favour of the antient stage in this respect, is that there were no 'foot-lights,' and consequently the faces of the performers were not lighted from beneath. Yet even this comparatively unimportant advantage was nullified by the use of masks, some of them so extravagantly grotesque as to bear scarcely any resemblance to the human countenance. The most natural masks were in some degree distorted, and a fixed expression of countenance was substituted for what could properly be only a momentary one. Hence one great excellence in acting was entirely suppressed: the face was as rigidly inanimate as in wax-work. It is true this was of no very great consequence, because, owing to the vast extent of the theatres, the faces of the actors could hardly have been distinctly seen, or seen at all by the great majority of the spectators, more especially as such aids to vision as opera-glasses were then unknown. The whole space was so great, that in regard to it the actors could have been no more than as the figures put by a painter into a landscape. Neither does what is said as to their *cothurni*, or thicksoled buskins, being intended to make the actors appear taller, give us any very high idea of the effect so produced; for while the increase of stature could have been scarcely perceptible—or if it had, it would have caused the limbs to appear strangely disproportioned—the means employed for it were ill calculated to give ease and gracefulness to the performer's movements.

On considering the audience part, and the accommodation provided for the spectators, although there the arrangement of an antient theatre was nearly perfect, and in some respects preferable to that of modern ones, it was not free from many inconveniences. The most obvious one is, that as there was no roof, there was no shelter from the weather, on which account awnings were sometimes made use of to screen from the heat of the sun, while in case of sudden and heavy rain the spectators were obliged to take shelter in the corridors behind and beneath the seats, where there were any, and in the porticos at the back of the theatre. Besides interruption to the performance, this must have occasioned considerable confusion in so numerous an assemblage of persons. Beautiful too as the arrangement of all the seats in concentric rows is in itself, it is attended with some disadvantage, as will be perceived on referring to the annexed plans, for instead of being placed, as in the pit of a modern theatre, parallel to and immediately facing the stage, a considerable portion of the audience must have sat sideways to it, with part of it behind them; and those at the ends of the further or upper benches could hardly have had any view of the scena at all, at least not in the Greek theatre.

The Greek and Roman theatres so very nearly resemble each other in their general form and principal parts, that it is only by comparing the plans, for the purpose of seeing wherein they vary, that the difference between them can be clearly understood. Such difference however is ex-



Greek Theatre.



Roman Theatre.

ceedingly slight, the general arrangement and the essential parts being the same in both,—the *Coelum* (Κοῖλον), *Orchestra* (Ὀρχήστρα), and *Scena* (Σκηνή) in the one, and the *Cavea*, *Orchestra*, and *Scena* in the other. The cavea was the general term for the whole of the space appropriated to the seats of the spectators, which were all concentric with the orchestra, and which were intersected, in one direction, by ascents or flights of steps (κλίμακες) dividing the seats into so many compartments, termed κερκίδες, or *Cunei*, and separated into two or more 'flights' or 'tiers' by broader spaces or landing-places, called Διαζώματα, or *Præcinctiones*. The number of the κλίμακες, or ascents, and that of the Διαζώματα, or Præcinctions, and also the breadth of the latter, appear to have been regulated entirely according to the extent of the theatre and other circumstances. In general there seems to have been only one Præcinction between the seats, dividing them into two 'flights,' not however so as to give an equal number of rows of seats to each. In the theatre near Epidaurus, for instance, there were 54 rows of seats, divided by a single Præcinction, and 34 of them formed the *first* or lowest tier nearest the orchestra; while in that at Syracuse there were 62 rows, with only a single Præcinction between them, and 41 were given to the *second* or upper flight, furthest from the orchestra. In the theatre at Dramyssus, again, there were two Præcinctions, dividing the entire number of rows, 54, into 18, 16, and 20 respectively, reckoning from the orchestra. As regards the distinct 'flights,' or series of seats, there were two modes of disposing them: the more usual one was to break into separate slopes, retiring from each other, like the 'flights' in an ascent of steps; the other was to place them in a continued slope from the lowest to the highest seats, whereby at each præcinction the next 'flight' was considerably elevated above the level of that landing, being raised upon a podium or wall, which showed itself between the lower and upper 'flight.' Besides the præcinctions *between* the seats, there was another surrounding the whole *coelum*, or auditory of the theatre, forming either an upper uncovered terrace as a standing-place for spectators, or a covered gallery with columns, as is shown in the plan of the Roman theatre, where such portico was assigned to females.

Between the Grecian and Roman orchestra there was a very wide difference as regards the purpose to which that space was appropriated. In the Roman theatre it was merely a continuation of the rest of the auditory, being occupied with seats and spectators, with no other difference than that the spectators were senators and other persons of dignity, and that benches or chairs must have been ranged parallel to the stage. The Greek orchestra, on the contrary, was, as its name imports, made use of for the dancers, musicians, and singers, whose performances constituted so important a part of the entertainment; and so far nothing could have been better planned than the Greek theatre, for the orchestra was visible from every part, whereas the scena could not have been distinctly seen, or hardly seen at all by those on the upper seats at either extremity of the coelum. By referring to the plans it will be seen that while the Roman orchestra does not exceed half a circle, the Greek forms three-fifths of one, or an arc of 216 degrees, its proportions and the depth of the stage being ascertained by merely inscribing a square within a circle, taking one side of that square as the boundary of the stage, and drawing parallel to it a tangent to the circle, which tangent coincides with the scena or back of the stage. Such plan therefore is simple enough, complex as it may appear in the cut, where two other squares are also drawn within the circle, and the points of the three squares determine how far the seats extend, and the situation of the steps (κλίμακες) between the seats,—a fanciful operation, nothing more being required after the first one than to divide the arc or curved portion of the orchestra into as many equal parts as would be requisite according to the number of ascents. In fact this last appears to have been the mode practised, for there are as many examples which differ from as agree with that established by Vitruvius for the Greek theatre. According to that, the divisions, the number of cunei and steps between them, would be uniformly the same, viz. seven of the former, and eight of the latter, including those next the stage, as shown in the cut. This however is so far from being the case, that very material differences occur in that respect. At Epidaurus, for instance, there are ten cunei in the lower tier, and eleven ascents, consequently an even number of the former and an odd one of the latter. At Dramyssus again there are nine cunei and ten ascents; and at Syracuse and Tauromenium the same. The Roman orchestra and scena were also defined by a circle, within which was inscribed an equilateral triangle, one of whose sides D D formed the scena, while the diameter H H of the circle, parallel to the scena, formed the boundary between the pulpitum or stage and the orchestra, the last being always a perfect semicircle. The other three triangles are merely for the purpose of determining the points where the scalæ, or steps between the cunei, are to be, for which nothing more is requisite than to divide the semicircle of the orchestra into as many equal parts as there are to be cunei, whether the number be six or any other; and the diameter of the orchestra H H being given, the distance of the scena from it would be ascertained by making it equal to one-fourth of that line. After all, as has been remarked by Wetter in his work on theatres, there is something more whimsical than rational in such an arrangement. What advantage is it, or what particular harmony of parts is produced by the front of scena exactly coinciding with the base of an equilateral triangle inscribed within a circle of which only one-half is visible, while the triangle itself is not visible at all. These arbitrary architectural fancies were rather defects, and they show how imperfect the art of scenic representation must have been. In addition to the disadvantages already pointed out, as regards the want of moveable scenery, it was no slight inconvenience that the stage could never be occasionally extended in depth, shallow as it was. Taking 70 feet as the diameter of the orchestra alone, which dimensions are equal to the whole of the largest of our modern theatres, the depth of the stage in a Grecian theatre would be a little more than 10 feet, or one-seventh of that diameter; and in a Roman one 17½ feet, or just one-fourth. While so confined a space would admit of very little dramatic action, it would scarcely admit of any change of scenery. Yet shallowness of the stage was in some measure matter of necessity, that the performers might be as near to the front of the stage as possible, separated as they were, in the Grecian theatre at least, from the audience by the intervening orchestra.

Strict as were the rules for proportioning the depth of the stage to the size of the orchestra, the relative size of the orchestra to the coelum or whole auditory does not appear to have been subject to any regulations: it varies considerably in different theatres, being in some nearly one-half, in others only one-fifth, or even little more than one-sixth of the entire diameter of the interior, as in the theatres of Epidaurus and Dramyssus, or Janina.

When it is said that the Grecian orchestra was considerably larger than the Roman, there is some ambiguity in the expression, for it might be inferred from it that it was larger than the other in proportion to the coelum, whereas the meaning is that the orchestra of the Greeks formed a larger portion of a circle, extending to 220 degrees, while the Roman was only 180 degrees, or an exact semicircle. In the Greek theatre, therefore, the orchestra cuts into the stage, and renders that part termed Logeion by the Greeks, and Pulpitum by the Romans, considerably narrower than the extremities, whereas in the Roman theatre the stage was of the same depth throughout, pulpitum being a mere technical distinction applied to that portion corresponding with the orchestra, and to which the actors confined themselves, in order that they might be better seen and heard[*] by the whole of the audience than would otherwise have been the case. The plans above given are not drawn to any particular scale, but supposing them to be upon the same scale, and the diameter of the orchestra in the Greek plan to be 100 feet, the diameter of the coelum or whole auditory will be 300 feet, the width of the stage and scena 180, and the depth of the logeion only 15 feet, while in the other the dimensions will be, orchestra 100, auditory 270, scena 195, depth of stage and pulpitum 25.

Another point of difference between the Grecian and Roman theatre is, that in the former the stage was conderably elevated above the orchestra, 12 feet or upwards, consequently there was a wall of that height at the back of the orchestra, to which was given the name of Hyposcenium (ὑποσκήνιον), or Lower Scena, and which formed a sort of architectural basement to the stage, and was adorned with niches and statues. This however is little more than conjectural, for what is known relative to this and other accessory parts of the stage is derived not from any examples of them discovered in antient structures of the kind, but merely from such mention of the terms applied to them as is found in a few antient writers and commentators, whose explanations are all more or less obscure, and full of discrepancies. We shall not therefore attempt to say more relative to either the Greek or Roman stage and scena than we have already done. It seems to have been assumed that, because the theatres themselves were of extraordinary extent and solidity in their construction—that because there were columns, and marble, and statues—the stage exhibitions also must have been in the same degree superior to those in the comparatively small theatres of modern times. Yet the truth is, that capacious as the buildings were, being intended to accommodate nearly the entire population of a city at each performance, the stage itself was not at all in proportion to the rest. There was so little space attached to it either behind or at its sides, that spectacle and scenic contrivance and effect must have been almost impossible: when therefore we read that 'not unfrequently a magnificent compilation of machinery gradually descended with the divinities of Olympus,' though we do not doubt the fact of there being some contrivance for letting down performers from above—in which case, however, the stage itself must have been roofed in—we greatly question the 'magnificence,' and rather suspect that the contrivance must have been somewhat clumsy, and the effect almost ridiculous.

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[*] The antients also were obliged to have recourse to what seems a strange expedient for transmitting the actors' voice to the furthest part of the theatre, namely, that of placing in cavities for the purpose beneath the seats both of metal or earthen vases, termed Echeia (ἠχεῖα), that is 'sounding things,' which augmented the sound. Mr. W. Bankes discovered something of the kind in the theatre of Scythopolis in Syria, but what effect such Echeia, and the metallic mouth-pieces of the masks worn by the actors really produced, it is not possible now to judge.

An experiment has lately been made (November, 1841) in the theatre of the new palace at Potsdam, towards reviving an antient dramatic performance, with rigorous attention to costume. The piece selected for the purpose was the 'Antigone' of Sophocles, and the theatre and all the arrangements were made to conform as nearly as possible to classical example. The pit was converted into an orchestra upon the Grecian model, and it was here that the persons who composed the chorus remained until they had to appear on the stage, when they ascended to it in the sight of the audience, and descended again in the same manner, so carefully was all the antient practice observed. Equal regard to precedent was shown in comparatively trifling matters: for instance, instead of the curtain being drawn up, it was let down, as was supposed to have been the case in the antient theatres, a circumstance which has already been questioned by us; and it is said that the effect of the upper part of the scene being disclosed before the lower was not a little striking. Indeed, if we may believe all that the Berlin journals have reported of this classical exhibition, it perfectly realized its prototype, and no doubt greatly surpassed it, if it were only because it took place by candle-light, and the actors did not wear masks.

Little more remains to be said on the subject of antient theatres, except to remark that the form of the orchestra also determined that of the exterior of the building; while the Roman theatres therefore did not exceed a semicircle, those of Greece had a greater curve. In the Greek theatres however the orchestra was not always extended beyond a semicircle, by the curve being continued, but sometimes by straight lines at right angles to the chord (or parallel to BB, in the plan of the Roman theatre, whose general form is so shaped, the external semicircle being prolonged by the colonnades). Grecian theatres were almost invariably built on the sloping side of a hill, so that, as regards the coelum, it was merely necessary to shape it out, and erect the seats; consequently there was no other architectural exterior than that formed by the Parascene (Παρασκήνη) and colonnade behind the stage; for which reason the degree of curvature did not manifest itself. The Roman theatres, on the contrary, were erected on level ground, and therefore the curved part of the exterior was confined to a semicircle, a form which unites better with the rectangular one and its straight lines.

The theatre at Athens (called that of Bacchus) was by no means so spacious as many others, its diameter being only 250 feet, and that of the orchestra 72, which are very moderate dimensions in comparison with those of some of the Asiatic theatres. The Odeion of Regilla, also at Athens, though similar in its general plan to the usual theatre, was a music-hall, and was covered in with a tent-like roof, with a semicircular *eye* or opening for light. Both structures were situated at no great distance from each other on the south side of the Acropolis [ATHENS, Plan]; therefore the scena of the theatre had a northern aspect, and must have been in shadow while the performances took place.

The following is a list of such antient theatres as are known, together with the respective dimensions of their general diameter and of their orchestra; which we have for the most part taken upon the authority of a similar table given by Col. Leake, in his 'Tour in Asia Minor,' to which several other examples are here added.

	Diam.	Orchestra.
Anemurium	197 feet.	
Aspendus	400	25 rows of seats.
(scena Ionic and Corinth.)		
Athens, Theatre of Bacchus	250	72 ft.
,, Odeion	90	36
Cnidus	400	
Delos	175	
Dramyssus, or Joannina	440	78
Ephesus	660	240
Epidaurus	370	55
Herculaneum	180	16 rows of seats.
Hierapolis	346	100
Laodicea, Great Theatre	364	136
Limyra	195	not known
Mantineia	227	not known
Miletus	474	224
Myra	360	120
Nicopolis (in Epirus)	360	120
Orange (scena only remaining, 336 ft. wide, 114 ft. high.)		
Patara	265	96
Perga		25 rows of seats.
Phellus	400	Scena 150.
Pola, about	200	68
(destroyed 1636, but plan preserved by Scamozzi)		
Pompeii	190	62
Pompeiopolis	219	138
Rome, theatre Marcellus	517	172
Sardes	396	162
Selinus (in Cilicia)	114	
Sicyon	313	100
Side	390	120
Sparta	453	217
Stratonicea	390	106
Syracuse	440	
Tauromenium	330	width of scena 132
Teos	285	70
Tralles	540	150

Of some of these theatres scarcely anything remains, little more than their general shape and extent being now distinguishable; accordingly the statements of their dimensions are not to be strictly relied upon, though they are sufficient to enable us to estimate their comparative size.

Fortunately the antient theatre was not taken as a model for modern structures of the kind. The revival of theatrical representations took place before anything was known relative to that branch of architectural archæology, and under very different circumstances. Dramatic entertainments were then either partly religious, and performed within churches, convents, and colleges; or were acted for the amusement of princes and nobles on occasions of state and festivity, in halls merely temporarily fitted up for that purpose; consequently spacious and permanent structures, as public theatres, were not required until long afterwards, when the drama had become a distinct profession. In the meanwhile a taste for scenic display had developed itself, which required a very different arrangement of the stage and its apparatus from that of the antients. Imperfect as they were in many respects, the dramatic pageants and recitations performed before Leo X. were 'got up' with great magnificence, and some of the greatest artists were employed upon the decorations; among others Baldassare Peruzzi [PERUZZI], whose skill in architecture and perspective carried scene-painting almost to perfection at once. Even in the preceding century dramatic exhibitions had been produced at Florence in a style then unprecedented; and we are told that the first Italian theatre was one erected in that city by Bernardo Buontalenti in 1581; but it does not appear to have been a public theatre, nor could it have been very spacious, as it now forms merely a saloon in the building called the Ufizi. Theatres on the present system were not built until the early part of the seventeenth century: just before which time an attempt had been made to restore the form of the antient theatre and stage, with the permanent architectural scena and its entrances, by Palladio, whose celebrated Teatro Olimpico at Vicenza is one of those things which have gained a traditional reputation far beyond their real merits. Admired at first, because then superior to anything of the kind, it has continued to be admired since, partly on account of the character attached to it, which few care to dispute; and partly perhaps on account of its singularity, and because it shows the peculiarities of the antient theatre. By no means however is it a very accurate imitation, though its chief merit lies in being a mere imitation; it is semi-elliptical instead of semicircular, with the stage on the longer axis of the ellipse; wherefore it looks too much squeezed up one way, and stretched out the other, and produces the same kind of disagreeable effect as would arise from placing the stage on the longer side of a parallelogram of the same extent (96 × 45 feet). It is said that the space to which the architect was restricted compelled him to adopt that form, yet it hardly appears so from the published plans of the building, for it would not be difficult to show how a semicircle might have been brought in. With regard to the scena, for which unlimited admiration is claimed, nothing can be more tasteless: it abounds in almost as many architectural barbarisms and solecisms as could well be brought together. Even Robert Adam spoke of it as mere 'gingerbread;' and another architect, Woods, says, 'The scene, which is the part most admired, borders upon trumpery;' and that although the building 'is too celebrated to be omitted, for him it might have slept in oblivion.' It is not however so much the scena or facciata itself, as the avenues seen beyond it through the centre arch and other openings which attract notice, and have been extolled by some as greatly superior to the 'flimsy' painted decorations upon canvas used in modern theatres. Those avenues represent as many streets, the fronts of the buildings being modelled or carved in relief, and attempted to be shown in perspective by the floor and ceiling sloping very much upwards and downwards, and the other horizontal lines accordingly, and by the passages themselves being narrower at the further end. The contrivance is puerile at the best; and instead of being more deceptive or natural than painted scenery, the imitative perspective becomes distorted when viewed from any other situation than the centre of the theatre and the level of the stage. It is also difficult to understand how these narrow enclosed passages could have been properly lighted at the time of a performance; and although they are, in stage language, 'practicable,' hardly could they have been made use of, at least not for their whole extent, because at their further end an actor would appear gigantic. This structure is nevertheless entitled to notice as an example of a very defective and faulty system, and because it has been frequently mentioned for the purpose of recommending, on the imposing authority of the name of Palladio, what ought not to be imitated.

We are not aware of more than one other attempt to revive the antient theatre in all its strictness, which was that built in 1588 at Sabbionetta, for the Duke Vespasiano Gonzaga, by Scamozzi, who completed the Teatro Olimpico after Palladio's death. Temanza, who gives a description of the structure, speaks of it as then no longer remaining; but Tiraboschi points this out as a mistake, saying that the building still existed, though very much out of repair. How far the theatre at Sabbionetta differed from that at Vicenza in size, Temanza has not stated; but it was superior to the latter in its plan, the spectatory being semicircular, and the orchestra somewhat more. There was likewise, as at Vicenza, a Corinthian loggia or colonnade around the upper part above the seats, but in much better taste, all the intercolumns, except one at each end containing a niche, being open; whereas in the other building the centre intercolumns are closed. Yet whatever improvement Scamozzi may have made upon his predecessor's work in these respects, he attempted none where it was most of all wanted, but copied the permanent scena, with its avenues of mock perspective in relief. We do not say that the antient theatre offers nothing for imitation, or capable of being applied to modern ones. On the contrary, the general form of the spectatory is the most elegant and commodious that can be devised; the absurdity lay in adopting, together with that, the antient scena and stage, than which nothing can be more ill-contrived, defective, and inconvenient. In fact the antient model supplies no stage at all in comparison with what is now required for one, but merely a proscenium; and such *avant-scene*, with merely a stationary architectural 'drop' [Scene-Painting], would answer every purpose of dramatic representation, just as well as the Logeion of the Greeks, the Pulpitum of the Romans, and Palladio's 'classical architectural background, which will not endure the slightest comparison with the drop-scene at Covent Garden. For the plan of a complete theatre, the modern stage, with its extensive and complex scenery and mechanism, should be combined with the form and arrangement of the antient spectatory, though not without very considerable modification. This was done by Quarenghi in the Theatre of the Hermitage at St. Petersburg; in another private theatre in Prince Besborodko's palace, and in a design for a public theatre intended to be erected at Bassano. After all, such plan and disposition of the seats are by no means well adapted for a modern public theatre and mixed audience: unless many inconveniences were to be submitted to, great loss of space, or what would be considered such, would be incurred, and the number of spectators would be much less in proportion to the width of the 'house' and stage. On the other hand, the form of the antient theatre may be applied to a concert-room with such very slight alteration, that it is rather surprising it should not have been taken as a model for public rooms of the kind. There a permanent scena, either of painted or real architecture, behind the orchestra and singers, would be appropriate, because not intended to have any immediate reference to the performance itself.

In claiming a decided superiority for the modern theatre over that of the antients, we speak only as regards the respective systems; and as Ugoni, in his Life of Milizia, observes, to prefer the Grecian theatre, with all its inconveniences and the awkward expedients resorted to in it, as being of more classical and dignified character than our own comparatively small and fragile yet greatly improved structures of the kind, is to wish to limit art and science within their first bounds. There certainly was good reason at one time for exclaiming against modern theatrical architecture as very defective in regard to the audience portion of the 'house.' Till within a comparatively late period, scarcely any study was bestowed on beauty and convenience of plan. The accommodations were hardly so good as those in many very ordinary playhouses, where for want of space, there are no other seats than what directly face the stage. The 'house' was usually an oblong, either rectangular or elliptical, so that the greater part of the audience,—at least those in the boxes,—were placed quite on the sides. Where the 'house' contracted towards the proscenium, as was frequently the case, the side-boxes were actually turned *from* the stage; and whether such was the case or not, they were allowed to encroach upon the stage itself in such manner, that when the actors advanced to the front of the stage or beyond the line of the curtain, they may be said to have mingled with the audience, and those in the boxes on the *avant-scene* were actually behind them. If we may judge from the plans and other drawings of them, the two principal theatres in London were, even less than a century ago, both as inconvenient and as ugly as can well be imagined. The approaches, too, used formerly to be exceedingly bad; not only mean and inconvenient, but in many places most dangerously narrow. Such is strikingly the case in most of the modern Roman theatres, for instead of the box-corridors following the curve of the 'house,' and being of the same width throughout, they are so contracted where the other is widest, that more than two persons cannot pass.

Very great reforms have now taken place, yet there is still room for further improvements, obvious, though not likely to be adopted so long as it is considered a matter of course that the space before the curtain must be made to contain as many persons as can possibly be packed into it, and that an audience must be piled up around the whole house to the very ceiling. We do not say that modern theatres are too lofty; the error does not lie there but in carrying up the boxes, tier after tier, to such a preposterous height that the uppermost box is several feet above the top of the curtain or stage-openings, and the back seats of the upper-gallery are actually on a level with the ceiling over the pit. Such accumulation of diminutive stories gives a crowded appearance to the whole, and leaves no space for architectural decoration around the upper part. No doubt a very striking appearance of a different kind presents itself from the pit and from the stage, when the house is entirely filled to the very top; and if we consider merely the coup-d'œil from such points, it may be allowed to be imposing. But then, as regards that part of the audience who occupy the upper part of the house, the arrangement is bad. From the seats which are at all above the level of the top of the curtain, there is only a bird's-eye view of the stage and the scenery, and that only from the front seats, and also facing the stage, for from those on the side of it it is impossible at that height to obtain a sight of the scene or even the actors, unless when they come forward towards the foot-lights. There should be no seats at a greater height than midway that of the curtain, or the level of what is now the second tier of boxes in our large theatres; for, as the scenery can be painted only to one horizon,—generally that of the stage itself,—its perspective effect is more or less impaired when it is seen from either very much above or below that level. No less preposterous is the practice of continuing the side-boxes up to the proscenium, and sometimes (as in the Opera-house at London) quite up to the very curtain, so that there is no proscenium at all, unless the space on the floor of the stage, between the curtain and foot-lights can be so called. While those so seated lose the scenery altogether, they have the disadvantage of seeing between the wings on the side opposite them; and although the positive inconvenience resulting from such arrangement is felt only by a portion of the audience, the bad effect occasioned by it extends to the whole theatre. Not only ought there to be a distinct proscenium, serving as an architectural frame to the stage and its scenery, dividing that part of the theatre from the rest, but it ought to be of much ampler proportions than are now given it. It should extend so far as to leave some interval—a sort of neutral ground—between the curtain and the boxes, so as to remove the nearest spectator in them to a tolerable distance for properly viewing the stage as a picture; for it is possible to be as inconveniently near the stage as distant from it. Where, in order to contract the stage, or to render the pit and general diameter of the house considerably greater than what is required for the width of the curtain, the plan is made to approach a circle (as is the case in nearly every theatre built within the last twenty years), the boxes should be confined to the semicircle facing the stage; and, so far from being a blank, the curved space on each side between them and the curtain might be made to contribute very much to the architectural appearance of the whole house. This would not take away anything from the pit, and if it materially diminished the number of the boxes and seats in them, it would be only where there ought to be nothing of the kind. The banishing of boxes from such situations, and making also no more than two tiers, would certainly greatly abridge the present capacities of theatres: a house of the same size would not contain the same number of persons as at present, when a large part of the audience are put where they cannot well see the performance. It is likely, therefore, to be objected that such a system would be too expensive, since a large house would be requisite for a comparatively moderate audience; but curtailments might very well be made elsewhere, for at present the whole building is frequently very much larger and more costly than actual necessity requires, the 'house' itself, be its dimensions what they may, taking up a comparatively small area of the entire plan, while the rest is occupied by stately approaches and saloons, which, where economy rendered it expedient, might be greatly abridged, and much plainer in style, and some of them omitted altogether as superfluous appendages.

In some of the modern continental theatres, the pomp displayed in such accessory parts of the building far exceeds anything of the kind in this country. In that at Berlin, besides several other spacious apartments, is a music-saloon 38 feet high, 44 wide, and 106 feet in length in its upper part, where there is a screen of six Ionic columns at each end; the whole highly decorated, and forming one of Schinkel's richest pieces of interior architecture. The theatre at Münich has two staircases to the boxes, with flights of marble steps 13 feet wide; and besides two saloons for the public (each 82 × 31 feet), there is a very magnificent one communicating with the royal box—not a mere anteroom, but what would be termed a noble room even in a palace, its dimensions being 46 × 44 feet, and 25 in height. In both these theatres, and in that of Genoa, the royal or state box is itself a room of some size, about 15 by 18 feet, more or less; and according to the general custom of the continental theatres, this box (which occupies the height of two tiers, and is adorned with caryatides in front) is directly in the centre of the house, facing the stage, consequently in the very best situation of all; whereas the situation assigned to royal visitors in our theatres is almost the very worst, as far as seeing the stage and the performance is concerned.

In regard to the form of the 'house,' a decided improvement has taken place of late years; and the circular plan, or one approaching to it (either extended by the curtain being a tangent to the circle or somewhat beyond it, or reduced by the curtain intersecting and forming a chord to the segment), may now be considered the one established as being the most pleasing and commodious—that which is best adapted for affording a distinct view of the stage to the majority of the audience. But there is considerable difference of opinion as to its being the best form in regard to hearing. In fact, the science of acoustics is not yet brought to exactness as regards practical purposes in building: it is easy enough to ascertain beforehand how much of the stage will be visible from different parts of the theatre, but not so what will be the result as to sound, since that will depend upon a variety of circumstances, some of them counteracting each other, and not every one of them to be guarded against or foreseen. The shape of the house is but one of them out of many: much will also depend upon size, much upon the depth of the boxes and galleries, and also upon accidental and such trivial matters, that any defect or advantage so occasioned is not likely to be traced to them. Here the chief guide is experience; and experience seems at present to be in favour of, at least not at all against, the circular form; for the new theatres at Mayence, Dresden, and other places where it has been adopted, are said to be perfectly satisfactory in regard to the actors being distinctly heard in every part.

While in their internal embellishment and fitting up theatres afford very great scope to the architect, though not so much as they might do, they also afford opportunity for accomplishing much in regard to characteristic external design. Magnificent as are the exteriors and façades of the theatres at St. Petersburg, Berlin, Münich, Bordeaux, and Nantes, with their porticos and colonnades, there is nothing in them that very clearly expresses their particular purpose, because nothing that corresponds with or indicates the form of the 'house' itself within. Moller, we believe, was the first who made the internal plan discover itself from without, by making the auditory, at least the corridors and saloon surrounding it, project out as a spacious semicircle, in the façade of the theatre at Mayence. The same form of exterior has been given by Semper to the new theatre at Dresden, which is also remarkable for the display it makes of sculpture.

After all it is the stage itself, with its multifarious contrivances and complex mechanism, its scenery and pictorial effects, which manifest the extraordinary perfection to which the moderns have carried the scenic, if not the dramatic art; nor can we exclude the latter, unless we choose to blot out the name of Shakspere. It does not enter into our purpose however to speak of stage mechanism, which is a subject and study by itself, and not otherwise connected with theatres and their architecture than as being made use of in the former. Those who seek for information of the kind will meet with many plates showing the stage construction and mechanism of Plymouth theatre, in Foulstone's 'Public and Private Buildings;' and, with more general and complete instructions, in Stephenson's work on the machinery of theatres. Neither can we make any additions here to what has been already said on the subject of Scene-Painting. We will only observe that very great improvements and numerous contrivances for producing stage and scenic effects had been introduced into theatres at the commencement of the seventeenth century.

Table of Modern Theatres.

ITALY.

	Architect.	Date.	Width of Curtain.	From Curtain to Back of Pit.	Greatest Breadth of Pit.	Height from Floor of Pit.	Stage.	
Bologna . . .	Ant. G. Bibbiena		49 ft.	77 ft.	59 ft.	62 ft.		
Genoa	Carlo Barabino	1826-8	46	88½	64	59	82 ft. deep 69 ft. wide	Entire building 314 by 158 feet. Hexastyle, Doric portico, six tiers of boxes, royal box, oval in plan; two tiers in height, with anteroom 21 by 13½ feet, and Saloon 62 by 46½ feet, and 39 feet high.
Imola	Cos. Morelli	About 1780	22	68	42	38	24 deep 68 wide	Remarkable for singular arrangement of proscenium, with three separate openings.
Milan, La Scala .	Gius. Piermarini	About 1775	44	90	67	75		Six tiers of boxes. Saloon 100 by 24 feet.
Naples, San Carlo	Gior. Metrano; restored, &c. Ant. Niccolini	1735 1817	50	83	73	80	88 deep 110 wide	Burnt 1816, rebuilt 1817. Six tiers of boxes, in all 181. Spectators 2800.
Parma, Great Theatre	Giam. Aleotti, Bernini	1619	36	148	50	85		On the first floor of the Ducal Palace. Not used since 1733.
Parma, New Theatre	Canonica and Nic. Bettoli	1822-3	30	75 to back of boxes				
Rome, T. Aliberti	Ferd. G. Bibbiena		39	66	52		46 by 72	Shape very bad, and staircases and corridors dangerously narrow.
Rome, La Argentina	Marq. Teodoli		39½	66	54	43	54 deep 79 wide	No other proscenium than a decorated pilaster face between boxes and curtain. Six tiers of boxes. Pit floor quite level.
Rome, Teat. della Valle . . .		Restd. 1766	30	47	40		13 deep	No proscenium, the boxes coming quite up to curtain. Stage unusually small and confined, but capable of being extended 19 feet more in depth.
Rome, T. Tordinona	C. Fontana, but since altered		43	51	56		75 deep 72 wide	Six tiers of boxes.
Turin, Opera-House	Ct. Bened. Alfieri	1740	40	78	53	53	105 deep 78 wide	
Venice, La Fenice	Ant. Selva	About 1790	42	76 to back of boxes	62	49	46 deep 91 wide	Burnt down 1836, but since restored. Five tiers of boxes.
Vicenza, T. Olimpico	Palladio	About 1580	78 width of scene	56	115 greatest width of salle	49	22 depth of stage before scene.	

FRANCE.

	Architect.	Date.	Width of Curtain.	From Curtain to Back of Pit.	Greatest Breadth of Pit.	Height from Floor of Pit.	Stage.	
Paris, L'Odéon .	Baraguey, restored	1820	42½	62		51	66 deep	An insulated structure, about 172 × 118 feet, originally built by De Wailly and the elder Peyre.
Paris, Français .	Louis, partly rebuilt by Fontaine	1790 1822	39	59		54		
Paris, Académie Roy. de Musique, or Opera . .	Debret	Opend. Augt. 1821	52½	67		61	95 deep	Saloon 98 by 21, and 21 feet high.
Paris, Ventadour .	Huvé		49	57		64		Insulated structure, 172 by 114 feet. Exterior two orders, Doric and Ionic, in arcades. Saloon 98 × 21, and 21 high
Paris, Feydeau .	Legrand and Molinos	About 1790	49	49			32 deep 78 wide	Front curved.
Versailles, in Palace			34	60	50	44	70 deep 48 wide	

	Architect	Date.	Width of Curtain.	From Curtain to Back of Pit.	Greatest Breadth of Pit.	Height from Floor of Pit.	Stage.	
Bordeaux . . .	Louis	Fin. 1780	39½ ft.	64 ft. includ. boxes	62½ ft. ditto	57½ ft.	70 ft. deep	This splendid theatre restored and refitted up by Bonfin, 1832.
Besançon . . .	Ledoux	About 1777	49	64		52	36 deep 65 wide	Insulated, about 124×100 feet.
Lyon	Soufflot	1754–6	32	63 to back of boxes	36	35½	68 deep 50 wide	Insulated building, 180×130 feet. This theatre has been rebuilt after a different design.
Nantes . . .	Crucy	About 1810	37½	62	49	51	47×65	Portico, Corinthian octastyle before tetrastyle in antis.
				GERMANY AND BELGIUM.				
Berlin, Opera-house	Von Knobelsdorff	1740–3	26	64	42	58	50 deep 52 wide	An insulated building, 214×78 feet. Principal front, Corinth. portico, hexastyle monoprostyle, on low basement.
„ Great Theatre	Schinkel	1816	43	62		44	66 deep 86 wide	A magnificent structure, with Grecian Ionic hexastyle portico on a lofty flight of steps.
Dresden . . .	Semper	1837–1841						
Hamburg . . .	Schinkel	1826–7	40	69 to back of boxes	50	56	60 deep 80 wide	Plan of auditory nearly circular, *i.e.*, a circle of 66 feet diameter, to which the curtain is a tangent. Four tiers of boxes, and amphitheatre formed by a colonnade of 22 pillars.
Mannheim . . .	Ant. G. Bibbiena		30	46			71 deep	
Mayence . . .	Moller	Fin. 1833	54	74		60	56 deep 80 wide	Insulated, about 250×140 feet, with semicircular projection, 140 feet diameter on one of longer sides or façade.
Münich	K. von Fischer	Open. 1818	39	78	62	64	91 deep 94 wide	Burnt Jan. 14, 1823; restored 1824-25. Octastyle Corinth. portico, including boxes, the auditory, a circle 72 feet diameter, between which and curtain is a space of 9 feet. Five tiers of boxes.
Wolfenbüttel, in the palace . . .	Ottmer	1836–7	28	44 includ. boxes	29	27	36 deep 56 wide	Private theatre, fitted up in Gothic style, but detail in poor taste.
Ghent	Roelandt	1837–9	37	59	42		60 deep 78 wide	Façade 300 feet. Oval saloon 91×59, making, with smaller saloon and concert-room, an extent of 270 feet.
				RUSSIA.				
St. Petersburg, Great Theatre . . .	Tischbein; Thomond	1782–3 1803	52	60	50	52	95 deep 70 wide	Insulated building, 150×270 feet, with octastyle Ionic portico. Saloon 125×30 feet.
„ Theatre of 'Hermitage'. .	Quarenghi	1780	36	60	60	42	70 deep 70 wide	Theatre a semicircle, without boxes, but surrounded by a Corinthian colonnade of 13 intercolumns, with seats.
				ENGLAND.				
London, Opera-house	Novosielsky	1790	40	84	60	51	35 deep 80 wide	No proscenium. Corridors, &c. very mean.
„ Covent-garden	Sir R. Smirke	1809	32	66	51	54	56 deep 86 wide	The whole building about 209×160 feet. Saloon 56×19 feet.

	Architect.	Date.	Width of Curtain.	From Curtain to Back of Pit.	Greatest Breadth of Pit.	Height from Floor of Pit.	Stage.	
London, Drury-lane	Ben. Wyatt Beazley	1811-2 1822	32 ft.	64 ft.	56 ft.	60 ft.	48 ft. wide 80 deep	The whole 240×145 feet. Salon 90×26 feet.
„ English Opera	Beazley	1831-4	32	50½	39			The inner hall, with staircase and screen of columns at each end, a pleasing part of the design.
Birmingham . .	Beazley		28	44	45			
Plymouth . . .	J. Foulstone	begun 1811	28	43	33		35 deep 60 wide	The 'house' or auditory forms a circle, 48 feet diameter, of which the boxes occupy about three-fourths. Pit 33 feet diameter.

Several theatres, all more or less worthy of notice, have been erected within the present century, but are omitted in the table, as we cannot specify the respective dimensions. The subjoined list of them, with their architects' names, may however be useful:—

Brescia; Canonica.
Ferrara; Ant. Foschini.
Florence, Teatro Goldoni; Gius. del Rosso, 1817.
„ Theatre after antient plan; Anton. Corazzi.
Mantua; Canonica.
Trento; Ducati, 1823.
Baden; Weinbrenner.
Breslau; Langhans, opened November, 1841.
Cannstadt; Ludw. Zanth, begun 1839.
Carlsruhe; Weinbrenner, 1807-8.
Coblentz; Von Krahe.
Darmstadt; Moller and Heger, 1818-19.
Gotha; Semper, 1837-9. Opened May, 1840.
Münich, Isar-thor Th.: Dericoyen, 1811.
St. Petersburg; Alexandrinsky Theatre; Rossi. Opened August, 1832.

THEATRE. Before the reign of Elizabeth theatrical representations appear to have been subject to no legal restraint beyond the liability of those who conducted them to the vagrant laws. Until the middle of the seventeenth century, players were always attached to the establishment either of the court or of some wealthy subject, whose badge and livery they wore, and whose superintendence was presumed to control any excesses which might be injurious to the public; but when their services were not required by those to whom they especially belonged, it was usual for such persons to wander about the country, exhibiting their performances for gain, and thus becoming strollers, and even mendicants. In the reign of Henry VII. an instance is recorded of a gratuity given by that king to some 'players that begged by the way.' The chief restrictions to which such persons were liable previously to the statute of Elizabeth in which they were expressly mentioned, were measures of police for preventing tumults and breaches of the peace by the assemblage of large numbers of people at their representations. Occasionally however these popular exhibitions attracted the animadversion of the government by holding up matters of state to public censure or ridicule. Thus in 1556, when the unpopular marriage of Queen Mary with Philip of Spain had created great excitement throughout the country, the council direct the attention of the lord president of the North to 'certain lewd persons naming themselves to be servants of Sir Francis Lake, and wearing his livery or badge on their sleeves, have wandered about these north parts, and representing certain plays and interludes reflecting on the queen and her consort and the formalities of the mass.' (Strype's *Ecclesiastical Memorials*, vol. iii., Appendix, p. 185.) Excesses of a similar character, occurring at the beginning of the following reign, and directed against the Protestant religion, were checked by the stat. 1 Eliz., c. 2, s. 9, which inflicted a penalty of 100 marks upon 'persons who in plays or interludes declared or spoke anything in derogation, depraving or despising of the Book of Common Prayer.'

But although players, as such, were in those days subject to no general legal restrictions, it is probable that the practice of granting licences from the crown to such persons prevailed as early as the reign of Henry VIII. It appears too, from a curious paper published by Malone, in his 'Historical Account of the English Stage,' that in the reign of Elizabeth strolling players, though belonging to some great person, usually applied for a licence to the local authorities of any town in which they meant to perform. 'When players of interludes come to the city of Gloucester,' says this document, 'the manner is, as in other like corporations, that they first attend the mayor to inform him what nobleman's servants they are, and so to get licence for their public playing.' The earliest theatrical licence from the crown now extant is that granted by Queen Elizabeth, in 1574, to James Burbage and four other persons, 'servants to the earl of Leicester,' which contains a proviso that the performances thereby authorised, before they are publicly represented, shall be seen and allowed by the queen's master of the revels; a stipulation analogous to the licence of the lord chamberlain under the Licensing Act at the present day. These licences from the crown were originally nothing more than authorities to itinerate, which exempted strolling players from being molested by proceedings taken under the laws or proclamations against vagrants, and also superseded the necessity of licences from local magistrates. The statute 39 Eliz., c. 4, went a step farther, and by implication authorised noblemen to license players, by enacting that 'all common players of interludes wandering abroad, other than players of interludes belonging to any baron of this realm, or any other honourable personage of greater degree, to be authorised to play under the hand and seal of arms of such baron or personage, should be adjudged rogues and vagabonds.' This statute has been frequently misrepresented as denouncing all players as rogues and vagabonds (Prynne's *Histriomastix*; Howell's *State Trials*, vol. iii., p. 567); whereas it is obvious that the enactment applies only to *strolling* players.

Although theatrical representations became much more general in the reigns of James I. and Charles I., no laws were expressly enacted for their regulation, with the single exception of the stat. 1 Car. I., c. 1, which suppressed the performance of 'interludes and common plays' upon the Lord's Day. An ordinance of the Long Parliament, in 164[illegible] was directed to the suppression of all stage-plays and interludes, but though occasionally enforced with much rigour, it failed to abolish these entertainments. The stat. 12 Ann., stat. 2, c. 23, in general terms, classed players of interludes as rogues and vagabonds; but the stat. 10 Geo. II., c. 28, s. 1 expounded the former statute by enacting that 'every person, who should for hire, gain, or reward, act, represent, or perform any play or other entertainment of the stage, or any part therein, if he shall not have any legal settlement where the offence should be committed, without authority by patent from the King, or licence from the Lord Chamberlain, should be deemed a rogue and vagabond within the stat. 12 Ann.' But this provision is now repealed by the stat. 5 Geo. IV., c. 83, and players as such, whether stationary or itinerant, are at the present day not amenable to the law as rogues and vagabonds. By the 2nd section of the above statute, 10 Geo. II., c. 28, which, with the exceptions just mentioned, is still in full operation, and forms the law of the metropolitan theatres, it is enacted generally, that 'every person who shall, without a patent or licence, act or perform any entertainment of the stage for hire, gain, or reward shall forfeit the sum of 50*l*.' By the 3rd section it is declared that 'no person shall for hire, gain, or reward act, perform, or represent any new interlude, tragedy, comedy, opera, play, farce, or other entertainment of the stage, or any parts therein; or any new act, scene, or other p added to any old interlude, tragedy, comedy, opera, play, farce, or other entertainment of the stage, or any new prologue or epilogue, unless a true copy thereof be sent to the Lord Chamberlain of the King's household for the time being, fourteen days at the least before the acting, representing, or performing thereof, together with an account of the play-house or place where the same shall be, and the time when the same is first intended to be first acted, represented, or performed, signed by the master or manager.' The 4th section authorizes the Lord Chamberlain to prohibit the performance of any theatrical entertainment, and subjects the persons infringing this prohibition to a penalty of 50*l*. and the forfeiture of their patent or licence. The 5th section provides, that 'no person shall be authorized by patent from the Crown or licence from the Lord Chamberlain to act, represent, or perform for hire or reward any interlude, tragedy, comedy, opera, play, farce, or other entertainment of the stage, in any part of Great Britain, except in the city of Westminster and within the liberties thereof, and in such places where the King shall personally reside, and during such residence only.' The 7th section enacts, that 'if any interlude, tragedy, comedy, opera, play, farce, or other entertainment of the stage, or any act, scene, or part thereof, shall be acted, represented, or performed in any house or place where wine, ale, beer, or other liquors shall be sold or retailed, the same shall be deemed to be acted, represented, and performed for gain, hire, and reward.' Within a few years after the passing of this act of parliament, the clause which restricted the power of granting patents by the Crown to theatres within the city of Westminster and places of royal residence, was found to be productive of inconvenience; and special acts of parliament were passed exempting several large towns, in which such entertainments were desired, from the operation of that clause, and authorizing the King to grant letters for establishing theatres in such places. Instances of statutes of this kind occur with respect to Bath in stat. 8 Geo. III., c. 10; with respect to Liverpool in the stat. 11 Geo. III., c. 16; and with respect to Bristol in the stat. 18 Geo. III., c. 8.

A further relaxation of the rule established by the stat. 10 Geo. II., c. 28, for the regulation of theatrical performances, was effected by the statute 28 Geo. III., c. 30, in favour of places which could not be expected to bear the expense of a special act of parliament. By this latter statute, the justices of the peace at general or quarter sessions are authorized to license the performance of any such tragedies, comedies, interludes, operas, plays, or farces as are represented at the patent or licensed theatres in Westminster, or as have been submitted to the Lord Chamberlain, at any place within their jurisdiction not within 20 miles of London, Westminster, or Edinburgh, or 8 miles of any patent or licensed theatre, or 10 miles of the king's residence, or 14 miles of either of the universities of Oxford or Cambridge, or 2 miles of the outward limits of any place having peculiar jurisdiction.

The penalties imposed by the stat. 10 Geo. II., c. 28, being found in practice insufficient to prevent the performance of theatrical entertainments without licence, and great evils being experienced from the resort of the lower orders in London to such entertainments, the legislature in the year 1839 gave additional powers to the metropolitan police for their prevention. By the 46th section of he stat. 2 and 3 Vict., c. 47, 'the Commissioners of police are empowered to authorize a superintendent, with such constables as he may think necessary, to enter into any house or room, kept or used within the metropolitan police district, for stage-plays or dramatic entertainments into which admission is obtained by payment of money, and which is not a licenced theatre, and to take into custody all persons who shall be found therein without lawful excuse.' The same clause enacts that 'every person keepng, using, or knowingly letting any house or other tenement for the purpose of being used as an unlicenced heatre, shall be liable to a penalty of 20*l*., or, in the discretion of the magistrate, may be committed to the House of Correction, with or without hard labour, for two calendar months; and every person performing or being therein without lawful excuse shall be liable to a penalty of forty hillings.'

It may be desirable in this article to refer to a statute which was passed in the year 1833 for the protection of dramatic literary property, and which placed such property upon the same footing as the copyright of published books. The stat. 3 & 4 Will. IV., c. 15, enacts that the author of any tragedy, comedy, play, opera, farce, or any other dramatic piece or entertainment, shall have as his own property the sole liberty of representing the same at any place of dramatic entertainment; and that the author of any such production, published within 10 years before the passing of the act, or his assignee, shall, from the time of publication until the end of twenty-eight years, and, if the author be living at the end of that period, during the residue of his natural life, have as his own property the sole liberty of representing such production. The infringement of this right is forbidden under a penalty of 'forty shillings for every unauthorized representation of such production, or the amount of the benefit derived from such representation, or of the injury sustained by the author therefrom, whichever shall be the greater damages.'

THEATRE, ENGLISH, FRENCH, &c. [ENGLISH DRAMA.]

THEATRE, HINDU. [SANSCRIT LANGUAGE AND LITERATURE.]

THEBAIA. [PARAMORPHIA.]

THEBAID, or THEBAIS (Θηβαΐς, sc. χώρα, *Thebais*), signifies the territory or district belonging to Thebes, and is consequently applied to the whole territory subject to the city of Thebes in Boeotia. [THEBES IN BOEOTIA.] In a similar, though a much wider sense, the name was given to the whole of Upper Egypt, the modern Said, of which Thebes was the principal city. This territory extended from Hermopolis Magna southward as far as the first cataracts of the Nile, or to Philæ; or, according to others, as far as Hiera Sicamina. This great province was, according to Strabo (xvii., p. 787), originally divided into ten nomes (*νομοί*); but Pliny (*Hist. Nat.*, v. 9) enumerates eleven, and others mention fourteen — the nomos Lycopolites, Hypseliotis, Aphroditopolites, Tinites, Diospolites, Tentyrites, Phaturites, Hermonthites, Apollinopolites, Antaeopolites, Panopolites, Coptites, Ombites, and the nomos Dodecaschoenus. Respecting the nature of these nomes and the physical features of the Thebaid, see EGYPT.

THEBES (Θῆβαι, Thebae). Towns and cities of this name occur in several parts of the antient world, but the two which are most renowned in history are the Egyptian and the Boeotian Thebes, of which we shall speak separately, and subjoin a list of the other places of this name.

THEBES IN EGYPT, in the Bible called No, or No Ammen, was situated in the central part of Upper Egypt, which derived from this city the name of Thebais. [THEBAID.] This city consisted of two main parts, which were divided by the Nile, one occupying the eastern, and the other the western bank of the river, and each extending from the river to the foot of the hills which enclose the valley of the Nile. This gigantic city, whose ruins still excite astonishment, was believed to be the most antient town of Egypt, and the original metropolis of Egypt. Its foundation was ascribed by some to Osiris, who named it after his mother (Diodorus Sic., i. 15), and by others to the last king of the house of Busiris. (Diodorus Sic., i. 45.) According to other authorities, Thebes was an Ethiopian colony. Its original circumference is stated to have been 140 stadia. Its most flourishing period appears to have been about 1600 B.C., when it was the capital of all Egypt, and when, according to Herodotus and Aristotle, the whole country of Egypt bore the name of Thebes (Θῆβαι). During that period, which probably comprises several centuries, Thebes was the residence of the Egyptian kings, whose tombs are still extant in the rocks on the western side of the city, and extend even to the borders of the desert. (Strabo, xvii., p. 816, ed. Casaub.) Homer (*Iliad*, ix. 381, &c.) speaks of the splendour, greatness, and wealth of Thebes, and calls it 'the city with a hundred gates, each of which sent out two hundred men with horses and chariots. During the invasion of Egypt by the Persians under Cambyses, Thebes, like other towns, suffered very severely, especially the private dwellings, which were for the most part constructed of wood, while the great architectural works defied the flames as much as they have defied the slower influence of time. (Diodorus Sic., i. 46; Herodotus, iii., 25; Pliny, *Hist. Nat.*, xxxvi. 9.) After this catastrophe the city appears never to have recovered her former greatness. During the time of the Ptolemies, when the seat of government was in the northern extremity of the country, Thebes appears to have been neglected by the Egyptian kings. In the reign of Ptolemy Lathyrus, about B.C. 86, it revolted, and after a siege of three years it was taken and plundered by the Greeks. As early as the time of Strabo, when its name Thebes had been changed by the Greeks into Diospolis (Διὸς πόλις, Diospolis Magna, that is, the great city of Jove), and the circuit of the city, which could still be traced, amounted to eighty stadia, the place consisted of a number of villages, and what remained of the antient city consisted chiefly of temples. Under the Roman dominion something appears to have been done to restore or preserve the venerable city; but new calamities broke in upon it when Christianity was introduced into Upper Egypt, and the Christians in their religious zeal destroyed and appropriated to themselves as much as they could of the works of the antient idolaters. At present the site of the city is occupied by four principal villages, Luxor and Carnac on the eastern, and Gournou and Medinet-Abou on the western side of the river. The buildings and sculptures still extant are the most antient of any that exist in Egypt, and are the best and most genuine specimens of Egyptian art and architecture, for we have every reason to believe that by far the greatest part of them were executed before Egypt had yet experienced the influence of the Greeks, that is, long before the Persian invasion. (B.C. 525.) The ruins, chiefly consisting of temples, colossi, sphinxes, and obelisks, occupy nearly the whole extent of the valley of the Nile, a space of six miles from east to west; and on the western side, where the ruins of the city end, there begins, as it were, the city of the dead, the tombs in the rocks, with their paintings, which are still as fresh as if they had been made only a few days ago. For an account of these remains, see the articles EGYPT, CARNAK, LUXOR; and more especially the British Museum, 'Egyptian Antiquities,' 2 vols.; and Wilkinson's 'Topography of Thebes,' in his work 'On the Manners and Customs of the Antient Egyptians,' chap. v.

THEBES IN BOEOTIA, one of the most antient and most important cities of Greece, was situated in the plain between Lake Hylice on the north, and a range of low hills on the south. The Acropolis of the city, built upon an eminence in this plain, was said to have been founded by Phœnicians under Cadmus, whence it was called Cadmea (Καδμεία; Strabo, ix., p. 401; Pausanias, ix. 5, 1; Stephanus Byz., s. v. Καδμεία). Around this citadel the city arose at a later time, and was so disposed, that the greater portion of it occupied the part north of the citadel. According to an antient legend, the city was fortified by Zethos, and Amphion, the wonderful lyre-player, who, by his music, made the stones move and form the walls round the city. (Pausanias, ix. 5, 4, &c.; Homer, *Odyss.*, xi. 262, &c.) Previous to the Trojan war the city was destroyed by the Epigoni, that is, the descendants of the seven Argive heroes who had been defeated by the Thebans, and from this destruction it does not appear to have recovered before that war, as it took no part in the expedition against Troy. In the time of Homer however, who calls it 'a city with seven gates (ἑπτάπυλος),' and gives it the attribute of εὐρύχορος, on account of the extensive plain which formed its territory, it appears to have again been in a flourishing condition. The names of the seven gates of Thebes are still preserved in Æschylus, Pausanias, Apollodorus, and Statius. In 335 B.C. Thebes was destroyed a second time, by Alexander the Great. On his accession to the throne of Macedonia it had revolted, and attempted to shake off the Macedonian yoke. Of the lower city nothing was left on this occasion except the gates, the temples, and the house of Pindar the poet: 6000 inhabitants were killed, and 30,000 sold as slaves. Cassander rebuilt the city in B.C. 316, with the generous aid of the Athenians, Messenians, and Megalopolitans. (Pausanias, ix. 7.) The city suffered a third time in B.C. 291, under Demetrius Poliorcetes. (Plutarch, *Demetr.*, 39, &c.; Diodorus Sicul., *Fragm.*, xxi., p. 273, ed. Bip.) Dicaearchus, who saw Thebes about this time or shortly after, has left us an interesting description of it. This city, says he, is about seventy stadia in circumference; its form is nearly circular, and its appearance somewhat gloomy. It is plentifully provided with water and pastures, and the gardens around it are better than any in Greece. It is most agreeable in summer, on account of the plentiful supply of cool and fresh water, and the beautiful gardens: in winter however it is very unpleasant, because it is destitute of fuel, and exposed to floods and cold winds. At this season heavy falls of snow were frequent, and the city was very dirty. (Dicaearchi Messenii, *Quae supersunt*, p. 143, &c., ed. Fuhr.) Its population about this time is supposed to have been between fifty and sixty thousand. After the Macedonian time however the city declined still more, and Sulla seems to have given it the last blow by depriving it of half of its territory, which he assigned to the Delphians (Pausanias, ix. 7, 4); and Strabo remarks that in his time it had scarcely the appearance of a village (ix., p. 403, ed. Casaub.). In the time of Pausanias the citadel, then called Thebes, was still inhabited, but the lower city was entirely abandoned; and he only saw the walls, gates, and temples, of which he gives a description. The place which now occupies the antient Cadmea is called Theba, or Pheba, and in Turkish, Stiva; and here, as well as in the surrounding plain, there are many remains of antient buildings, sculptures, and inscriptions. The inhabitants of antient Thebes were distinguished above all the other Greeks for rusticity, fierceness, and passion. Hence a Theban was always ready to settle any dispute, either with a fellow-citizen or with a foreigner, by fighting rather than by the ordinary course of justice. The women were celebrated for their gentleness and beauty. (Dicaearchus, as above.)

In early times Thebes was governed by kings, who play a more prominent part in the mythical traditions of Greece than the chiefs of any other part of the country. The last of these kings, Xanthus, was slain in single combat by Andropompus. After this event the government of Thebes became an aristocracy, or rather an oligarchy. (Pausanias, ix. 5, 8.) This form of government, although it was frequently restored for a short time, gave way to a democracy. When we read that no one was allowed to hold any public office unless he had, at least for ten years, not been engaged in any trade, this rule seems to refer to the oligarchic period. (Aristot., *Polit.*, iii. 3, p. 80, vi. 4, p. 209, ed. Göttling.) During the time of the Persian invasion, the government is again called an oligarchy; but it is added that this was not the constitution which the Thebans had inherited from their fathers. (Thucydides, iii. 62; Plutarch, *Aristid.*, 18.) The democracy, which must have been restored soon after, was again abolished after the battle of Oenophyta, in B.C. 457. (Aristotle, *Polit.*, v. 2, p. 155.) In the Peloponnesian war we again find mention of an oligarchy at Thebes (Thucydides, iv. 76; v. 31; Diodorus Sic., xii. 69); but this appears to refer only to the influence of the magistrates, for throughout that time, as well as afterwards in the time of Epaminondas and Pelopidas, it was the assembly of the people which decided the most important political questions, such as those relating to war and peace. (Xenophon, *Hellen.*, iii. 5, 8.) Henceforth the democratical constitution appears to have continued at Thebes down to the time that Greece fell into the hands of the Romans, and a shadow of it remained even afterwards. Along with the assembly, which, at least in later times, was as tumultuous as that of Athens (Polybius, vi. 44), Thebes also had a senate; and the magistrates, who were elected annually by ballot, bore the name of polemarchs. As a state Thebes was not confined to the city and its immediate neighbourhood, but comprised the whole territory between the eastern coast of Lake Copais and Mount Cithaeron, and extended to the north as far as the little river Cephissus, which empties itself in the sea between Euboea and the mainland. This whole territory was called Thebais, and contained a great number of towns which were subject to Thebes. Among the fourteen confederate states of Boeotia, Thebes was the first, whence it is generally called the capital of Boeotia, which, in the strict sense of the word, it certainly was not. [BOEOTIA.]

Besides the Egyptian and Boeotian Thebes, the following towns of this name are mentioned by antient writers:—

1. Thebes in Phthiotis in Thessaly (Θῆβαι αἱ Φθιώτιδες, Thebae Phthioticae, or Thebae Phthiae) was an important commercial town with a good harbour. (Strabo, ix., p. 431, 433, 435; Livy, xxxix. 25; xxxviii. 7, &c.)

2. Thebe (Θήβη) in Troas in Asia Minor was celebrated as a fortified place as early as the Trojan war. It was situated north of Adramyttium, and taken and destroyed by Achilles. The plain in which the town had been situated was known down to the latest times as the Plain of Thebe (τὸ Θήβης πεδίον; Homer, *Iliad*, i. 366; vi. 397; Strabo, xiii., p. 584, &c.; Herodotus, vii. 42).

3. Thebes, in that part of Arabia Felix which was called the country of the Cinaedocolpitae.

4. Thebes in Lucania in Italy. (Pliny, *Hist. Nat.*, iii. 15.) Stephanus of Byzantium (s. v. Θῆβαι) mentions several other towns of this name, of which however nothing is known.

THECA, a term in vegetable anatomy. It was applied by Grew to that part of the stamen which contains the reproductive granules and which is now generally called the anther. [Anther.] It is also extensively employed in cryptogamic botany. Among the ferns, it is applied, in common with the terms capsule, conceptacle, and sporangium [Sporangium], to those little granules which constitute the masses called sori. In the Equisetaceæ it expresses the assemblage of cases, which are attached to scales arranged in a conical manner.

The same term is used to indicate the kidney-shaped two-valved cases that contain the reproductive matter of Lycopodiaceæ and also the urn-like organs that enclose the sporules of mosses. It is by some writers still further extended, and used to express the parts that contain the sporules in Lichens and Fungi.

THECA (in Anatomy) is a term commonly applied to the strong fibrous sheaths in which certain soft parts of the body are enclosed. Thus the *theca vertebralis* is the sheath of dura mater in which the spinal chord is enclosed; and the canals through which many of the long tendons of the muscles of the hand and foot run are called thecæ. These last are always lined by a synovial membrane, and contain a small quantity of fluid [Synovia], by which the sliding of the tendons is facilitated.

THECADACTYLS, Cuvier's name for those *Geckos* which have the toes enlarged throughout their length, and furnished below with transverse scales, which are divided by a longitudinal furrow, where the claw may be entirely hid. [Gecko.]

THECI'DEA, or THECI'DIUM. [Brachiopoda, vol. v., p. 313.] Mr. J. E. Gray arranges the *Thecideidæ* as the fourth family of the *Brachiopoda*, placing it between the *Productidæ* and the *Craniadæ*, and making it consist of the single genus *Thecidea*.

THECODONTOSAU'RUS. [Thecodonts.]

THE'CODONTS. Professor Owen, in his 'Report on British Fossil Reptiles,' observes that among the inferior or squamate saurians there are two leading modifications in the mode of attachment of the teeth, the base of which may be either anchylosed to the summit of the alveolar ridge, or to the bottom of an alveolar groove, and supported by its lateral wall. These modifications are, he remarks, indicated respectively by the terms 'acrodont' and 'pleurodont.' A third mode of fixation is presented by some extinct saurians, which, in other parts of their organization, adhere to the squamate or lacertine division of the order, the teeth being implanted in sockets, either loosely or confluent with the bony walls of the cavity: these Professor Owen has, in his 'Odontography,' termed the *Thecodont Lacertians*, the most antient of all saurians belonging to this group.

Commencing with the *Thecodontosaurus* of Dr. Riley and Mr. Stutchbury, described by them in the 'Geological Transactions' of 1836, from remains found in the dolomitic conglomerate of Redland, near Bristol, the oldest or lowest division of the new red sandstone series, Professor Owen remarks that this reptile is allied to the typical *Varanian Monitors*, but differs from them in having the teeth imbedded in distinct sockets; but that the *Varani*, among the squamate saurians, approach to this condition in the shallow cavities containing the base of their teeth along the bottom of the alveolar groove.

But, in the extinct genus now under consideration, the sockets are, he states, deeper, and the inner alveolar wall is nearly as high as the outer one; the teeth are arranged in a close-set series, slightly decreasing in size towards the posterior part of the jaw; each branch of the lower jaw is supposed to have contained twenty-one teeth, which are conical, rather slender, compressed and acutely pointed, with an anterior and posterior finely serrated edge, the serratures being directed towards the apex of the tooth, as in G. Fischer's genus *Rhopalodon*; the outer surface is more convex than the inner one; the apex is slightly recurved; and the base of the crown contracts a little to form the subcylindrical fang. He then goes on to remark that the pulp-cavity remains open in the base of the crown; that, in their microscopic structure the teeth of the *Thecodontosaurus* closely correspond with those of *Varanus, Monitor*, and *Megalosaurus*; that the body of the tooth consists of compact dentine, in which the calcigerous tubes diverge from an open pulp-cavity at nearly right angles to the surface of the tooth; that they form a slight curve at their origin, with the concavity directed towards the base of the tooth; then proceed straight, and, at the periphery, bend upwards in the contrary direction. The diameter of the calcigerous tube he gives as 1-30,000th of an inch, and the breadth of the interspace of the tube as 1-8000th of an inch. The crown of the tooth is invested with a simple crown of enamel. This microscopic examination, which Professor Owen was enabled to make by the kindness of Mr. Stutchbury, satisfactorily establishes, in the Professor's opinion, the distinction between the saurian of the Bristol conglomerate and *Labyrinthodon*. [Salamandroides.]

Of Palæosaurus Professor Owen states that its tooth is compressed, pointed, and with trenchant serrated margins; but that its breadth, compared with its length, is much greater than in *Thecodontosaurus*. The vertebræ associated with these teeth were biconcave, with the middle of the body more constricted, and terminal articular cavities rather deeper than in Teleosaurus; but, the Professor adds, they are chiefly remarkable for the depth of the spinal canal at the middle of each vertebra, where it sinks into the substance of the centrum, and thus the canal is wider vertically at the middle than at the two ends of the vertebra: an analogous structure, he observes, but less marked, obtains in the dorsal vertebræ of the *Rhynchosaurus* from the new red sandstone of Shropshire.

Professor Owen then points out that besides deviating from existing lizards in the thecodont dentition and biconcave vertebræ, the antient saurians of the magnesian conglomerate also differed in having some of their ribs articulated by a head and tubercle to two surfaces of the vertebra, as at the anterior part of the chest in *Crocodiles* and *Dinosaurs*. The shaft of the rib, he tells us, was traversed, as in the Ichthyosaur and Rhynchosaur, by a deep longitudinal groove; and some fragmentary bones indicated obscurely that the pectoral arch deviated from the Crocodilian, and approached the Lacertian or Enaliosaurian type in the presence of a clavicle, and in the breadth and complicated form of the coracoid. The humerus, he observes, appears to have been little more than half the length of the femur; and to have been, like that of the *Rhynchosaurus*, unusually expanded at the two extremities.

After quoting the description of the femur by the discoverers of the present thecodont reptiles, Professor Owen remarks that the tibia, fibula, and metatarsal bones manifest, like the femur, the fitness of the thecodont saurians for progression on land. The ungual phalanges, he observes, are subcompressed, curved downwards, pointed, and impressed on each side with the usual curved canal.

The Professor draws the following conclusions from the knowledge at present possessed of the osteology of *Thecodontosaurus* and *Palæosaurus*, whose antiquity the discoverers of these genera regard as being greater than that of any other vertebrated animals, excepting fishes:—

In their thecodont type of dentition, biconcave vertebræ, double-jointed ribs, and proportionate size of the bones of the extremities, they are nearly allied to the *Teleosaurus*; but they combine a lacertian form of tooth and structure of the pectoral and probably pelvic arch with these crocodilian characters, having distinctive modifications, as the moniliform spinal canal, in which however the almost contemporary Rhynchosaur participates.

Professor Owen adds that it would be interesting to ascertain whether the caudal vertebræ are characterized, as in the Thuringian Protosaur, by double diverging spinous processes.

Cladyodon, Owen.—'In the new red sandstone (keuper?) of Warwick and Leamington,' says the Professor, 'there occur detached, pointed, trenchant, recurved teeth, the crowns of which are sometimes 1 inch 4 lines in length, and 5 lines across the base: they have been found in the same quarries as those containing the remains of *Labyrinthodon*. In their compressed form, anterior and posterior serrated edges, sharp points, and microscopic structure, these teeth agree with those of the Saurian reptiles of the

Bristol conglomerate. In their breadth, as compared with their length and thickness, they are intermediate between the *Thecodontosaurus* and *Palæosaurus platyodon;* but they are larger, with longer and more recurved crowns, and thus more nearly approach the form characteristic of the teeth of the *Megalosaurus.* From these teeth however they differ in their greater degree of compression, and in a slight contraction at the base of the crown; I therefore indicate the genus, of which, as yet, only the teeth are known, by the name of *Cladyodon*, and the species from the Warwickshire sandstones by the name of *Cladyodon Lloydii*, in testimony of the friendly aid of Dr. Lloyd of Leamington, to whose zealous co-operation I owe the materials for the description of the teeth of the present genus, and the still more remarkable ones of the British species of *Labyrinthodon*, with which the teeth of the *Cladyodon* are associated.

In conclusion, Professor Owen refers to a tooth of *Cladyodon* figured by Mr. Murchison and Mr. Strickland in their paper on the Warwick sandstones. (*Geol. Trans.*, 2nd series, vol. v.)

THECOSO'MATA, M. de Blainville's name for his first family of *Aporobranchiata*, the first order of his second section of his second subclass (*Paracephalophora Monoica*).

The *Aporobranchiata*, according to M. de Blainville, consist of those *Malacozaria*, or Mollusks, which have the body of a slightly variable form, but constantly provided with natatory appendages which are equal and lateral, without any foot properly so called, and which often have the organs of respiration but little evident.

The following genera are arranged by M. de Blainville under the family of *Thecosomata*:—

Hyalæa: Cleodora, divided into two sections; 1, depressed species, Ex., *Cleodora Brownii;* 2, conical and not depressed species (genus *Vaginella*, Daud.), Ex., *Vaginella depressa; Cymbulia:* and *Pyrgo* (fossil).

The principal forms of this family are treated of under the article HYALÆIDÆ.

Mr. J. E. Gray, who makes the *Thecosomata* the first order of the class (4th) PTEROPODA, divides the forms which, in his opinion, should be arranged under that order, into the following families and genera:—

Fam. 1. Cleodoridæ.

Genera:—*Hyalæa; Diacria; Cleodora; Balantium; Pleuropus; Vaginella; Creseis; Brochus; Psyche; Euribia.*

Fam. 2. Limacinidæ.

Genus, *Limacina.*

Fam. 3. Cuvieridæ.

Genera:—*Cuvieria; Tripteres.*

Fam. 4. Cymbuliadæ.

Genus, *Cymbulia.*

THEDEN, JOHANN CHRISTIAN ANTON, a celebrated German surgeon, was born Sept. 13, 1714, at Steinbeck, a small village not far from Wismar, in the duchy of Mecklenburg. His family had been ruined by the disasters of war, and his father died when he was young, which two melancholy events had an unfavourable influence upon his education and his first entrance into life. He had hardly received the bare elements of education, when, at the age of thirteen, he was reduced to the necessity of hiring himself out as a servant; but this occupation was so revolting to his feelings, that he determined to learn a trade. Accordingly his elder brother, who was a tailor, received him as an apprentice; but Theden did not find this employment more suited to his taste and talents than his former one, and, as he got nothing but reproofs from his brother, he finally determined to devote himself to the study of medicine. He was first placed by his friends with a surgeon at Butzow, where he spent four years in a barber's shop without any real advantage; and as soon as his apprenticeship was finished, he went to Rostock, Hamburg, Lübeck, and Danzig. In this last city he at length succeeded in obtaining some employment in the troops of the king of Prussia, and was attached as surgeon to a squadron of cuirassiers. The zeal and punctuality with which he performed all his duties in this post soon gained him the esteem and friendship of his superior officers: the jealousy however of the chief surgeon (*chirurgien-major*) prevented his profiting by the good-will shown him by king Frederick William I. at a review at Riesenburg, and the death of this prince put an end to all the hopes of promotion which he had at first entertained. In 1742 he went to Berlin, where the celebrated Schaarschmidt, who justly appreciated his talents, honoured him with his friendship, and procured for him the post of chief surgeon during the second war in Silesia. At the end of three years he returned to Berlin, and devoted himself with unremitting attention to the study of anatomy and surgery. The Seven Years' War afterwards furnished him with numerous opportunities of displaying the skill that he had acquired, and also the excellent qualities of his heart. Frederick the Great raised him gradually from one post to another, till he became at last his chief military surgeon. Theden, in this eminent position, improved all the branches of the service, and displayed an activity which contributed still more to gain him the good opinion of his sovereign. The successor of Frederick honoured him equally with his confidence, and Theden continued to enjoy to the end of his life an esteem and respect for which he was indebted only to his real merit and eminent services. He died, October 21, 1797, at the age of eighty-three. The continual fatigue and agitation of war did not prevent his drawing up and putting in order the observations which an immense field of action had given him an opportunity of collecting. His works are not numerous, but they bear the stamp of experience, and one recognises in them the firm and bold touch of a man who did not venture to take up his pen till after thirty years of most extensive practice. From this eulogium we must however except all the theoretical parts of his writings, which, unfortunately, hold a prominent place in them, and which are only based upon the foundation of the antiquated principles of the humoral theory. The following is the list of his works mentioned by M. Jourdan in the 'Biographie Médicale,' from which work the preceding account has been taken:—'Neue Bemerkungen und Erfahrungen zur Bereicherung der Wundarzneykunst und Medicin,' Berlin and Stettin, 1771-1795, 8vo.; 'Unterricht für die Unterwundärzte bey Armeen,' Berlin, 1774, 8vo., and 1782, 8vo.; 'Sendschreiben an Richter, die neu erfundenen Catheter aus der Resina elastica betreffend,' Berlin, 1777, 8vo.

THEFT. [LARCENY.]

THEIN, or Theina, the peculiar principle of tea, which was procured and analysed by M. Jobst of Stuttgard. He prepared it by boiling tea-leaves in water, filtering and concentrating the solution, and adding to it acetate of lead as long as precipitation occurred; after filtration the excess of lead was precipitated by hydrosulphuric acid, and by subsequent evaporation crystals of thein were deposited which possessed the following properties after purification: they were soft, acicular, snow white, much more soluble in hot than in cold water, alcohol, or æther; they dissolved readily in acids, and were decomposed when heated either in sulphuric or nitric acid. Thein has no effect on vegetable blues; alkalis do not precipitate it from solution in acids, and when boiled in a strong solution of potash it is decomposed, and ammonia is evolved; it contains water of crytallization, which it loses at 212°. Thein may be sublimed.

According to the analysis of Jobst, thein is composed of

Hydrogen	5·22
Carbon	49·60
Oxygen	16·27
Azote	28·91
	100·

It is to be remarked that this analysis very closely resembles that of Caffein as given by Liebig.

THELICO'NUS, Mr. Swainson's name for a subgenus of CONUS. Ex., *Conus nussatella.* (*Malacology.*)

THELIDERMA, Mr. Swainson's name for a subgenus of *Unio.* (*Malacology.*) [NAIADES.]

THELI'DOMUS, a form placed by Mr. Swainson under his family *Trochidæ*, in the subfamily *Rotellinæ*, with the generic name at the head of this article.

Example, *Thelidomus Braziliensis.*

Mr. Swainson thus describes it. 'We have placed the *Trochidæ* next to the *Helicidæ* under the belief that they followed each other, although the links of connection were wanting. It is clear that of all the types of the *Trochidæ*, *Rotella* is that which by its general form makes the nearest approach to *Helix;* while the thickening of the inner lip, which spreads over the umbilicus, is found also, but in a less degree, in many of the land volutes, *Lucer-*

ninæ. But a singular discovery recently made has thrown an entirely new light upon this interesting question. Among a considerable number of freshwater *Planorbi*' (sic) 'all of one species, which were sent to us from Brazil, we picked out two helix-looking shells, so precisely of the same olive-brown colour, and of the same size, as the others, that none but a conchologist would have been led to examine them. They appeared in fact like two little land-snails of the subgenus *Zonites*, that had fallen into the water where the *Planorbi*' (sic) 'had been found, their outside being discoloured, and covered with little particles of dirt and sand. On placing them however under the magnifier, a conchologist alone can judge of our astonishment at finding that the whole of the shell was actually composed of little stones and grains of sand only, agglutinated together, yet with so much skill by the animal, that the regular turns of the volutions of the spire, and the form of the umbilicus, were most accurately preserved; they were, in short, freshwater carriers—absolute counterparts of their marine brethren, *Onustus*. As we can find no notice nor even allusion to such an extraordinary genus of shells in any writer, we have considered it new, and affixed to it the name of *Thelidomus*. In regard to its affinity, we suspect that it fills the same situation among the *Rotellinæ* which *Onustus* does among the *Trochinæ:* this will make it the most aberrant type and consequently that which comes nearest to the *Helicidæ*, whose form it actually possesses. The annexed figures are taken from the only two specimens, in our cabinet, which we have either seen or heard of. Thus, there is ground for supposing that the passage from the marine *Trochidæ* to the terrestrial snails is marked by one or more fluviatile types; just as is the passage, on the other side, of the *Helicidæ* marked by the *Limnacinæ*. The accidental discovery also of this extraordinary shell will probably induce naturalists to a more accurate examination of the fossil turbinated univalves; for it is clear that although *Thelidomus* opens the path to the *Helicidæ*, there must be several other forms between the two, either extinct or undiscovered.' (*Malacology: Cabinet Cyclopædia*, 1840.)

This so-called shell, which is twice figured and described as that of a *mollusk* in the work quoted, is the case of an insect.

We notice the error, that a mistake in a useful book bearing the authority of a name so generally known and deservedly respected as Mr. Swainson's, may not mislead.

THELIDON'TA, a genus of pulmoniferous gastropods, which Mr. Swainson apparently places among the *Lucerninæ*, or *Land Volutes*, as he terms them: but we do not find it in the 'Natural Arrangement' at the end of his vol. on *Malacology*, unless *Thelidomus*, which appears there for the third time, following *Pusiodon* at the end of the subfamily *Lucerninæ*, be a misprint for it.

THELLUSSON, PETER. He was the son of Isaac de Thellusson, ambassador from Geneva to the court of Louis XV. He fixed his residence in London about the middle of the eighteenth century, and accumulated an immense fortune as a merchant. He died on the 21st of July, 1797. His name has been rendered remarkable by the extraordinary nature of his will. The capricious and extensive use of the power of disposing of his property, which the law, as then existing, placed in his hands, led to the restraints subsequently imposed upon testamentary dispositions.

The property which was the subject of his will consisted of a landed estate of about 4000*l.* a year, and of personal property to the amount of about 600,000*l.* This property he devised and bequeathed to trustees upon trust for accumulation and investment in the purchase of lands during the lives of his sons, grandsons, and the issue of sons and grandsons living, or *in ventre sa mere*, at the time of his death, and the lives of the survivors and survivor of them; and after that period, to be conveyed to the lineal descendants of his sons in tail male.

It had been long understood to be the rule of law that the absolute ownership of property might be suspended, and consequently the property rendered inalienable, during lives in being at the time of the creation of the trust, that is, where the trust is created by will, at the time of the death of the testator. This period was afterwards extended so as to allow for the cases of infancy, and of a child *in ventre sa mere;* but it was for some time questioned whether a term of twenty-one years might in all cases be added to the period of suspension, though it has since been determined that it may. [SETTLEMENT.] Restraint on the accumulation of income was unknown to the common law, except in so far as the rule against perpetuities necessarily prevented accumulation from being carried beyond its limits; and Mr. Thellusson's will, by confining the restriction to existing lives, escaped the question which then existed as to the allowance of an absolute term of twenty-one years in addition to a life or lives in being at the time of the creation of the trust.

This will, which, in the events that happened, had the effect of postponing the usufructuary enjoyment of the bulk of the estate till the expiration of nine lives in being at the time of the testator's death, was, after many hard struggles, occasioned rather by the immense value of the property implicated (which it was computed would have amounted, with the expected accumulations, to upwards of 18,000,000*l.*), than by any new difficulty in the principle, finally established by the decision of the House of Lords on the 25th of June, 1805. (*Thellusson* v. *Woodford*, 11 Ves., 112.)

The case of Thellusson *v.* Woodford gave rise to the act of the 40 Geo. III., c. 98, 'for restraining all trusts and directions in deeds or wills whereby the profits or produce of real or personal estates shall be accumulated and the beneficial enjoyment thereof postponed beyond the term therein limited.' By the provisions of this act no person can settle or dispose of property by deed, will, or otherwise, so as to accumulate the income thereof, either wholly or partially, 'for any longer term than the life or lives of any such grantor or grantors, settlor or settlors, or the term of twenty-one years from the death of any such grantor, settlor, devisor, or testator, or during the minority or respective minorities of any person or persons who shall be living or in *ventre sa mere*, at the time of the death of such grantor, devisor, or testator, or during the minority or respective minorities only of any person or persons, who, under the uses or trusts of the deed, surrender, will, or other assurances directing such accumulations, would for the time being, if of full age, be entitled to the rents, issues, and profits, or the interest, dividends, and annual produce so directed to be accumulated. And in every case where accumulation shall be directed otherwise than as aforesaid, such direction shall be null and void, and the rents, issues, profits, and produce of such property so directed to be accumulated shall, so long as the same shall be directed to be accumulated contrary to the provisions of this act, go to and be received by such person or persons as would have been entitled thereto, if such accumulation had not been directed.' Sect. 2 provides, 'that nothing in this act contained shall extend to any provision for payment of debts of any grantor, settlor, or devisor, or other person or persons, or to any provision for raising portions for any child or children of any person taking any interest under any such conveyance, settlement, or devise, or to any direction touching the produce of timber or wood upon any lands or tenements; but that all such provisions shall be made and given as if this act had not passed.' Sect. 3 provides that the act shall not extend to dispositions of heritable property in Scotland.

It has been sometimes thought that periods specified in the act might be taken accumulatively, and that accumulation might be directed for them all successively. The language of the statute however is disjunctive, and therefore seems to give the option of selecting one only of the designated periods. (9 Ves., 136.) And it has been determined that the clause respecting the minority of persons entitled under the limitation in the instrument does not authorize a trust for accumulation extending over the minority of an unborn person to whom at majority the accumulated fund with the principal from which it arose is given. (4 Madd., 275.)

It is now settled upon this statute that a trust for accumulation reaching beyond the allowed period is good for the period allowed by law. (12 Ves., 295; 4 Russ., 403.)

THELPHU'SA. [THELPHUSIANS.]

THELPHU'SIANS, M. Milne Edwards's name for a tribe of brachyurous crustaceans belonging to his family of *Catometopes*, having, as he observes, considerable analogy with the *Cancerians*, and evidently forming the passage between them and the *Gecarcinians*, or Land Crabs. [GECARCINUS.] The general form, in fact, he remarks, of many of the *Thelphusians* differs but little from that of **Eriphia**, and the disposition of the organs of generation is the same as in the two preceding families*; but the structure of their respiratory apparatus and other characters place them at a distance from those natural groups, and do not permit their separation from the *Catometopes*. Thus, he observes, each of the branchial cavities occupies about a third of the carapace and is elevated into a vault at a very considerable distance from the branchiæ. Sometimes the lining membrane is covered with spongy vegetations. The branchiæ are, it is true, nine on each side, namely, two reduced to the state of vestiges and fixed to the jaw-feet, and seven lying on the vault of the sides as in the *Cyclometopes;* but their texture is softer, and they are directed backwards so as to cover nearly the whole of the vault of the sides, a disposition which is only met with in the family of the *Catometopes*.

The *carapace* of the *Thelphusians* has but little or no convexity, and is wider than it is long: its anterior border is straight, and occupies about two-thirds of its transversal diameter: its lateral borders describe a regular curve. The *front* is remarkably wider than the buccal frame, and more or less curved downwards. The *eyes* have a stout and short peduncle, the length of which is never more than double the diameter, and its lower surface is occupied by the cornea for about half its length. The orbits are oval, and always present at their internal angle a narrow gap filled by the external antenna. The *internal antennæ* are horizontal, and, in general, nearly entirely hid by the front. The basilary joint of the *external antennæ* penetrates into the gap which occupies the internal angle of the orbit and separates this cavity from the antennary fossets; it is but little developed, and the moveable stem which springs from it in the same gap is very small. The *epistome* is nearly linear, and placed on the same level as the lower border of the orbit. The *buccal frame* is nearly as large before as behind, and the fourth joint of the external jaw-feet is inserted sometimes at the internal angle, sometimes at the middle of the anterior border of the preceding joint, and sometimes at its external angle. The anterior *feet* are much stronger and nearly always longer than the succeeding ones; they are but little, if at all, compressed. The third pair of feet are the longest of all, but they are not twice the length of the post-frontal portion of the carapace, and they terminate, like the others, in a styliform tarsus. The second joint of the *abdomen* of the male covers the corresponding portion of the sternal plastron throughout its width, and extends to the basilary joint of the posterior feet. The abdominal appendages of the second pair in the male are filiform towards the end, and at least as long as those of the first pair. (M. E.)

Habits of the Tribe.—These are very remarkable. All the known species live in the earth near the banks of rivers or in humid forests; bearing a strong analogy to the Land-Crabs. (M. E.)

M. Milne Edwards divides the tribe into three sections:—

1. Third joint of the external jaw-feet nearly square, and giving insertion to the succeeding joint by a notch in its internal angle.

Genus, *Thelphusa* (Latreille).

Generic Character.—*Carapace* wider than it is long, narrowed behind and very slightly convex above. The regions generally scarcely separated, but the *stomachal region*, when it is distinct, is extremely wide forwards. The fronto-orbital or anterior border of the carapace occupies about two-thirds of its transversal diameter, and its lateral borders are very much arched in their two anterior third portions: the posterior border is equal in width to the half or two-fifths of its transversal diameter. The *front* is very little inclined, nearly straight, and wider than the buccal frame. The *orbits* are oval; they present no fissures above, and are furnished with a large vertical tooth which rises from their lower wall near the internal canthus of the eye. The *antennary fossets* are very narrow. The basilary joint of the *external antennæ* varies in its form, but only reaches a little, or not at all, beyond the tooth of the lower orbital wall against which it is applied. *External jaw-feet* elongated, and their third joint, nearly quadrilateral, carrying the succeeding joint at its internal angle, which is truncated: *Sternal plastron* nearly as long as it is wide, and approaching in its form that of the *Cancerians*. Anterior *feet* always much longer than the second pair, and unequal in size: the hands slightly curved inwards, and the claw which terminates them pointed, very much elongated, and finely dentilated. Succeeding feet all slightly channelled above; their tarsus is quadrilateral and armed with very strong horny spines; the second pair are much shorter than the third, the length of which last does not quite eqnal twice the length of the carapace. *Abdomen* composed of seven joints in both sexes. (M. E.)

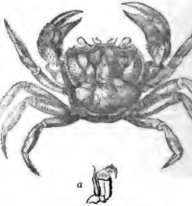
There are several species, and the *Geographical Distribution* appears to be wide. The form is found in Italy, Greece, Egypt, and Syria. On the Coromandel coast; at the Cape of Good Hope; and at Pondicherry.

Example, *Thelphusa fluviatilis*. Length 2¼ inches. Colour yellowish.

Localities.—South of Italy, Greece, Egypt, and Syria.

This species is generally considered to have been well known to the antients, and to be that noticed by Hippocrates and Aristotle: these *Thelphusæ* are supposed to be the Heracleotic Crabs (οἱ Ηρακλεωτικοὶ καρκινοι) of the latter (*Hist. Anim.*, iv. 2); and to be those represented on antient medals.

Thelphusa fluviatilis burrows in the earth on the banks of rivers.



Thelphusa fluviatilis (reduced).

a. External jaw-foot of same.

2. Third joint of external jaw-feet nearly square and giving insertion to the succeeding joint towards the middle of its anterior border.

Genus, *Boscia* (Edwards; *Potamia*, Latreille).

Generic Character.—General form nearly the same as some of the *Thelphusæ;* but the *front*, which is sharply bent downwards, is vertical, and the third joint of the *external jaw-feet*, instead of being square and having the ordinary form existing in the *Cancerians*, is narrowed forwards and carries the succeeding joint on the middle of its anterior border. (M. E.)

M. Milne Edwards remarks that this genus is terrestrial like the *Thelphusæ*,* and inhabits also the banks of rivers. He states that a dissection of an individual well preserved in spirit by M. Andouin and himself, discovered to them a very remarkable disposition in the branchial apparatus of this crustacean: the cavities which enclose the breathing organs are elevated far above the upper surface of the branchiæ, and present a great vacant space, the walls of which are lined with a tomentose membrane covered with vegetations.

Example, *Boscia dentata*, the only known species. Length about 2 inches.

Localities.—The Antilles and South America.

3. Third joint of the external jaw-feet having nearly the form of a reversed triangle, and giving insertion to the succeeding joint by its external angle.

Genus, *Trichodactylus* (Latreille).

Generic Character.—*Carapace* nearly horizontal above and much less wide than in *Thelphusa*. *Front* wide, lamellar, and simply inclined; *orbits* nearly circular; lateral borders of the carapace curved. *Antennæ* disposed nearly as in *Thelphusa;* but the form of the *external jaw-feet* is very different, their third joint is nearly triangular, with its summit directed inwards, and it is articulated with the succeeding joint by its anterior and external angle.

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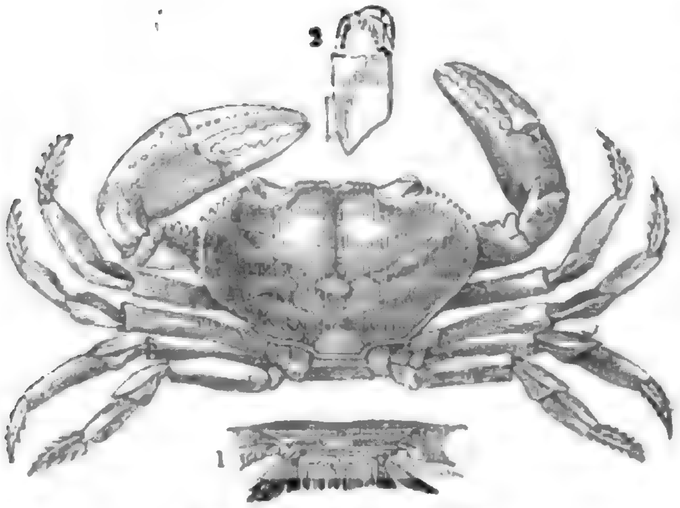
* These appear to be the *Oxyrhynchi* and *Cyclometopes*.

* But see post, p. 307.



Boscia dentata, reduced one-third.
1, Antennary region; 2, external jaw-foot.

Feet nearly of the same form as in the preceding genera. (M. E.)

Example, *Trichodactylus quadratus*, the only known species. Length about 1 inch.

Locality.—Brazil.

M. Milne Edwards is of opinion that this species establishes the passage between the preceding genera and the tribe of *Grapsoidians.* [GRAPSUS.]

Mr. W. S. MacLeay, in his interesting paper 'On the Brachyurous Decapods of the Cape' (Smith's *Illustrations of the Zoology of South Africa*), in a note to the sixteenth species (*Thelphusa perlata*, M. E.), remarks that this crab is common in all the rivers of Southern Africa, and grows to the size of nearly three inches long. 'The male,' says Mr. W. MacLeay in continuation, 'has a much more convex shell than the female, and in aspect resembles much a *Gegarcinus.* The pearly tubercles of the anterior margin of the shell are also still more small and evanescent than in the female. I may take this occasion to observe, that in my cabinet I separate those species of *Thelphusa* which, like the present, have a transversal crest in front of the shell, and call them *Potamonautes.* They are easily distinguished from true *Thelphusæ*, of which the type is the European species *Thelphusa fluviatilis.*

THELWALL, JOHN, son of Joseph Thelwall, a silk-mercer, was born on the 27th July, 1764, in Chandos-street, Covent Garden, London. He was the youngest of three children, two sons and a daughter. At an early age he manifested so much talent for drawing, that he was intended for an artist, but his father's decease changed his prospects before he had completed his ninth year. He received the ordinary education of a tradesman's son, but as he was rather slow in acquiring knowledge and was removed from school at thirteen years of age, his attainments must necessarily have been limited.

The widow continued to carry on her deceased husband's business, and placed her son John in the shop, where he remained three years, but spent his time chiefly in reading, which was of a miscellaneous character, consisting of poetry, history, the drama, moral philosophy, metaphysics, and divinity. A distaste for the business, joined to family discord, induced him to leave it, and although he earnestly desired to be an artist or an actor, he yielded to his mother, who apprenticed him to a tailor, with whom however he remained only a short time. At the suggestion of Mr. Holt of the Chancery bar, who had married his sister, he turned his attention to the law, but after several years' study he abandoned it in consequence of doubts arising in his mind on the morality of a hired advocate pleading to support a cause rather than to discover the truth; and now, in his 22nd year, he embraced literature as a profession.

In 1787 he published by subscription poems on several subjects, in 2 vols., which introduced him to some valuable friendships and to the editorship of a magazine. He was now a rising and prosperous man, and on the 27th July, 1791, he married Miss Susan Vellum, of Rutlandshire, who was then 17 years of age. He took a house near the Borough hospitals, and ardently studied anatomy, physiology, and chemistry, under Mr. Cline, Dr. Haighton, and Dr. Babington.

He began his career as an orator, before he was twenty years of age, at the Society of Free Debate held at Coachmakers' Hall. He had been educated a churchman in religion and a tory in politics, but on both subjects his opinions were changing, and he now joined in the political struggles of the period by becoming a member of the Corresponding Society, where his boldness and fluency of speech attracted the notice of the leading men of the day. With Thomas Hardy and John Horne Tooke [HORNE TOOKE] he was tried for high treason, and acquitted. Thelwall's trial lasted five days. On his acquittal he lectured on politics and political history for several years, when, after a retirement of two years in Wales, made in order to disconnect himself from public affairs and to escape from extra-judicial persecution, he began his career in 1801 as a lecturer and tutor in elocution, and in the application of elocutionary science to the cure of stammering and other impediments to speech. His knowledge of anatomy and physiology, his habits of recitation, his practice of public speaking, and his accuracy of observation, eminently qualified him for his new profession, and his success was great. He communicated papers to the 'Medical and Physical Journal,' on defective and difficult utterance, and to the 'Monthly Magazine,' on elocution and its kindred sciences.

In 1816 Mrs. Thelwall died, leaving a family of four children, two of whom are sons, and both are in the church. Mr. Thelwall afterwards married Miss Cecil Boyle, by whom he has left one son. He died at Bath after a few hours' illness, of disease of the heart, to which he had been long subject, on the 17th February, 1834, in his 70th year.

The researches of Steele, Herries, and Walker, on human speech, had left little room for new and brilliant discovery, although much accurate observation was yet necessary to give exactness and fulness to their knowledge. Thelwall, unaware of Steele's researches, found himself anticipated on rhythmus. Steele had given the inquiry a musical direction, which Thelwall ardently followed out, and the extent and precision of his observations may be estimated by the fact that he anticipated nearly all that is new and valuable in Dr. Rush's 'Philosophy of the Human Voice.' Mr. Thelwall's immature ideas were first sketched out in the syllabus of his lectures on elocution.

Thelwall was of a mild and amiable disposition, of domestic habits, open-hearted and generous, of high moral feeling, and of inflexible integrity. His sentiments were exalted by poetic feeling, and he was buoyed up by hope.

Besides magazine contributions and pamphlets, he wrote poems on several subjects, in 2 vols., already mentioned; 'Poems written in the Tower and in Newgate,' 1 vol.; 'The Tribune,' 3 vols., and 'Political Miscellanies,' 1 vol.; 'A Letter to Mr. Cline, on Stammering,' 1 vol.; 'The Peripatetic,' 3 vols.; and a novel, entitled 'The Daughter of Adoption.'

THE'MEON. [FORAMINIFERA, vol. x., p. 348.]

THEMIS (Θέμις), a Greek divinity, was, according to Hesiod and Apollodorus, a daughter of Uranus (Heaven) and Gaea (Earth), or, according to Tzetzes, a daughter of Helios. She was a favourite of Zeus, and bore him several daughters,—the Horæ, Eunomia, Dice, Eirene, and the Moerae. (Hesiod, *Theog.*, 135, 901, &c.; Apollodorus, i. 3, 1.) These personified abstractions, which are represented as her daughters, show the ideas which the antients had formed of her character, and consistently with these ideas she appears in Homer as a personification of the order of things sanctioned by usage or by law, and as the goddess who rules in the assemblies of the people. (Homer, *Odyss.*, ii. 68, &c.) According to the same poet she lived with the other great gods in Olympus, was on good terms with Hera, and occasionally assembled the gods at the command of Zeus. (Homer, *Iliad*, xv. 87, &c.; xx. 4, &c.) Diodorus (v. 67) states that she was believed to have made men acquainted with the will of the gods, the mode of their worship, and to have instituted laws, religious as well as civil. As a deity revealing the future she was believed to have been in possession of the Delphic oracle after her mother Gaea, and previous to the time that it came into the hands of Apollo, whence the act of giving an oracle was, even in later times, frequently called by a word derived from her name (θεμιστεύειν). She was worshipped as the goddess of law and order in various parts of Greece, as at Thebes, Olympia, Athens, Tanagra, and Troezen. She is frequently represented on coins in a form resembling that of Athena, but carrying the horn of plenty in one hand and a pair of scales in the other.

THE'MISON (Θεμίσων), an antient physician, who is probably best known to most persons from Juvenal's somewhat equivocal line (*Sat.*, x., v. 221)—

> 'Quot Themison ægros auctumno occiderit uno;'

but who was in reality the founder of a celebrated medical sect, and one of the most eminent physicians of his time. He was born at Laodicea in Syria, in the first century before Christ, and, from Juvenal's line above quoted, may be conjectured to have practised at Rome. He was a pupil of Asclepiades, from whose opinions however he afterwards dissented, and finished by founding a new medical sect, called the Methodici. (Pliny, *Hist. Nat.*, lib. xxix., cap. 5, ed. Tauchn.; Galen, *Introd.*, cap. 4, tom. xiv., p. 683, 684, ed. Kühn; Cramer,[*] *Anecd. Gr. Paris.*, vol. i., p. 395, l. 26.) The following is the analysis of the opinions of this school, which is given by Celsus in the historical introduction to his work :—'They assert that the knowledge of no cause whatever bears the least relation to the method of cure; and that it is sufficient to observe some general symptoms of distempers; and that there are three kinds of diseases, one bound, another loose,[†] and the third a mixture of these. For that sometimes the excretions of sick people are too small, sometimes too large; and sometimes one particular excretion is deficient, while another is excessive. That these kinds of distempers are sometimes acute, and sometimes chronic; sometimes increasing, sometimes at a stand,[‡] and sometimes abating. As soon then as it is known to which of these classes a distemper belongs, if the body be bound, it must be opened; if it labours under a flux, it must be restrained; if the distemper be complicated, then the most urgent malady must be first opposed. And that one kind of treatment is required in acute, another in inveterate distempers; another when diseases are increasing; another when at a stand; and another when inclining to health. That the observation of these things constitutes the art of medicine, which they define as a certain way of proceeding, which the Greeks call *method* (μέθοδος), and affirm it to be employed in considering those things that are common to the same distempers: nor are they willing to have themselves classed either with the rationalists (*i.e.* the Dogmatici), or with those who regard only experiments (*i. e.* the Empirici): for they dissent from the first sect, in that they will not allow medicine to consist in forming conjectures about the occult things; and also from the other in this, that they hold the observation of experiments to be a very small part of the art.' (Futvoye's *Translation.*) What we know of his mode of treating diseases does not give us a very high idea of his skill in therapeutics. He thought he could cure the most violent attacks of pneumonia by means of oil and baths; in pleurisy he permitted the use of wine mixed with sea-water (Cael. Aurel., *De Morb. Acut.*, lib. i., cap. 16, p. 62, 63); he recommended also violent exercise in several acute diseases. (Id., *ibid.*, lib. ii., cap. 29, p. 144.) He is said by Sprengel (*Hist. de la Méd.*) to have been the first person who made use of leeches. (Id., *De Morb. Chron.*, lib. i., cap. 1, p. 286.) He is also said to have been himself attacked with hydrophobia, and to have recovered. (Id., *De Morb. Acut.*, lib. iii., cap. 16, p. 232; Dioscor., *Theriac.*, cap. 1, p. 423.) He wrote several medical works, of which nothing but the titles remain. (Cael. Aurel., *De Morb. Chron.*, lib. i., cap. 1, p. 285; i. 4, p. 323; ii. 7, p. 387, &c.) His followers were very numerous, of whom the most eminent were Soranus [SORANUS], Thessalus [THESSALUS], Caelius Aurelianus, whose work 'De Morbis Acutis et Chronicis' is one of the most valuable of antiquity; and Moschion, author of the work Περὶ τῶν Γυναικείων Παθῶν, 'De Mulierum Passionibus.'

(Sprengel, *Hist. de la Méd.*; Fabricius, *Biblioth. Græca*; Haller, *Bilioth. Medic. Pract.*; *Biogr. Médicale*; *Dict. of Greek and Roman Antiq.*, art. 'Methodici.')

THEMIS'TIUS, of Paphlagonia, was a distinguished orator in the fourth century after Christ, and was surnamed Euphrades, on account of his skill in his profession. He was much favoured by the Roman emperors. Constantius made him a senator; Julian appointed him prefect of Constantinople in 362, and corresponded with him by letters; and although he was a heathen, he was intrusted by Theodosius the Great with the education of his son Arcadius. In the year 384 he was appointed, for the second time, prefect of Constantinople; and during a period of almost forty years he was repeatedly employed in embassies and other state business. He was the teacher of Libanius and Augustin, and kept up a friendly intercourse with Gregory Nazianzen, who calls him in his letters 'the king of arguments' (*βασιλεὺς λόγων*).

Themistius had deeply studied the writings of Plato and Aristotle; and he taught the Peripatetic philosophy, as well as rhetoric, at Rome and Constantinople.

Of thirty-six orations composed by him which were known to Photius, thirty-three have come down to us in the original Greek, and one in a Latin translation. They have reference for the most part to public affairs, and several of them are panegyrics upon the emperors by whom the orator was patronised.

Editions of some of the orations were published by Aldus (fol. 1534), H. Stephens (8vo. 1562), Remus (4to. 1605), Petau (8vo. 1613, and 4to. 1618). The most complete edition is that of Harduin (Paris, 1684, fol.), which contains thirty-three orations, thirteen of which had not been printed before. Another oration was discovered by Angelo Mai, and published by him at Milan, 1816, 8vo. W. Dindorf also published, in 1830, two orations of Themistius, corrected from a Milan MS.

The philosophical works of Themistius consist of commentaries, in the form of paraphrases, on some of Aristotle's works, in Greek, and two Latin translations of commentaries, one upon the work 'On Heaven,' and the other upon the twelfth book of the 'Metaphysics.' The paraphrases were first published in a Latin version by Hermolaus Barbarus, 1481, which has been several times reprinted: the Greek text of them forms part of the Aldine edition of Themistius. The two commentaries in Latin were printed at Venice in 1558, 1570, and 1574. There are some letters by Themistius in the collection of H. Stephens, 8vo. 1577.

(Schöll, *Geschichte der Griech. Litt.*, iii. 96, 388.)

THEMISTO, M. Guerin's name for a genus of *Amphipodous Crustaceans*, placed by M. Milne Edwards in the tribe of *Ordinary Hyperines*, the second tribe of his family *Hyperines.*

Example, *Themisto Gaudichaudii.*

Locality.—Found by M. Gaudichaud at the Falkland Islands.

N.B.—M. Milne Edwards distinguishes from this species *Themisto Gaudichaudii* of Ross (*Suppl.* to Sir John Ross's Voyage), naming it *Themisto arctica.* Capt. James Ross, R.N., found the northern species near the west coast of the peninsula of BOOTHIA.

THEMI'STOCLES (Θεμιστοκλῆς) was born about the year B.C. 514. He was the son of Nicocles, an Athenian of moderate fortune, who however was connected with the priestly house of the Lycomedæ; his mother, Abrotonon, or, according to others, Euterpe, was not an Athenian citizen; and, according to most authorities, not even a Greek, but either a native of Caria or of Thrace. The education which he received was like that of all Athenians of rank at the time, but Themistocles had no taste for the elegant arts which then began to form a prominent part in the education of Athenian youths; he applied himself with much more zeal to the pursuit of practical and useful knowledge. This, as well as the numerous anecdotes about his youthful wilfulness and waywardness, together with the sleepless nights which he is said to have passed in meditating on the trophies of Miltiades, are more or less clear symptoms of the character which he subsequently displayed as a general and a statesman. His mind was early bent upon great things, and was incapable of being diverted from them by reverses, scruples, or difficulties. The great object of his life appears to have been to make Athens great, in order that he himself might be great. The powers with which nature had endowed him were quickness of perception, an accurate judgment of the course which was to be taken on sudden and extraordinary emergencies, and sagacity in calculating the consequences of his own actions; and these were the qualities which Athens during her wars with Persia stood most in need of. His ambition was unbounded, but he was at the same time persuaded that it could not reach its end unless Athens was he first among the Grecian states; and as he was not very scrupulous about the means that he employed for these ends, he came into frequent conflict with Aristides the Just, who had nothing at heart but the welfare of his country; and no desire of personal aggrandizement. In he year 483 B.C., when Aristides was sent into exile by ostracism, Themistocles, who had for several years taken an active part in public affairs, and was one of the chief authors of the banishment of his rival, remained in the almost undivided possession of the popular favour, and the year after, B.C. 482, he was elected archon eponymus of Athens. The city was at that time involved in a war with Aegina, which then possessed the strongest navy in Greece, and with which Athens was unable to cope. It was in this year that Themistocles conceived and partly carried into effect the plans by which he intended to raise the power of Athens. His first object was to increase the navy of Athens; and this he did ostensibly to enable Athens to contend with Aegina, but his real intention was to put his country in a position to meet the danger of a second Persian invasion, with which Greece was threatened. The manner in which he raised the naval power of Athens was his. Hitherto the people of Athens had been accustomed o divide among themselves the yearly revenues of the ilver-mines of Laurion. In the year of his archonship hese revenues were unusually large, and he persuaded his countrymen to forego their personal advantage, and to apply these revenues to the enlargement of their fleet. His advice was followed, and the fleet was raised to the number of 200 sail. (Herodot., vii. 144; Plutarch, *Themist.*, 4.) t was probably at the same time that he induced the Athenians to pass a decree that, for the purpose of keepng up their navy, twenty new ships should be built every year. (Böckh, *Public Economy of Athens*, p. 249, Engl. ransl., 2nd edit.) Athens soon after made peace with Aegina, as Xerxes was at Sardis making preparations for nvading Greece with all the forces he could muster. At he same time Themistocles was actively engaged in allayng the disputes and hostile feelings which existed among he several states of Greece. He acted however with great severity towards those who espoused the cause of the Persians, and a Greek interpreter, who accompanied the envoys of Xerxes that came to Athens to demand earth and water as a sign of submission, was put to death for having made use of the Greek tongue in the service of the common enemy. After the affairs among the Greeks were tolerably settled, a detachment of the allied troops of the Greeks was sent out to take possession of Tempe, under he command of Themistocles of Athens and Euaenetus of Sparta; but on finding that there they would be overwhelmed by the host of the barbarians, they returned to the Corinthian isthmus. When Xerxes arrived in Pieria, the Greek fleet took its post near Artemisium, on the north coast of Euboea, under the command of the Spartan admiral Eurybiades, under whom Themistocles condescended o serve in order not to cause new dissensions among the Greeks, although Athens alone furnished 127 ships, and supplied the Chalcidians with twenty others; while the Spartan contingent was incomparably smaller. When the Persian fleet, notwithstanding severe losses which it had sustained by a storm, determined to sail round the eastern and southern coasts of Euboea, and then up the Euripus, n order to cut off the Greek fleet at Artemisium, the Greeks were so surprised and alarmed, that Themistocles had great difficulty in inducing them to remain and maintain their station. The Euboeans, who perceived the advantages of the plan of Themistocles, rewarded him with he sum of thirty talents, part of which he gave to the Spartan Eurybiades and the Corinthian Adimantus to induce them to remain at Artemisium. (Herodot., viii. 4, 5; Plutarch, *Themist.*, 7.) In the battle which then took place, the Greeks gained considerable advantage, though he victory was not decided. A storm, and a second engagement near Artemisium, severely injured the fleet of he Persians, but the Greeks also sustained great losses, as half of their ships were partly destroyed and partly rendered unfit for further service. When at the same time they received intelligence of the defeat of Leonidas at Thermopylæ, the Greeks resolved to retreat from Artemisium, and sailed to the Saronic gulf. Xerxes was now advancing from Thermopylæ, and Athens trembled for her existence, while the Peloponnesians were bent upon seeking shelter and safety in their peninsula, and upon fortifying themselves by a wall across the Corinthian isthmus. On the approach of the danger the Athenians had sent to Delphi to consult the oracle about the means they should employ for their safety, and the god had commanded Athens to defend herself behind wooden walls. This oracle, which had probably been given at the suggestion of Themistocles, was now also interpreted by him as referring to the fleet, and his advice to seek safety in the fleet was followed. He then further moved that the Athenians should abandon the city to the care of its tutelary deity, that the women, children, and infirm should be removed to Salamis, Aegina, or Troezen, and that the men should embark in the ships. The fleet of the Greeks, consisting of 380 ships, assembled at Salamis, still under the supreme command of Eurybiades. When the Persians had made themselves masters of Attica, and Athens was seen in flames at a distance, some of the commanders of the fleet, under the influence of fear, began to make preparations for an immediate retreat. Themistocles and his friend Mnesiphilus saw the disastrous results of such a course, and the former exerted all his powers of persuasion to induce the commanders of the fleet to maintain their post: when all attempts proved ineffectual, Themistocles had recourse to threats, and thus induced Eurybiades to stay. The example of the admiral was followed by the other commanders also. In the meantime the Persian fleet arrived in the Saronic gulf, and the fears of the Peloponnesians were revived and doubled, and nothing seemed to be able to keep them together. At this last and critical moment Themistocles devised a plan to compel them to remain and face the enemy. He sent a message to the Persian admiral, informing him that the Greeks were on the point of dispersing, and that if the Persians would attack them while they were assembled, they would easily conquer them all at once, whereas it would otherwise be necessary to defeat them one after another.

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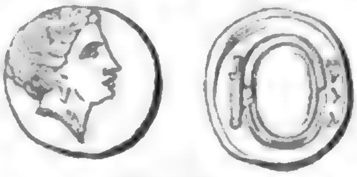
[*] In this last passage the name is written Μεθήσων, which error is left unnoticed by the editor, but may readily be accounted for by recollecting that the vowels ι and η have in Romaic exactly the same sound, and that for many centuries past Greek words have been pronounced by the Greeks according to the accent and not according to the *quantity*; so that a transcriber might easily confound two names so much alike as Themĭson and Methēson.

[†] The word in the original is *fluxus*, that is, a disorder attended with some discharge.

[‡] Our author means here the ἀκμή of a disease after which it increases no more.

This apparently well-meant advice was eagerly taken up by the enemy, who now hastened, as he thought, to destroy the fleet of the Greeks. But the event proved the wisdom of Themistocles. The unwieldy armament of the Persians was unable to perform any movements in the narrow straits between the island of Salamis and the mainland. The Greeks gained a most complete and brilliant victory, for they only lost forty ships, while the enemy lost two hundred; or, according to Ctesias, even five hundred. Very soon after the victory was decided, Xerxes with the remains of his fleet left the Attic coast and sailed towards the Hellespont. The battles of Artemisium and Salamis occurred in the same year, 480 B.C. [SALAMIS.]



Coin of Salamis.
British Museum. Actual Size. Silver

When the Greeks were informed of the departure of Xerxes, they pursued him as far as Andros without gaining sight of his fleet, and Themistocles and others proposed to continue the chase. But he gave way to the opposition that was made to this plan, and consented not to drive the vanquished enemy to despair. The Greek fleet therefore only stayed some time among the Cyclades, to chastise those islanders who had been unfaithful to the national cause. Themistocles, in the meantime, in order to get completely rid of the king and his fleet, sent a message to him, exhorting him to hasten back to Asia as speedily as possible, for otherwise he would be in dange. of having his retreat cut off. Themistocles availed himself of the stay of the Greek fleet among the Cyclades for the purpose of enriching himself at the cost of the islanders, partly by extorting money from them by way of punishment, and partly by accepting bribes for securing them impunity for their conduct. His fame, however, spread over all Greece, and all acknowledged that the country had been saved through his wisdom and resolution. But the confederate Greeks, actuated by jealousy, awarded to him only the second prize; at Sparta, whither he went, as Herodotus says, to be honoured, he received a chaplet of olive-leaves,—a reward which they had bestowed upon their own admiral, Eurybiades,—and the best chariot that the city possessed, and on his return 300 knights escorted him as far as Tegea in Arcadia.

When the Persian army had been again defeated at Platææ and Mycale, in B.C. 479, and when the Athenians had rebuilt their private dwellings, it was also resolved, on the advice of Themistocles, to restore the fortifications of Athens, but on a larger scale than they had been before, and more in accordance with the proud position which the city now occupied in Greece. This plan excited the fear and jealousy of the rival states, and especially of Sparta, which sent an embassy to Athens, and under the veil of friendship, which ill concealed its selfish policy, endeavoured to persuade the Athenians not to fortify their city. Themistocles, who saw through their designs, undertook the task of defeating them with their own weapons. He advised his countrymen to dismiss the Spartan ambassadors, and to promise that Athenian envoys should be sent to Sparta to treat with them there respecting the fortifications. He himself offered to go as one of the envoys, but he directed the Athenians not to let his colleagues follow him, until the walls, on which all hands should be employed during his absence, should be raised to such a height as to afford sufficient protection against any attack that might be made upon them. His advice was followed, and Themistocles, after his arrival at Sparta, took no steps towards opening the negociations, but pretended that he was obliged to wait for the arrival of his colleagues. When he was informed that the walls had reached a sufficient height, and when he could drop the mask with safety, he gave the Spartans a well-deserved rebuke, returned home, and the walls were completed without any hindrance. He then proceeded to carry into effect the only thing which remained to be done to make Athens the first maritime power of Greece. He induced the Athenians to fortify the three ports of Phalerum, Munychia, and Piræus, by a double range of walls, and to connect the Piræus by long walls with the city of Athens. [ATHENS.]

When Athens was thus raised to the station on which it had been the ambition of Themistocles to place it, his star began to sink, though he still continued for some time to enjoy the fruits of his memorable deeds. He was conscious of the services he had done to his country, and never scrupled to show that he knew his own value. His extortion and avarice, which made him ready to do anything, and by which he accumulated extraordinary wealth, could not fail to raise enemies against him. But what perhaps contributed more to his downfall was his constant watchfulness in maintaining and promoting the interests of Athens against the encroachments of Sparta, which, in its turn, was ever looking out for an opportunity to crush him. The great men who had grown up by his side at Athens, such as Cimon, and who were no less indebted to him for their greatness in the eyes of Greece than to their own talents, were his natural rivals, and succeeded in gradually supplanting him in the favour of the people. They also endeavoured to represent him as a man of too much power, and as dangerous to the republic. The consequence of all this was, that in 472 B.C. he was banished from Athens by the ostracism. He took up his residence at Argos, where he was still residing when, in the same year B.C. 472, Pausanias was put to death at Sparta for his ambitious and treacherous designs, and his fate involved that of Themistocles. [PAUSANIAS.] The Spartans, in their search to discover more traces of the plot of Pausanias, found a letter of Themistocles, from which it was evident that he had been acquainted with his plans. This was sufficient for the Spartans to ground upon it the charge that Themistocles had been an accomplice in his crime, and ambassadors were forthwith sent to Athens to demand that he should suffer the same punishment as Pausanias. This charge was no less welcome to his enemies at Athens than the discovery of his letter had been to the Spartans. Orders were consequently issued to arrest and convey him to Athens. But he had been informed in time of the proceedings at Athens, and foreseeing that his destruction would be unavoidable if he should fall into the hands of his enemies, he fled to Corcyra, and thence to the opposite coast of Epirus, where he took refuge at the court of Admetus, king of the Molossians. On his arrival, the king was absent, but his queen Phthia received him kindly, and pointed out to him in what manner he might win the sympathy of Admetus. When the king returned home, Themistocles, seated on the hearth and holding the child of Admetus in his arms, implored the king not to deliver him up to his persecutors, who traced him to the court of the Molossians. It is stated that Themistocles was here joined by his wife and children. The king not only granted his request, but provided him with the means of reaching the coast of the Ægean, whence he intended to proceed to Asia, and seek refuge at the court of the king of Persia. From Pydna he sailed in a merchant ship to the coast of Asia Minor. At Ephesus he received such part of his property as his friends had been able to wrest from the hands of his enemies at Athens, together with that which he had left at Argos. A few months after his arrival in Asia, Xerxes was assassinated (B.C. 465), and was after a short interval succeeded by Artaxerxes. Various adventures are told of Themistocles before he reached the residence of the Persian king. On his arrival he sent him a letter, in which he acknowledged the evils he had inflicted upon his predecessor, but at the same time claimed the merit of having saved him from destruction by his timely advice. He added that his present exile was only the consequence of his great zeal for the interests of the king of Persia. He did not ask for an immediate interview with the king, as he was yet unacquainted with the language and the manners of the Persians, to acquire which he requested a year's time. During this period, he applied himself so zealously and with such success to these studies, that at the close of the year, when he was presented to the king, he is said to have excited the jealousy of the courtiers, and was most kindly received by the king, to whom he held out prospects of conquering Greece by his assistance. The king became so attached to him, that Themistocles was always in his company. After he had spent several years at the court, he was sent to Asia Minor, to wait there for an opportunity of carrying his promises into effect. A pension was now bestowed upon him after the Oriental fashion: three towns were given him, of which Magnesia on the Maeander was to provide him with bread, Myus with meat, and Lampsacus with wine. He took up his residence in the first of these towns, where he lived with a sort of princely rank. But death overtook him at the age of sixty-five, before any of his plans were carried into effect. Most of the ancient writers state that he put an end to his life by poison, or, according to another strange story, by drinking the blood of a bull, because he despaired of being able to fulfil his promises to the king. The motive for his suicide is very questionable. Reflections on his past life and upon the glory of his former rivals at Athens are much more likely to have rendered him dissatisfied with life. Before he took the poison he is said to have requested his friends to convey his remains secretly to Attica, and in later times a tomb which was believed to contain them existed in Piræus. In the market-place of Magnesia a splendid monument was erected to his memory, and his descendants in that place continued to be distinguished by certain privileges down to the time of Plutarch.

(Herodotus, vii. 143, &c.; viii. 4, &c.; Thucydides, i. 14, 135, &c.; Plutarch, *Themistocles;* Diodorus Sicul., xi. 2, 12, &c.; C. Nepos, *Themistocles;* Pausanias, i. 1, 2; compare Thirlwall, *History of Greece*, vol. ii.)

THEMISTO'GENES. [XENOPHON.]

THENARDITE—(*Anhydrous Sulphate of Soda*)—occurs crystallized. Primary form a right rhombic prism; cleavage parallel to the primary planes; colour white or reddish; transparent; translucent; opaque; soluble in water; effloresces on the surface; specific gravity 2·73.

It occurs in crystalline coatings at the bottom of some lakes, at a place called Les Salines Espartines, about five leagues from Madrid; it is used in the preparation of carbonate of soda. According to the analysis of Casaseca it is composed of

Sulphate of soda . .	99·78
Carbonate of soda . .	0·22
	100·

THENUS, Dr. Leach's name for a genus of macrurous crustaceans, formed at the expense of *Scyllarus* of authors. [SCYLLARIANS, vol. xxi., p. 144.]

THEOBALD, LEWIS, was born at Sittingbourne, in Kent. We have no record of the date of his birth. His father was an attorney, and he was bred to his father's business. His first literary production was 'Electra,' a tragedy, which appeared in 1714. As the writer of twenty very indifferent plays, he is utterly forgotten. Those productions belong to an age in which the true spirit of dramatic poetry was for the most part lost, and Theobald possessed none of those brilliant qualities which could impart a lengthened existence to his attempts in portraying the manners of his age. But he has attained a celebrity of another description. He is most commonly known as the unhappy dunce whom Pope assailed with the most inveterate ridicule; but, after a century of prejudice against his name, he is now pretty generally acknowledged to have deserved an honourable reputation as an editor of Shakspere, having brought to that task diligence, knowledge, and judgment, beyond comparison superior to the critical talents of his rival the author of the 'Dunciad.' His 'bad eminence' as the original hero of that poem was earned by a pamphlet in which he pointed out many of the errors of Pope's Shakspere. 'Shakespear Restored, or Specimens of Blunders committed and unamended in Pope's Edition of this Poet,' was published in 1726. The first notice which Pope took of this pamphlet was in his second edition of Shakspere, which appeared in 1728. 'Since the publication of our first edition, there having been some attempts upon Shakspeare published by Lewis Theobald (which he would not communicate during the time wherein that edition was preparing for the press, when we, by public advertisements, did request the assistance of all lovers of this author), we have inserted in this impression as many of 'em as are judged of any the least advantage to the poet; the whole amounting to about twenty-five words.' In the same year came out the 'Dunciad.' The revenge of Theobald was the severest that could be inflicted, and it was unexceptionable. In 1733 he produced an edition of Shakspere which utterly destroyed that of Pope. It has been asserted that of Theobald's edition, which was in seven volumes, 8vo., nearly thirteen thousand copies were sold. (Steevens's 'Shakespear,' 1793, vol. i.) In his preface Theobald thus notices the attacks of his distinguished rival: 'It is not with any secret pleasure that I so frequently animadvert on Mr. Pope as a critic, but there are provocations which we can never quite forget. His libels have been thrown out with so much inveteracy, that, not to dispute whether they should come from a Christian, they leave it a question whether they could come from a man. I should be loth to doubt, as Quintus Serenus did in a like case,

> "Sive homo, seu similis turpissima bestia nobis
> Vulnera dente dedit."

The indignation, perhaps, for being represented a blockhead, may be as strong in us as it is in the ladies for a reflection on their beauties. It is certain I am indebted to him for some flagrant civilities; and I shall willingly devote a part of my life to the honest endeavour of quitting scores; with this exception, however, that I will not return those civilities in his peculiar strain, but confine myself, at least, to the limits of common decency. I shall ever think it better to want wit, than to want humanity; and impartial posterity may perhaps be of my opinion.' It is to be feared that it was rather a new hatred than a sense of justice, however tardy, which induced Pope in 1743 to dethrone Theobald from the heroship of the 'Dunciad,' setting up Colley Cibber in his place. In the subsequent year both Pope and Theobald were at peace; death had for ever silenced their controversy. Theobald died in September, 1744. On the 20th of the following October, his library, which included 295 old English plays, was sold by auction. He had collected these productions, now so rare and highly valued, at a time when our early drama was neglected, if not despised; and he made a judicious use of them in his edition of Shakspere. When we speak of his edition with commendation, we of course look at those things which are of permanent value in it; and we pass over those ebullitions of offended pride, venting itself in self-commendation and acrimonious objection, which were natural to one who had been so hunted by satire as Theobald had been. Dr. Johnson says that Theobald, 'by the good luck of having Pope for his enemy, has escaped and escaped alone with reputation from this undertaking [the undertaking of editing Shakspere]. So willingly does the world support those who solicit favour against those who command reverence, and so easily is he praised whom no man can envy.' This, we think, is mere phrase-making, and does not represent the world's opinion of any man at any period: reputations are not made upon the compassion of the world. Johnson has, a little before, stated the case with greater correctness, although not wholly correct. 'Pope was succeeded by Theobald, a man of narrow comprehension, and small acquisitions, with no native and intrinsic splendour of genius, with little of the artificial light of learning, but zealous for minute accuracy, and not negligent in pursuing it. He collated the ancient copies, and rectified many errors. A man so anxiously scrupulous might have been expected to do more, but what little he did was commonly right.' The great merit of Theobald as an editor is that he did not attempt too much, that he did not 'do more,' and that *therefore* he was 'commonly right.' The great fault of nearly all the editors of Shakspere has been that they set themselves up above their author; that they would exhibit their own 'native and intrinsic splendour of genius' in the improvement of what they did not understand, and the adaptation of the verse of Shakspere to the standard of another age. The most happy emendations of Shakspere, almost the only admissible ones, have been produced by the caution of Theobald. In his own preface he says, 'I have not by any innovation tampered with his text, out of an ostentation of endeavouring to make him speak better than the old copies have done;' and then he adds, 'Where, through all the former editions, a passage has laboured under flat nonsense and invincible darkness, if, by the addition or alteration of a letter or two, or a transposition in the pointing, I have restored to him both sense and sentiment, such corrections, I am persuaded, will need no indulgence.' All subsequent editors have a debt to Theobald which has not always been acknowledged. Johnson himself says, 'I have sometimes adopted his restoration of a comma, without inserting the panegyric in which he celebrated himself for his achievement.'

There is a curious matter connected with the history of Theobald, which needs here only a slight mention. In his edition of Shakspere in 1728, he printed a play, 'The Double Falsehood,' as an original by William Shakspere, it having been a short time before produced on the stage. The play was stated to have been found in manuscript. One passage, which is certainly not in the manner of Shakspere, is said to have been particularly admired:—

> 'Strike up, my masters;
> But touch the strings with a religious softness:
> Teach sound to languish through the night's dull ear,
> Till melancholy start from her lazy couch,
> And carelessness grow convert to attention.'

The admiration was too much for the vanity of Theobald: he came forward to state that he certainly had written those lines, but that all the rest was genuine Shakspere. Dr. Farmer holds that 'The Double Falsehood' was not Shakspere's because the word *aspect* was wrongly accentuated, that is, not as aspéct, according to the usage of Shakspere and of his time; and he holds the play to be Shirley's. It is not worthy even of that writer. The probability is that Theobald had a greater hand in the matter than he was subsequently willing to acknowledge. The restless vanity and love of notoriety which, according to his own account, impelled Psalmanazar to his impostures, has perhaps in nearly every case been the great motive to literary forgery. Theobald was the author of a Life of Sir Walter Raleigh; and he also wrote the greater part of the periodical papers entitled 'The Censor,' which appeared as a separate work in 1717, having been previously published in Mist's 'Weekly Journal.'

THEOBALDUS, a bishop who probably lived in France, and whose name is sometimes written *Tebaldus* or *Tibaldus*, the reputed author of a didactic and theological poem entitled 'Physiologus de Naturis Duodecim Animalium.' It is written in hexameter, sapphic, and other kinds of verse, and describes first some one or more of the natural habits of twelve different animals, and then draws from each some moral and religious reflections. The twelve animals chosen are the lion, eagle, serpent, ant, fox, stag, spider, whale, siren and centaur, elephant, dove, and panther; and the whole poem appears to be borrowed in a great measure from the little work in prose by Epiphanius on the same subject. The poem begins thus:—

> 'Tres leo naturas et tres habet inde figuras,
> Quas ego, Christe, Tibi bis seno carmine scripsi.
> Altera divini memorant animalia libri,
> De quibus apposui quæ rursus mystica novi,
> Tentans diversis si possem scribere metris.
> Nec numerum nostrum complent simul addita solum.
> Nam leo stans fortis super alta cacumina montis,' &c.

And ends thus:—

> 'Coelos ascendens ubi regnat cum Patre praesens
> Quem gentes cunctae sic sunt credendo secutae
> Aut fugit atque latet nec in ipso tempore paret
> Serpens antiquus, qui nobis est inimicus:
> Namque palam nullos licet audet fallere multos
> Nos hinc defendet, qui secla per omnia regnat.
> Carmine finito sit laus et gloria Christo,
> Cui si non alii placeant hæc metra Tibaldi.'

The last two verses are not to be found in the old editions, but only in Beaugendre's edition of the works of Hildebert. With respect to the author of the poem, as it is found in a Paris manuscript of the thirteenth century, containing the works of Hildebert, archbishop of Tours (who lived in the twefth century), and has also been ascribed to Hildebert himself, he may be supposed to have lived some time in the twelfth century, or even as early as the eleventh, if he is the person meant in an epitaph on *Magister Theobaldus Dervensis*, written by Hildebert. (Hildebert, *Opera*, p. 1322, edit. Beaugendre.) The first edition of this work to which a date is attached is that of Antwerp, 1482, 4to., but five others are enumerated by Choulant (*Handbuch der Bücherkunde für die Aeltere Medicin*), which were probably printed before this year. The last edition, in a separate form, was published at Leipzig, 1510, 4to.; but it is inserted in 'Hildeberti Cenomanensis Episcopi, Turonensis Archiepiscopi, Opera,' edit. Ant. Beaugendre, Paris, 1708, fol., and erroneously attributed to Hilbebert. The *Proœmium* and the chapter *De Elephante* are inserted by Freytag in the 'Analecta Litteraria de Libris Rarioribus,' Lips., 1752, 8vo. In some of the old editions there is appended to the poem a theological commentary, written in the style of the scholastic philosophy of the middle ages: the author is unknown, but it was not composed by Theobaldus himself. (Choulant, *loco cit.*)

THEOBRO'MA (from θεός and βρῶμα, the food of gods), the name of a genus of plants belonging to the natural order Sterculiaceæ, the species of which yield the cocoa of commerce. They are trees with large simple leaves and with the flowers in clusters. The calyx is composed of 5 sepals; the petals are 5, lengthened into a strap-like form at the apex; the stamens are 5, each with double anthers and a horn-like appendage between each filament; the style is filiform, with a 5-parted stigma; fruit a 5-celled capsule without valves; seeds embedded in a soft pulp; no albumen, and thick oily wrinkled cotyledons.

T. Cacao, Common Cacao or Chocolate-nut tree, has entire, elliptic, oblong, acuminate, quite smooth leaves, and oblong smooth fruit. This tree is indigenous in South America, and is generally found at a height of 600 feet above the level of the sea. It is however extensively cultivated in the West Indies, and in the tropical parts of Asia and Africa. The Mexicans call the tree *chocolalt*, hence our word chocolate for the prepared seeds. The capsules of the fruit are large, and contain each about 25 seeds; the pulp in which these are enveloped has a sweet and not unpleasant taste, and is frequently eaten where the tree is grown. The trees are evergreens, and bear fruit and flowers all the year through, but the usual times for gathering the fruit are in June and December. The cotyledons of the seeds contain a large quantity of oily albumen, which has an agreeable flavour, and on this account they are not only used as a principal article of diet by the natives of the countries in which they grow, but are now used for the same purpose thoughout the civilized world. The composition of these seeds, in which amylaceous matter is combined with oil, and a principle probably similar in its constitution to Thein and Caffein, is well adapted, when combined with sugar, to form a valuable article of diet. The consumption of them for this purpose is already on the increase, and under the present greatly decreased rate of duty will probably go on in a greater ratio. The following are the quantities consumed in this country since 1835:—

1836	.	.	1,130,168 lbs.
1837	.	.	1,416,615
1838	.	.	1,601,787
1839	.	.	1,606,800
1840	.	.	2,045,478
1841	.	.	1,930,764

Before the alteration of the tariff in 1842, the duty on cocoa from British possessions was 2*d*., and from foreign countries 6*d*. per lb.; now reduced to 1*d*. and 4*d*. On husks and shells the duty was ½*d*. and 1*d*., and remains unaltered. The duty on cocoa paste and chocolate, which was 4*d*. per lb. from British possessions, and 4*s*. 4*d*. from foreign countries, has been reduced in the former case to 2*d*., and in the latter to 6*d*. per lb. The duty on foreign cocoa under the old tariff was nearly prohibitory.

The chocolate of different countries varies according to its mode of preparation and the ingredients contained in it. The most common form however in which they are consumed in this country is what is called cocoa, which consists of the seeds pressed into flakes or reduced to a paste. It is to this paste whilst hot that the honey, sugar, and other things are added, which constitute it chocolate. The paste is frequently adulterated. Hogs' lard and sago are added to make up weight, and red lead to give it a colour. On this account the flake-cocoa is the best to be used.

The largest quantity of the seeds that are used in this country are brought from the West Indies, and of these the Trinidad nuts are considered the best. Of the 1,600,000 lbs. of cocoa consumed in 1839, 959,000 lbs. came from the West Indies, 375,000 from Columbia, 186,000 from Brazil, and 133,000 from Chili.

The oil contained in the seeds is sometimes obtained separately, and called cocoa butter. It may be obtained easily by expression, especially if hot water is added. It is said to be very nutritive, and to act as an anodyne. It is particularly recommended for making ointments. (Ersch and Gruber, *Allgem. Encycl.*, art. 'Cacao.')

In the cultivation of the Cacao a wet soil must be selected, as, wherever planted, if it has not a large quantity of water it perishes. The plants also require shade, and on this account in Trinidad and other islands of the West Indies the seeds are placed between rows of the Erythrina umbrosa, one, two, or three rows of the Cacao being planted between the Erythrinas. In sowing them the seeds are placed two or three together in the soil, at about two yards distant in the rows; and when the plants are about two feet high, all except the strongest are removed. In rearing them the only further care necessary is that all weeds are removed. If this be not attended to, the plants will not flourish.

There are several other species of Theobroma, yielding seeds possessing the properties of the above, but they are not cultivated or employed to the same extent. They are all of them natives of South America, and used by the inhabitants where they grow as food. The *Theobroma Guazuma* of Linnæus, the Bastard Cedar or Orme d'Amérique, now the *Guazuma ulmifolia*, is a native of the West Indies, and is a handsome tree resembling the elm. It has ovate, oblong leaves, smooth on both surfaces. In Jamaica cattle eat its leaves when fodder is scarce. Its pods have a sweet flavour like green figs, and are frequently eaten in the West Indies. Its wood is much used by coachmakers on account of its lightness. Its leaves and bark yield a mucilaginous decoction, which is reputed of much value in elephantiasis and in diseases of the chest.

(Don's *Miller's Dictionary*; *Dictionnaire des Sciences Naturelles*; *Parliamentary Reports*.)

THEOBRO'MA. (*Cocoa and Chocolate*.) The species of this genus which yield articles of nutriment are chiefly natives of South America and the West Indies. They are also found in the Philippine Isles. It is customary to refer cocoa to the species described by Linnæus under the name Theobroma Cacao (*Theobroma sativa*, Lamarck), but this yields only a small portion of this most widely consumed article, and none of that used in Mexico, where the Cacao does not even grow. Besides this species, the following furnish some of the different kinds, viz.: T. speciosum, Wildenow; T. subincanum, Mart.; T. sylvestre, Mart. The Mexican cocoa is conjectured by Decandolle to be yielded by T. angustifolia and ovalifolia, as well as from some undescribed species. That of Guatemala is certainly from an undescribed species. The Columbian is yielded by a species called by the natives *montaras* *symoron*, which is cultivated like the T. Cacao. The cocoa of Guiana is yielded by the T. Guianensis. (Aublet.)

The fruits are collected both from wild and cultivated plants; from the latter two harvests are obtained, from the former one only. The cultivation is easy and unexpensive. The tree begins to bear about the age of seven or eight years, and one slave can superintend a thousand plants, the produce of which however is not more than from 1500 to 1600 lbs. of seeds. The statement of Labat is an exaggeration—that a tree in full vigour will produce 150 lbs. of seeds. Notwithstanding the small return from each tree, it is a very lucrative branch of culture. The produce is always greatest after the greatest floodings of the rivers. The seeds from the wild plants are termed by the native Brazilians *cacao bravo* or *cacao do Mato*.

The fruits of the different species vary in size, form, and the number of the seeds they contain. The seeds, which are the only part employed, vary in size and quality according to the species from which they are obtained. The general number is from twenty-five to thirty in each fruit, being more abundant, as well as of better quality, in the cultivated than in the wild plants. They vary much in bitterness and in the quantity of oil they yield, not only according to the species from which they are obtained, but the manner in which they are treated after being gathered and taken out of the pulpy fruit. In some instances they are buried in the earth in heaps, and allowed to ferment for thirty or forty days; a process which greatly improves them, and destroys the germinating power of the seed. The different kinds met with in commerce derive their names either from the place where they grew or from some corruption of the native designation. The average size of good beans is that of a sweet almond, but somewhat thicker. The most esteemed of the known sorts is that termed *Soconuzco*, or Mexican, with very small beans, with a remarkably fine flavour, and scarcely any acrid taste. These beans are always buried. This sort never comes to Europe. The next most valuable comes from Esmeraldas, and has a very agreeable flavour: the chocolate prepared from it has a golden colour; it is seldom met with out of Mexico. The Guatemala cocoa consists of very large beans, very convex, often angular, and very much pointed at the one end. They contain much oil, and are mild, with a pleasant flavour. The beans from Guayaquil, which are three times as large as those of Soconuzco, are less prized than those of Guatemala.

The Caracas or New Granada cocoa, which is among the more highly prized kinds that reach Europe, is obtained from the Theobroma bicolor (Humboldt, *Pl. Aequin.*, t. 30), called by the natives Bacao, and cultivated at Carthago. The beans are of medium size, and very oily. But chocolate made of these alone is not very agreeable, and another kind is commonly mixed with them, which are much smaller and harder. Berbice cocoa beans are not unfrequently mingled with those of Granada. These are also smaller and thinner, but in other respects difficult to distinguish; the shell separates very easily from the kernel, which is reddish-brown, and has a strong smell, but a pleasant flavour.

The Surinam and Essequibo cocoas are not unlike that from New Granada, but are harder, thicker, and not so sweet.

All the foregoing are earth-dried: the following are called sun-dried, being merely collected in heaps, and often turned over in the sun; they are consequently much cheaper.

Brazilian, called also of Para, and of Maranham, is very extensively employed: the beans are small, smooth, long, somewhat flattened, externally reddish-brown, with a bitter astringent taste: it is only worth half the amount of the former. The West Indian, called Cocoa des Iles or des Antilles, is still less valuable, and is employed to form the low-priced cocoas and chocolates.

Lampadius has analyzed the West Indian kernels, and found them to consist of, in the 100 parts, besides water, 53·1 of fat or oil, 16·7 of an albuminous brown matter, which contains all the aroma of the bean, 10·91 of starch, ·75 of gum or mucilage, 0·9 of lignine, and 2·01 of a reddish dye-stuff, somewhat akin to the pigment of cochineal. These proportions vary very much in the different sorts the West Indian kinds containing far more of the oil or butter of cocoa than the kind from New Granada. It is therefore most advantageous to employ the latter to form cocoa or chocolate for nutriment, and the other to yield this solid oil, to form candles, soap, or pomades. This oil contains a large proportion of stearine, and is therefore solid at the ordinary temperature of the air, but it melts at 122° Fahr. When purified by long boiling in water, it is perfectly white, and does not readily become rancid. It is perfectly soluble in æther, a means of detecting adulterations with beef-fat, suet, marrow, or almond oil, wax, &c. It is however less employed in this country than in France. Nevertheless it is a most valuable material, and a soap made with it and soda, which is preferable to potass, forms an article for the toilet of great service to those who are troubled with a rough harsh skin or chapped hands. The soap sold in this country under the name of *cocoa-nut oil* must not be confounded with that just spoken of, as this is obtained from the Cocos nucifera. The cocoa-nut-oil candles are likewise prepared from the latter.

The kernels of the Theobroma are used as an article of nutriment either in the natural state as they are received from America or prepared in various ways. The simplest and best form is that of the seeds roughly crushed, termed *cocoa-nibs*, which however require two hours boiling, as, owing to the peculiar nature of the endosperm, or inner seed-coat, which passes down into the substance of the cotyledons, the prolonged application of heat and moisture is necessary to dissolve the contents. Flake cocoa is merely the seeds crushed between rollers. When chocolate is to be made, the beans, after being carefully picked so as to free them from mouldy or worm-eaten ones, are to be gently roasted over a fire in an iron-cylinder, with holes in the ends to allow the vapour to escape. When the aroma begins to be well developed, the process is considered complete. The beans are then turned out, cooled, and freed by fanning and sifting from their husks. The husks, which often amount to 20 or 25 per cent. of the beans employed, should not be thrown away, as they contain half their weight of soluble matter of a mucilaginous nature, which furnishes a tolerable nutriment for the poor. The seeds are then to be converted into a paste, either by trituration in a mortar heated to 130° Fahr., or now almost universally by a machine impelled by steam. (See Ure's *Dictionary of Arts*, &c., p. 293.) The paste is then put into moulds and sent into the market. It always improves by keeping. The colour is said to be owing to the addition of arnotto, but this is probably a mistake, for if the South American contain as much colouring-matter as the West Indian, any extraneous pigment is unnecessary. When the kernels alone are used, or only a little sugar added, the chocolate is termed 'Chocolat de santé.' But vanilla, cloves, cinnamon, and other aromatics are frequently added; as are also rice, almonds, starch, &c. Simple chocolate is mostly preferred in Britain, the perfumed sorts in France, Italy, and Spain, in which countries the consumption is immense. For invalids the plain chocolate is best, the perfumed being too heating. Where tea and coffee disagree, cocoa or chocolate is the best substitute. It is complained that it proves heavy and disturbs the stomach, and not unfrequently causes headaches. In almost all instances this arises from making the beverage too strong. The printed directions order far too much of the substance to be employed. Half the quantity is sufficient. The Spaniards do not reckon chocolate very nutritious, and even permit the priests, who should fast for many hours before saying mass, to drink it. But this is a very convenient mistake. Schrader, who analyzed cocoa, regarded the bitter principle as similar to *caffein*. The analysis of Theobromine by Woskresensky shows how nearly he was correct, and also that this article, being one of the most highly azotised vegetable compounds, must be highly nutritious. Liebig considers that this principle contributes to the formation of bile, like thein. [THEA; THEIN.]

THEOCRACY (*θεοκρατία, a government by God*) is a term applied to the constitution of the Israelitish government, as established by Moses, on account of its being under the direct control of God. Michaelis enumerates the following particulars as those in which the theocratic form of government is most remarkable:—1. The laws of the Israelites were given by God. 2. The judges are represented as holy persons, and as sitting in the place of God. 3. The judges were usually taken from the tribe of Levi, and the chief expounder of the law was the high-priest. 4. In difficult cases of law, relating both to government and war, God was to be consulted by Urim and Thummim. 5. In matters which concerned the welfare of the state, God often made his will known by prophets, and the people were of course bound in duty to obey their voice. 6. God bound himself by promises and threatenings to reward them with prosperity, victory, and plenty, if they kept the law of Moses, and to punish them with defeat, and other public calamities, if they disregarded it.

In fact, in the earliest form of the Israelitish constitution, *God was their king*; and the desire of the people to have a king at the time when Saul was raised to that office is expressly declared to be an act of rebellion on their part. (1 *Sam.*, viii. 7.)

The theocracy did not supersede the establishment of a visible human government, consisting of judges and other officers, but all these officers were considered as subordinate to God as the only supreme ruler of the state. [Compare MOSES, p. 439-441.]

(Michaelis, *Commentaries on the Laws of Moses*, sec. 35, Eng. trans.)

THEO'CRITUS (Θεόκριτος) was a son of Simichidas, or, according to others, of Praxagoras and Philinna. He was a native of Syracuse, where he also spent the greater part of his life. He is said to have been connected with Philetas of Cos and Asclepiades of Samos, and to have been their pupil, whence we may infer that he visited these islands. He was on very intimate terms with Aratus the poet, and it is highly probable that he formed this acquaintance in the island of Cos. (Wüstemann, *Argument. ad Theocrit. Idyll.*, vii.) His exact period is not known, and we can only say that he lived in the reign of Ptolemaeus, the son of Lagus, and Ptolemaeus Philadelphus, and that the time of his greatest reputation was about the year B.C. 277. Some years before this time, probably about B.C. 284, he had visited Alexandria, and the influence of the court of that city is manifest in several of his poems. It has further been supposed that he spent some time at Croton in Southern Italy, because the scene of three of his poems is laid in that place. Beyond these circumstances, which are little more than probabilities, we know nothing of the life of Theocritus. The Alexandrine grammarians valued his works very highly, and assigned to him the second place in the pleiad of the seven miscellaneous poets, which comprised Lycophron, Theocritus, Callimachus, Aratus, Apollonius Rhodius, Nicander, and one Homer, the son of Moero of Byzantium. Several Greek grammarians also wrote commentaries on the works of Theocritus, some fragments of which are still extant in the scholia on his poems. There is extant by Theocritus a collection of various poems, which are written in what the Greek grammarians call the new Doric dialect, which is softer than the old Doric, and the softness of this new Doric is still increased in the poems of Theocritus by the admixture of epic and Ionic or Aeolic forms. The particular species of poetry by which he has acquired most celebrity are the Bucolics (μέλη βουκολικά). This pastoral poetry was very popular in Sicily, and having been originally cultivated by shepherds and rustics, was raised to a really artistic rank by several poets before Theocritus. He however brought this kind of poetry to perfection, and the antient critics regard him as the model of bucolic poetry, and Virgil for this reason calls this poetry Syracusan (*Eclog.*, vi. 1). But the number of real bucolic poems still extant in the collection which bears the vague name of Idyls (εἰδύλλια), is only ten; the remaining twenty poems are either epic poems (such as idyl xiii., xxii., xxiv., and xxv.), or imitations of mimes (such as idyl ii. and xv.), or are of a mixed nature, and belong either to the lyric kind, or are mere exercises of a poetical imagination. Nine of these poems, xii., xvii., xviii., xix., xx., xxvi., xxvii., xxix., and xxx., and some portions of others, have been considered by modern critics not to be the work of Theocritus: as to some there can be no doubt that they are spurious, though they are not without great poetical merit, if we except idyl xxx. Besides these thirty idyls, there is a fragment of one poem called 'Berenice,' and twenty-two epigrams, which are ascribed to Theocritus.

All the poems which are genuine productions of Theocritus show him to have been a perfect master of his art. His power over the language is not less wonderful than his taste for the simple beauties of nature, and the skill with which he handled his subjects. His poems are indeed founded upon the national shepherd songs of Sicily in the form of dialogues, but he has added features of his own and idealized his persons, without depriving them of their natural simplicity. We do not know whether Theocritus himself ever published a collection of his poems, but from an epigram in the 'Anthologia Graeca' (ix., n. 205), we might rather suppose that the collection was made by Artemidorus, the author of that epigram. It is however a curious fact that none of the MSS. of Theocritus contain all the poems which are published in our modern printed editions under his name. The editio princeps, which appeared at Milan in 1493, fol., only contains eighteen idyls of Theocritus, with the works of Hesiod and Isocrates. The most important among the subsequent editions are those of J. J. Reiske, with a Latin translation, the Greek scholia and notes, Leipzig, 1765, 2 vols. 4to.; Thomas Warton, with additional scholia and notes, Oxford, 1770, 2 vols. 4to.; Valckenaer, Leyden, 1779 and 1781. The edition of Valckenaer, which also contains the poems of Bion and Moschus, is still valuable. In 1773 Valckenaer had published an excellent edition of select idyls of Theocritus. His complete edition was reprinted at Berlin, 1810, 2 vols. 8vo., with additional notes by Brunck and Toup. After these followed the editions of Schaefer (Leipzig, 1811, fol.), Kiessling (Leipzig, 1819), and J. Geel (Amsterdam, 1821, 8vo.). The last edition, which is very useful to students, is by E. F. Wüstemann, Gotha and Erfurdt, 1830, in one vol. 8vo. The introductory essay gives a good account of the literature of Theocritus. The works of Theocritus have been translated into all the languages of modern Europe. There is an English translation by Fawkes, 8vo., 1767, and a translation, including Bion and Moschus, by Polwhele, 4to., 1786, and in 2 vols. 12mo., 1811. The best French translation is that of J. B. Gail, with explanatory and critical notes, Paris, 1808, 3 vols. 4to. The best German translations are those of J. H. Voss (Tübingen, 1808, 8vo.) and Witter (Hildburghausen, 1819, 8vo.). Respecting the character of the poems of Theocritus, see Eichstädt, *Adumbratio Quaestionis de Carminum Theocriteorum ad Genera sua Revocatorum Indole ac Virtutibus*. Lipsiae, 1793, 4to.; and Reinhold, *De Theocriti Carminibus Genuinis et Supposititiis*, Jena, 1819, 8vo.

THEODOLET, or THEODOLITE (the word is found in both forms), is the name generally given to the instrument used for measuring horizontal angles. In its simplest form the theodolet consists of a divided circle, which is to be set parallel with the horizon, and a telescope which has so much motion in a vertical plane as to enable the observer to view any object which he may require above or below the horizon. The derivation of the word is obscure, although the instrument and its name are comparatively of recent date. The earlier observers did indeed use divided circles, which they called astrolabes, armillas, &c. for the purposes of surveying, but these were, generally speaking, very rude. The quadrant was employed in all accurate surveys up to the latter half of the last century, although Roemer had shown by reason and example the superiority of the entire circle. [CIRCLE.] The first instance of a survey conducted with an entire circle, on a considerable scale, was, so far as we recollect, the Survey of Zealand by Bugge,* in 1762-8. The horizontal circle was two feet in diameter, and constructed by the Danish artist Ahl.

Ramsden finished his great theodolite in 1787, the circle of which is three feet in diameter. This was used for a triangulation, to connect the Observatories of Greenwich and Paris. A very full description of it is given in *An Account of the Operations carried on for accomplishing a Trigonometrical Survey of England and Wales*, London, 1799, pp. 107-130, with four plates; a reprint, in a great measure, from the 'Phil. Trans.,' vol. 80 et seq. The principal triangles of the English, Irish, and Indian surveys have been observed with this instrument or with those nearly identical in size and construction; and though several minor additions and improvements have been made, the great theodolite is still considered by the officers of the survey as a most efficient and almost infallible instrument. We believe that the high reputation of the great theodolite depends in a great degree on the *superstitious* care with which it has been used and preserved: it is undoubtedly a very fine, well-divided strument, but in common hands its want of solidity and firmness would probably have been felt. It would be impossible as well as useless to give an account of the various constructions of different artists at home and abroad. The general properties of a theodolite, that it should be firm, well balanced, &c., will be easily recognised by a person who knows how to make good use of the instrument, and we shall advert in the course of this article to some of the qualities which are, and to others which are not, essential.

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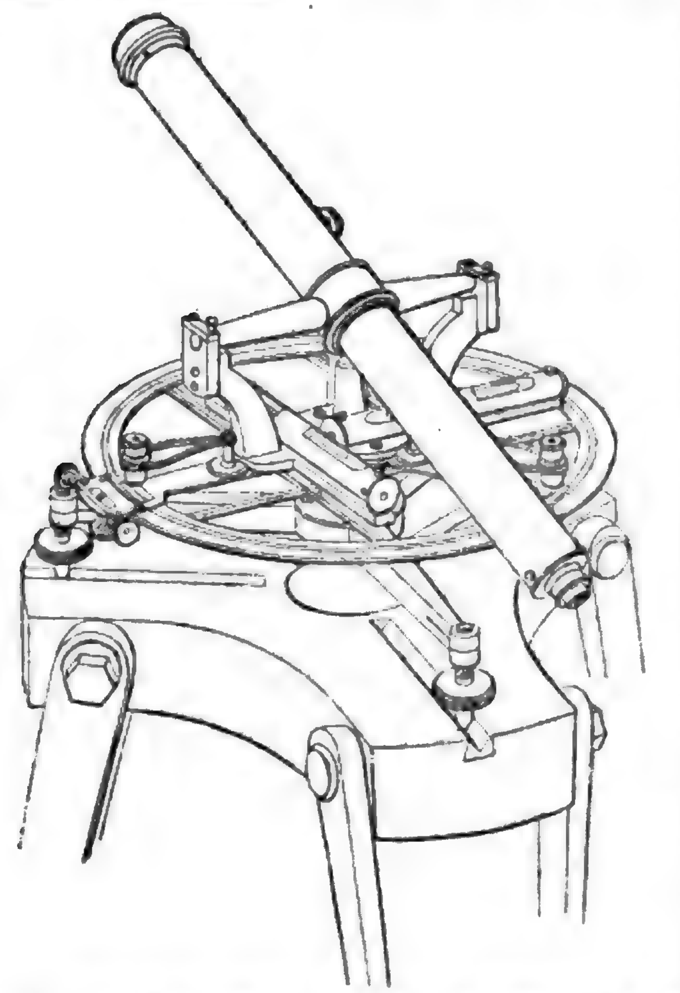
* See Bugge's 'Observationes Astronomicæ,' p. 84, where he refers to a description of this instrument in Danish, and p. 61, where he states its [illegible]



We have given here a sketch of the theodolite in its simplest form, such as would be proper for the secondary triangulation of a national survey, or for the most accurate private survey. The tripod which carries the instrument rests with three foot-screws in brass notches let into the top of a wooden stand. The legs of the stand are not fully represented, but the two parts of which each is composed end below in a strong and sharply-pointed metal socket. The circle is fixed, and the upper works, telescope, verniers, levels, &c., turn on a centre, which may be seen just under the cross of the telescope. The adjustments are very simple. The wooden stand is first set down with a good opening of the legs, and the top nearly horizontal. The foot-screws are placed in their notches, the plumb-line hung from its hook, below the centre of the circle, and the telescope turned round till one level is parallel to the line joining two foot-screws, while the other level is in a line from the third foot-screw to the centre. Bring the bubble of the first-mentioned level into the middle by raising one of the two foot-screws and depressing the other, and then adjust the cross-level by raising or depressing the third foot-screw alone. Now turn the telescope round 180°, and if the bubbles are not in the middle, bring them half way there by touching the foot-screws, and the other half by screws which adjust the levels themselves. When this has been nicely done, the bubbles will remain in the middle in every position of the telescope. If the objects to be observed lay all in the horizon, or in a plane parallel to it, the above adjustment would be sufficient; but when the objects are out of the horizontal plane they must be referred to it by a perpendicular, that is, the plane described by the telescope must be a great circle, and must also pass through the zenith. There are generally two wires at least in the focus of the telescope, one horizontal and the other vertical. Place the eye-piece to give sharp vision of the wires, and turn the milled screw, seen towards the object-glass, until the objects you are going to observe are distinct. Place the vertical wire on any well-defined object, making the bisection near the crossing of the wire; raise or depress the telescope until the object is nearly at the bottom or top of the field; if it is still bisected, the wire is rightly placed, but if not, twist the tube carrying the eye-piece so as to effect a bisection. To make the telescope describe a *great* circle, select some well-defined object near the horizon, and bisect it: now take the telescope *very carefully* out of its Y's, reverse it, and look again at the object. If it is still bisected, there is no error; but if not, the bisection is to be effected half by the tangent-screw of the instrument and half by the screws which carry the wire-plate, screwing up one and releasing the other. Restoring the telescope to its first position, it will be seen whether the adjustment is correct, and if not, the process must be repeated until the bisection is the same in both positions of the telescope, the clamp and tangent-screw remaining fixed. For the adjustment of the axis of the telescope a level would be convenient, but in this instrument the axis is supposed to have been correctly placed by the maker, and the only mode of correcting any error is by filing the Y's. It may be ascertained whether the axis is tolerably correct as follows:—Bisect an object as far above or below the horizon as the motion of the telescope will allow. Reverse the telescope, and if the object is still bisected, the pivots of the telescope are the same size: if not, the observer must deduce the difference of the pivots from the altitude and the error observed, which is not difficult. When this has been satisfactorily executed, bisect, as in the last instance, an object as far as possible from the horizon, and read off the verniers. Turn the instrument round 180°, return the telescope *end for end*, bisect the object again, and read off the verniers. If the mean readings differ exactly 180°, the axis is horizontal; but if they do not, the observer will have sufficient data from this, and the altitude or depression, for determining the quantity and direction of the error, which he may correct by the file or by calculation, according to his pleasure. There is a much easier method of examining the position of the axis by observing an object directly and as seen by reflexion from a fluid, as mercury, oil, or water. The axis is truly horizontal when the vertical wire bisects the object and its reflected image without moving the tangent-screw. It must be recollected that the adjustments of the horizontal circle already described must be previously and very scrupulously performed before attempting the examination or adjustment of the cross-axis.

As the objects in a survey are at very different distances, an adjustment is required for forming the image exactly on the wires. The use of the milled screw, seen towards the object-end of the telescope for this purpose, has already been mentioned.

In use, this theodolite should be placed on a repeating table or tripod, such as is to be found figured and described in REPEATING CIRCLE, and the repeating-tripod upon the stand. This was not done in the present plan for the sake of clearness. To adjust the repeating tripod, place the levels as described in the first adjustment, and clamp the theodolite. Bring the foot-screws of the theodolite over the foot-screws of the repeating-tripod by the motion of the tripod, and then by touching the foot-screws of the tripod or theodolite set the level-bubbles in the middle. Turn the upper plate of the tripod half-round, and again bring the bubbles into the middle, half by the tripod foot-screws, half by those of the instrument, and repeat the operation until the revolution of the repeating-table does not alter the position of the level-bubbles. The repeating-stand is now clamped, and the instrument itself is to be adjusted exactly as we have described above.

The course of observation after the instrument is adjusted is very simple. The problem is to measure the horizontal angle between two objects. Turn the telescope two or three times round in the direction in which you intend to observe, then bisect one of the objects, read off the verniers, and take a mean; bisect the second object, read the verniers, and take a mean. The difference between the two means is the angle required. This is all that can be done by the instrument as usually mounted; but with a repeating-table the operation is continued thus. Bring the telescope back on the first object, by the motion of the repeating-table, using its clamp and tangent-screw, and by the motion of the instrument bring the telescope on the second object. It is clear the motion of the repeating-table has merely restored the telescope to its original direction, without altering the readings of the circle; and that if the telescope be turned on the second object by its motion alone, without distributing the circle, the difference between the mean of these new readings and the preceding mean will also be the angle required. By continuing the process, the angle may be measured as often as the observer pleases. It is evident that all readings-off, except the first and last, are superfluous, save as checks, or as giving the means of estimating the accuracy of the final result. The series should terminate after a whole number of revolutions as nearly as possible, when the excentricity of the repeating-table will be eliminated, a matter of possible importance if the objects are near and the repeating-table carelessly made, or, if the objects are pretty distant and this caution superfluous, when the verniers are nearly at the divisions at which you set out, which gets rid of or at least diminishes any errors of division. The latter condition is however rather a speculative than a practical one. As the error of division is divided by the number of observations, and the casual error of observation only by the square-root of the same number, it is evident that a moderate number of repetitions in our excellently-divided circles will reduce the error arising from mal-division to a much smaller quantity than that which belongs to the class of casual error of observation.

The essential condition of repetition is, that the motion of the theodolite shall not disturb the repeating-table. The motion of the latter therefore should be as heavy as will admit of nicety in the tangent-screw, while the motion of the parts which move with the telescope should be as light and free as is consistent with firmness. There is, we believe, no difficulty whatever in effecting both these points; but lest any error should arise from repetition, we should recommend a careful observer to determine his angles by two series,—one by always moving the telescope and its tangent-screw forward, and the repeating-stand and its screw backwards; and another, by reversing the process. If the two results agree, as they should do within the limits of casual observation, the mean is probably free from all other error; and if they do not, the observation should be repeated and varied until the quantity and probable law of the error is ascertained. We should then be able to say decidedly where, when, and under what precautions repeating was a safe as well as a convenient and economical process, which at present is rather a *vexata quæstio*, unless the decision be supposed to be against all repetition, to which we do not bow.

The foregoing description has been confined to a form of theodolite which is not in ordinary use, though from its simplicity and power it is well adapted to the purpose of explanation. The common theodolite is generally carried by a pair of parallel plates, fixed on a three-legged staff. The lower of these circular plates is screwed upon the staff, and has an aperture above the screw. The upper plate has a strong descending shank which passes loosely through this aperture. A button of a spherical form is fixed on the end of the shank, the curvature uppermost, and rubs against the under surface of the lower plate, which is dome-shaped to fit it. Four strong screws pass through the upper plate and abut with their lower ends against the lower plate. When the screws are turned the plates are separated until the button and the spherical surface on which it rubs are brought into squeezing contact. To level the theodolite, set the levels each parallel to a diagonal pair of screws of the parallel plates. Then screw one pair until you come to a bearing, and by releasing one screw and screwing up the other, but not very tight, set the corresponding level horizontal; leaving this pair and taking hold of the other pair set the second level also right, and if the first level is deranged, as it probably will be a little, restore its position by screwing up the proper screw. Turn the telescope half round and correct the error, half by the parallel plate-screws, and the other half by the level-adjustments themselves. It is desirable that, when the final adjustment is made, the screws should bite pretty hard, otherwise there is a great chance that the upper plate will turn a little during the observation. This objection would seem fatal to the use of parallel plates where great nicety is required: they are however very convenient and of very ready use, and perhaps if the screws are strong and the observer is careful to give the telescope three or four turns round in the direction he means to observe, before starting, and always to move the telescope the same way, serious error may be avoided. The first object observed should always be observed at the end of the service, in order to see whether there has been any change in the original position. If one of the screws rest in a notch, perhaps the tendency to twist may be wholly overcome.

Another contrivance which is to be found in almost all theodolites is much more objectionable. The surveyor wishes to save himself addition or subtraction, and requires an adjustment by which he can turn the whole circle about and bring the telescope upon the first object, the verniers being previously set to zero. There is therefore a motion with a clamp and tangent-screw for this purpose, which, as the clamp has usually a very short bearing, is particularly liable to yield and so to destroy all accuracy. To remedy this unnecessary evil, a second or watch telescope, as it is called, is attached to this part of the instrument and brought to bear upon a well-defined object. Any motion or wriggling of the zero-clamp is betrayed by the watch-telescope, and when an angle is taken, it must be first ascertained whether the watch-telescope keeps its position, and the position if disturbed must be restored to the zero tangent-screw, before the observation is finally made. In some theodolites made for the Indian survey, under the direction of Colonel Everest, the zero and slow-motion clamp take the form of a repeating-table, and may be so applied. It would be safer to have this motion made considerably heavier than in the patterns we have seen, and if the instrument is likely to fall into clumsy hands the watch-telescope might easily be added for greater caution. Such a theodolite would, so far as we can judge, have no limit to its accuracy, except that depending on the diminutive telescope.

For many purposes of surveying it is desirable that the telescope should allow of being considerably elevated or depressed, and that means should be given for measuring this angle with considerable accuracy. A circle, or portion of a circle, is then fixed upon the telescope axis, and the necessary verniers and level may be secured by a tail-piece or otherwise to the support. If the vertical angles are to be measured as accurately as the horizontal angles, the instrument becomes an altitude and azimuth circle. [CIRCLE.] But such instruments are rarely applied to the measurement of terrestrial angles. The direction of the meridian was determined in the Ordnance Survey by observing Polaris at its greatest elongations E. and W., and taking the middle of the two readings for the direction of the north. Hence the telescope required all the transit adjustments except that for azimuth [TRANSIT], and was considerably elevated above the circle. Though the results were upon the whole satisfactory, yet we greatly doubt the prudence of ascertaining this fundamental and delicate point from such an instrument, or of risking the steadiness of the telescope supports by raising them so much above the body of the instrument. It would have been better, we conceive, to have determined the direction of the meridian by a series of careful transit observations, using more optical power with greater steadiness, and to have kept the theodolite to its proper office, that of measuring horizontal angles, greatly reducing the height of the telescope supports. The great theodolite had originally a semicircle fixed to the axis of the telescope, for measuring altitudes and depressions. This has since, very properly, been removed, and a whole circle substituted.

Where a theodolite is merely used for surveying, the telescope requires only a moderate vertical range. Mr. Troughton fixed a portion of a circle (which may be more properly called a slice than a sector) to one or two of his 12-inch theodolites, and this construction is often found in other makers. The telescope is thus kept lower, the instrument is firmer, and the larger radius gives the portion of the circle a seeming advantage over the entire circle of smaller radius. There is however something very unsatisfactory in a portion of a circle, and we should prefer a sort of compromise, giving the supports such an elevation as would allow a vertical circle of about half the dimensions of the horizontal circle: if the direction of the meridian is to be determined by this instrument, the supports must be at least so high as to see 2° or 3° above the lattude of the place, and the vertical circle may be increased accordingly.

It is perhaps requisite to give some description of the mode of adjusting the vertical circle. Where the supports are high enough to allow the telescope to pass when turned round in a vertical plane, all the adjustments are the same as in the altitude and azimuth circle. [CIRCLE.] When the telescope is too long for this, the circle must be lifted out of its Y's in order to bring the line of sight again upon the object to be bisected, and then set down again. The operation is in fact the same, whatever be the nature of the vertical arch, and the adjustment is to be effected either by altering the level or the horizontal wire until the reading is the same in both positions of the telescope. If the observer has a Y level or collimator, he can set the cross of his level-wires horizontal, and this being bisected by the telescope of the theodolite, the vernier must be made to read zero, and the bubble of the level be brought to the middle by its proper screws. Or if the observer possess two stands (and there is a great convenience in having more stands than one in surveying), he may place the stands at a considerable distance from each other, and, fixing the instrument on one stand and a mark of exactly the same height as the telescope-axis on the other, observe the mark, noting its elevation or depression. Now exchanging the instrument and mark, he must reobserve the depression or elevation exactly as before. On drawing the figure, it will be seen that if light move in a straight line, $90^\circ -$ elevation at lower station $= 90 -$ depression at higher station $+$ the angle between perpendiculars to the earth's surface at each station, which last quantity is known from the distance between the stations, and may be easily calculated, *i.e.* depression $-$ elevation $=$ a known angle. But if the zero is wrong, depressions will be increased while elevations are diminished, and *versâ vice*, so that depression observed $-$ elevation observed $-$ the known angle, instead of being $= 0$, will be ± 2 error of the vernier, which may be corrected accordingly either by the adjustment of the level or of the horizontal wire. Or, lastly, if the telescope has so much motion as that a star can be observed directly and by reflexion from mercury or any other fluid, the index-error of the vertical circle may be most accurately determined thus. Take any star in the meridian, and having observed it directly, observe it immediately after by reflexion. If great nicety is required, the observations should be repeated alternately several times, and the partial results reduced to the meridian. The mean reading between the meridian altitude and meridian depression is the reading which corresponds to the horizon, and the difference of this from 0, or 90°, according as the circle reads altitudes or zenith distances, is the error of the instrument, which may either be corrected or allowed for. This method, though very accurate, requires some knowledge of the time, and is rather restricted by the choice of stars. It is nearly as safe to observe a star not far from the east or west point, first directly, then by reflexion, and lastly directly, making the contacts at following whole minutes, or at even or odd minutes if the interval of a minute is not sufficient. As the stars rise nearly uniformly in this part of the heavens, the mean of the first and third observations should give an altitude equal to the depression observed midway; the discrepancy between these results will be the double index-error as before, which may be corrected or allowed for. By some of these methods, the index-error of the verticle circle or sector is to be found.

In some of the older theodolites the telescope rides in Y's at the top of the vertical arch, and is reversible as a level. The horizontal position of the telescope Y's can therefore be found as in any other level, and the verniers of the vertical circle set to zero when the telescope is horizontal. The vertical angles measured by these instruments are not however to be greatly depended on. They are usually greatly out of balance in all positions of the telescope, except the horizontal position, and therefore they make better levels than altitude instruments. This error may be partially got rid of by having a second level fixed to the instrument which is parallel to the plane of the vertical circle, and adjusted to the telescope level when that is horizontal. If this supplementary level is pretty well graduated, it will show the tilt which is given the plane of the instrument by want of balance, and so give the correction required.

It may be as well to mention here that the principal adjustment being that of setting the plane of the theodolite horizontal, or, more correctly speaking, the principal axis vertical, any horizontal level anywhere placed is sufficient for the purpose, though the cross-levels are a little handier. A box-level is convenient, if a stand and repeating-table are used, to bring the planes nearly horizontal, and to make both ends of the bubbles visible at first.

Many surveyors give themselves and the instrument-maker a great deal of unnecessary trouble by being very difficult on the chapter of excentricity, which they confound with error of division. The English dividing-engines, up to the present time, do not divide the circles upon their centres; and therefore it frequently happens that the point round which the circle turns is not the point round which it is divided. When this error is not absolutely monstrous, the only effect is that one vernier gains what another loses, and that the mean of two opposite, or of three, four, or more equidistant readings, is precisely the same as if there were no excentricity. The advantage of a *little* excentricity is, that it gives you the benefit of an unbiassed reading at every vernier as well as the first: again, if all the verniers are recorded, it is a check on the dishonest observer, who might read one vernier and set down the rest. The instrument-maker must please his ignorant customer, and so either hammer his circle after it is divided, which may deform his work, or have an adjustment, which injures its solidity.

In Ramsden's great theodolite, and several others which have been made, the circle is read off by micrometer microscopes. Sometimes the microscopes revolve with the telescope (as the verniers do in our figure); sometimes the microscopes are fixed, and the circle revolves with the telescopes, as in Ramsden's theodolite.

Ertel of Münich has made several *astronomical* theodolites in which the rays entering into the telescope are reflected along the horizontal axis by a prism. The observer therefore looks in at the end of the horizontal axis, whatever the position of the star may be. The eye and body of the observer are more satisfactorily placed, and the supports are kept close and snug to the horizontal circle. The instrument is well adapted to one of its principal objects, observing stars at their passage over the prime vertical [TRANSIT]; but there is some trouble in finding an object when you have no better direction to look for it than your eye affords. Excellent latitudes have been determined by instruments of this class used in the prime vertical, and even the small vertical circle seems from some accounts to possess more power than from its dimensions we should have thought probable. As a general rule, the greater the number of readings, the less the effect of bad division, but beyond a limited number, the trouble and difficulty of reading-off is found in practice to counterbalance the advantage. Two opposite readings annul the effect of excentricity; three or four equidistant readings destroy such an error as would arise from the circles becoming elliptic after it was divided, or any error which follows the same law. In small stoutly-made theodolites we think two the most convenient number, and they can be much more conveniently read off than a larger number. When the circle is so much as 8 inches in diameter and the telescope good, we should prefer three or four readings. The vertical circle or sector may have two opposite readings. For many matters connected with surveying on the most extensive and accurate scale, see the memoirs published and to come of the English, Scotch, and Irish Trigonometrical Survey; and the 'Base Métrique,' or account of the French measurement of an arc of the meridian, although that survey was conducted by a different instrument. Similar operations have been carried on in many countries during the last half-century, and the memoirs which relate to these surveys contain the best information which can be had on the subject.

THEODO'RA. [JUSTINIAN.]

THEODORE OF CORSICA. [CORSICA.]

THEODORE, or THEODORUS, *of Mopsuestia*, a learned bishop of the Oriental church. He was descended from a rich and distinguished family at Antioch, and was the brother of Polychronius, who became bishop of Apamea. He studied rhetoric, together with his friend John Chrysostom, under Libanius, who resided at Antioch from the year A.D. 354. His teacher of philosophy was Andragathus. After having finished his studies, he intended to marry a

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lady of Antioch (about 369); but his friend Chrysostom, who was then a monk, persuaded him to choose the monastic life. Theodore was for some time a priest at Antioch, and afterwards bishop of Mopsuestia, an antient town of Cilicia (394). In the same year he was present at the council of Constantinople. He died in 429, at a very advanced age, and after he had discharged his episcopal functions during thirty-five years. During fifty years he was known as one of the most distinguished writers of the Greek church, especially by his works against the Nestorians, Pelagians, and other sectarians. His zeal however for the Catholic faith did not save him from the charge of being an adherent of the doctrines of the Nestorians, and he 'was obliged to make a public apology.' After his death the Nestorians continued to quote his works, and to call him the support of their faith; and this was the cause of his works, or perhaps only part of his works, being condemned by the fifth Council (553). Theodore of Mopsuestia is said to have written largely on divinity and morals. Few of his writings have come down to us: others exist in Syriac and Latin translations, and of the greater part there are only fragments. A treatise on the Magi of the Persians, and his commentaries on the Psalms, the Book of Job, and the Song of Solomon, are lost: his commentary on the twelve greater prophets is preserved in MS., according to Fabricius, under the title of Θεοδώρου Ἀντιοχέως ἑρμηνεία εἰς τοὺς Προφήτας. A catalogue of the works which contain fragments of him is given in Fabricius, and the Syriac translations are mentioned in Assemannus's 'Bibliotheca Orientalis.' Theodorus of Mopsuestia is still one of the first theological authorities among the Syrian Christians.

(Fabricius, *Bibl. Graeca*, x., p. 346-362; 346, note a; 347, note o; 352, note gg; 355, note kk; p. 748: Tillemont, *Memor. Eccles.*, vol. xii.; Cave, *Script. Eccles.*, vol. ii.)

THEODORETUS, or THEODORITUS, a theologian and church historian, was born about 393 A.D. He was brought up under the care of a pious mother, to whom he acknowledges his obligations in his writings; and he had instruction from Theodore of Mopsuestia and John Chrysostom in a monastery, to which he was sent to receive his education when not quite seven years old, and where he had for his fellow-pupils Nestorius and John, who were afterwards patriarchs of Constantinople and Antioch. Theodoret became a deacon in the church at Antioch, and in the year 423 he was chosen bishop of Cyrus, a city in Syria, near the Euphrates. His diocèse abounded with Marcionites and persons who held heretical opinions concerning the Trinity. Against the opinions of these heretics he directed his efforts with so much success, that, according to his own statement, he baptized ten thousand Marcionites.

In the year 431 Nestorius was condemned by the council of Ephesus [NESTORIANS], whose decision gave great offence to many of the Oriental Christians, who, without being avowed followers of Nestorius, were supposed to be not unfavourable to his opinions. Among these was Theodoret, who was a personal friend of Nestorius; and he was one of those who assembled after the council of Ephesus had broken up, and condemned its proceedings. A reconciliation was however effected between Cyril, patriarch of Alexandria, the great enemy of Nestorius, and John, patriarch of Antioch, the leader of the Oriental party, who signed an agreement by which Cyril approved of John's statement of the controverted point of doctrine, while John gave his approval of the sentence passed on Nestorius. With this agreement Theodoret and others of the Oriental party were greatly dissatisfied. Theodoret approved on the whole of the doctrinal statements in the agreement, but he warmly protested against John's consent to the condemnation of Nestorius, as an act of unmitigated injustice. He expressed these feelings in a letter to Nestorius. But when John, armed with an imperial edict, proceeded to take measures against the more decided partisans of Nestorius, Theodoret considered himself bound to submit, both for the sake of the peace of the church, and because of his own approval of the doctrine which it was John's object to enforce. He therefore used every means in his power to induce the friends of Nestorius, namely, Meletius, bishop of Mopsuestia, Alexander of Hierapolis, and Helladius of Tarsus, to submit to John; and, upon their rejection of his advice, he offered no opposition to their being deposed. But when, in the year 435, new and severe edicts were issued against the Nestorians, Theodoret refused to carry his submission any further; and, by his firmness he incurred the hatred of Cyril, to whom he had already been opposed in this controversy, and between whom and Theodoret such a bitter feeling existed, that when Cyril died, in 444, Theodoret made no secret of his joy at the event.

If, as we are bound to conclude from the character of the man and from the Christian spirit with which he elsewhere speaks of Cyril's death, Theodoret's joy on this occasion sprung from a belief that the divisions which had been kept alive by Cyril would die with him, and peace be restored to the church, he was doomed to bitter disappointment. Cyril was succeeded by Dioscurus, a man as haughty and impetuous as himself, and quite as unscrupulous. The new bishop followed up his predecessor's plan of enforcing upon the whole Eastern church the doctrine of the coalescence of the Deity and humanity into one nature in the person of Christ; and perhaps he also kept in view the object of obtaining a kind of supremacy for the see of Alexandria. Determined to admit of no compromise, he made his first attack upon the moderate party in the Syrian churches, which was headed by Theodoret. Dioscurus was supported by a large party in Syria, chiefly consisting of monks, whose leader was an abbot named Barsumas; and at Constantinople many monks, the most remarkable of whom was the abbot Eutyches, were strongly in favour of the Cyrillian doctrine, on the ground that it alone was consistent with the simple letter of Scripture, 'the Word became flesh,' and other similar expressions.

These Constantinopolitan monks were a most important party in the dispute, partly from their close connection with the anti-Nestorian monks of Syria, and still more from their great influence with the emperor Theodosius II., whom they had induced from the very first to espouse the party of Cyril. Theodoret was, as usual, slow to take up the controversy. He wrote to Dioscurus in the hope of effecting a reconciliation between the two parties. In this attempt he failed; and then, looking upon the doctrine of Dioscurus and his allies as the sure road to the various heresies which denied the true humanity of Christ, he wrote a book against them in the year 447, entitled 'The Beggar, or the Many-shaped' (ἐρανιστής, or πολύμορφος. By this title he meant to imply that the Eutychian doctrine (as the views held by Cyril, Dioscurus, Barsumas, Eutyches, and the monks, are generally named for the sake of brevity) was borrowed from a variety of antient heresies. The work consists of three dialogues: in the first, entitled ἄτρεπτος, he treats of the impossibility of the divine essence undergoing a change; in the second, ἀσύγχυτος, of the impossibility of the two natures (the divine and human) being mingled into one; and in the third, ἀπαθής, of the impossibility of the divine nature suffering or dying. This work displayed great learning and power, together with a moderation which drew upon Theodoret the reproaches of the zealots of his own party. His opponents, however, saw in his doctrines nothing less than a revival of Nestorianism; and Dioscurus accused him before Domnus, the patriarch of Antioch, of dividing the one Lord Jesus Christ into two sons of God, and wrote also a severe letter to Theodoret, making the same charge. Theodoret replied with great mildness and moderation, conceding as much of the disputed doctrine as he could conscientiously, and praying Dioscurus to consult for the peace of the church rather than for the views of a party. This letter only the more incensed Dioscurus, who permitted monks publicly to anathematize Theodoret in the church, while he himself confirmed their anathemas. He also sent ambassadors to Constantinople to accuse the whole Eastern church of Nestorianism before the emperor. Domnus also sent deputies to clear his church of this charge, and Theodoret wrote with the same object to some of the most powerful ecclesiastics and statesmen. No immediate decision of the dispute took place, but the emperor ordered Theodoret, as a troubler of the church, to confine himself within the limits of his own diocese. Theodoret bitterly complained of being thus condemned unheard.

In the meantime the two parties grew more violent, and the imperial court itself became the scene of their disputes. In the year 448 Eutyches, in his zeal against Nestorianism, incurred the charge of an opposite heresy, of which he was condemned by the synod held by Flavianus at Constantinople, but again acquitted by the second Council of Ephesus, under the presidency of Dioscurus (A.D. 449). [EUTYCHIANS.] In convening this council every care was taken to exclude the anti-Eutychian party. With respect to Theodoret, the emperor commanded that he should only be admitted in case his presence should seem good to the whole assembly. The hint was taken, and he was excluded. The emperor carried his dislike to Theodoret still further, and intimated to the council that such men as Theodoret should not only have no voice in it, but that they ought rather to be visited with its censures. Accordingly the council deposed Theodoret from his bishopric, and he was compelled, by an imperial edict, to retire into the monastery where he had been educated. As he had been peaceful and moderate in prosperity, so he was resigned and cheerful in adversity: indeed his amiable spirit, and his firmness in obeying the dictates of his conscience, form a most agreeable relief to the strife and ambition which mark the character of most of the ecclesiastics of the age.

The only check to the triumph of Dioscurus and the Eutychians was the influence of Leo the Great, the then bishop of Rome, who had been already appealed to by Eutyches, after his condemnation by the synod of Constantinople, and whose aid was now sought by the opposite party. Flavianus and Theodoret wrote letters to him, proposing to submit the whole controversy to an œcumenical council to be convened in Italy. To this arrangement the emperor (Theodosius II.) refused his consent, but his death in the following year (450) changed the state of affairs. In the next year (451) an œcumenical council was assembled, first at Nicæa, but very soon removed to Chalcedon, to which Theodoret was summoned, and in which he was received by his friends with the greatest enthusiasm. He petitioned the council for restoration to his bishopric: at the eighth sitting his petition came on for hearing: he rose to plead his cause; but the party of Dioscurus exclaimed that he must first condemn Nestorius. Theodoret had never been a Nestorian, but had all along held a middle course between the parties of Nestorius and of Cyril; but he hesitated to pronounce the required condemnation till some clear definition of Nestorianism should be given. The bishops of the opposite party interrupted him with the shout 'He is a heretic: he is a Nestorian: thrust the Nestorian out!' Upon this Theodoret exclaimed:—'Anathema on Nestorius and on every one who denies Mary to be the mother of God, and who divides the only begotten Son into two sons. I have subscribed the confession of faith, and the letter of the bishop Leo; and this is my faith—Farewell.' He was pronounced to have established his orthodoxy, and the unanimous vote of the council restored him to his bishopric.

In this transaction we perceive that Theodoret's firmness had at length given way before the furious zeal of the Eutychians; and his courage appears never to have revived, for in his latest work, which was a history of heresies (*αἱρετικῆς κακομυθίας ἐπιτομή*), he speaks of his former friend Nestorius in the harshest terms.

After the council of Chalcedon, Theodoret returned to his diocese, where he devoted the rest of his life to literary labours. He died in the year 457. Even after his death he was looked upon as a formidable enemy by the Monophysites and the Origenists, who procured the condemnation of his writings against Cyril by the council of Constantinople (A.D. 553).

His works were:—1, 'A History of the Church,' in five books, from 325 to the death of Theodore of Mopsuestia in 429. Gennadius, a Latin writer, at the end of the fifth century, says that Theodoret's history consisted of ten books, and came down to the year 457, but no other writer mentions more than five books. It is a work of great learning and impartiality. 2, *Φιλόθεος ἱστορία*, an account of the lives of thirty celebrated hermits, ten of whom were his contemporaries and in some degree personally known to him. 3, The work against the Eutychians, already mentioned. 4, 'The History of Heresies,' also mentioned above. It is sometimes entitled, 'Against all Heresies, or a discrimination of falsehood and truth' (*κατὰ πασῶν τῶν αἱρέσεων, ἢ ψεύδους καὶ ἀληθείας διάγνωσις*). It consists of five books, and relates almost exclusively to the heresies respecting the person of Christ. 5, 'Ten Orations against the Heathen;' an 'Apology for Christianity;' besides 146 letters and commentaries on most of the books of the Old Testament and on all the epistles of Paul.

The best edition of his works is that of Schulze, in 5 vols. 8vo., Halle, 1768-74.

(Mosheim's *Ecclesiastical History*, by Murdock and Soames, i., p. 443; Neander's *Geschichte der Christl. Relig. und Kirch.*, ii., passim; Schöll's *Geschichte der Griech. Litt.*, iii. 318.)

THEODORIC or **THEODERIC I.**, king of the Visi-Goths, was the elected successor, but was not the son, of king Wallia, who died A.D. 419. During the latter years of the reign of the emperor Theodosius II., Theodoric invaded Gaul, and in 425, just after the accession of Valentinian III., he laid siege to the city of Arles. Aëtius however relieved this town, and made peace with the Goths, who were obliged to come to terms because they were threatened by the Vandals, and they marched against the Vandals together with the Romans. After a peace of ten years, a new war arose between the Romans and Theodoric, who in 436 besieged the city of Narbonne, which was only relieved in the following year, 437. The issue of this war proved unfortunate for the Romans, the inhabitants of their provinces in Gaul being reduced to despair by heavy taxes and other kinds of oppression, and the Goths being superior to the Romans in courage. Aëtius therefore enlisted several thousand Huns, in order to employ them against the Goths; but these auxiliaries were more destructive to the inhabitants than their enemies. A body of the Romans, together with these Huns, commanded by Litorius, the best of the generals of Aëtius, having made some progress, laid siege to Toulouse in 439. Theodoric proposed to conclude a peace, but Litorius, remembering his former victories over the Armoricans, refused all terms. Upon this the Goths made a sally; the Romans were entirely beaten, and Litorius himself was made a prisoner, and carried in triumph through the streets of Toulouse.

The whole country as far as the Rhône was now open to the Goths, and the inhabitants being well-disposed, Theodoric made fresh conquests. The remainder of the Roman army was disorganized and in the greatest consternation. Nevertheless Avitus, who was then Præfectus Prætorio in Gaul, found means to make peace, which was certainly favourable to the Goths, though the conditions are not known. In 450 Gaul was invaded by Attila with his Huns and a numerous body of Teutonic auxiliaries. Attila pretended that his object was only to attack the Visi-Goths, but the Romans also took arms, and the united forces of Aëtius and Theodoric met the Huns at Châlons-sur-Marne (451). Theodoric commanded his army in person, and he was accompanied by his two sons, Thorismund and Theodoric. The battle was short, but bloody and disastrous for Attila, who fled on the following day, and thus escaped total destruction. King Theodoric was killed at the beginning of the battle. Prince Thorismund was proclaimed king in the camp of his father, whom he caused to be interred on the field of battle with great pomp. [ATTILA.] (Mascov, *History of the Antient Germans*, ix. 11, 14, 27, 28.)

THEODORIC, or more correctly **THEODERIK**, surnamed 'the Great,' king of the Ostro-Goths, was the son of king Theodemir by his concubine Eralieva (Ehrlieb). He was born in 455, and he was seven years old when he was sent to Constantinople to the court of the emperor Leo Magnus (457-474) as a hostage, peace having just been concluded between this emperor and Theodemir, who had engaged to assist the Romans for an annual payment of two thousand pounds of gold. Theodoric received his education at Constantinople, and returned to his father in 472.

Without any orders from his father, he attacked and subjugated some Slavonian tribes on the Danube, and he afterwards accompanied Theodemir in his expedition to Thessaly, which was undertaken for the purpose of obtaining a larger territory for the Goths. This happened at the same time as the death of Leo (January, 474); and Zeno Isauricus the elder, who became emperor in the month of February, hastily made peace with the Goths, and ceded to them the country of Pautalia, that is, the south part of Pannonia and the south-west part of Dacia (474). Theodemir died in 475, and Theodoric became king of the Ostro-Goths.

Zeno having been deposed by another Theodoric, the son of Triarius, a Gothic prince who had great influence in the Byzantine empire, king Theodoric marched to his assistance, and by his aid Zeno was again acknowledged as emperor (476-477). It seems that Zeno did not show himself so grateful as he ought, for serious differences broke out between him and the Goths. Theodoric, on the contrary, was loyal and generous, and he continued to be a faithful ally when the emperor had satisfied his just claims. He proved so serviceable, that Zeno created him Patricius and Magister Militiæ Præsentis in 483, and subsequently promoted him to the consulship in 484, a year which is still distinguished in the annals by his name. Jornandes affirms that Zeno adopted him as his son, and caused an equestrian statue to be erected in honour of him before the imperial palace. (*De Rebus Gothicis*, c. 57.)

Notwithstanding the honours which Zeno conferred upon the king of the Goths, Zeno showed his insincerity wherever he saw an opportunity. To avenge himself, Theodoric invaded Thrace (in 488), dispersed the imperial troops, and besieged Zeno in Constantinople. It is said that Zeno saved himself by ceding to his adversary Italy, or his right to Italy, which was then in the hands of Odoacer, the chief of the Rugians. Perhaps he ceded only his claims on this country, hoping thus to get rid of a neighbour and friend whom he had changed by his own misconduct into a dangerous enemy. However this may be, the conditions of agreement are obscurely known. The Greeks afterwards pretended that Zeno had sent the Goths to Italy to re-annex that country to the empire: the Goths, on the contrary, affirmed that he surrendered Italy to their king. (Procopius, *De Bello Gothico*, i. 1.) Theodoric had certainly formed the plan of conquering Italy, and he was bent on carrying it into execution. If therefore he found it advisable to use the name of Zeno, he probably did so for the purpose of gaining those among the Romans who, although they detested foreigners, would submit to any conqueror whom they could consider as a delegate of the antient legitimate authority.

Theodoric assembled his nation (489), that is, that part of the Ostro-Goths which obeyed the kings of the house of the 'Amali,' of which Theodoric was a descendant. Some Gothic tribes only remained in Thrace and in the Tauric Chersonese. A whole nation, men, women, and children, carrying all their moveable property with them, left their homes and took the road to Italy, following the Danube as far as the tract which lies between that river and the lake of Balaton in western Hungary. Trapstila, the king of the Gepidæ, appeared with an army to prevent them from passing through his dominions; but he was routed by Theodoric on the river Ulca (the present Szala), which flows into the western corner of the lake of Balaton. Enduring hardships of all kinds, and fighting their way through the armed inhabitants, the Goths traversed the western part of Pannonia, crossed the Julian Alps, and reached Isonzo, where they met with the army of Odoacer, who was beaten in three battles—on the Isonzo, at Verona, and on the Adda (490). Odoacer, who fled to Ravenna, was forsaken by his best general, Tufa, and Frederik, a prince of the Rugians, and Epiphanias, bishop of Pavia, also came to Milan to pay homage to the king of the Goths. Odoacer was blocked up in Ravenna by one part of the Goths, and Theodoric, with another part, took possession of the whole peninsula of Italy, leaving Sicily, Sardinia, and Corsica to the Vandals. The siege of Ravenna lasted three years; but at last Odoacer surrendered to Theodoric, who, notwithstanding his oath to spare the life of his prisoner, ordered him to be put to death in his own palace (493). Odoacer's son and his whole family shared the same fate.

Theodoric was now acknowledged as king of Italy by the emperor Anastasius, the successor of Zeno, who gave him the furniture of the palace at Ravenna, which Odoacer had sent to Constantinople. Theodoric did not assume the imperial title although he adopted the name of Flavius. In 500 he went to Rome and celebrated a triumph; he convened the senate 'ad palmam auream,' confirmed the immunities of the Romans, and gained the affection of the lower classes by his liberality and by the exhibition of magnificent spectacles.

Theodoric had already confirmed his power by alliances with the neighbouring kings. Gundobald and Godegisel, the kings of the Burgundians, having made an invasion into Italy and carried away many of the inhabitants, Theodoric sent Epiphanias, bishop of Pavia, and Victor, bishop of Turin, as ambassadors to Burgundy. They succeeded in delivering the captives, and concluded an alliance between these kings and Theodoric, who gave his daughter Ostrogotha in marriage to Sigismund, the son of Gundobald. He likewise kept peace with the Vandals, and gave his sister Amalfrida, then the widow of a noble Goth, in marriage to their king Thrasimund. His eldest daughter, Theodichusa, was married to Alaric II., king of the Visi-Goths; and his niece, Amalaberga, became the wife of Hermanfrid, the last king of the Thuringians. Theodoric himself took for his second wife Andofleda, the sister of Clovis, king of the Franks.

In 504 Theodoric was at war with Trasaric, king of the Gepidæ, who, after many defeats, ceded his southern provinces as far as Sirmium, now Mitrowicz on the Save, near its junction with the Danube. The inhabitants of the eastern part of the Alemannian kingdom, which had been destroyed by Clovis [ALEMANNI; TEUTONIC NATIONS—*Alemanni*,] acknowledged Theodoric as their protector, who summoned Clovis to desist from any further violence against the Alemanni. (His letter is contained in Cassiodorus, *Variar.*, ii. 41.)

Meanwhile a war had broken out between Clovis and Alaric II., king of the Visi-Goths. Alaric fell in the battle of Vouglé in 507, in consequence of which the greater part of the dominions of the Visi-Goths in Gaul came into the hands of the Franks. Alaric's only legitimate son was a child named Amalaric, whom he had by his wife Theodichusa. As there was danger of all Spain being invaded by the Franks, the Visi-Goths intrusted the guardianship of their young king to Theodoric, who thus became the ruler over the Ostro-Goths and the Visi-Goths, or over Spain, southern Gaul, Italy with the dependent province of Illyricum, and parts of Rhætia, Noricum, and Pannonia. Theodoric had previously sent an army into Gaul, commanded by Iba, who delivered Arles, which was besieged by the Franks (508); and the same general made a prisoner of Gesalic, the natural son of Alaric II., who was a dangerous rival of young Amalaric. Clovis was compelled to content himself with the northern and larger part of the Visi-Gothic dominions in Gaul. From this year, 511, is dated the regency of Theodoric in the kingdom of the Visi-Goths, who however styled himself king, and the councils which were held during his government are dated according to the years of his reign. He took possession of the cities of Provence, perhaps under the pretext of the expenses which he had been put to in saving the Visi-Gothic kingdom. He appointed Liberius his lieutenant in Gaul, and Theudis in Spain.

The relation between Theodoric and the emperors of Constantinople was maintained to the satisfaction of both parties, until Justin published a severe edict against all who were not of the Catholic church (523), and soon after deprived the Arians of their churches. About the same time this emperor had engaged with some members of the Roman Senate in designs against the Gothic dominion in Italy. Boëthius, then one of the first men in Italy, was charged with being a principal conspirator. He was imprisoned in 522, and during his captivity he wrote his Treatise on the Consolation of Philosophy. The conspiracy proved abortive, Boëthius was put to death in 524, and Symmachus, his father-in-law, shared the same fate in the following year at Ravenna. With regard to religious affairs, Theodoric, who was an Arian, like all the Goths, ordered Pope John with several bishops to go to Constantinople and to obtain better conditions for the Arians in the Eastern empire. The pope reluctantly obeyed, but it seems that in Constantinople he spoke rather according to his conscience than in favour of the Arians; for he was imprisoned at his return, by order of Theodoric, and died not many days after, on the 18th of May, 526. On Theodoric's recommendation, Felix was elected pope, and his election was confirmed by Athalaric, the successor of Theodoric. This fact proves the great influence which Theodoric had in the affairs of his time. Not having obtained favourable conditions for the Arians in the East, Theodoric was about to retaliate on the Catholics in his dominions, when he died suddenly on the 26th of August, 526, in the 72nd year of his age. His contemporaries have invented many fables about the sudden death of this great king. Procopius ('De Bello Gothico,' i. 1) says that the head of a large fish being served up at table, he fancied it to be the head of Symmachus, whom he had put to death, and whose participation in the conspiracy against Theodoric had not been proved; it is added that he was so terrified by his imagination, that he fell into a fever and shortly afterwards died. Others pretend that his death was the consequence of a divine judgment, because he had deposed and imprisoned Pope John: this story savours of its origin. Others dreamt that the ghosts of Pope John and Symmachus had cast the soul of Theodoric into the burning crater of a volcano. The ashes of Theodoric were deposited in a porphyry urn, which still exists in the wall of the castle of Ravenna, and under it is an inscription on marble, bearing the date 563, which states that the urn once contained his remains. Theodoric having left no male issue, Athalaric, the son of his daughter Amalaswinth, succeeded him on the throne of Italy, and Amalaric became king of the Visi-Goths.

Theodoric generally kept his court at Ravenna, as the Roman emperors had done after the time of Honorius, and thus Ravenna became a centre of the arts and sciences, of no less importance than Rome. Among the high officers of Theodoric there were several very distinguished men, such as Cassiodorus, who was his private secretary, and Ennodius, who has written a eulogy of his master, which however is far from containing all the truth. He was celebrated as a hero in the old Teutonic songs, and in the 'Niebelungen-Lied' he appears as Diederich of Bern, that is, Verona.

Theodoric was not only a conqueror; he was also a legislator. [TEUTONIC NATIONS, *Goths.*] It is his greatest glory that he was a friend of peace, of toleration, and of justice; a glory, however, which is somewhat obscured by some acts of rashness and violence. Whenever a war between Teutonic kings was threatening, he tried to prevent it by mediation; a fact which is proved by his letters to the kings of the Franks, of the Visi-Goths, of the Thuringians, of the Burgundians, of the Heruli, and of the Warni. He always reminded them that they were of one common origin, and that they ought to maintain peace and friendly intercourse. Theodoric was especially vigilant in preventing Clovis from invading the states of his neighbours; he protected the Thuringians and the remnant of the Alemanni, and he saved the kingdom of the Visi-Goths from destruction.

(Ennodius, *Panegyricus Regis Theodorici*, ed. Chr. Cellarius, 1703, 8vo.; and also in his *Opera*, ed. Jac. Sirmondus, Paris, 1611, 8vo.; Jornandes, *De Rebus Gothicis*; Isidorus, *Chronicon Gothorum*, &c.; Procopius, *De Bello Gothico*; Cöchlaeus, *Vita Theodorici Reg. Ostrogoth.*, ed. Peringskjöld, Stockholm, 1699, 4to. Cochlaeus has written without any just criticism; and Peringskjöld has shown no historical ability in his additions, which however contain very interesting matter relative to the language and the antiquities of the Goths. Manso's *Geschichte des Ost-Gothischen Reiches in Italien*, Breslau, 1824, 8vo., is a very valuable work.)

THEODORIC, a bishop and celebrated surgeon of the thirteenth century, was a pupil of Hugo of Lucca. He at first belonged to the order of the Preaching Friars (*Frères Prêcheurs*); afterwards he became chaplain to the Bishop of Valentia, and penitentiary to Pope Innocent IV.; and he was at last made bishop of Bitonti and Cervia successively. Towards the end of his life he settled at Bologna, where he died in 1298. He was especially distinguished from his contemporaries by not resting content with imitating his predecessors; on the contrary, he appears to have carefully studied the cases that presented themselves to his notice, and to have recorded in a great measure the results of his own observations. He also introduced several useful innovations in the practice of surgery, and was the first person who ventured to lay aside the cumbrous and frightful machines which had hitherto been used in the reduction of fractures and luxations. He left behind him a surgical work, entitled 'Chirurgia Secundum Medicationem Hugonis de Luca,' which was published at Venice in 1490 and 1519, in folio. (Haller's *Biblioth. Chirurg.*; Sprengel's *Hist. de la Méd.*; *Biographie Médicale.*)

THEODO'RUS (Θεόδωρος), a native of Cyrene, was a philosopher of the Cyrenaic school, who lived towards the end of the fourth century B.C. He was a pupil of Arete, the daughter of Aristippus, and afterwards became the successor of Anniceris. His philosophical system, which was a kind of medium between that of Aristippus and Anniceris, appeared so dangerous to his fellow-citizens, among whom he had been held in very high esteem, that they banished him from their city. Theodorus went to Athens, where he would have experienced worse treatment if Demetrius Phalereus had not interposed and saved him; for here too his doctrines soon came into disrepute, and a public accusation was brought against him of moral and religious indifference. After the fall of Demetrius Phalereus, Theodorus thought it advisable to withdraw from Athens, and he went to Egypt, where he soon gained the confidence of Ptolemaeus Soter, who, on one occasion, sent him as his ambassador to Lysimachus. On this mission Theodorus is said to have shown much courage and a strong feeling of independence towards Lysimachus, who taunted him for having been obliged to leave Athens The time of his death is unknown.

We do not possess a complete view of the philosophical system of Theodorus, but he appears to have been one of the forerunners of Epicurus. His ideas of the deity were explained in a book which he wrote on the gods (περὶ θεῶν), and which earned him the name of atheist, though it is doubtful whether this opprobrious name was given him because he really denied the existence of gods, or merely because he was above the common prejudices of his countrymen. The following doctrines are especially mentioned as characterising his views of human affairs:—wisdom and justice are desirable, because they procure us the enjoyment of pleasure: friendship, on the other hand, has no real existence; for, in a person who is not wise, it ceases as soon as he ceases to feel the want of it, and a wise man is in want of nothing beyond himself. Patriotism is not a duty, because it would be absurd to make it incumbent upon a wise man to sacrifice himself for the ignorant, who form by far the majority of a state. His followers, who constituted one of the three branches into which the Cyrenaic school was divided, were called Theodorians.

(Diogenes Laert., ii. 86; vi. 97; Cicero, *Tusculan.*, i. 43; v. 40; *De Natura Deorum*, i. 1, 23, 43; Suidas, s. v. Θεόδωρος.)

From the philosopher Theodorus of Cyrene we must distinguish Theodorus the mathematician, who was a native of the same place, and is mentioned among the teachers of Plato. (Xenophon, *Memorab.*, iv. 2, 10; Maximus Tyrius, *Dissertat.*, 22.)

THEODO'RUS PRISCIA'NUS, the author of a Latin medical work, which is still extant, and which sometimes goes under the name of *Octavius Horatianus.* He was a pupil of Vindicianus, and is supposed to have lived at the court of the emperors of Constantinople in the fourth century after Christ. He belonged to the sect of the Empirici, but appears to have also mixed up some opinions of the Methodici, and even of the Dogmatici. His work, which is not of much value, is entitled 'Rerum Medicarum Libri Quatuor,' and is written in a barbarous Latin style. The first book treats of external disorders, the second of internal, the third of female diseases, and the fourth of physiology, &c. It was first published in 1532, fol., at Strassburg, and also in the same year at Basle, 4to.; of these two editions, the former is the more complete, the latter the more correctly printed. A new edition was undertaken by J. M. Bernhold, of which the first volume was published in 8vo., without place or date, at Ansbach in 1791; but which, in consequence of the editor's death, has never been completed. Another work, entitled 'Diaeta, seu de Salutaribus Rebus Liber,' has been attributed to Theodorus Priscianus, but (as Choulant thinks) incorrectly. It was first published together with 'Hildegardis Physica,' Argentor., 1533, fol. It first appeared in a separate form at Halle, 1632, 8vo., edited by G. E. Schreiner, and was afterwards inserted in Rivinus's collection of antient physicians, Leipzig, 1654, 8vo. (Haller's *Biblioth. Medic. Pract.*; Sprengel's *Hist. de la Méd.*; Choulant's *Handbuch der Bücherkunde für die Aeltere Medicin.*)

THEODO'RUS, or DIODO'RUS, OF TARSUS, of a noble and very distinguished family, lived in the fourth century of our æra, and was most probably born at Antioch. He studied under Sylvanus Tarsensis; and after having taken orders, he first became priest, and then Archimandrita at Antioch. The Catholic churches of this town having been shut up by order of the emperor Valens (A.D. 364-378), who was an adherent of Arianism, Theodorus preached in the fields round the town, and he was always surrounded by a numerous congregation of Catholics. He also defended the orthodox faith with great intrepidity against the attacks of the Arians and the tyranny of Valens. Immediately after the death of Valens, he was appointed bishop of Tarsus (378), Gratianus, the successor of Valens, being a zealous Catholic. In 381 Theodorus was at the Council of Constantinople. The year of his death is not known, but as Phalerius was chosen bishop of Tarsus in 394, it is probable that he died in this year. Theodorus was much esteemed by his contemporaries for his plain and lucid eloquence, but though he was known as the most zealous defender of the Catholic faith, he was accused of having shown himself favourable to the heretical doctrines of Nestorius. The same charge was made against his contemporary Theodorus of Mopsuestia. Theodorus of Tarsus wrote numerous works on theology and morals, none of which have come down to us. It is said however that one of his works on Politics, which Fabricius believes to be identical with another work on Providence, exists in a Syriac translation.

(Cave, *Script. Eccles. Historia Literaria*, vol. ii., p. 266, 267; Fabricius, *Bibl. Græca*, p. 380, 381.)

THEODO'RUS I., a native of Greece, and son of Theodorus, patriarch of Jerusalem, was elected bishop of Rome after the death of John IV., A.D. 641. Constans II. was then emperor of Constantinople, and Rotaris was king of the Longobards in Italy. The heresy of the Monothelites was disturbing the church, and it was supported by the emperor Constans, and by Paulus, patriarch of Constantinople. Theodorus held a council at Rome in 648, in which Paulus was excommunicated. It does not seem proved however that Theodorus condemned, as some have asserted, the typus or edict of the emperor Constans, in which he forbade all his clergy from disputing on the subject of the two wills in Christ, the Monothelites asserting that there was only one will in him. [EUTYCHIANS.] Theodorus built several churches at Rome. He died in 649, and was succeeded by Martin I. (Muratori, *Annali d'Italia*: Panvinio, *Vite dei Pontefici*.)

THEODORUS II., a native of Rome, was elected pope after the death of Romanus, in August, 897, and died three weeks after his election, and was succeeded by John IX.

THEODO'RUS LA'SCARIS, emperor of Nicaea, was descended from an antient and noble Byzantine family, the early history of which is unknown. In 1198 he married Anna Angela-Comnena, the widow of Isaac Comnenus Sebastocrator, and the second daughter of the emperor Alexis III., Angelus-Comnenus, who usurped the throne of Constantinople, after having blinded and thrown into a prison the emperor Isaac Angelus (1195). Alexis, the son of Isaac, fled to Italy and implored the protection of the Western princes, who, in 1203, were assembled at Venice for the purpose of a new crusade. They promised him assistance, and sailed to Constantinople with a powerful fleet, commanded by Dandolo, the doge of Venice. They laid siege to Constantinople, but although Theodore Lascaris prepared a vigorous resistance, Alexis III., who was of a mean and cowardly character, secretly left his capital and fled to Conrad, marquis of Monteferrato, in Italy, who had married his sister Theodora. Assailed by bold and experienced troops, and abandoned by their emperor, the Greeks were struck with alarm: they surrendered their capital, and did homage to the blind Isaac and his son Alexis IV. (19th of July and 1st of August, 1203), who reigned together under the protection of the Latin princes. However, Alexis Ducas Murzuphlus had made a party among the Greeks, who were enraged at the haughtiness of their foreign protectors. He murdered Alexis IV., Isaac died of grief, and Murzuphlus was proclaimed emperor under the name of Alexis V. (28th of January and 8th of February, 1204). The Latins immediately laid siege to Constantinople, to avenge the murder of their ally and friend; and although the new emperor, assisted by Theodore Lascaris, defended the capital with skill and energy, the fall of this city became imminent. Suddenly Alexis V. fled with his treasures (April, 1204), and the consternation which had reigned after the flight of Alexis III. once more discouraged the Greeks, and led to anarchy. During a period of six months, four, and as Isaac reigned twice, five emperors successively occupied the throne; and such was the passion for ruling among the Greek nobles, that in this critical moment, when the very existence of the empire was at stake, two candidates presented themselves to the people for the purpose of obtaining the crown.

These candidates were Theodore Lascaris and Theodore Ducas, who was of Imperial descent. Lascaris was proclaimed emperor, but fearing some sudden opposition from the adherents of the fugitive emperors, he declined the Imperial title, and declared he would content himself with that of 'despote' until he had re-established tranquillity. However, while he encouraged the people to resist the besiegers, the Latins made an assault and succeeded in taking the town, the Greeks having cowardly abandoned their posts. During the confusion of plunder and violence, Theodore Lascaris escaped with his wife Anna, and fled to the opposite shore of Asia. The Latins chose Baldwin, count of Flanders, emperor of Constantinople, and gave him the capital and one-fourth of the empire; the remaining three-fourths were divided between Venice and the Frankish barons.

Meanwhile Theodore succeeded in raising troops in Asia, and, assisted by the Turks of Koniah, or Iconium, he made himself master of the important town of Nicaea and the greater part of Bithynia, proclaiming that he acted only as despote, and in the name of his father-in-law, the fugitive emperor Alexis III. (Autumn, 1204). His conquests were soon taken from him by Louis, count of Blois, who, in the division of the empire, had received Bithynia, and who defeated Theodore at Paemanene, on the frontiers of Mysia and Bithynia (6th of December, 1204). Theodore retired to Brusa, one of the few towns which had not fallen into the hands of the count of Blois; but he was pursued and obliged to fight with Henry, count of Flanders, the brother of the emperor Baldwin, who defeated him.

Theodore would have been ruined but for the victories of the king of the Bulgarians and the revolted Greeks over the troops of the emperor, who was obliged to call for the assistance of the count of Blois and the Latin troops in Bithynia. Theodore again became master of this country, and his father-in-law, Alexis III., being then kept a prisoner by the marquis of Monteferrato, he himself assumed the title of emperor. He styled himself Βασιλεὺς καὶ Αὐτοκράτωρ Ῥωμαίων, which was the title of the emperors of Constantinople, and he thus showed that he considered himself as the only legitimate emperor of the East, having a right to the crown by his wife Anna, the daughter of Alexis III., who was prevented from ruling on account of his captivity, and all the other emperors of Greek extraction being then dead. In order to solemnize his accession to the Imperial throne, Alexis convoked a general assembly of the Greek bishops, who met at Nicaea. The new patriarch, Michael Autorienus, presided, who had been chosen patriarch for the special purpose of crowning Theodore, the patriarch Didymoticus having resigned.

Meanwhile several Greek nobles, profiting by the deep hatred of the Greeks against the Latin conquerors, had made themselves independent in Asia. Theodore, called Morotheodorus, reigned at Philadelphia, and Manuel Maurozomus, supported by Ghaïyáth-ed-dín, sultan of Koniah, became powerful in Phrygia; but they were both defeated by the emperor of Nicaea, as Theodore Lascaris is generally called. A third and more dangerous adversary was Alexis Comnenus, who had reigned as emperor at Trebizond from the year 1204, and whose brother David overran Asia Minor as far as the Propontis and the Ionian Sea. Theodore and David were equal in military skill, in activity, and in perseverance: neither of them was discouraged by defeats, nor made less vigilant by sudden success. After their first encounter, David, appreciating the character of his adversary, concluded an alliance with Henry of Flanders, emperor of Constantinople, who had succeeded his brother Baldwin. Theodore however defeated them both, and some time afterwards David was again completely beaten by Guido Andronicus, the general of the emperor of Nicaea. After the truce between Theodore and Henry in 1210, David, who had hitherto carried on the war with various results, was compelled to give up all hopes of keeping the field any longer. He lost all his conquests, and his brother Alexis was obliged to cede them to Theodore (1214), who thus became master of the greater part of Paphlagonia.

The truce between Theodore and Henry was the em-sequence of various victories obtained by Theodore over the troops of Henry. In 1207 the emperor of Nicaea was besieged by the Franks in Nicomedia, but in a sally he made prisoner Count Thierry de Los, or more correctly Diedrik van Looz, a powerful baron from the Low Countries, and a descendant of the first dukes of Lower Lorraine. Henry ransomed the count by surrendering several fortified towns to the emperor of Nicaea, and arrangements were made which led to the truce of 1210. In this year the old emperor Alexis III., who had escaped from the marquis of Monteferrato, fled to Asia, to the court of Sultan Ghaïyâth-ed-dîn, and persuaded him to support his claims to the throne of Nicaea, or of any other part of the Eastern empire. The sultan summoned Theodore to restore his father-in-law to the throne, and left Koniah at the head of 20,000 men. He was attacked in the neighbourhood of Antioch by Theodore, who had only 2000 men, but who charged the Turks with such impetuosity that their lines were broken, and they were entirely defeated. Ghaïyâth-ed-dîn himself was killed by Theodore, and old Alexis was made a prisoner (1210). He was confined to a monastery at Nicaea, where he died some years afterwards. Although Theodore had acted in his father-in-law's name while he was only despote, he had ascended the throne in his own name and at his own risk. Theodore's wife, Anna, the daughter of Alexis, was then dead.

It is said that in 1214 Theodore fell into the hands of Az-ed-dîn Key-kaus, the successor of Ghaïyâth-ed-dîn: but this is an error, and Fallmerayer, in his work cited below, has shown that it was Alexis of Trebizond who was made prisoner by the sultan. Except one short campaign against Henry in 1213, which was followed by a truce in 1214, Theodore reigned the last ten years of his life in peace, beloved by his friends and respected by his enemies. After the death of Anna he married Philippa, an Armenian princess, whom he repudiated after she had borne him a son; and in 1220 (?) he chose for his third wife Maria, the daughter of Peter of Courtenai (Kortryk), emperor of Constantinople after Henry, who was sister to Robert, the son and successor of Peter. Theodore wished to give his daughter Eudoxia in marriage to Robert, who was of a very mild and amiable character, but this marriage was strongly opposed by the Greek patriarch Manuel, because the two emperors were brothers-in-law, and it was not carried into effect.

Theodore died in 1222, being between forty-five and fifty years old, in the same year with Alexis I. of Trebizond. Although he left a son, his successor was his brother-in-law John Vatatzes. One of Theodore's daughters, Maria, was married to Andreas, king of Hungary.

(Nicetas, *Alex. Comn.*, and *Balduinus*; Acropolita, especially cap. vi.; *Historia Franco-Byzant.*, lib. iii.; Gibbon, *Decline and Fall*; Le Beau, *Histoire du Bas Empire*; Fallmerayer, *Geschichte des Kaiserthums Trapezunt*.)

THEODO'RUS, Sculptor. [SCULPTURE.]

THEODO'SIUS of Bithynia or of Tripolis in Lydia, for it appears that both these descriptions are applied to him (though there is another Theodosius of Tripolis, the author of an obscure poem), was a mathematician, of whom there is some question whether he lived about fifty years before Christ, or some centuries after. Strabo and Vitruvius both mention a Theodosius: the latter speaks of him as the inventor of a dial for every climate (or latitude): if this be the subject of our article, he must have lived before Christ. But on the other hand, Ptolemy does not mention him (though this tells little either way); and Suidas, enumerating under the head of Theodosius the works we shall presently mention, adds that he was also a commentator on some parts of Theudas: if this be the case, he must have lived after Christ. The balance of authorities seems to be in favour of the former supposition: if the writings only were looked at, there would be little reason to doubt that they were composed before the time of Ptolemy.

We have left of Theodosius—1, Σφαιρικά, Spherics, in three books; 2, *περὶ νυκτῶν καὶ ἡμερῶν*, in two books; 3, *περὶ οἰκήσεων*. The first is a profound and accurate work on what we should now call spherical geometry; the second and third simply describe astronomical phenomena as they appear in different parts of the world. It is hardly a matter of certainty that the three works have the same author: the second and third add nothing to the fame of the author of the first.

The Spherics were translated by the Arabs, and from their version a Latin one (of little worth) was made at Venice in 1518, but whether it was published is not stated (Heilbronner). Another Latin version, probably also from the Arabic, was published by Vogelinus at Vienna, 1529, with scholia. John Pena gave the first Greek text, with Latin, Paris, 1557; and Barrow gave a Latin edition in 1675. But the best edition is the Oxford one, Greek and Latin, 8vo., 1707. The other works were published by Dasypodius, in Latin, Strassburg, 1572, 8vo. Joseph Auria published the third work in Latin, Rome, 1587, and (*Biogr. Univ.*) the second, also in Latin, Rome, 1591 (1587, according to Fabricius); but Heilbronner does not mention this last. (Weidler; Heilbronner; Delambre.)

THEODO'SIUS I., FLA'VIUS, surnamed the Great, was the son of the general Theodosius who had signalised himself greatly during the reign of Valens and Valentinian in Britain and Africa, but was put to death in A.D. 370 at Carthage through the envy of the courtiers. The Theodosii were an illustrious family of Spain, of the town of Italica, near the modern Seville. The great Theodosius was born in A.D. 345, and was educated by the ablest men of the time, while his father, himself one of the greatest generals, instructed his son in the art of war, and accustomed him to the strictest and severest discipline. He took him with him in his campaigns in Britain, Germany, and Africa, and made him acquainted with all kinds of warfare, so that the boy became early accustomed to the endurance of hardship. The various occasions on which he distinguished himself were not overlooked, and he was raised to the rank of duke of Moesia, with an independent command. Here again he distinguished himself above all the other military commanders. He vanquished the Sarmatians, and it was only owing to his intrepid character that the province was not lost altogether. (Ammianus Marcel., xxix. 6; Zosimus, iv., p. 219, &c.) After the death of his father, in A.D. 376, he obtained permission to withdraw from public affairs, and retired to Cauca in Spain, where he devoted himself to agricultural occupations on his extensive estates, and won the affection and esteem of all who came in contact with him, for he possessed no less the virtues of social and domestic life than the talents of a general. But he did not remain long in the enjoyment of his quiet happiness: his virtues and talents had made too deep an impression to be forgotten in the hour of need; and on the 16th of January, 379, the emperor Gratian raised Theodosius at Sirmium to the dignity of Augustus, with the command over Illyricum and all the eastern provinces of the empire. The immediate object of this elevation was the hope that he would save the empire from the Goths, who in the preceding year had totally defeated the Roman army near Adrianople, and were now ravaging the country. Theodosius established his head-quarters at Thessalonica in Macedonia, strengthened the garrisons in those parts of the empire, and restored discipline among the troops; but he only ventured upon partial engagements with the enemy, and only on such occasions when he was sure of success. He thus convinced his soldiers that the barbarians were not invincible, and revived their courage and their confidence. The Visi-Goths were thus gradually and without any great battle driven out of Thrace. While at Thessalonica, Theodosius was seized with a severe illness. He was of a Christian family, but had not yet been baptized, and he now celebrated this solemnity by the advice of his friends, in the hope that it would contribute to his recovery. When his illness had disappeared, he went to Constantinople, and the first acts of his administration were to expel all the Arians from the capital, to assign the churches they had occupied to the orthodox Christians, and to appoint Gregorius Nazianzenus archbishop of Constantinople (A.D. 380). His persecution of the Arian sect was conducted with such zeal, that orthodoxy was soon restored throughout his dominions. He then held a council at Constantinople of 150 bishops to complete the system, the foundation of which had been laid at the council of Nicaea, and a number of edicts were successively issued, inflicting the severest punishments upon all kinds of heretics. The example of these rigid persecutions was imitated in the west by Gratian, and subsequently in the north also by the usurper Maximus.

As regards his Gothic enemies, Theodosius was indebted as much to his good fortune as his military talents; for after the death of Fritigern dissensions and hostilities broke out among the Gothic tribes themselves, and he succeeded even in engaging some of their chiefs in the service of the empire. The greater part however of the subjects of Fritigern, tired of their state of anarchy, made Athanaric their king, who concluded a treaty with Theodosius at Constantinople (A.D. 381). Athanaric indeed did not long survive the conclusion of this peace, but his subjects, who were pleased with the kind treatment they had received from Theodosius, willingly submitted to him, and numbers of them enlisted under the Roman standard. The treaty of the king and the submission of his army was followed by successive separate treaties of the Visi-Gothic chiefs, who promised to become the faithful allies of the Romans. Lands were then assigned to the Visi-Goths in Thrace and Lower Moesia (A.D. 382). The Ostro-Goths on the banks of the Danube were conquered several years later (A.D. 386), and received settlements in Phrygia and Lydia. The conditions on which the Goths became subjects of the Roman empire are imperfectly known: thus much only is certain, that they acknowledged the sovereignty of Rome without submitting to her laws or the jurisdiction of her magistrates; their chiefs also still continued to have the command of their respective tribes in peace and war, and an army of 4000 Goths was maintained for the perpetual service of the empire. Theodosius, although he had felt obliged, for the safety of his dominions, to make several concessions, yet succeeded in persuading the Goths that all were the voluntary acts of his own sincere friendship towards them. The conduct of the emperor, certainly the wisest that he could adopt under existing circumstances, was praised by some and blamed by others. There was certainly every reason for placing little confidence in the professions of the barbarians, although they called themselves the confederates of the Romans. Their whole nation soon became divided into two parties: the one, faithful to the empire, was headed by Fravitta; the other, which was only waiting in secret for an opportunity to revolt, was headed by Priulf, who, after he had disclosed his secret in the presence of Fravitta, was slain by him. Had it not been for the firm but temperate character of the emperor himself, the indomitable spirit of the barbarians could not have been restrained. On him alone the public safety depended.

In the year 383 Theodosius raised his son Arcadius to the rank of Augustus: in the same year his benefactor Gratian was murdered in a rebellion. Maximus, supported by the troops in Britain, had set himself up as emperor, and had conquered Gaul. Theodosius, who for the present was unable to carry on a war, concluded a peace with him, and left him in possession of the countries which he was occupying north of the Alps, on condition that he should not disturb Valentinian, the brother of Gratian, in his rule over Italy, Africa, and western Illyricum. The empire was thus divided among three emperors. But Maximus had no intention to keep the peace, and his ambition stimulated him to make himself master of Italy also. In A.D. 387 he broke in upon Italy, and took Milan, the residence of Valentinian, by surprise. The young emperor, his mother Justina, and his sister Galla, fled to Thessalonica, to implore the protection of Theodosius. The emperor of the East received the fugitives kindly, and as his own wife Flacilla had died, he married Valentinian's sister Galla, and thus established a direct interest for himself in protecting the exiled family. The opportunity of chastising the faithless Maximus was very welcome to him, and preparations for war were made throughout the whole extent of his dominions. In order to secure his empire on its south-eastern frontier, a treaty was concluded with Persia. A large fleet assembled in the ports of Epirus and Greece, and Theodosius placed himself at the head of a well-disciplined army, with which he marched into Pannonia to meet the enemy, who had pitched his camp in the neighbourhood of Siscia, on the Drave. A battle was fought, in which the Huns, Alani, and Goths, who served in the army of Theodosius, greatly distinguished themselves. Maximus was defeated and put to flight. Theodosius, determined to get possession of his enemy either alive or dead, pursued him as far as Aquileia, in which town Maximus shut himself up. The usurper, who had no hold on the affections of the people, was dragged forth from his palace into the hands of the conqueror, who gave him up as a victim to the rage of the soldiers. Victor, the son of Maximus, was killed in Gaul by the hand or at the command of Arbogastes, the Frank, who made himself master of Gaul (A.D. 388).

After having thus easily and quickly terminated a war which had threatened the empire with long and serious calamities, Theodosius stayed for three years in Italy to regulate the state of the western provinces, and it was in this period that he showed his great and amiable character in the most brilliant light. He not only spared the lives of the friends and relatives of Maximus, but afforded them every support in their misfortunes, while, on the other hand, he restored to the oppressed people of the west their lands, and gave them compensation in money for the losses that they had sustained. In the year 389 he entered Rome in triumph, together with his son Honorius and Valentinian.

During the period of his stay in Italy an insurrection broke out at Antioch, in which the people demanded redress of several grievances, especially a diminution of their heavy taxes. When these demands were haughtily refused by the imperial officers, the populace destroyed the statues of Theodosius, his wife Flacilla, and of his sons Arcadius and Honorius. The insurrection however was soon put down, and when Theodosius was informed of the occurrences, he sent Hellebricus and Caesarius to inflict the most severe punishment upon the city. But when messengers came soliciting a milder treatment, and assuring the emperor that the people sincerely repented of their crime, he generously granted them a general pardon. But this generous act was followed by another which was as rash as it was cruel. In A.D. 390 another insurrection broke out at Thessalonica, in which Botheric, the commander of the garrison, and several other officers, were cruelly murdered by the people, because they refused to give up a handsome boy to the unnatural lust of some dissolute favourite of the people. Theodosius was at first uncertain whether he should take vengeance upon the city or exercise clemency as he had done towards Antioch. Rufinus induced him to do the former, and commissioners were accordingly sent to punish the criminal inhabitants. Theodosius however soon regretted his step, and countermanded his orders; but it was too late; a general and indiscriminate massacre took place in the devoted city, in which no less than 7000 lives were sacrificed to the manes of Botheric. When Ambrose, the archbishop of Milan, was informed of this cruel massacre, he was seized with indignation and grief; and eight months later, when the emperor, on Christmas-day, wanted to attend the service in the great church of Milan, he was stopped in the porch by Ambrose, and was not admitted until he had promised to do public penance for his monstrous cruelty. [AMBROSE.] It was not till after the lapse of eight months from that day that the emperor, who had performed all the acts of public penance which the archbishop had imposed upon him, was restored to the communion of the faithful. An edict was at the same time issued that no capital punishment should henceforth be inflicted on any one till thirty days after it had been pronounced. During his stay in Italy Theodosius acted as a kind of guardian of the young emperor Valentinian, whom he might have deprived of his empire with the greatest facility and perfect impunity if he had been less magnanimous. When he left Italy for Constantinople in A.D. 391, he left Valentinian in the apparently secure possession of the western part of the empire. It was one of the characteristic features of Theodosius to carry into effect his great plans with the utmost vigour and energy, but when the object was attained he sank into a state of indolence, and gave himself up to the enjoyment of pleasures which, although harmless in themselves, in many cases prevented him from deriving all the advantages from his successful undertakings that he might have done. This was also the case after his return to Constantinople. The most important occurrence in the year of his arrival there was the final and total abolition of paganism throughout the Roman empire. In the following year (392) Valentinian was murdered at Vienna, in Gaul, by Arbogastes, who raised Eugenius, a rhetorician, to the imperial throne, in whose name he himself hoped to wield the sceptre. Theodosius, who had allowed himself to be deceived by the professed faithfulness of Arbogastes, was deeply moved when he heard of the fate of his brother-in-law and of the elevation of Eugenius. But he was at that moment not prepared for a civil war, and the ambassadors of Eugenius were consequently received with apparent favour and dismissed in a friendly manner. Preparations for war however, which lasted for almost two years, were immediately commenced, and Stilicho and Timasius were charged with recruiting and disciplining the forces. In the spring of the year 394 Theodosius set out from Constantinople against Eugenius. The armies met in Pannonia, and, after a long and dubious contest, Eugenius was defeated on the banks of the Cold River, near Aquileia. Eugenius was put to death, and Arbogastes in despair put an end to his own life. Theodosius was now sole emperor of the Roman world, and was cheerfully acknowledged by all the provinces, even by those which had recently paid homage to Eugenius. The empire might now look forward to a period of peace and happiness under the administration of Theodosius. But he was suffering from dropsy, and his health was rapidly declining. He died on the 17th of January, 395, at Milan, whence his body was conveyed to Constantinople, and buried there. His two sons Arcadius and Honorius had been raised to the rank of Augustus, and the father had shortly before his death given to Honorius the empire of the West, while Arcadius was to occupy the throne of the East. The Roman empire henceforth remained divided into the Western and the Eastern empire. [Rome, p. 110.]

(S. Aurelius Victor, *Epitome*, c. 48; Orosius, vii. 34, 35; Sozomen, vii. 2; Paulus Diacon., ii.; Compare Gibbon, *Hist. of the Decline and Fall*, c. 26, 27, and 28.)

THEODO'SIUS II., or the Younger, was the son of Arcadius, and grandson of Theodosius the Great. He was born on the 10th of April, 401. His father died in 408 at Constantinople, and left his son, then a child seven years old, at the head of the Eastern empire. There is a statement that Arcadius in his will made Jezdegerd, king of Persia, the guardian of his son and regent of the empire during his minority. (Jornandes, *De Bell. Pers.*, i. 2.) This isolated account however scarcely deserves credit, and it is a fact that Anthemius, the præfectus prætorio, from the very first assumed the government of the Eastern empire in the name of the young prince, and carried it on in a praiseworthy manner down to the year 414, when he voluntarily resigned it to Pulcheria, the sister of Theodosius, who was only two years older than her brother, and had shortly before received the title of Augusta. This woman continued to exercise the sovereignty in the name of her brother, not only after he had grown up to manhood and down to his death, but even three years later, until she herself died. During the early part of Theodosius's life Pulcheria herself conducted and superintended his education; but the prince seemed to possess no ambition, and not to aspire to the glory of a monarch: he passed his whole life in a perpetual infancy, surrounded by women and eunuchs, and he idled away his time in hunting, painting, carving, and making elegant transcripts of sacred books. The whole government was carried on in his name; but whether its acts deserve praise or blame, he can have no share in either, as he blindly acquiesced in all that his sister did. She also persuaded him, in A.D. 421, to marry Eudocia (before her baptism her name was Athenais), the daughter of Leontius, an Athenian sophist. This woman, who was no less distinguished for her beauty than for intellectual powers, soon gave birth to a daughter, Eudoxia, after which she was raised to the rank of Augusta. She lived with her husband till the year 444, when, after having drawn upon herself suspicion of some improper conduct, she was obliged to quit the court, and withdrew to Jerusalem.

In 421 a war broke out with Varanes, king of Persia, which was successfully concluded by Ardaburius, a general of Theodosius, and a peace was concluded for a hundred years, which lasted at least for thirty. With this exception, the long reign of Theodosius was one of almost undisturbed peace. It was only during the last years of his life that the European parts of the empire were harassed by Attila and his Huns. [Attila.] The Asiatic provinces, by far the most extensive, continued to enjoy a profound and permanent repose. Theodosius died on the 28th of July, 450.

(Paulus Diacon., iv.; Zonaras; Socrates, *Histor. Eccles.*, vii. 1, &c. Compare Gibbon, *History of the Decline and Fall*, c. 32, 33, 34.)

The reign of Theodosius II. is memorable in the history of jurisprudence through the collection of laws that was made in it, and bears the name of Codex Theodosianus.

THEODO'SIUS III., surnamed Adramytenus, emperor of Constantinople. He succeeded Anastasius II. in the year A.D. 715, being proclaimed emperor in the fleet of his predecessor near Adramyttium in Troas. He was a man of obscure birth, and accepted the throne with reluctance. He is praised for his unblemished conduct, and for the protection he afforded to the orthodox faith. He had not enjoyed his elevation much more than one year, when Leo III., a man of superior abilities, was proclaimed emperor. Theodosius willingly withdrew, and spent the remainder of his life, together with his son, in a monastery. (Theophanes, *Chronographia*; Georgius Cedrenus, *Compendium Historiarum*; Zonaras.)

THEODOSIAN CODE. In the year A.D. 429 Theodosius II. appointed a commission of eight persons, at the head of whom was Antiochus, to form a code out of all the constitutions and other laws which had been promulgated since the time of Constantine the Great. The code was to be formed on the model of the private compilations respectively called the Codex Gregorianus and the Codex Hermogenianus. Either nothing was done by this commission, or, for some reason, a renewal of it was thought necessary, and this renewed commission received its instructions in the year A.D. 435. This second commission consisted of sixteen members, with the same Antiochus at its head. In remodelling their materials the commission was empowered to omit the superfluous, insert the necessary, change the ambiguous, and reconcile the incongruous. The code was completed and promulgated as law in the Eastern empire in the year A.D. 438; and it was declared that the laws enacted since the time of Constantine should only be in force so far as they were incorporated into this code. It was further declared, as it had been on the occasion of naming the first commission, that all the general constitutions which were made by the emperors of the East and West should be sent from the one to the other, but that each of them should have full power to adopt for the use of his own subjects, or to reject, what the other sent. The code was forwarded in the year 438 by Theodosius to his son-in-law Valentinian III., who confirmed it and laid it before the Roman senate, by whom it was received. In the year 448 Theodosius forwarded to Valentinian other constitutions which he had made since the completion of the code, as circumstances had arisen; and these new constitutions were promulgated in the Western empire in the same year. The new constitutions were called Novellae, and all such new constitutions which were interchanged between the East and West, and had reference to the code of Theodosius, were called by the name Novellae. This interchange subsisted as long as the empire of the West continued: the last constitution of the kind that we know is one of Anthemius, who was contemporary with Leo I. in the Eastern empire: it belongs to the year 468, and relates to Bona Vacantia.

This code consists of sixteen books, which are divided into titles, and the titles are subdivided into sections. The arrangement of the matter differs from that in the subsequent compilation of Justinian, also called the Code. The code of Theodosius treats of Jus Privatum in the first part, and especially in the second and fourth books, both included, and in the beginning of the fifth: the following books treat chiefly of Jus Publicum. The first book treats of offices, and the sixteenth book treats of matters pertaining to the Christian church. The code of Theodosius was the first great compilation of the kind, and it was much used in the compilation of the code of Justinian. It also forms the basis of the code of the Ostrogoths, called the Edictum Theoderici: it was incorporated into the code of Alaric II., commonly called the Breviarium, in an abridged form, accompanied by a continual interpretation or explanation; and it was used in the compilation of the Lex Romana of the Burgundians, which is often incorrectly called Papiani Liber Responsorum.

The greater part of the Theodosian code and of the Novellae Constitutiones exist in their genuine state: the first five books of the code and the beginning of the sixth are chiefly found only in the Breviarium. The excellent edition of J. Gothofredus (6 vols. fol., Lyon, 1665, re-edited by J. D. Ritter, fol., Leipzig, 1736-1745), and also the edition of the Jus Civile Antejustinianeum, Berlin, 1815.

have followed the text of the Breviarium for the first five books and the beginning of the sixth. But Clossius and Peyron have subsequently made additions to the first five books, and particularly to the first; the former from a Milan MS. of the Breviarium, and the latter from a Turin palimpsest of the Theodosian Code. (*Theodos. Cod. Genuina Fragmenta, &c.*, W. F. Clossius, Tüb., 1824, 8vo.; *Cod. Theodos. Fragment. inedd., &c.*, Amad. Peyron, 1823, 4to.) Hänel has also added to the later books. (Zimmern, *Geschichte des Röm. Privatrechts.*)

THEODO'TION, of Ephesus, the author of a Greek version of the Old Testament, was an Ebionite, and lived in the former part of the second century after Christ. He is quoted by Justin Martyr, in his dialogue with Tryphon (A.D. 160), and by Irenæus (A.D. 177). His version appears to have been undertaken for the purpose of furnishing the Ebionites with a more exact translation of the Hebrew text than that of the Septuagint, and one therefore which would render them more service than the Septuagint in their disputes with the Jews. It agrees almost exactly with the Septuagint, except that it supplies the deficiencies of that version, and omits those parts of it which are not in the Hebrew text. Theodotion had not a competent knowledge of Hebrew. He has retained certain Hebrew words which appear to have been in use among the Ebionites. Theodotion's version of Daniel was substituted by the antient church for the Septuagint version of that book.

This version occupied one column of Origen's 'Hexapla.' [Origenes.]

THEODO'XIS, or THEODOXUS, Montfort's name for a division of the genus *Nerita*, type *Theodoxus Lutetianus*; Syn. *Nerita fluviatilis*, Felix de Roissy.

THEOGNIS (Θέογνις), an elegiac poet of Megara, the capital of the small state of Megaris, was living at the close of the sixth century B.C.; and it appears from his own writings that he lived to the date of the battle of Salamis, B.C. 480. In one of those revolutions which frequently occurred in the small Grecian states, the democratic body at Megara overpowered the aristocratic, to which Theognis belonged. Theognis, who was then absent from his country, lost his landed property in this revolution, which, with the rest of the Megarian territory, was partitioned among the successful party. It appears that he lived in exile at Thebes. The fragments of Theognis abound in allusions to the revolution by which he had suffered, and he expresses in bitter language his complaints against that base class which had usurped the station and property of the body to which he belonged. He had also the mortification of seeing a rich rival of mean birth preferred to him by the parents of a girl whom he courted. Yet he was in some measure indemnified for his loss by retaining the affections of the girl after she had married his ignoble rival.

It appears from his verses that he had been in Sicily, Euboea, and Sparta; and it was in Sicily that he wrote one of his elegies which was addressed to the Sicilian Megarians, who were a colony from his native state. There seems no reason to doubt that his elegies were composed on various occasions and on particular subjects, and that so far they resembled the elegies of Tyrtæus, Archilochus, and Solon. But as these elegies contained numerous general maxims or lessons for conduct, it is conjectured that in the course of time nearly everything was omitted from them which had a particular application, and thus the elegies of Theognis were formed into that general collection of gnomae such as we now have it, consisting of above fourteen hundred hexameter and pentameter verses. It is observed that nearly all the passages in this collection which have a political reference are addressed to a person named Cyrnus, the son of Polypas. Cyrnus appears to be a youth of noble family for whom Theognis has a tender regard, and whom he exhorts to the practice of virtue, to prudence in conduct, and to the enjoyment of life.

The verses of Theognis contain many allusions to the symposia, or entertainments, of the Greeks, in which it was usual, after the libation had been duly performed, for some of the guests to sing a poem, accompanied by the flute. This poem, or elegy, was addressed either to all the company, or, as appears to have been always the case with the elegies of Theognis, it was addressed to a single person.

The fragments of Theognis have been often printed. They were first printed in the Collection of Gnomic poets by Aldus, Venice, 1495; and they are contained in Gaisford's 'Poetae Minores Graeci,' Oxford, 1814-20. One of the latest and best editions is by F. T. Welcker, Frankfort-on-the-Main, 1826. They were translated into German verse, with short notes, by G. Thudichum (1828); and also by W. E. Weber (1834).

(Müller, *History of the Literature of Antient Greece*, vol. i.; Hoffmann, *Lexic. Bibliograph.*; Fabricius, *Bibliotheca Græca*, vol. i.)

THEOLOGY (ϑεολογία, the science which relates to God).

In order to guard against any misconception of the object of this article, it seems advisable to state in the outset that it is designed to treat the subject of theology purely in a scientific and historical point of view. Any discussion of the doctrines of Christian theology, or any attempt to frame a system of Christian theology, would be inconsistent with the plan of this work.

I. Definition of Terms.

All that men know of the nature of God, considered absolutely, of the relations between God on the one hand, and themselves and other beings on the other, together with the consequences resulting from those relations, and the duties arising out of those relations:—all this knowledge is described by the word *religion*. To reduce this knowledge to a systematic form, is the province of the science of *theology*; and the truths of religion, when arranged in a scientific form, constitute *a system of theology*. Theology stands to religion in the same relation as that in which every other science stands to its subject: for instance, natural philosophy to matter, metaphysics to the mind, philology to language. By many writers the words *theology* and *religion* are used as synonymous terms; but such a usage of them is incorrect. [Compare Religion.]

The above definition applies to the word as it has been understood for some centuries; but its earlier use was somewhat different from this. The ϑεολογία of the antient Greeks was φιλοσοφία περὶ τῶν ϑείων, the philosophy of divine existences; and it included all questions relating to the origin, the nature, and the service of the gods. As relating to the origin and mode of existence of the gods, Aristotle uses the verb ϑεολογέω (*Metaphys.*, i. 3); and Cicero the noun *theologus* (*De Nat. Deor.*, iii. 21). In a wider signification the word is used by Varro (Augustin., *De Civitat. Dei*, vi. 5; compare Eusebius, *Praeparat. Evang.*, iv. 130), who distinguishes three different kinds of theology: (1) μυθικόν, or *fabulosum*, mythical or legendary); (2) φυσικόν, or *naturale* (physical, or relating to the nature of the gods); (3) πολιτικόν, or *civile* (political or popular). Of these the first is the theology of poets, the second that of philosophers, the third that of the people; or, as Varro expresses it, 'The first is chiefly adapted to the theatre, the second to the universe (*ad mundum*), the third to the city.

In the New Testament the word is not used. (The title of the Apocalypse, in which the word θεόλογος is applied to the author, is much later than the book itself. [Apocalypse.] The simpler terms *knowledge* (γνῶσις) and *faith* (πίστις) are those which approach most nearly to the meaning of the word *theology*; but the fact being that theology, as a system, is not taught in the New Testament, there is nothing surprising in the absence of the word.

In the early Christian church the word was sometimes used in the general etymological sense of the science which relates to God and divine things; but we also find it employed at a very early period in a peculiar sense. In the controversies respecting the nature of Christ, the orthodox party adopted as a kind of motto the dogma of the Evangelist, ϑεὸς ἦν ὁ λόγος ('the Word was God,' *John*, i. 1), and the meaning which they attached to that sentence was transferred by them to the word ϑεολογία, which therefore, in this use of it, may be defined as the doctrine concerning the divinity of the Word. [Logos.] It is in this sense that the epithet ϑεόλογος is applied to the author of the Apocalypse. In a short time the word acquired a meaning somewhat more extended, and was used to describe the whole teaching of the church concerning the Trinity.

Lastly, the modern usage of the word, as expressed in the above definition, was first adopted by Peter Abailard (ob. 1142), who drew up a system of scholastic divinity, to which he gave the title of 'Theologia Christiana.'

It should be remarked that instead of the Greek word *theology*, the Latin word *divinity* is often used to describe the science of religion.

II. Foundations of the Science.

Like every other science, theology consists in the application of the human reason to certain ascertained truths. These truths are, as is plain from the definition, the truths of religion. If therefore the existence of God, of attributes belonging to him, and of relations subsisting between him and men and other beings can be proved, the foundations of theology are laid. Now all mankind, with the exception of a most insignificant minority (if indeed, which has often been doubted, the existence of a real *atheist* be possible), believe either that these subjects are within the natural compass of human knowledge, or that some kind of revelation respecting these subjects has been made by God to men. [Religion; Revelation.] Therefore, according to the general sense of mankind, theology is a possible science, founded upon knowledge derived from nature, or from revelation, or from both these sources.

Now, it is true that attempts have been sometimes made to frame a system of theology entirely out of the religious truths which may be learned from natural sources, that is, from the constitution of the human mind, and from the phenomena of the mental and material universe. Such truths constitute *Natural Religion*, and form the subject of the science of *Natural Theology*. But the vast majority of religious systems are founded on the supposed existence of a divine revelation; and for this reason the science of theology is generally understood to have reference to *Revealed Religion*. Moreover, if it be true that a divine revelation has been given from God to man, it will follow that that revelation cannot possibly be contradictory to any of the truths of natural religion: also many reasons might be urged to show that such a revelation, when completed, would contain in itself at least all the truths of natural religion, and, as a matter of fact, all the alleged revelations in existence claim to teach everything which might be learned from nature concerning God; and hence the theology which is founded on revelation must include within itself the theology which is founded on natural religion. For this reason the grand foundation of theology is usually understood to be revelation, to which natural religion is a valuable but not necessary auxiliary; and it has even been disputed whether it is an essential part of a theologian's duty to establish the consistency between the doctrines of natural and revealed religion.

Hence, with reference to the Christian religion, theology is founded entirely upon the canonical books of the Old and New Testament.

III. Divisions of the Science.

1. With reference to its foundation, it is divided, as explained in the preceding paragraph, into *Natural* and *Revealed*, or *positive*. The latter word is used to indicate that the foundations of revealed theology are the *expressed will* of God; just as we speak of *positive* laws.

The term *positive theology* is also used to describe any system of theology which rests upon authority, as, for example, the system embodied in the formularies of a particular church. See below, under the head of *Dogmatic Theology*.

2. According to the method of treating the subject, it is divided into *popular* or *biblical*, and *systematic* or *scholastic* theology.

3. According to the part of the subject which is treated of, it is divided into *theoretical* and *practical* theology. Of these the former includes—(1) The knowledge of the documents which contain the revelation, the proof of their authority, and the explanation of their meaning, that is, *Exegetical Theology*; (2) the investigation, arrangement, and discussion of the truths so revealed, that is, *Systematic Theology*; (3) the workings and changes of religion among those who have professed it, or *Historical Theology*. *Practical Theology* has for its subjects the duties of practical religion, and the various modes of enforcing them on men; and with reference to the latter, it is divided into (1) *Homiletics*, or preaching; (2) *Catechetics*, or teaching; (3) *Liturgics*, or worship and the administration of the sacraments, and (4) *Pastoral theology*, or the care and government of a church.

IV. Of Dogmatic Theology, or Dogmatics.

This is a very useful term, which is chiefly employed by German writers. It may be defined as the science of exhibiting clearly, and of tracing to their results, the doctrines taught by revelation. It means more than the term *systematic theology*. The province of the latter is simply to give to the scattered truths of revelation the scientific form of a connected system, in whatever manner may seem most convenient to the framer of the system; but dogmatic theology aims at forming a system which shall be accepted as binding by a large body of religionists, and then views all religious truth in the light of that system: it is systematic theology, with the idea of *authority* superadded.

This may perhaps be made clearer by a reference to other branches of science. The natural philosopher, for example, observes certain phenomena, which he soon finds to have in them some points of connection or similarity; and by arranging the phenomena with reference to those points, he has reduced his knowledge of natural philosophy to a sort of system. He may have been deceived in his observations; the analogies he thinks he has detected may not really exist: but still the system he has framed may be for him a convenient classification of the observed phenomena: his system is a *theory*. But suppose him to proceed further, and to detect (in his own opinion) the real causes of the observed phenomena, and to trace them to further results: suppose that he frames a system of natural philosophy upon the principles which he has thus detected; and that this system is received by a number of men as furnishing a true explanation of the observed phenomena: then his theory has gained the element of *authority*, and it may be called a *dogmatic theory*. The former kind of theory may serve as an illustration of what is meant by *systematic theology*; the latter, of what is meant by *dogmatic theology*.

Now, in the case of the Christian revelation, it is a remarkable fact that the documents which contain it present no systematic form. The truths revealed in them, considered separately, may be called *dogmas*, since they all contain the element of authority; but as they are not systematically arranged, they do not form a *system of dogmatic theology*. But to such a system they might be reduced by a person who fully understood them in all their bearings; and supposing his qualifications for the task complete, his system would be a perfect system of dogmatics: absolutely true if the revelation were a true one; and therefore absolutely binding on all who accepted the revelation as true. Now, as a matter of fact, such an attempt has been made again and again: many systems of theology have been framed, each claiming to give an exposition of the word of God at once true and scientific. It is also a matter of fact that these systems have presented different and contradictory results: but many of them have been accepted as true by bodies of Christians; and they therefore form, to those who accept them, systems of *dogmatic theology*: and in many cases these systems are embodied in creeds, or confessions of faith, which then become for all future time the *dogmatics*, or *positive theology*, of those who accept them.

It has very naturally been usual for persons adopting a system of dogmatics to look upon their system not only as probably true, but as absolutely true; and hence they have given to it the title of *orthodoxy* (ὀρθοδοξία, the right belief), applying to every other system the name of *heterodoxy* (ἑτεροδοξία, another belief, *i.e.* than the right one). But it is deserving of notice that there are some subjects upon which a particular opinion has prevailed so extensively among Christians, that the word *orthodoxy* is applied to that opinion, for the sake of convenience, by persons who do not intend thereby to give their assent to the absolute truth of that opinion. Such a use of the word is found very convenient in ecclesiastical history. [Heresy.]

Illustrations of these remarks are furnished by the manner in which we commonly speak of the dogmas of the Roman and English churches, of Calvinistic and Arminian dogmas, of the orthodox and heterodox doctrines respecting the person of Christ.

Out of *Dogmatic Theology* springs *Controversial Theology*, or that mode of treating the subject of religion in which some particular system of dogmatics is defended, or some other system attacked.

V. History of Theology.

It is by no means intended to give under this head a sketch of the history of the Christian church, considered with reference to the development and diversities of theological opinions within it. Such a statement would be, properly speaking, a history of theology, and indeed such a history is at present a great desideratum in our literature. But the information which would be given on this head will be found for the most part already scattered through this 'Cyclopædia' in separate articles, to which therefore the reader is referred. All that will be attempted here is to point out the characteristic elements out of which the prevailing theology of different periods has been formed. The first thing to be done, then, is to classify those elements.

In the widest sense of the word Theology, including both natural and revealed theology, we have among theologians who reject revelation the systems of (1) *Atheism*, or that doctrine concerning God which rejects his existence altogether; (2) *Deism*, or the system which teaches that God is the Creator of all things, but that having once created them and impressed upon them certain laws for the regulation of their future existence, commonly called the *laws of nature*, he has left them to the government of those laws, and concerns himself no more with his creation; or in other words, this system acknowledges the existence of God, but denies his providence. (3) *Theism*, the system which differs from Deism by acknowledging the providence of God. The systems of Deism and Theism suppose the existence of an Almighty Creator, whose existence is independent of the universe (*principium extramundanum*); but there is another system according to which the laws of nature are in themselves the eternal self-existent causes of all the phenomena of the universe, and there is no causative principle external to nature. This system takes two different forms: *Materialism*, which makes all the phenomena of nature to result from the physical constitution of matter itself; and the various shades of *Pantheism*, which suppose an intelligent principle (*anima mundi*) to be inseparably connected with everything that exists, and to pervade the whole creation.

There is another system which stands apart both from Naturalism and Revelation, namely *Scepticism*; the leading principle of which is that in metaphysical inquiries, or in short in all subjects which do not admit of mathematical demonstration, certainty is unattainable, and consequently that neither from nature nor from a supposed revelation can we derive a sure religious belief nor a rational system of theology. [Scepticism.]

These systems deserve notice in connexion with the history of theology, inasmuch as they relate to the same class of subjects as those which are embraced in theology: and they belong particularly to the history of Christian theology, inasmuch as at every period these systems have been brought more or less into direct collision with Christianity itself. But according to our more restricted definition of theology, as the science which is founded upon a divine revelation, and more especially as the science which has for its subject the religion of the Old and New Testaments, it will be found that the principal varieties in theological systems have arisen out of different opinions concerning that revelation itself, either with reference to the degree of its authority or to the mode of its interpretation.

1. With reference to the former point, the *authority of the Scriptures*, it would seem an axiom that every person who accepts them as a divine revelation must receive them as of full authority in matters of faith, and consequently that every system of theology must rest upon the admitted and unquestionable authority of the Scriptures. For this reason it would appear that all questions respecting the authority of the Scriptures are rather introductory to theology than a part of the science. But in point of fact different opinions are held on this matter by those who profess to receive the Christian religion, and therefore such opinions are considered to form a part of Christian theology.

Now with reference to this point every possible variety of theological opinion may be included under the two great divisions of *Supranaturalism* and *Antisupranaturalism* or *Rationalism*; the former word being used for that theology which rests professedly on a special, supernatural revelation from God, and the latter for that system which rejects all that is supernatural in such a revelation. The terms *Rationalism* and *Natural Theology*, though etymologically meaning the same thing, are employed to describe different theological systems. Both make the foundations of theology to rest upon the knowledge concerning God which may be learned by mere natural means, but in natural theology the idea of a revelation is not even entertained, while rationalism (in the modern sense of the word) professes to regard the Scriptures as possessed of *some* degree of authority, and indeed as upon the whole containing in some form or other the elements of religious truth.

The great question between supranaturalism and rationalism relates to the inspiration of the Scriptures. The adherents of the former system, though they differ respecting the mode in which supernatural information was conveyed to the minds of the sacred writers, agree in the great principle that they did receive such information as to preserve them from all error in the statement of religious truth. Rationalists, on the other hand, either reject the dogma of inspiration altogether, or understand by it nothing more than that by the ordinary providence of God the natural faculties of the writers were brought into the best state for exercise while they were composing the Scriptures. Generally speaking, the rationalists admit the writers of the Scriptures to have had better means of information on the subjects they wrote about than any other persons could acquire; and therefore, while reserving to themselves the liberty of choosing what they will believe and what they will disbelieve, they upon the whole accept the facts and opinions contained in the Scriptures as the basis of their theology. [Revelation.]

There is also a difference between supernaturalism and rationalism respecting the mode of interpreting the Scriptures: the former holding that the aid of the Spirit is still vouchsafed to the humble inquirer into religious truth; the latter denying the existence of any other means of understanding the Scriptures than the natural powers of the human mind.

Some of the many forms which rationalism has assumed during the last century are almost indistinguishable from some of the forms of naturalism. [Rationalism.]

2. Supposing the Scripture to be received as strictly a divine revelation, the questions arise:—By whom, and on what principles, are they to be interpreted?

The opposite opinions on this point may be called the *Protestant* and *Catholic*, or the *biblical* and *positive* systems of theology. The fundamental principle of the Protestant or biblical system is that the Scriptures are to be interpreted by each individual reader according to the ordinary laws by which the meaning of any other book is ascertained; while the Catholic or positive system supposes the existence of a positive mode of interpretation, handed down by a tradition in the visible church through all ages of Christianity, and forming in fact a system of dogmatic theology, from which no individual is at liberty to differ upon the evidence derived from his own research. The Protestant theology may be supranaturalistic or rationalistic, according as it admits or rejects the dogma of the divine assistance granted to the inquirer; and it also branches out into two great divisions, which may be called *popular* and *critical* theology. The popular theology professes to be derived from the obvious meaning of the letter of Scripture, without any external aid: the critical theology is based upon the principle that, although God has granted to every humble and diligent inquirer the power of learning from the Bible itself all religious truth which it may be necessary for his safety that he should know, yet that there is a body of religious truth in the Bible which can only be discovered by applying to its interpretation all the resources of human learning and of critical investigation, and therefore that these means must be employed in order to the construction of a complete system of theology.

One important difference between the Protestant and Catholic systems is in the use they make of the body of historical testimony to the doctrines of Christianity.

The Catholic system esteems it the privilege of the true church to be the certain possessor and the authorised expositor of religious truth. In many of the antient Christian writers it recognises members of the true church and authorised teachers in it; and therefore it regards the doctrines taught in their writings as the true doctrines of Christ. The obvious difficulty presented by the different opinions of various writers is removed in various ways. Vincent of Lirins has stated the Catholic dogma in the following form:—'That which has been held always, everywhere, and by all, is true.' (*Quod semper, quod ubique*, &c.) But who are the *all?* All the orthodox: and it is the province of the church to determine who are orthodox and who are heretics; and if the decision of the church on this point be doubtful, the appeal lies first to its authorised teachers individually, and then to their collective voice as given in the decrees of a general council.

On the other hand the Protestant system recognises in the early Christian writers nothing more than persons of various degrees of ability and information, whose statements and opinions are to be accepted or rejected entirely upon the grounds of ordinary criticism, and neither their teachings nor those of any other person whatever are allowed to have any authority beyond that due to their intrinsic worth and to their agreement with Scripture.

The application of these principles to the canon of Scripture is an important point of difference between the Roman Catholic and Protestant systems. The former rests upon the authority of those books which have been declared canonical by the voice of the church as expressed in general councils; the latter looks to historical and critical evidence to determine the genuineness and authenticity of the books of Scripture, and then it finds the evidence of their inspiration, and consequently of their authority, in the statements and claims of the writers themselves, which rest not merely on the established honesty of the writers, but chiefly on the attestation of the miracles they wrought. [Canon; Miracles.]

3. Another mode of interpretation leads to the systems of theology which are embraced under the name of *mysticism*, the great principle of which is, that within the mind of the true believer there exists a sense of truth which will always lead him to a surer and higher knowledge of religion than he could ever gain from his own critical inquiries or from the teaching of other men. [Gnostics; Mystics.]

4. To trace the relation of one set of truths to another, and to show the coincidence of the same truths when proved by different trains of reasoning, is one of the highest objects of true philosophy: and, on the other hand, an unwillingness to renounce a cherished belief when it is found opposed to a newly discovered truth, is one of the strongest tendencies of the human mind. Hence have arisen numerous theological systems according as men have brought the tenets of Judaism, the systems of heathen religion, and the reasonings of philosophy, into comparison with the statements of the New Testament. From the first of these processes arose the Judaizing sects of the first two or three centuries, from the second many of the early heresies, such as Manichæism [Heretics; Manichees], and from the third the theology of the New Platonists and others of the early Alexandrian school, and that of the schoolmen of the middle ages.

5. Besides the classification, which we have thus attempted, of systems of theology, according to the fundamental principles on which they rest, there is another important division of them according to their actual differences of doctrine. On this subject, for the reasons above stated, the reader is referred to the several articles in which an account is given of the tenets and history of the principal doctrinal sects.

It only remains to give a slight sketch of the influence of these different systems in the history of Christianity. At the rise of Christianity the *popular biblical* system was that which naturally prevailed, with a partial intermixture of the *positive* system, arising out of the great deference always paid to the first teachers of a new religion by their disciples, and more especially out of the authority with which the apostles were invested. The novelty and simplicity of the religion impressed its truths clearly on the minds of the first believers, who had no historical difficulties to solve, no contending sects to decide between, and no leisure to speculate on the ultimate consequences of the doctrines they received, or on their relations to other supposed truths. If a difficulty arose, their teachers were at hand to solve it. And accordingly the language of the apostolic epistles invites the believers to examine the truth for themselves and to receive it in its simplicity, though it also gives hints of the existence of a consistent system of truth, and claims on the part of the apostles to be the teachers of that system. But they did not teach it *as a system*, and it is only in the later books of the New Testament, the writings of John and some of those of Paul, that any tendency to reduce Christian truth to a system becomes apparent. The degree of freedom thus left to believers was abundantly used, and before the close of the apostolic age different opinions had sprung up, exemplifying nearly all the principles above described. [Heretics.] To restore unity to the church, and especially to settle the orthodox doctrine respecting the person of Christ, was the object of the Council of Nice, in the creed of which we find the first appearance of a system of *positive* theology. [Nice, Council of; Nicene Creed.] The immediate consequence of this Council however was to exasperate the very controversy which it professed to settle, and which continued to rage during the following centuries. [Arians; Nestorians; Theodoretus.] These and other controversies led to the frequent meeting of councils [Œcumenical Councils], and to the settlement of the canon of Scripture about the end of the fourth century [Canon]; while at the same time the episcopal system became more and more firmly established; and from all these causes theology acquired more and more the form of a positive system, the most complete development of which is presented by the Greek and Roman churches. [Catholic Church; Greek Church.]

The positive system evidently leaves little liberty to the speculations of an active mind, or to the practice of scrupulous or turbulent individuals. Those of the former class sought for satisfaction in the scholastic philosophy; those of the latter made repeated attacks on the ruling system, which at last produced the Reformation in Germany and England. The scholastic philosophy was at its height from the 11th century to the 14th. It was for the most part a revival of the philosophy of Aristotle. The schoolmen were in profession firm believers of the Catholic doctrine, and generally succeeded in gaining rather praise than censure from the rulers of the church. But within the limits thus prescribed for them they pushed the application of their philosophy to theology to the utmost extent, and occupied themselves especially with the most subtle questions on the nature of God and angels, and on points of casuistry.

The Reformation was far from abolishing the positive system in Protestant countries. To hold their ground against the power of the church of Rome, the reformed churches strove to make for themselves a visible and united constitution, and for this purpose they adopted symbols of faith and worship, which constituted for them respectively bodies of positive theology. The various dissenters from these reformed churches, though generally leaving them on the ground that their theology was not purely Protestant, still preserved much that was positive in their theology, either by a tacit consent or by a formal confession of faith. And thus it has happened that, to the present day, theology is far less a system based upon and continuing to challenge scientific inquiry, than the exposition of a body of positive law.

Still there have always arisen individuals and parties who have claimed for themselves the utmost latitude of that right of private judgment which is the basis of the Protestant principle. Since the Reformation there has always existed, especially in England, a large amount of *biblical* theology, which has been chiefly of the *popular* school, but which, since the middle of the last century, has continually gained more and more of the *critical* element, both here, and still more in Germany; and it may be now safely affirmed, that with an admixture of the mystical theology, the adherents of which have always formed a considerable minority among Christians, the prevailing theological systems of the present day are the *catholic* and the *critical*.

It would be impossible within the limits of this article to give a list of even the best writers on theology. The following are taken at random as among the best, and as directing to other sources of information. The 'Institutes' of Calvin; the works of Turretin, Maestricht, Pictet, Doddridge, Bishop Watson, Richard Watson, Dwight, Ernesti, Bertholdt, Schleiermacher, Bretschneider, Nitzsch, and other recent German writers, among which may be especially mentioned, as having been used in the composition of this article, Hahn's *Lehrbuch des Christlichen Glaubens*, Leipzig, 1828.

THEON, an eminent Greek painter, who was a native of Samos, and appears to have lived in the time of Philip and Alexander of Macedonia. He was reckoned one of the first masters of his age, on account of his powers of invention and the gracefulness of his execution. (Quinctilian, xii. 10, 6.) We know the subjects of only a few of his works, but the execution is spoken of in such a manner that the excellence of the artist cannot be doubted. Pliny (*Hist. Nat.*, xxxv. 40, § 40) mentions two of them, the one representing Orestes in the act of killing his mother (compare Plutarch, *De Audiendis Poet.*, p. 18, ed. Frankf.), and the other Thamyris playing the cithara. A description of a splendid painting by Theon representing a youthful warrior, who, animated by a martial spirit and eager to fight, is hastening to meet the enemy, is given by Aelian (*Var. Hist.*, ii. 44).

THEON, AELIUS, a rhetorician and grammarian of Alexandria, who, according to some critics, lived about A.D. 500, but, according to a more probable opinion, about A.D. 315. According to Suidas he wrote a commentary on Xenophon, on the orations of Demosthenes and Isocrates, a work on rhetoric, one on the structure of language, Progymnasmata, and several other books. With the exception of the Progymnasmata (*προγυμνάσματα*), or practical rules on rhetoric, derived from the examples of the best Greek orators, there is no work extant that can be ascribed to him with certainty. Theon's Progymnasmata excel those of Aphthonius in elegance, precision, and clearness, and were, like those of Aphthonius, long used as a text-book in schools. The first edition appeared at Rome, 1520, 4to.; that of D. Heinsius at Leyden, 1626, 8vo. Scheffer's edition, Upsala, 1670 and 1680, is incorrect. The best edition of the text, accompanied by Greek scholia, is in Walz's 'Rhetores Graeci,' vol. i., p. 145-262.

Kuster (on Suidas, ii., p. 182) ascribes to Theon also the still extant scholia on Aratus, Apollonius Rhodius, Lycophron, and Theocritus. The *ἐπιστολικοὶ τύποι* which are contained in Aldus's and Cujacius's collections of epistles, are likewise attributed by some writers to Theon, while others assign them to Libanius or Proclus. A separate edition of them appeared at Leyden, 1614, 12mo.

(A. Westermann, *Geschichte der Griech. Beredtsamkeit*, p. 230, &c.)

THEON. Theon, the Elder, of Smyrna, was the contemporary of Ptolemy (who cites one of his observations), but a little older. Theon, the Younger, of Alexandria, the commentator on Ptolemy, and father of Hypatia, lived in the latter half of the fourth century.

Of Theon the Elder, or Theon of Smyrna, we know nothing but that he was a follower of Plato, and has left a work entitled *τῶν κατὰ μαθηματικὴν χρησίμων εἰς τὴν τοῦ Πλάτωνος ἀνάγνωσιν*, or, on the parts of mathematics which are useful towards a knowledge of Plato. Other works have been mentioned written by some Theon (there are many of this name), but they are lost. This work consisted of four parts, treating on arithmetic, music, astronomy, and the harmony of the universe (*περὶ τῆς ἐν κόσμῳ ἁρμονίας*). Bouillaud (Gr. Lat., Paris, 4to, 1644) published the first two of these parts, or what he found of them, from a manuscript which came from De Thou's library; together with what he supposed to be a fragment of the third, from the King's library. Isaac Vossius assured Bouillaud that the third part was to be found in the Ambrosian library at Milan, but it has never appeared. Professor de Gelder, of Leyden, has recently (Gr. Lat., 8vo., Leyden, 1827) published the arithmetic, with ample notes and dissertations.

Of the private life of Theon the Younger (who was also a Platonist) we know nothing, except that he professed the ancient heathen doctrines, which led to the memorable fate of his daughter Hypatia (A.D. 415), a crime which will excite disgust and indignation to the end of time. The words of the ecclesiastical historian Socrates, from Wells's translation (1709) of the Latin of Valesius (Henry of Valois), are as follows; and his simple manner of narrating, in all its enormity, a circumstance which it was so much the interest of his party to conceal, or at least to soften, might have been a lesson to his successors in the task of writing history: 'There was a woman at Alexandria by name Hypatia. She was daughter to Theon the philosopher. She had arrived to so eminent a degree of learning that she excelled all the philosophers of her own times, and succeeded in that Platonic school derived from Plotinus, and expounded all the precepts of philosophy to those who would hear her. Wherefore, all persons who were studious about philosophy flocked to her from all parts. By reason of that eminent confidence and readiness of expression wherewith she had accomplished herself by her learning, she addressed frequently even to the magistrates with a singular modesty. Nor was she ashamed of appearing in a public assembly of men, for all persons revered and admired her for her eximious modesty. Envy armed itself against this woman at that time. For, because she had frequent conferences with Orestes,' the prefect of Alexandria, 'for this reason a calumny was framed against her among the Christian populace, as if she hindered Orestes from coming to a reconciliation with the bishop. Certain persons therefore, of fierce and over-hot minds, who were headed by one Peter, a reader, conspired against the woman, and observed her returning home from some place: and having pulled her out of her chariot, they dragged her to the church named Cæsareum, where they stripped her and murdered her with shells,' or broken crockery. 'And when they had torn her piecemeal, they carried all her members to a place called Cinaron and consumed them with fire. This fact brought no small disgrace upon Cyrillus,' the bishop [CYRIL], 'and the Alexandrian church.' Damascius (the author of the Life of Isidore, in Photius) says, that Hypatia was the wife of this Isidore, and that Cyrillus was the instigator of the murderers. Some particulars are added in Suidas (*Ὑπατία*), who states that Hypatia was beautiful, and adds an anecdote which it is not desirable to repeat, but which, if true, entitles her to be called the most singularly straight-forward of women. He says she wrote commentaries on Diophantus, and the Conics of Apollonius, and also an astronomical canon. A fuller account of her may be found in Ménage's 'Lives of the Female Philosophers.'

Theon of Alexandria is known as the commentator of Ptolemy and the editor of Euclid. There is a commentary on Aratus which is said to have been his, but Grotius is of opinion that it is the work of several hands, for which he gives good reasons. The whole of the commentary on the Syntaxis is preserved, except one or two books. A full account of it is given in Delambre's History of Antient Astronomy, who observes that it helps but little in the understanding of the Syntaxis, and gives none of that additional information which is usually expected from a commentator. This commentary was first printed in Greek, in the Basle edition of Ptolemy (1538). [SYSTEM, PTOLEMAIC.] J. Baptist Porta published two books only (Latin, Naples, first book 1588, first and second 1605), and Halma gave an edition of these same books (Greek and French, Paris, 1821, 2 vols. 4to.). Besides the commentary, we have the *κανόνες πρόχειροι*, or manual tables, described by Delambre from the manuscript, and since published by Halma (Greek and French, Paris, 1822-23, 2 vols. 4to.). They contain a description of the modes of astronomical calculation in use at the time.

It only remains to speak of Theon as a commentator on Euclid, a character which some still persist in giving him. The fact is, that Theon, as he himself informs us in the commentary on Ptolemy, gave an edition of Euclid, with here and there an additional proposition. [GEOMETRY, p. 155.] Some manuscripts of Euclid call this a commentary, and our fathers of the middle ages got the notion that *all the demonstrations* were commentaries supplied by Theon, only the enunciations of the propositions being Euclid's. For instance, in the folio of 1516 (Stephens), in which the propositions are given twice, namely, Adelard's translation (called Campanus's) from the Arabic, and Zamberti's, from the Greek, in this work the enunciations are headed *Euclides ex Campano* and *Euclides ex Zamberto*, but the demonstrations are headed *Campanus* and *Theon ex Zamberto*. Again, in 'I quindici Libri degli Elementi di Euclide, di Greco tradotti in Lingua Thoscana,' Rome, 1545, we find nothing but the enunciations of the propositions. The editor has kept his word, and given all he believed to be Euclid's: had he meant to give demonstrations, his title would have been 'Euclid, with Theon's Commentary.' Many editions professing to give Euclid in Greek and Latin have the enunciations only in Greek, a necessary warning to a person who wishes to buy Euclid in the original. Hence arises the pertinacious continuance of the assertion that Theon commented Euclid: so late as the article 'Theon' in the 'Biographie Universelle,' we find this statement made; and even more, namely, that the commentary by Theon was published at the end of the Basle edition of 1533, in Greek, that it was translated into Latin by Commandine, and has been often republished. Any one who looks into the Basle edition will see that the commentary at the end is by Proclus, not by Theon.

Robert Simson, and other editors who alter according to their own ideas of perfection, and then swear that they have restored Euclid, always lay the blame of the supposed alterations upon Theon: Simson's phrase is, 'Theon, or some unskilful commentator.' There is no reason to suppose that Theon altered Euclid: all that is known is, that he added occasionally, and, if we look at those additions which it is certain he made, judiciously.

THEO'PHANES, a native of Mitylene, was a contemporary and friend of Pompey the Great. During the war between Rome and Mithridates, when the Mitylenæans supported the king and delivered up to him the Roman general Manius Aquilius, Theophanes, who refused to take any part in the revolt, was expelled, and went to the camp of Sulla. (Velleius Pat., ii. 18.) In Italy Theophanes became acquainted with Pompey, formed an intimate friendship with him, and henceforth accompanied him in all his expeditions. After the termination of the war against Mithridates, Theophanes endeavoured to perpetuate the exploits of his friend. His history, which is now lost, appears to have been a work of no mean order, for Strabo calls Theophanes the most distinguished Greek of his age. Although he is not charged with having sacrificed the truth, yet he was undoubtedly anxious to wipe off any stain that was attached to the family of his friend. Pompey is said to have been so delighted with the performance, that he procured Theophanes the rights of a Roman citizen. (Cicero, *Pro Archia*, 10.) Although Theophanes had been exiled from Mitylene, he bore no grudge against his country, and on the return of Pompey from Asia he availed himself of his influence with the conqueror, and induced him to restore to the Lesbians their liberty and the privileges of which they had been deprived for having supported the king of Pontus. In B.C. 59 Theophanes was sent by the senate of Rome as ambassador to Ptolemaeus Auletes of Egypt, to carry to him the decree of the senate, which guaranteed him the sovereignty of his country. His conduct on this mission is blamed, because he is said to have endeavoured to direct events according to the secret wishes of Pompey. During the civil war Theophanes continued faithful to his friend, and supported him with his advice, and it was on his well-meant suggestion that after the battle of Pharsalus Pompey fled to Egypt, where he was murdered. After this event Theophanes returned to Rome, where he appears to have spent the last years of his life in retirement. After his death the Lesbians paid divine honours to his memory for the benefits which he had conferred upon them. His son, M. Pompeius Macer, held the office of praetor in the time of Augustus, and was afterwards appointed governor of Asia; but in the reign of Tiberius he and his daughter put an end to their own lives, in order to avoid the punishment of exile to which they had been condemned.

Theophanes was the author of several works, both in prose and in verse, but very little of them has come down to us. Plutarch's Life of Pompey is chiefly based on the historical work of Theophanes, and we may thus possess more of it than we are aware; but besides this we have four or five fragments of it in Strabo, Plutarch, and Stobaeus. The 'Anthologia Græca' (xv., n. 14 and 35) contains two epigrams of Theophanes, and Diogenes Laertius (ii. 104) mentions a work of his on painting, but of its nature and contents nothing is known.

(Sevin, in the *Mémoires de l'Académie des Inscriptions et Belles-Lettres*, vol. xiv., p. 143, &c.)

THEO'PHANES NONNUS. [NONNUS.]

THEO'PHILUS, a Constantinopolitan jurist, who lived in the reign of the emperor Justinian (A.D. 527-565). He was a distinguished teacher of jurisprudence at Constantinople (antecessor), and, at the command of the emperor, he was employed among those who compiled the 'Digest;' and afterwards he undertook, along with Dorotheus and Tribonian, to compose the 'Institutes,' that is, the elementary treatise on jurisprudence, which was part of Justinian's plan. This Theophilus is generally supposed to be the author of the Greek paraphrase of the 'Institutes,' though it is maintained that the paraphrase is not the work of Theophilus himself, but was taken down from his lectures by some pupils. It was discovered in the beginning of the sixteenth century by Viglius ab Aytta Zuichemius at Louvain, who published and dedicated it to the emperor Charles V. (Basle, 1534, fol.). The work was frequently reprinted during the same century, but the last and best edition is that of W. O. Reitz, in 2 vols. 4to., Hagæ, 1751. It contains a Latin translation and the notes of previous editors, together with those of Reitz; and also a very interesting dissertation on the obscure and much disputed history of Theophilus. Theophilus also wrote a commentary on the first three parts of the 'Digest,' which however is now lost, with the exception of a few fragments which are incorporated in Reitz's edition of the 'Paraphrase of the Institutes.' The value of the paraphrase of Theophilus in establishing the text of the 'Institutes' may be estimated by an examination of the edition of the 'Institutes' of Gaius and Justinian by Klenze and Böcking, Berlin, 1829.

(*Institutionum D. Justiniani Sacrat. Princip. Proœmium*; P. B. Degen, *Bemerkungen über das Zeitalter des Theophilus*, Lüneburg, 1808, 8vo.; Zimmern, *Geschichte des Röm. Privatrechts*.)

THEO'PHILUS PROTOSPATHA'RIUS (Θεόφιλος Πρωτοσπάθαριος), the author of several Greek medical works, which are still extant, and some of which go under the name of 'Philotheus' and 'Philaretus.' Everything connected with his name, his titles, the events of his life, and the time when he lived, is uncertain. He is generally styled 'Protospatharius,' which seems to have been originally a military title given to the colonel of the bodyguard of the emperor of Constantinople (*Spatharii*, or σωματοφύλακες). Afterwards however it became also a civil dignity, or at any rate it was associated with the government of provinces and the functions of a judge; they possessed great authority, and were reckoned among the Magnifici. (Further information respecting this office may be found in Brisson, *De Verb. Signif.*; Calvinus, *Lex Jurid.*; Du Cange, *Gloss. Med. et Inf. Graecit.*; id., *Gloss. Med. et Inf. Latinit.*; Carpentier, *Gloss. Nov. ad Script. Med. Aevi*; Goar, Note on Georg. Codin., p. 29; Guidot, Note on Theoph., *De Urin.*, pp. 142, 143, 145; Meursius, *Gloss. Graeco-Barb.*; Prateius, *Lex Juris Civ. et Canon.*; Suicer, *Thes. Eccles.*) In some manuscripts however he is called 'Philosophus' (Lambec., *Biblioth. Vindob.*, lib. vii., p. 352, ed. Kollar.); in others, 'Monachus' (id., *Ibid.*, lib. vi., p. 244, 494); 'Archiater' (Codd. MSS. Theoph. *De Puls.* ap. Ermerins, *Anecd. Med. Gr.*); or 'Iatrosophista' (Ἰατροσοφιστοῦ περὶ Οὔρων, ed. Fed. Morell., Paris, 1608, 12mo.)

Of his personal history we are told nothing: if, as is generally done, we trust the titles of the manuscripts of his works, and so try to learn the events of his life, we may conjecture that he lived in the seventh century after Christ; that he was the tutor of Stephanus Atheniensis (Lambec., *Ibid.*, lib. vi., pp. 198. 223 492; lib. vii., p. 352), who dedicated his work, 'De Chrysopoeia,' to the emperor Heraclius (Fabricius, *Biblioth. Græca*, vol. xii., p. 695. ed. vet.); that he arrived at high professional and political rank, and that at last he embraced the monastic life. It must however be confessed that all this is quite uncertain, for, in the first place, Freind, in his 'History of Physic' (*Opera*, pp. 448, 449, ed. Lond., 1733), after remarking how little credit is sometimes due to the titles prefixed to manuscripts, doubts whether Theophilus was ever tutor to Stephanus, and thinks, from the barbarous words that he makes use of (such as φιάλιον, στομομάνικον, *De Corp. Hum. Fabr.*, p. 177, l. 1, 2, ed. Oxon.; ἰξοχή, τράνα, *Ibid.*, p. 181, l. 11, 12; ἀπακία, *Ibid.*, p. 193, l. 11; χυμίνη, ὠμόβραστος, *De Urin.*, c. 6, p. 266, l. 34, ed. Ideler), that he probably lived later. And, secondly, even if Theophilus was the tutor of a person named Stephanus, still it seems probable that this was not the alchemist of that name. [STEPHANUS ATHENIENSIS.] His date is equally uncertain. Some persons ('Chronologia inconsulta,' as Fabricius says, *Biblioth. Græca*, vol. xii., p. 648 n., ed. vet.) think he was the person mentioned by St. Luke; others place him as early as the second century after Christ, and others again as late as the twelfth. He is generally supposed to have lived in the time of the emperor Heraclius, who reigned from A.D. 610

to 641; but this opinion rests only on the conjecture of his having been the tutor of Stephanus Atheniensis. The Oxford editor thinks, from the barbarous words quoted above, that he may possibly be the same person who is addressed by the title Protospatharius * by Photius (*Epist.*, 123, p. 164, ed. Montac., Lond., 1651), and who therefore must have lived in the ninth century. He was a Christian, and a man of great piety, as appears from almost all his writings; in his physiological work especially, he everywhere points out with admiration the wisdom, power, and goodness of God as displayed in the human body. (See *De Corp. Hum. Fabr.*, pp. 1, 2, 25, 89, 127, 153, 185, 272; *De Urin.*, Præf., p. 262; c. 10, p. 273; c. 23, p. 283; *De Excrem.*, c. 19, p. 408; *De Puls.*, in fine, p. 77.) He appears to have embraced in some degree the Peripatetic philosophy. (*De Corp. Hum. Fabr.*, pp. 2, 3, 4, 103, 105, 222, &c.; Mart. Rota, Pref. to Philothei *Comment. in Hippocr.* '*Aphor.*')

Five of his works remain, of which the longest and most interesting is an anatomical and physiological treatise, in five books, entitled Περὶ τῆς τοῦ Ἀνθρώπου Κατασκευῆς, *De Corporis Humani Fabrica.* It contains very little original matter, as it is almost entirely abridged from Galen's great work, 'De Usu Partium Corporis Humani,' from whom however he now and then differs, and whom he sometimes appears to have misunderstood. In the fifth book he has inserted large extracts from Hippocrates, 'De Genitura,' and 'De Natura Pueri.' He recommends in several places the dissection of animals, but appears never to have examined a human body; in one passage he advises the student to dissect an ape, or else a bear, or, if neither of these animals can be procured, to take whatever he can get, 'but by all means,' adds he, 'let him dissect something.' The work was first translated into Latin by J. P. Crassus, and published at Venice, 1536, 8vo., together with Hippocrates, 'De Purgantibus Medicamentis.' This translation was frequently reprinted, and is inserted by H. Stephens in his 'Medicae Artis Principes,' Paris, 1567, fol. The manuscript from which Crassus made his translation is probably lost; but, though defective, it was more complete than that which was used by Guil. Morell in editing the original text, which was published at Paris, 1555, 8vo., in a very beautiful type, but without preface or notes. This edition is now become scarce, and was reprinted, together with Crassus's translation, by Fabricius, in the twelfth volume of his 'Biblioth. Græca,' p. 783, sq., Hamb., 1724 and 1740. Two long passages which were missing in the fourth and fifth books were copied from a manuscript at Venice, and inserted by Andr. Mustoxydes and Demetr. Schinas in their collection entitled Συλλογὴ Ἀποσπασμάτων Ἀνεκδότων Ἑλληνικῶν μετὰ Σημειώσεων, Venet., 1817, 8vo. The last and best edition of this work is that by Dr. Greenhill, which has lately been printed at the Oxford University press, Gr. and Lat., 8vo., 1842. The editor says in the preface that he has taken as the basis of his edition the manuscript at Venice mentioned above, as being more complete than any other that he had met with; that three other manuscripts at Paris have been collated; that several passages have been corrected by referring to the original parts of Galen and Hippocrates from which they were copied; that Crassus's Latin version has been retained, as representing the readings of a manuscript no longer in existence; and that the notes are intended rather to illustrate and explain the Greek technical terms, than to correct all the anatomical errors and supply the deficiencies of the author.

Another of the works of Theophilus is entitled Ὑπόμνημα εἰς τοὺς Ἱπποκράτους Ἀφορισμούς, *Commentarii in Hippocratis Aphorismos*, which also seems to be taken in a great measure from Galen's Commentary on the same work. It was first published in a Latin translation by Ludov. Coradus, at Venice, 1549, 8vo., under the name of 'Philotheus.' The Greek text appeared for the first time in the second volume of F. R. Dietz's 'Scholia in Hippocratem et Galenum,' Regim. Pruss., 8vo., 1834.

His treatise Περὶ Οὔρων, *De Urinis*, contains little or nothing that is original, but is a good compendium of what was known by the antients on the subject, and was highly esteemed in the middle ages. It first appeared in a Latin translation by Pontius (or Ponticus) Virunius (or Virmius), in several early editions of the collection known by the name of the 'Articella.' It was first published in a separate form at Basle, 1533. 8vo., translated by Albanus Torinus, together with the treatise 'De Pulsibus;' and this version was reprinted at Strassburg, 1535, 8vo., and inserted by H. Stephens in his 'Medicae Artis Principes.' The Greek text was published without the name of Theophilus, under the title 'Iatrosophistae de Urinis Liber Singularis,' &c., at Paris, 1608, 12mo., with a new Latin translation by Fed. Morell, which edition was inserted entire by Chartier in the eighth volume of his edition of the works of Hippocrates and Galen. The best edition is that by Thom. Guidot, Lugd. Bat., 1703, 8vo., Gr. and Lat.; and again with a new title-page, 1731. The text is much improved by adopting the readings of a manuscript in the Bodleian Library at Oxford: there is a new Latin version by the editor, and also copious and learned prolegomena and notes. The Greek text only, from Guidot's edition, is inserted by J. L. Ideler in his 'Physici et Medici Graeci Minores,' Berol., 1841, 8vo.

A short treatise, Περὶ Διαχωρημάτων, *De Excrementis Alvinis*, was first published by Guidot, in Greek, with a Latin translation by himself, at the end of the edition 'De Urinis' mentioned above: the Greek text alone is inserted by Ideler in his 'Physici et Medici Graeci Minores.'

The last of the works of Theophilus that remains is a treatise, Περὶ Σφυγμῶν, *De Pulsibus*, which first appeared in a Latin translation, under the name of 'Philaretus,' in several of the old editions of the 'Articella.' It was first published in a separate form at Basle, 1533, 8vo.; translated by Albanus Torinus, together with the treatise 'De Urinis' mentioned above. It was reprinted at Strassburg, 1535, 8vo., and inserted by H. Stephens in his 'Medicae Artis Principes.' The Greek text was first published by F. Z. Ermerins in his 'Anecdota Medica Graeca,' Lugd. Bat., 8vo., 1840, together with a new Latin translation. The text is taken from one manuscript at Leyden and four at Paris, and differs very considerably from the older Latin translation going under the name of Philaretus.

(Guidot's Notes to Theoph. *De Urinis*; Fabricius, *Biblioth. Graeca*; Freind's *Hist. of Physic*; Haller's *Biblioth. Anat.* and *Biblioth. Medic. Pract.*; Sprengel's *Hist. de la Méd.*; Dietz's Preface to the second volume of his *Scholia in Hippocr. et Gal.*; Ermerin's Preface to his *Anecd. Med. Gr.*; Choulant's *Handbuch der Bücherkunde für die Aeltere Medicin*; Greenhill's Notes to Theoph. *De Corp. Hum. Fabr.*)

THEOPHRASTA, the name of a genus of plants dedicated to Theophrastus. It was originally called Eresia by Plumier, but afterwards altered by Linnæus. It belongs to the natural order Myrsinaceæ, and is a small tree with a simple unbranched stem, furnished with a tuft of long evergreen leaves at top, giving it a resemblance to a palm-tree. The flowers are of a white colour, and are arranged on terminal racemes, which are very short, and hidden amongst the leaves of the plant. The calyx is campanulate and cartilaginous. The corolla is also campanulate, with a short tube, and has a dilated throat, girded by an elevated angularly-lobed, fleshy, arched ring: the limb is spreading. The stamens are five, combined with the tube of the corolla; anthers horned. The fruit is a crustaceous spherical berry, about the size of a crab-apple, with the seeds half-immersed in the placenta. There is but one species, named after Jussieu, *T. Jussieui*. This plant is the same as the *T. Americana* of Linnæus. It is a native of the mountains of St. Domingo, and is much cultivated on account of its long handsome holly-like leaves. It may be propagated by cuttings, and grows well in a soil of peat, loam, and sand.

THEOPHRASTUS was born at Eresus, in the island of Lesbos, but the year of his birth is uncertain: some writers state it to be B.C. 371; others place it much earlier. According to Hieronymus (*Epist.*, 2, ad Nepotianum) he died in the year B.C. 285, and, as some say, at the age of 85 (Diogenes Laert., v. 40), or, according to others, at the age of 106 years. These different accounts of his age leave the date of his birth uncertain. When a youth his father Melantas sent him to Athens for the purpose of studying. Here he was first a pupil of Plato, and became an intimate friend of Aristotle, who, charmed with his talents and his beautiful pronunciation, is said to have given him the name of Theophrastus (one who speaks divinely): his real name was Tyrtamus. (Quinctilian, x. 1, 83; Cicero, *Orator.*, 19.) After the death of Plato, when Speusippus had placed himself at the head of the Academy, Theophrastus, with a number of the former disciples of Plato, left the Academy. Plutarch has preserved a bare account of an event in the life of Theophrastus, which must perhaps be assigned to the time which he spent away from Athens after his withdrawal from the Academy. Plutarch says that he and Phidias delivered their country twice from the oppression of tyrants. After the battle of Chaeronea, Theophrastus returned to Athens, from which he had been absent for many years; and as Aristotle had then just opened his school (the Lyceum), Theophrastus ranged himself among the hearers of his friend, and cultivated most zealously all the departments of philosophy and science of which Aristotle was then the great master. When Aristotle himself withdrew, Theophrastus became his successor in the Lyceum, and acquired great reputation in his new sphere, not because he created any new system of philosophy, but because he combined the knowledge and profundity of Aristotle with the fascinating eloquence of Plato. The number of his pupils on one occasion is said to have amounted to two thousand (Diogenes Laert., v. 37), who flocked around him from all parts of Greece. This popularity, and the influence which it gave him in the public affairs of Greece through the practical character of his philosophy, roused the indignation and envy of those who saw in him an obstacle to their designs. The consequence was that Agnonides, who probably acted on behalf of many others, brought against him a charge of impiety. Theophrastus pleaded his own cause before the Areopagus with his usual eloquence, and convinced that court of his innocence. His accuser would have fallen a victim to his own calumny, if Theophrastus had not generously interfered and saved him. After this event he enjoyed undisturbed peace for several years, and he saw his school, which was visited by the most eminent men of the age, daily increase. The tranquillity which he enjoyed was however chiefly owing to the influence of Demetrius Phalereus, who had himself been a pupil of Theophrastus. After the fall of Demetrius the persecutions began afresh; and, in 305 B.C., Sophocles, son of Amphiclides, carried a law which forbade all philosophers, under pain of death, to give any public instruction without permission of the state. (Diogenes Laert., v. 38; Athenaeus, xiii., p. 610; J. Pollux, ix. 5.) Theophrastus left Athens; but in the following year, the law being abolished, and the mover condemned to pay a fine of five talents, Theophrastus and several other philosophers returned to Athens, where he continued his labours without any interruption until his death. The whole population of Athens is said to have followed his body to the grave. His will, in which he disposed of his literary and other property, is preserved in Diogenes Laertius. His library was very valuable, as it contained the works of Aristotle, which this philosopher had bequeathed to Theophrastus. Theophrastus bequeathed them, together with his other literary property, to Neleus of Scepsis.

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* In *Epist.*, 193, p. 292, he is called Ἀσπαθάριος, but this is merely a mistake of the transcriber, and means Πρωτοσπαθάριος; for Du Cange tells us (*Gloss. Med. et Inf. Graecit.*, in v. πρῶτος) that the word πρῶτος, when prefixed to titles, and signifying the first or chief, is generally expressed in manuscripts by the letter α, with a short line above it, thus ᾱ.

Theophrastus, as already observed, did not develop a new system of philosophy, but he confined himself to explaining that of his master Aristotle. With this view he wrote numerous works on various branches of philosophy and on natural history. His philosophical works may be divided into works on philosophy, in the narrower sense of the word, works on historical subjects, and works on certain arts, such as oratory, poetry, and the like. It is to be lamented that most of his writings on these departments are now lost, and more especially those on politics (Πολιτικά), on legislators (περὶ νομοθετῶν), on laws, a work of which Cicero made great use, and his works on oratory, of which Theophrastus himself was so distinguished a master. A list of the lost books of Theophrastus is given in Fabricius (*Biblioth. Graeca*, iii., p. 445, &c.). Andronicus of Rhodes, a Peripatetic philosopher of the time of Lucullus, made a list of all the works of Theophrastus, and arranged them in systematic order. The following philosophical works of Theophrastus are still extant:—

1. 'Characteres,' or ἠθικοὶ χαρακτῆρες, consisting of thirty, or, according to Schneider's arrangement, of thirty-one chapters. In this work the author gives thirty characteristic descriptions of vices, or rather, of the manner in which they show themselves in man. The descriptions however are mere sketches, and form a gallery of bad or ridiculous characters. Many modern critics have maintained that the work in its present form is not to be regarded as a production of Theophrastus, but that it is either an abridgement of a greater work of this philosopher, or a collection of descriptions of vicious characters, compiled either from the writings of Theophrastus, or from those of others. Neither of these opinions is incompatible with the statement of Diogenes Laertius, Suidas, and other late writers who mention ἠθικοὶ χαρακτῆρες among the works of Theophrastus; for the 'Characteres' which we now possess may have been compiled and published under the name of Theophrastus long before their time. Either of these hypotheses would also account for the fact that nearly all the definitions of the vices that occur in the book contain some error, which, it must be presumed, would not have been the case if the work had been written by Theophrastus. Other critics, on the contrary, have vindicated the 'Characteres' as a genuine work of Theophrastus, and have attributed all its defects and inaccuracies to the bad MSS. upon which the text is based. This opinion has received considerable support from the discovery of a Münich codex, part of which was published by Fr. Thiersch in 1832, in the 'Acta Philologorum Monacensium' (vol. iii., fasc. 3). This MS. contains the titles of all the thirty chapters, but the text of only twenty-one. The first five chapters and the introduction, which were edited by Thiersch, are considerably shorter than the common text, the language is perfectly pure, and there is very little doubt that this is the genuine text of the work of Theophrastus, and that the common one is only a paraphrase, made perhaps by Maximus Planudes, who is known to have written a commentary on the 'Characteres' of Theophrastus. The editio princeps of the 'Characteres' is by Wilibald Pyrckheimer, Nürnberg, 1527, 8vo. This edition, which contains only fifteen chapters, was reprinted with a Latin translation by A. Politianus, Basle, 1531, 8vo., and 1541, fol. Chapters 16 to 23 were first added by Camotius, who published the works of Theophrastus in the sixth volume of his edition of Aristotle (Venice, 1551-52). These twenty-three chapters were increased by five new ones from a Heidelberg MS. in the excellent edition of Casaubon, of 1599 (reprinted in 1612 and 1617, 8vo.). The last two chapters were added in the edition which appeared at Parma, 1786, 4to. A still more perfect, and in fact the first complete edition, is that of J. P. Siebenkees, which was edited by Goetz, Nürnberg, 1798, 8vo. In 1799 there appeared two new editions, the one by Coraes (Paris, 8vo.), and the other by Schneider (Jena, 8vo.). The last edition, which is very useful, is that of Fr. Ast, Leipzig, 1816, 8vo. The 'Characteres' have been translated into French by Jean de la Bruyère (Paris, 1696, 12mo., often reprinted, and lastly edited by Schweighaüser, Paris, 1802), and by Levesque (Paris, 1782, 12mo.). The best German translations are those of C. Rommel (Prenzlau, 1827, 12mo.), and of J. J. Hottinger (München, 1821, 8vo.). The reare several English translations: the latest is by F. Howell, London, 1824, 8vo. That by Eustace Budgell, London, 1713, 8vo., is generally called the best. There is also a translation into modern Greek by Larbaris, Vienna, 1815, 8vo.

2. A fragment of a work on Metaphysics, which consists of one book entire (Τῶν μετὰ τὰ φυσικὰ ἀποσπασμάτιον ἢ βιβλίον ά). This book was not mentioned by Andronicus of Rhodes in his catalogue of the works of Theophrastus, but it is ascribed to him by Nicolaus Damascenus. It is printed in all the early editions of the works of Theophrastus in connection with those of Aristotle, as in those of Venice (1497), Basle (1541), Venice (1552), and in that of Sylburg (Frankfort, 1587). The last edition is that of Ch. A. Brandis, who annexed it to his edition of Aristotle's 'Metaphysics' (Berlin, 1823, 8vo.).

3. A Dissertation περὶ αἰσθήσεως, that is, on the Senses and the Imagination. There is a paraphrastic commentary on this work by Priscian, the Lydian, who lived in the sixth century of our æra. It was first edited by Trincavelli, Venice, 1536, fol., with Priscian's paraphrase, an 'Quaestiones' by Alexander Aphrodisiensis. It is also printed in the above-mentioned collections of the works of Theophrastus, and in that published by Schneider, Leipzig, 1818-21.

The fragments of other philosophical works are too brief and numerous to be noticed here.

The 'History of Plants,' by Theophrastus, περὶ φυτῶν ἱστορίας, is one of the earliest works on botany that was written with anything like scientific precision. The work is divided into ten books, of the last of which only a fragment is preserved. The matter is arranged upon a system by which plants are classed according to their modes of generation, their localities, their size as trees or shrubs and herbs, and according to their uses as furnishing juices, potherbs, and seeds which may be eaten. The first book treats of the organs or parts of plants; the second of the reproduction of plants, and the times and mode of sowing. Here he mentions the sexes of plants, and describes the mode of reproduction in palms, and compares it with the caprification of figs. The third, fourth, and fifth books are devoted to a consideration of trees, their various kinds, the places they come from, and the economical uses to which they may be applied. The sixth book treats of undershrubs and spiny plants; the seventh of potherbs; the eighth of plants yielding seeds used for food; and the ninth of those plants that yield useful juices, gums, resins, or other exudations. In this work there is much original and valuable observation, but at the same time it is intermixed with many absurd statements with regard to the functions and properties of plants. It is probable that much of the valuable matter recorded in this work was the result of his own observation, as he is known to have travelled about Greece, and to have had a botanic garden of his own, whilst he was probably dependent on the statements of soldiers and others connected with the armies of Alexander for his information on Indian, Egyptian, and Arabian plants.

Theophrastus wrote also another work, 'On the Causes of Plants,' περὶ φυτῶν αἰτιῶν. This work was originally in eight books, six of which remain entire. It treats of the growth of plants; the causes which influence their fecundity; of the times at which they should be sown and reaped; the modes of preparing the soil, of manuring it, and of the instruments used in agriculture; of the odours, tastes, and properties of many kinds of plants. In this, as in the history of plants, the vegetable kingdom is considered more in reference to its economical than to its medical uses, although the latter are occasionally referred to. In both works there is much valuable matter that deserves the attention of the botanist, and a very little knowledge of botany will enable the reader to separate the chaff from the wheat. Both Haller and Adanson complain of the errors which translators and editors of these works have fallen into for want of botanical knowledge. Both works have gone through several editions; they were printed together by the sons of Aldus at Venice, in 1552, 8vo.; and again by Heinsius at Leipzig, in 1613. The 'History of Plants' has been published separately more frequently than the 'Causes.' The best edition is that of Bodæus à Stapel, which was published by his father after his death. It contains a preface by Corvinus; the Greek text, with various readings; the commentaries and remarks of Constantinus and J. C. Scaliger; the Latin translation of Gaza; very careful commentaries by Stapel; a very copious index, and the whole is illustrated by woodcuts. The cuts however are very inferior, and are copies of those in the works of Dodonæus, which seem to have been copied into nearly all the works published on botany at this period. It appeared at Amsterdam in 1644, folio. The latest edition of this work was published at Oxford, in 1813, by Stackhouse. This edition is accompanied with a Syllabus of the genera and species of the 500 plants described by Theophrastus, also a glossary, and notes, with a catalogue of the editions of the botanical works of Theophrastus. The 'History of Plants' was translated into German by Kurt Sprengel, and published at Altona, in 1822, 8vo.

Besides his botanical works Theophrastus wrote many others on various subjects of natural history, which are enumerated with his philosophical works in Diogenes Laertius (v. 42, &c.). One of them, on Stones (περὶ λίθων), from which Pliny, in his account of stones, derived the greatest part of his information, is still extant. De Laet has prefixed it, with a Latin translation and notes, to his work, 'De Gemmis et Lapidibus,' Leyden, 1647, 8vo. A separate edition, with an English translation, was published by Hill, London, 1746, 8vo.; another, with a French translation, appeared at Paris, 1754, 8vo.; and a third, with a German translation, by Baumgärtner, Nürnberg, 1770, 8vo. The last edition is that of Schneider, Freiburg, 1807, 8vo.

Of his two books on Fire (περὶ πυρός), only one is now extant; of his other works on natural history, which are now lost, we possess a considerable number of fragments.

The editio princeps of all the works of Theophrastus is that of Aldus, Venice, 1495-98, printed, together with the works of Aristotle, in 5 vols. fol. Theodorus Gaza published a Latin translation, which was made from the same MS. from which the Aldine text was taken. The first edition of this translation is without date or place; a second appeared at Tarvisium in 1483. The last and best edition is that of Link and Schneider, Leipzig, 1818, 4 vols. 8vo.

(Haller, *Bibliotheca Botanica*, tom. i., p. 31; Schulte, *Geschichte der Botanik;* Adanson, *Familles des Plantes;* Bischoff, *Lehrbuch der Botanik;* Stackhouse, *Theoph. Hist. Plant.;* Fabricius, *Biblioth. Graec.*, iii., p. 408, &c.; Ritter, *History of Philosophy;* Krug, *Geschichte der Philosophie*, § 99.)

THEOPHYLACTUS SIMOCATTA, of Locri, an historian, sophist, and natural philosopher, who was living about 610-629 A.D. He wrote a 'Universal History' (ἱστορία οἰκουμενή), in eight books, from the death of the emperor Tiberius II., in 582, to the murder of Maurice and his children by Phocas, in 602. This work is known by the Latin title of 'Historiae Rerum à Mauritio gestarum Libri VIII.' It was printed, with a Latin translation, by J. Pontanus, at Ingolstadt, 1604, 4to. An improved edition was published by Fabrotti, Paris, 1648, fol., reprinted 1729. It is also contained in Niebuhr's collection of the Byzantine writers.

He also wrote 85 short letters, 'Epistolae Morales, Rusticae, et Amatoriae,' which were published in the collections of Aldus, Cujacius, and Henry Stephens; and a work entitled 'Problems in Natural History' (Ἀπορίαι φυσικαί, Quaestiones Physicae), which was published at Leyden, 1596, and at Leipzig, 1653. The two last-mentioned works have been recently edited by Boissonade, Paris, 1835.

(Fabricius, *Bibliotheca Graeca;* Schöll, *Geschichte der Griech. Litt.*)

THEOPHYLACTUS, a native of Constantinople, was archbishop of Achris, the chief city of Bulgaria, about the year 1070 or 1077. He wrote a work on the 'Education of Princes' (παιδεία βασιλική), for the perusal of Constantinus Porphyrogennetus, the son of Michael VII. and the empress Maria. This work forms a part of the collections of Byzantine writers.

Theophylactus is better known by his valuable commentaries on the twelve minor prophets and the greater part of the New Testament, which are chiefly compiled from the works of Chrysostom. He also wrote 75 epistles and several tracts. These works were printed in Greek and Latin, at Venice, 1754, fol.

(Fabricius, *Bibl. Graec.*, vii., p. 765; Lardner's *Credibility*, pt. ii., c. 163; Schöll, *Geschichte der Griech. Litt.*, iii. 286.)

THEOPOMPUS, an eminent Greek historian, was a native of the island of Chios, son of Damasistratus, and brother of Caucalus, the rhetorician. He was born about B.C. 380, and was instructed in rhetoric by Isocrates during his stay in Chios. (Plutarch, *Vit. dec. Orat.*, p. 837 C; Photius, *Cod.* 260, p. 793.) Photius in another passage states that Damasistratus and his son were obliged to quit their native island on account of their partiality towards Sparta: this seems to have occurred about B.C. 360, when Chios was distracted by two parties, the popular and the most powerful one being in favour of Thebes, while a small number of aristocrats supported the interest of Sparta. To the latter belonged Theopompus and his father. The influence of the instruction of Isocrates on Theopompus appears to have been very great, for although he did not apply his oratorical powers to politics or to speaking in the courts of justice, yet he wrote, like his master, a considerable number of orations, which were recited at rhetorical contests, and in which he is said to have even excelled his master. When he was obliged to leave Chios, he went with his father to Asia Minor, where he spent several years in travel and study, and acquired great celebrity for his eloquence. At the age of forty-five he obtained leave to return to his country through the interference of Alexander the Great. After this event he took an active part in the political affairs of his native island.

and by his talents he became one of the principal supports of the aristocratic party. So long as Alexander the Great lived, his adversaries could not venture anything openly against him; but no sooner had the king died than the popular party again expelled Theopompus. He now took refuge in Egypt under the protection of Ptolemaeus, the son of Lagus, during whose reign he remained unmolested. But his successor Ptolemaeus Philadelphus was ill disposed towards him, and if Theopompus had not been advised by some friends to quit the country, he would have been put to death. Whither he now fled, what were his subsequent fortunes, and where he died, are questions to which no answer can be given, though it is highly probable that he died about or shortly after 308 B.C.

The loss of the works of Theopompus, of which we now only possess numerous fragments, is one of the greatest that antient history has sustained. The following list contains the works he is known to have written:—

1. An abridgement of the work of Herodotus (Ἐπιτομὴ τῶν Ἡροδότου ἱστοριῶν). This epitome is mentioned by Suidas and several other grammarians. Modern critics think it highly improbable that Theopompus should have undertaken such a task, and that it was probably the work of some grammarian, who published it under the name of the historian. The reasons adduced for this opinion are not satisfactory, and it is not improbable that Theopompus may have made this abridgement as a first attempt at historical composition. A few fragments of it are still extant.

2. A more important work was a history of Greece (Ἑλληνικαὶ ἱστορίαι, or Σύνταξις Ἑλληνικῶν). It took up the history of Greece where Thucydides breaks off, B.C. 411, and carried the events down to the battle of Cnidus, B.C. 394. The work consisted of twelve books, and many fragments are still preserved.

3. The history of Philip of Macedonia and his time (Φιλιππικά, or simply Ἱστορίαι). It contained in 58 books the history of Greece from the accession of Philip, or more properly from the foundation of Philippi, down to his death. Five books of it were lost as early as the time of Diodorus Siculus (xvi. 3), and they were probably the same which Photius (*Cod.*, 176, p. 390) mentions as being lost in his time, viz. books 6, 7, 9, 20, and 30. This voluminous work not only embraced the history of Greece in the widest sense of the word within the period mentioned, but also treated of those earlier parts of Greek history and of the history of such barbarous nations as he had occasion to mention. These things formed numerous and long digressions in the work, and of their extent we may judge from the fact that Philip III. of Macedonia, after cutting out these digressions, reduced the work from 58 to 16 books. (Photius, *Cod.*, 176.) We still possess many fragments of the work, which the antient writers refer to and quote.

Besides these historical works, Theopompus wrote many orations, and we know that he also composed Panegyrics on Mausolus, Philip, and Alexander. As regards his character as an historian, the antients praise him as a lover of truth, but they also state that he was extravagantly severe in his censure, and unbounded in his praise. His ardent and vehement temper did not allow him to preserve that calmness which becomes the historian. He is also charged with having been too fond of the marvellous, and with having for this reason dwelled too much upon the mythical stories of Greece wherever he had occasion to mention them.

The fragments of Theopompus have been collected by Wichers: 'Theopompi Chii Fragmenta, collegit, disposuit, et explicavit, ejusdemque de Vitâ et Scriptis Commentationem praemisit,' &c., Lugduni Batavorum, 1829, 8vo. They are also contained in C. and J. Müller's 'Fragmenta Historicorum Graecorum' (Paris, 1841), p. 278-333. Compare F. Koch, *Prolegomena ad Theopompum Chium*, Stettin, 1803, 4to.; A. J. E. Pflugk, *De Theopompi Chii Vitâ et Scriptis*, Berlin, 1827, 8vo.; Aschbach, *Dissertatio de Theopompo Chio Historico*, Frankfort, 1823, 4to.

THEORBO, a musical instrument of the lute kind, which has long fallen into disuse. The latest employment of it that we can trace was in Handel's oratorio of *Esther* (1720), where it is introduced, with the harp, as an accompaniment to the air 'Watchful Angels.' This instrument has been called the *Cithara Bijuga*, its two heads having been erroneously considered as two necks: and it was commonly known under the name of Arch-lute on account of its magnitude. The upper and middle strings were attached to the lower head or nut; the lower, or base strings, to an upper or additional one. According to *Maister Mace* (1676), the Theorbo was the old English lute very much enlarged, and used chiefly, if not only, as an accompaniment to the voice. [LUTE.]

THEOREM (θεώρημα) means properly a thing to be looked at or seen; and is used in mathematics to signify any proposition which states its conclusion or makes any affirmation or negation; as distinguished from a PROBLEM which demands or requires a conclusion to be arrived at, without so much as stating whether that conclusion is even possible. Thus, 'Required to draw a tangent to a circle at a given point,' is a problem; but 'If a straight line be drawn at right angles to a diameter from its extremity, that straight line is a tangent to the circle,' is a theorem. The problem asks discovery both of method and demonstration; the theorem asks demonstration only.

This distinction, as noticed in detail in PROBLEM, was not made by the older Greek geometers; Theodosius is the first, as far as we know, who uses the word theorem, but none of his propositions are problems: Pappus is the first who uses both terms in the distinctive sense.

THEORIES OF MOLECULARITY. This important branch of science is directed to connect the known mechanical, dynamical, and hydrodynamical laws with those which govern the crystallization of solids, the operation of heat in producing liquidity and gaseity, the action of capillary tubes on fluids, and several other phenomena of constituted matter. The laws which regulate the motions of great masses taken as continuous bodies have been explored with success to an astonishing degree by the genius and labours of such men as Newton, D'Alembert, and Laplace. On the contrary, those laws which govern the constitution or elementary arrangement of such bodies are to a great extent absolutely unknown. The ordinary senses of sight, touch, &c. are sufficient to take cognizance of the facts from which the former laws are deduced; but for the latter it is necessary to apply the most delicate instruments supplied by nature, namely, heat, light, and electricity. The minute world is of more difficult research than the great, the plane sections of a crystal than the elliptic orbits of the planets, the infinitely small than the infinitely great.

It is not therefore wonderful that this branch of science, which should connect on one uniform basis the phenomena of chemistry, of crystallography, and of the mechanical action of masses, should have attracted the attention of the most able philosophers from the sixteenth to the nineteenth century; from Boyle to Berzelius, from Newton to Navier and Poisson; and the present unsatisfactory state of our knowledge on this subject must to a great degree be attributed to the neglect of the inductive method, to the substitution of hypotheses for the results of observation.

The first theory on this subject may be thus stated, that the particles of matter possess the attraction of cohesion, but are repulsed by the action of heat or caloric: when the former preponderates, the body is solid; when both are equal, it is in a fluid state; and when the latter exceeds the former, the body is a gas, and prevented from total dispersion only by the action of gravitation. This is purely hypothetic, and forms no more ground for mathematical calculation in relation to the phenomena alluded to above, than does the definition of a straight line in Euclid's Elements for the properties established in geometry. The second hypothesis, which of late has been more generally received both by chemists and mathematicians, is that the particles of matter are mutually attractive by a law analogous to that of gravitation, but are surrounded by atmospheres repulsive one of the other, in the same manner as the particles of elastic fluids. From this hypothesis the equations of equilibrium and of progressive and rotatory motions are deducible; but as the constitution of such atmospheres may be modified very much at the will of the calculator, so as still to obtain the same mechanical results (in the manner in which the distribution of the fluid of light in crystallized bodies has been by those analysts who have developed the undulatory theory), it seems probable that it will be long before the phenomena of crystallization, liquefaction, &c. will from this hypothesis be explained, and the absence of all external action in solids, with the exception of gravitation. The difference of the calculations of Navier and

Poisson show how much this hypothesis may be adroitly stretched. A third method of viewing the phenomena of matter is more strictly inductive, and is similar to that employed in the investigation of the distribution of latent electricity, in Mr. Murphy's 'Treatise on Electricity,' &c. Here we start from the fact that forces sufficiently powerful to prevent the penetration of solids by other solids, and which prevent their being torn asunder without great force being employed, are yet insensible to bodies at very minute distances from them. Here we have ample data for analytical calculation, the chief difficulty lying in the imperfect state of analytical calculation relative to definite integrals; nevertheless enough can be deduced to show the distribution of attractive and repulsive forces within the variously-formed bodies. It however requires the highest strength of analysis of a nature somewhat similar to that employed by Laplace on the figure of the earth and the tides.

The best test of the truth of any theory on this subject is that which, with the forces supposed to exist, shall show that the locus of the points of least resistance, commencing from a given point, shall be a plane surface, or several plane surfaces, as exhibited by crystals.

(Dr. Young's *Lectures on Natural Philosophy;* Various Papers in the *Mémoires de l'Institut;* and Poisson's *Traité sur l'Action Capillaire.*)

THEORY, THEORY AND PRACTICE. If articles upon the mere meaning of words be admissible, it is the consequence of the manner in which they are used. Of all the fallacies which infest society, the most common is that of applying to one sense of a word ideas or associations derived from another; and of all the words in use, there are few which are more often subjected to such process than those which stand at the head of this article.

By theory, properly speaking, is meant the mode of making seen and known the dependence of truths upon one another: a theory is a connected body of such truths belonging to one or more common principles. The use of this word has enlarged with the boundaries of the sciences. For example, before the discovery of universal gravitation, all that was known of any one planet was the empirical formula for one or two of its inequalities. This constituted the theory of the planet (then so called): thus the theory of the moon consisted in the statement of the laws of the inequalities called the equation of the centre, the evection, &c. In our day the point of view is changed; it is no longer the mere exhibition of these inequalities which constitutes the theory, but the deduction of them, as necessary consequences, from the principle of gravitation. The theoretical astronomer now starts from this principle, and, taking only one position and velocity for his numerical data, finds out every inequality of the planetary motions, those which were previously known from observation and more, and shows how to form them into tables. The practical astronomer makes these tables, computes places from them for the current year, compares these places with the results of observation, and returning the comparison into the hands of the theorist, enables him, if need be, to correct the original numerical data to which he applied his methods. The process is now deductive; but before the time of Newton it was the other way. The observer had the first task; the inequalities were to be collected from comparison of observations, and their laws, reduced to their simplest form, were the data for future tables.

Again, before the introduction of the undulatory hypothesis, the theory of light consisted in the exhibition of the laws of reflexion and refraction, with a certain extent of explanation from the emanatory hypothesis of Newton. Since that time the theory of light has become, though at a distance, a resemblance of the theory of gravitation in its character: prediction has commenced, that is to say, the phenomena which would appear under certain new circumstances have been announced before any experiments were made to discover them: and correctly announced. This is the end to which theory ought to be constantly tending; namely, the discovery of laws of action in so complete a manner that the necessary consequences of these laws never fail to make their appearance, so that every thing which is seen is found to be a consequence of the laws when examined, and every consequence of the laws is seen in phenomena when looked for. Whatever fulfils these conditions may be called a perfect theory, or a perfect *mathematical* theory.

The next step in the chain of discovery is one which may in most cases be incapable of attainment. For example, nothing is more certain than that the assumption of every particle of matter attracting every other particle, according to the Newtonian law, leads to the complete deduction of the celestial motions, and gives the complete power of prediction just alluded to. But whether this ATTRACTION does actually take place, or whether any intermediate agent is employed, though it matters nothing *at present* to the mathematical theory, is the next object of inquiry. Could this point be ascertained, it is more than probable that the knowledge of the constitution of matter to which it would lead, would open hundreds of important consequences even in the application of science to the arts. [CAUSE; HYPOTHESIS.]

Before coming to the distinction between theory and practice, we must observe that theories may be divided into two classes, the more perfect and the less perfect. We cannot say that any theory is absolutely perfect; but there are some of which the defects are hardly perceptible, and others in which the contrary is the case. For example, the theory of the statics and dynamics of *rigid* bodies is tolerably perfect; but that of bodies composed of particles acted on by molecular forces is in its infancy. We know a great deal more of the connection of the planetary worlds with each other than we do of the particles which, when connected together, form a bar of iron or of oak. We know that the bar is not perfectly rigid; that it bends and breaks: and the degree of bending which a given force will cause, and the amount of pressure necessary to produce fracture, must be sought for in experiments, from which, imperfect as they are, the laws which would follow from a good theory, if we had one, are to be deduced. In such a subject our theory, instead of being an all-sufficient guide, is only a help, the services of which are to be used to an extent which discrimination derived from practice and experience must point out. Many a person who thinks he is proceeding upon experience only, is really making use of a mixture in which there is theory, though his own knowledge of the process he uses, and of its history, may not be sufficient to inform him of it.

A person who uses an imperfect theory with the confidence due only to a perfect one, will naturally fall into abundance of mistakes: his predictions will be crossed by disturbing circumstances of which his theory is not able to take account, and his credit will be lowered by the failure. And inasmuch as more theories are imperfect than are perfect, and of those who attend to anything, the number who acquire very sound habits of judging is small compared with that of those who do not get so far, it must have happened, as it has happened, that a great quantity of mistake has been made by those who do not understand the true use of an *imperfect* theory. Hence much discredit has been brought upon theory in general; and the schism of theoretical and practical men has arisen. Fortunately there are many of the former who attend properly to the improvement of imperfect theory by practice; and many calling themselves practical who seize with avidity all that theory can do for them, and who know that step by step theory has been making her way with giant strides into the territory of practice for the last century and a half.

By practice, as distinguished from theory, is meant (not by us, but by those who contend for the distinction) the application of that knowledge which comes from experience only, and is not sufficiently connected with any general principles to be entitled to the name of a theory. The distinction of labourers in the field of science or art into theoretical and practical is not strictly a just one, for there is no theorist whose knowledge is all theory; and there is no practical man whose skill is all derived from experience. But the terms will do well enough to distinguish two classes whose peculiarities it might be difficult to define exactly.

The practical man, when he is really nothing more, is one who can just do what he has been taught to do, and who has acquired skill and judgment in a small range of occupations. All who pride themselves upon the title would be displeased at this definition, and we readily admit that many of them are entitled to a higher character; but only because the name by which they delight to describe themselves is a wrong one. They desire, under the name of a workman, to claim the qualities of a master. The term *theoretical* serves, as one of contempt, to designate any thing of which they disapprove; and as there never is any fallacy which is not carried to a fool's-cap extent by the lower order of users, it would not be difficult to make a most amusing selection of instances of the manner in which the distinction has been worked by the large number who are at the bottom of the class, and in whose heads it runs that their own *ignorance* is practical, and others' *knowledge* theoretical. We remember seeing a theorist, as he was called, endeavouring to make the managers of a certain undertaking comprehend that their profits could not exceed the excess of the gross returns over the outlay, after they had been trying to cheat the equation by inventing names for what they would have liked to have, but which the theorist assured them they would not get, for the preceding reason. The answer was, 'That is very true *theoretically*, but now let us look at it *practically*.' We shall say no more of the gross abuse of the terms, except to remark that were it worth while really to make a contest between theory and practice, it would be difficult to say on which side the balance of absurdity would incline; or whether the man who is too confident in his theory, or too confident in his experience, has done most mischief for the time being.

Coming now to the higher class of practical men, and speaking as of the balance between two methods, the value of both of which is admitted, we observe that there are obvious faults to which both parties are subject, both in conduct, and in argument respecting their pursuits. Great care is necessary to secure the theorist from pushing an imperfect theory too far, and neglecting causes of disturbance; but at least as much is necessary to prevent the practical man from generalising into theory from imperfect experience, or from restraining inquiry by a notion formed from practice. This is his besetting sin, to such an extent that we should almost be inclined to say that the fault of a practical man is a tendency to form false theory, as that of the theorist is to make false applications. We have often been surprised at the boldness with which the former assert generalities, upon evidence which would only make a pure theorist look for further information. Analogies are of all things the most deceptive.

In argument there is one mode which is common to both parties, and which is exceedingly detrimental. It is the selection of instances from the very highest minds of the two orders, to illustrate the effects of theory or practice upon the general mass of understandings: minds the superior calibre of which, and their power of adapting themselves to circumstances, and making the most of what they have, render them exceptions to all rules, and no proper examples of the most advantageous course of training. Every one likes, no doubt, to draw consequences about and concerning his own self from a contemplation of the minds and methods of the Newtons or the Galileos of a higher sphere of intellectual existence, or the Arkwrights or Telfords of a better state of power of adaptation. 'What is your theory good for?' says the tongue attached to some head which holds about the same weight of conceit that Telford's did of sagacity; 'Telford knew nothing of it, and I may do without it too.' The answer is, *Telford*. The opinion of Bacon was, that 'the root of *all the mischief* in the sciences is, that, falsely magnifying and admiring the powers of the mind, we seek not its real helps,' a maxim full of meaning, and a lesson to him who rates theory too highly, and also to the one who thinks that the only use of his mind is to arrange the results of experience, his own or others. What are the majority of men, that they should look down upon any course of training, theoretical or practical?

Another fault of argument, but almost peculiar to the practical world, who have the force of numbers on their own side, is the habit of claiming all who are successful in application as instances of their own method and knights of their own order. Suppose that one individual should discover a mine, work it with his own hand, purify the ore, and beat the metal into a horse-shoe; which is he, a geologist, miner, furnace-man, or blacksmith? He has done the work of all, but the community of blacksmiths would hardly be allowed to claim him as peculiarly belonging to themselves. When a person who has mastered the difficulties of theory has also successfully applied them, he is free of both corporations; but those who attend to application only, never fail to appropriate his merits. WATT is a striking instance; he was a highly accomplished theorist on every point on which he worked: and yet his name has been frequently cited as a proof that theory could be dispensed with. And his career, when compared with that of Telford, will illustrate theory applied to practice, as distinguished from practice alone, however acute. It is impossible to contemplate the career of Telford without a feeling of high interest, created by the comparison of his apparently inadequate education with his startling successes. Looking at the individual himself, there is everything for his age to admire; and as long as his structures last, each of them is the *monumentum*, but not *ære perennius*. The time will come when his name shall be like that of the builder of the old London bridge, who was no doubt the Telford of the day, a stimulus to his contemporaries, useful and honoured, but not the remembered of succeeding ages. On the other hand, the discoveries of Watt, though equally startling in what is called the practical point of view, have the mind of the discoverer impressed upon them, and have been, and must be, the guide of his successors, not merely to repetitions of what he did himself, but to enlargement of ideas, and to the conversion of principles into forms useful in art. Take away the honourable qualities which enabled the two men to outstrip their contemporaries, each in his line, qualities which are the properties of the individual minds, and consider what is left, namely, their modes of proceeding: consider the effect of these two modes upon men in general, and there is nothing in that of Telford which would raise the workman above a workman, while in that of Watt there is the vital principle to which we owe all the mechanical triumphs of civilization and all the theoretical successes of philosophy.

This country has been long and happily distinguished for the great attention which has been paid to application; but it is a mistake to suppose, as some do, that our supremacy in practical matters has been coordinate with, still less owing to, neglect of theory. It would be easy to show that though the comparative neglect of theory alone, as a pursuit, added to its diligent cultivation on the Continent, has given to foreign countries a decided preponderance of theoretical inquirers and writers, yet that there has been no country in Europe in which a competent knowledge of the mathematics and their applications has been spread over so large a mass, or raised to so high an average. At any time since the beginning of the seventeenth century the total amount of theory in Britain has been larger than in any other European country, on account of the numbers who have possessed a useful amount of knowledge: the diffusion of education in Germany may have altered our position, but of this we are not sure. For ourselves we are perfectly satisfied, however little those most concerned may know it, that this greater diffusion of theory has been the original moving cause of the practical excellence to which we have alluded. If those who have become known for splendid achievements in the former are few, the same may also be said of the latter; but a country owes its excellence in either department, not to one or two of the highest, but to the mass of those who have competent knowledge, producing good habits of thought and action. It is a new thing to hear one branch set against the other, and would make our writers of a century back think that posterity had lost its senses. The only addition wanted has been some means of systematically nurturing the growth of theory, so that, well as we have done with what we have, we may do better with more. The efforts which are making on every side to extend education will, it may be hoped, do what is wanted in this particular; they will at least have the effect of making it clear that, whatever the force of genius may do for an isolated exception, the mass of mankind must place their best hope of progress in the union of theory and practice.

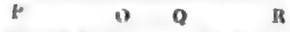
There is also a mode of viewing what we may call the action of theory, which is absolutely necessary to a true conception of the value of their labours who employ their time in its advancement. Watch the arguments of a person who calls himself, distinctively, a practical man, and it will be always found that a well-established theory, fifty years old, is practical knowledge, so called. To this there cannot be the slightest objection in the non-distinctive sense: a well-established theory, which has been shown to be sufficient, is practical, as opposed to one of which the investigation is more recent, and the completeness not so well ascertained. But when the question is theory, as theory, against practice, as practice, the advocates of the latter frequently find it convenient to assume, for their own share of the matters in contest, all the best theories *plus* the most recent practical knowledge, leaving to the other side the onus of supporting theory upon the most imperfect part of the mass of doctrines which it contains, being that part which is not yet off the anvil. Suppose a merchant going into the bail court to prove his being worth a certain sum; he is asked whether his business, all debts and risks allowed for, would produce that sum: he replies, that his ventures must be beyond record unsuccessful, if it would not be so, over and over again. 'So then,' he is further questioned, 'you cannot positively swear that your business will make you worth the sum in question.' 'I cannot,' he replies, 'positively swear any such thing; but I have enough not employed in business, in land and mortgages, and in the funds, to pay twenty shillings in the pound five times over, upon every risk which I am liable to.' What would be thought of counsel who should retort, 'That is nothing to us; you are described as a merchant, and your solvency must be tried by the state of that part of your property which is now undergoing the fluctuations of trade?' Such is and always must be the state of theory; the amount which is actually realised is enormously greater than the floating balance which is being worked out. Those who are engaged in producing fixed capital from the latter, have a right to the credit which arises from the interest of the former: their labours for the time being are not to produce their return at the instant.

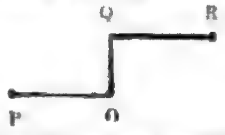
We have, in compliance with common notions, not adverted to the consequences of theory upon the mind and thoughts of men, but have treated it as if its sole object were to advance the mechanical arts and better the physical condition of society. But this is under protest that even if it could not be proved that rational investigation of nature had added one single atom to the physical comfort of life, there would remain such an enormous mass of social ameliorations which can be traced to that source as would outweigh even the triumphs of steam.

THEORY OF COUPLES. The two motions of which any rigid system is susceptible are those of TRANSLATION and of ROTATION. Each of these has this peculiarity, namely, that one particular case of its application yields the other kind of motion. Every motion of a system can, for any one instant, be resolved, at most, into a motion of translation of the whole system, combined with a motion of rotation about an axis; and every application of a system of forces to any rigid body, produces, generally speaking, this compound of translation and rotation. Also, if equal and opposite forces, such as would produce simple translation, be applied at the same point, or if equal and opposite forces, such as would produce rotation, be applied about the same axis, the result is that the equilibrium, or previous motion, of the system remains undisturbed.

But if the equal and opposite forces of translation be applied at different points, the result is rotation only, for the first instant; and if the equal and opposite forces of rotation be applied about axes not coinciding, but only parallel, the effect, at the first instant, is translation only. And though the doctrine of motion is now properly excluded from statics, yet the preceding theorems, together with others mentioned in ROTATION, should be well understood, and viewed in connexion with the science of equilibrium, which is always illustrated, though it may not be demonstrated, by such considerations.

It was for a long time a curious but barren exception, that though any two forces acting in the same plane may, generally speaking, have their joint effect supplied by one single third force, yet if the two forces be equal in magnitude, and opposite in direction, no such single third force will do. If indeed they be applied in the same line, as O P and Q R in the first figure, they equilibrate each other; but if not in the same line, as O P and Q R in the second figure, no one single force can be found which will either equilibrate them, or produce their effect. About twenty years ago, M. Poinsot, already mentioned for his beautiful theory of ROTATION, applied a remarkable theorem connected with such pairs of forces to the establishment of the theory of the statics of rigid bodies, in a manner which has made his system rapidly take its place among the fundamental bases of the science. We shall in this article point out the manner in which this can be done, without much demonstration, with a view to draw the attention of those who have learned the doctrine of equilibrium in the old way: we cannot make it intelligible (without too great length) except to those who have learned the principles of analytical statics.





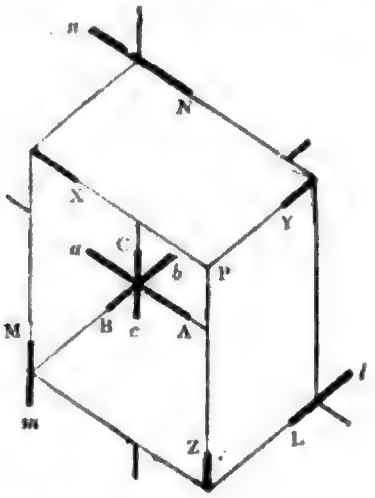
M. Poinsot called a pair of equal and opposite forces, not equilibrating each other, by the name of a *couple*, too general a term perhaps: by it is to be understood a couple which cannot be made anything but a couple, or cannot be replaced by one force: an *incomposible* couple. The *plane* of the couple is the plane drawn through the parallel forces: the *arm* of the couple is any line drawn perpendicular to the forces from the direction of one to that of the other: the *axis* of the couple is any straight line perpendicular to its plane. And if we consider any axis, it will be apparent that the moment or leverage of the couple [LEVER] to turn the system about that axis is represented by the product of one of the forces and the arm. For if, with reference to the axis, x be the arm of one of the forces, $x \pm a$ is that of the other, a being the arm of the couple. Hence if P one of the forces, the united leverage is $P(x \pm a) - Px$ or $\pm Pa$. This product Pa is called the *moment* of the couple.

The last-mentioned property will give a high probability of itself to the following theorems, which are the basis of the theory of couples, and can be proved, the first by aid of the composition of forces only, the second by the principle of the lever. Any couple may have the direction of its arm changed, and consequently of its forces, in any manner whatsoever, either in its own plane, or in any plane parallel to it, provided only that the direction in which it tends to turn the system remains unaltered. Secondly, any couple may be replaced by another which has the same moment, the plane and direction of turning remaining unaltered; that is, the arm may be shortened or lengthened in any manner, provided the forces be increased or diminished in the same proportion. If the system were in equilibrium before, it will remain in equilibrium, however its couples may be altered, in any manner described in the above theorems. Hence it follows that a couple is entirely given when there are given:—1, Its axis or any line perpendicular to its plane, which is also perpendicular to any of the planes into which it may be removed. 2, The moment of the couple; specific forces or arms are unnecessary for its description, so long as their product is given. 3, The direction in which it tends to turn the system. The easiest way of describing a couple is then as follows; suppose for example a horizontal one: Take any vertical line for the axis of the couple, on that axis lay down a line proportional to its moment, and agree that vertical lines drawn upwards shall represent moments tending to turn the system from west to east; and downwards, those tending to turn the system from east to west. But a sign must also be agreed upon; positive moment must consist in tendency to turn in one direction and negative in the other.

The composition and resolution of couples is easily shown to be done in a manner which perfectly resembles that of ROTATIONS. When the couples can have a common axis (act in the same plane or parallel planes), the moment of the resultant is, in sign and magnitude, the sum of the moments of the components, with their proper signs. To find the resultant of two couples which cannot have a common axis, take axes to them which pass through the same point, and on these axes lay down lines representing the moments of the couples in their proper directions. On those lines complete a parallelogram: the direction of the diagonal is the axis of the resulting couple, and its length represents the moment of that couple. Care must be taken to lay down the directions of the moments properly on the axes: the best isolated rule (when reference is not made to distinct co-ordinate planes) is as follows: let the parts of the plane of the axes which lie in the angle made by the lines representing moments be turned by the two couples in opposite directions.

To the student to whom such a direction would be useful we should say, appeal in all cases to the perceptions derived from ROTATION.

To apply the preceding theorems to the statics of a rigid body, we first take the following conventions:—Assume an origin and three rectangular axes of co-ordinates, as usual. Let the forces which act at each point of the system be decomposed into three, parallel to the axes of x, y, and z. Let each force be called positive, when it acts towards the positive part of the axis to which it is parallel; if for instance the axis of z be vertical, and if its positive part tend upwards, all forces in the direction of z, wherever they act, are called positive while they act upwards, and negative when downwards. As to couples, let their moments be called positive when, acting in the planes of x and y, y and z, z and x, they tend to turn the positive part of the first-named towards the positive part of the second (xy, yz, zx). Let P_1 be the first point of the system; let its co-ordinates be x_1, y_1, z_1; let the forces in the three directions acting at that point be X_1, Y_1, Z_1. Let P_2 be the second point; x_2, y_2, z_2, its co-ordinates; X_2, Y_2, Z_2, the forces there applied: and so on. All co-ordinates and forces have their proper signs. At the origin apply the following pairs of equilibrating forces, X_1 and $-X_1$, Y_1 and $-Y_1$, Z_1 and $-Z_1$; X_2 and $-X_2$, Y_2 and $-Y_2$, Z_2 and $-Z_2$, and so on: which of course do not affect the equilibrium, and are over and above those already applied. Again, at the extremity of x_1, in the axis of x, apply the equilibrating forces $Y_1, -Y_1$; at the extremity of y_1, in the axis of y, apply $Z_1, -Z_1$; at the extremity of z_1, in the axis of z, apply $X_1, -X_1$, and so on for the other points. Lastly, let the points of application of the original forces X_1, Y_1, Z_1, be changed so that each shall act at the projection of the point of application made by its co-ordinate: and the same for the other points. Nothing is done but the application of mutually destroying forces, or the change of the point of application of a force to another point in its direction, and the following figure will show the present arrangement for one point. The original forces, transferred, are marked X, Y, Z; the original point of application P, and the other forces, equilibrating two and two, have great and small letters at their extremities.



We now see that the forces X, Y, Z, are equivalent to

1. The forces X, Y, Z (marked A, B, C) applied at the origin.

2. A pair of couples to the axis of z (L, b) (X, n), the first positive with the moment Yx, the second negative with the moment Xy. These two are equivalent to one couple with the moment $Yx-Xy$.

3. A pair of couples to the axis of x (M, c) (Y, l), the total moment of which is $Zy-Yz$.

4. A pair of couples to the axis of y (N, a) (Z, m) the total moment of which is $Xz-Zx$.

Apply this to every point in the system, and let ΣX stand for X_1+X_2+, &c., and so on: hence it appears that the whole of the forces are equivalent to forces ΣX, ΣY, ΣZ, applied at the origin in the directions of x, y, and z, together with couples in the planes of xy, yz, zx, of which the moments are—

$$\Sigma(Yx-Xy),\ \Sigma(Zy-Yz),\ \Sigma(Xz-Zx).$$

$$\text{Let } A=\Sigma X,\ L=\Sigma(Zy-Yz)$$
$$B=\Sigma Y,\ M=\Sigma(Xz-Zx)$$
$$C=\Sigma Z,\ N=\Sigma(Yx-Xy)$$

$$V=\sqrt{(A^2+B^2+C^2)},\ W=\sqrt{(L^2+M^2+N^2)}$$

Then it appears that all the forces can be reduced to one force, V, acting at the origin, making angles with the axes whose cosines are A : V, B : V, C : V; and one couple having a moment W, and whose axis makes with the axes of co-ordinates angles whose cosines are L : W, M : W, N : W. But when there is equilibrium, both the force and the moment of the couple must vanish, for the single force cannot equilibrate a couple. Consequently the conditions of equilibrium are $V=0$, $W=0$, which give $A=0$, $B=0$, $C=0$, $L=0$, $M=0$, $N=0$, the six well-known conditions of equilibrium.

The forces will have a single resultant when V falls in the plane of the couple whose moment is W; that is, when the direction of V is at right angles to the axis of the couple. This takes place when $AL+BM+CN=0$, a well-known condition.

For further information we may refer to Poinsot's *Elémens de Statique*; or, in English, to Pratt's *Mathematical Principles of Natural Philosophy*; or Pritchard's *Theory of Couples*.

THEORY OF EQUATIONS. Under this term is expressed all that part of algebra which treats of the properties of rational and integral functions of a single variable, such as $ax+b$, ax^2+bx+c, ax^3+bx^2+cx+e, and so on: a, b, c, &c., being any algebraical quantities, positive or negative, whole or fractional, real or imaginary. Unless however the contrary be specified, it is usual to suppose these co-efficients real, not imaginary.

The great question of the earlier algebraists was the finding of a value for the variable which should make the expression equal to a given number or fraction: as what must x be so that $3x^2+2x$ may be 11, or x^3-x^2+6x may be 40, and so on. In modern form it would be asked what value of x will make $3x^2+2x-11=0$, or $x^3-x^2+6x-40=0$, and so on. To find values of a variable which should make an expression vanish, or become equal to nothing, was then the first desideratum; and these values are now called *roots* of the expression. Later algebraists made the finding of these roots subservient to the discovery of other properties of the expressions.

The Hindu algebraists communicated to the Arabs, and through them to the Italians, the complete solution of equations of the first and second degrees. The Italians added the solution of equations of the third degree, and of the fourth imperfectly. These last two degrees have been completed in more recent times, so that it may be now said that the equations of the first four degrees have been completely conquered: that is to say, having given the equation $ax^4+bx^3+cx^2+ex+f=0$, an algebraical expression can be found, having four values, and four values only, and being a function of a, b, c, e, f, which being substituted for x on the first side of the equation, shall make that first side vanish. But the student would look in vain through the books of algebra to see this expression: it is both complicated and useless, and it is more desirable to indicate how it is to be found, than to find it.

The equation of the fifth degree was attempted in all quarters, without success: means were found of approximating to the arithmetical value of one or another root in any one given equation; but never a definite function of the co-efficients which would apply in all cases. A proof was given by Abel, in Crelle's Journal (reprinted in his works), that such an expression was impossible, but this proof was not generally received: it was admitted by Sir W. Hamilton, who illustrated the argument at great length in the 'Transactions' of the Royal Irish Academy, vol. xviii., part ii.; but the singular complexity of the reasoning will probably prevent most persons from attending to the subject. We do not mean in this article to enter into the history of the theory of equations, but only to place its general state before the reader by an exhibition of the principal theorems, mostly without proof. For works on the subject we may refer as follows:—Hutton, *Tracts*, vol. ii., Tract 33, which contains a full account of the earlier algebraists; Peacock, 'Report on certain Parts of Analysis,' in the *Report of the Third Meeting of the British Association*; or the recent works of Murphy, Young, or Hymers; all of which are good, and written on such different plans that any one who makes a particular study of the subject will find it advantageous to consult them all. In French the standard works are those of Budan, Lagrange, and Fourier, which however all treat of particular topics; the algebraical treatises of Bourdon and Lefebvre de Fourcy take it more generally.

The particular points relative to equations of the first four degrees are as follows:—

1. The expression of the first degree can be reduced to the form $ax+b$; it vanishes when $x=-b:a$, and has only this one root. And $ax+b$ is of the same sign as a or not, according as x is greater or less than the root.

2. The expression of the second degree is more important. It can always be reduced to the form ax^2+bx+c, and its properties are best developed by transforming the preceding into

$$\frac{(2ax+b)^2+4ac-b^2}{4a}$$

There are three distinct cases, according as b^2 is greater than, equal to, or less than, $4ac$.

When $b^2>4ac$, the expression ax^2+bx+c has two real and differing roots, contained in the formula*

$$\frac{-b\pm\sqrt{(b^2-4ac)}}{2a}$$

and has always the same sign as a, except when x lies between those roots. Every change of signs in passing from a to b and from b to c indicates a positive root, and every continuation a negative root: and when one root is positive and one root negative, the positive or negative root is numerically the greater, according as (a, b) shows a change or continuation. When $x=-b:2a$, the expression is at its numerical maximum between the two roots, its then value being $(4ac-b^2):4a$.

When $b^2=4ac$, the expression ax^2+bx+c is a perfect square with respect to x, and absolutely so if a be a square. The two roots become equal, and each equal to $-b:2a$. The expression now never differs in sign from a.

When $b^2<4ac$, the two roots become imaginary, the expression always has the sign of a, and is numerically least when $x=-b:2a$, being then $(4ac-b^2):4a$.

3. The equation of the third degree (or cubic) has been separately considered in the article IRREDUCIBLE CASE.

4. Nothing belongs particularly to the equation of the fourth degree (or biquadratic) except the recital of the various modes in which the solution is reduced to that of a cubic. The various modes are distinguished by the names of their inventors.

Ferrari. Let $x^4+ax^2+bx+c=0$. This can be transformed into

$$(x^2+v)^2=(2v-a)x^2-bx+v^2-c:$$

make the second side a perfect square; that is, find v from $b^2=4(v^2-c)(2v-a)$,

or $$8v^3-4av^2-8cv+4ac-b^2=0;$$

the extraction of the square root then reduces the biquadratic to a couple of quadratics.

Des Cartes. Let $x^4+ax^2+bx+c=(x^2+\sqrt{p}.x+f)(x^2-\sqrt{p}.x+g)$, which gives

$$g+f-p=a,\ (g-f)\sqrt{p}=b,\ fg=c,$$

or $$p^3+2ap^2+(a^2-4c)p-b^2=0:$$

find a positive root of this equation (it certainly has *one*), and from it find g and f; then the roots of $x^2+\sqrt{p}.x+f=0$, and $x^2-\sqrt{p}.x+f=0$, are those of the given equation.

Thomas Simpson gave a modification of Ferrari's method, and Euler one of that of Des Cartes. (Murphy's Theory of Equations (*L. U. K.*), pp. 54, 55.)

The theory of equations of all degrees is to be divided into two distinct parts; the numerical solution, and the general properties of the roots and the expressions themselves. The *numerical solution* must be carefully distinguished from the *general solution;* the former term applying to any mode of approximating to a single root, the latter to any mode of exhibiting a general expression for the roots. We shall begin by the general properties of the roots: the expression in question being ϕx, or

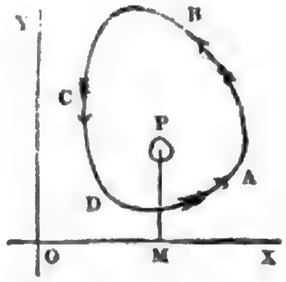
$$a_0x^n+a_1x^{n-1}+a_2x^{n-2}+\dots+a_{n-1}x+a_n.$$

1. If r be a root of ϕx, or if $\phi r=0$, then ϕx is divisible by $x-r$, and the quotient is another such expression of the $(n-1)$th degree, every root of which is also a root of ϕx, and every number which is not a root (r excepted) is not a root of ϕx. Hence ϕx cannot have more roots than it has dimensions, or cannot have more than n roots.

2. When the expression ϕx is divisible by $(x-r)^m$, it is said to have m roots each equal to r; and when this is the case, the substitution of $r+y$ for x would give an expression in which y^m is the lowest power of y.

3. Every expression has as many roots as it has dimensions. This proposition is one which has only latterly been demonstrated in elementary works, and we shall here give a demonstration with the view of extending the knowledge of a remarkable theorem of M. Cauchy, which is just such a theoretical victory over the difficulty of finding how many roots in general lie between given limits, as Sturm's theorem is relatively to real roots. We shall assume the extended algebra explained in NEGATIVE, &c.

Take any rectangular axes, and let x and y be the coordinates of a point, and consider the expression $\phi(x+y\sqrt{-1})$ which can be reduced to the form $P+Q\sqrt{-1}$, where P and Q is each a real function of x and y. Let the point move round the contour ABCD in the positive direction of revolution, and let the fraction P : Q be formed for all the points in the contour (or a sufficient number) in succession. Examine every case in which P : Q passes through 0 and changes sign: let it change sign from + to −, k times and from − to +, l times. Next, whenever x and y have such values that $x+y\sqrt{-1}$ is a root of the expression, or $\phi(x+y\sqrt{-1})=0$, let the point whose coordinates are x and y be called a radical point of the expression. The theorem to be proved is as follows: the number of radical points which lie *within* the contour ABCD is $\frac{1}{2}(k-l)$, neither more nor fewer. It must be understood that the contour is so taken that no radical point lies *upon* it.



Take any point P within the contour, and round it draw an infinitely small contour, round which a point is to be first carried. Four cases arise: neither P nor Q vanishes within nor on this contour; P vanishes, but not Q; Q vanishes, but not P; or both vanish.

If neither P nor Q vanish, there is never change of sign in either (for being integral functions, they cannot become infinite for any finite values of x and y), and the theorem is true for the infinitely small contour; for k and l are both $=0$, and there is no radical point.

If P alone vanish, the curve $P=0$ (remember that P is a function of x and y) passes through* the contour two or some other even number of times. The fraction P : Q *may* vanish and change sign as often as the curve passes through the infinitely small contour: but there must be as many changes from + to − as from − to +. For suppose P to be positive at the commencement of the revolution; it is therefore positive at the end. Write down the sign + twice, and between it write any signs whatever, as

$$+--++-+-+;$$

it will always be found that +− and −+ occur equal numbers of times. Hence the theorem is true in this case; for $k=l$, and there is no radical point.

If Q alone vanish, the curve $Q=0$ passes through the point, and everything is as in the last, except that P : Q always becomes infinite when it changes sign. Hence the theorem is true; for k and l are each $=0$, and there is no radical point.

Lastly, let there be a radical point within, but not on, the infinitely small contour: which may be supposed to contain not more than one distinct radical point. Let Z be the radius vector drawn from the origin to the point of the contour whose co-ordinates are x and y; so that, using the extended algebra, $Z = x + y\sqrt{-1}$. Again, let μ and ν be the co-ordinates of the radical point, and A its radius vector; so that $A = \mu + \nu\sqrt{-1}$. Let R be the radius drawn from the radical point to the contour, so that $Z = A + R$, R being infinitely small. By hypothesis $\mu + \nu\sqrt{-1}$ is a root of $\phi z = 0$; let there be m equal roots belonging to the radical point (m being 1, or some other integer): then will $\phi(A + R)$ be capable of expansion into the form $BR^m + B_1R^{m+1} +$, &c., of which, R being infinitely small, only the first term need be considered. Now let B and R (taking the most general forms) be $b(\cos\beta + \sin\beta \, . \sqrt{-1})$ and $r(\cos\rho + \sin\rho\sqrt{-1})$, whence BR^m will be

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* This formula should be committed to memory, and quadratic equations always solved by it. Nothing is more amusing than the vitality of the old method of completing the square and extracting the root in every particular case. No doubt a student should have some training in this last-mentioned process: but his ultimate method should be that of remembering, once for all, the formula in the text.

* Prevent the curve $P=0$ from touching the contour by enlarging the latter a little if necessary.

$$br^m\left\{\cos(m\rho+\beta) + \sin(m\rho+\beta) \, . \sqrt{-1}\right\},$$

and P : Q will be $\cot(m\rho+\beta)$, its remaining terms being infinitely small. Let R make a complete circuit, or let ρ increase from 0 to 2π, whence $m\rho + \beta$ will go m times through four right angles. In each revolution $\cot(m\rho+\beta)$ will change from + to − twice, passing through nothing: but never from − to + except by passing through infinity. The theorem is then true: for $k = 2m$, $l = 0$, $\frac{1}{2}(k - l) = m$, and there are m radical points (or one radical point belonging to m equal roots) within the contour.

The theorem is then true for every infinitely small contour. Next, let the whole contour ABCD be divided into an infinite number of infinitely small figures, with no other limitation than that no radical point is to fall upon one of the lines of division. Let a point move round each of the infinitely small figures in the positive direction of revolution. It is clear that the expression $\frac{1}{2}(\Sigma k - \Sigma l)$ will not be altered if we remove all the internal division lines and leave only the external contour ABCD: for each internal line is described by two points moving in opposite directions, and wherever one point adds a unit to Σk, the other adds one to Σl. Hence the value of $\Sigma k - \Sigma l$ can be found by finding that of $k - l$ for the boundary only: and the theorem is proved.

If $\phi Z = AZ^n + A_1Z^{n-1} + \ldots$, and if we make the contour in question a circle with the origin as a centre, and a radius so great that the highest term AZ^n need be the only one retained, we can immediately prove that ϕZ has neither more nor less than n roots. For, Z being $z(\cos\zeta + \sin\zeta\sqrt{-1})$ and A being $a(\cos\alpha + \sin\alpha \, . \sqrt{-1})$, we find as before that P : Q, or all of it that need be considered, is $\cot(n\zeta + \alpha)$, whence $k = 2n$, $l = 0$, and $\frac{1}{2}(k - l) = n$.

4. We may now refer to STURM'S THEOREM, to Fourier's theorem (given in the article just cited), to Des Cartes' theorem, a very limited particular case of Fourier's, and to Horner's adaptation of, and addition to, the old method of numerical solution by Vieta (an account of the history of this last problem is given in the 'Companion to the Almanac' for 1839). We have then, since the beginning of this century, a complete theoretical mode of determining the number of roots, real or imaginary, between any given limits; both exceedingly difficult in the complication of the operations which they require. Also, a mode of easy application, though not theoretically perfect, of determining the limits between which the real roots lie; and a process for the numerical solution which places that question upon the same footing as the common extraction of square, cube, &c. roots; making those extractions themselves, except only in the case of the square root, much easier than before.

5. The Newtonian method of approximation is in the following theorem. If a be nearly a root of $\phi x = 0$, and if $\phi a : \phi' a$ be small, then

$$a - \frac{\phi a}{\phi' a}$$

is more nearly a root. See APPROXIMATION for the use of this, and TAYLOR'S THEOREM, p. 129, for a more extensive result. But the use of Horner's method is very much more easy than that of Newton: the former, in fact, includes and systematizes the latter. But this remark applies only to algebraical equations: for all others Newton's form just given remains practically unamended.

6. We refer to the article ROOT for the solution of $x \pm 1 = 0$. The following equation, $x^{2n} \pm 2\cos\theta \, . \, x^n + 1 = 0$, admits of complete solution on the same principles.

7. If ϕa and ϕb have different signs, one or some other odd number of roots of ϕx lies between a and b: but if they have the same signs, either no one or an even number of roots lies between a and b. Every equation of an odd degree has at least one real root, negative or positive, according as the first and last terms have like or unlike signs. Every equation of an even degree having the first and last terms of unlike signs has at least two real roots, one positive and one negative.

8. If all the coefficients of ϕx be real, and one of the two, $a \pm b\sqrt{-1}$, be a root, so is the other: and if all the coefficients be rational, and one of the two, $a \pm \sqrt{b}$, a and b being rational, be a root, so is the other. If there be a rational fractional root, its denominator must be a divisor of the first coefficient, and its numerator of the last, as soon as the equation $\phi x = 0$ is cleared of fractions. N.B. Among the divisors of a number we reckon 1 and itself.

9. In the equation $a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_{n-1} x + a_n = 0$, the sum of all the roots is $-a_1 : a_0$, the sum of the products of every two is $a_2 : a_0$, that of the products of every three is $-a_3 : a_0$, and so on. Finally, the product of all the roots is $\pm a_n : a_0$, according as n is even or odd. And if $r_1, r_2, \ldots r_n$ be the roots, then $a_0 x^n + \ldots$ is the same as $a_0(x - r_1)(x - r_2) \ldots (x - r_n)$.

10. If the preceding expression be called ϕx, and $na_0 x^{n-1} + (n-1)a_1 x^{n-2} + \ldots$, its derived function, be called $\phi' x$, we have

$$\frac{\phi' x}{\phi x} = \frac{1}{x - r_1} + \frac{1}{x - r_2} + \ldots + \frac{1}{x - r_n};$$

and if ψx be any rational and integral algebraical function of x, the sum $\psi r_1 + \psi r_2 + \ldots + \psi r_n$ is the coefficient of the highest power of x in the remainder of the division of $\phi' x \times \psi x$ by ϕx.

11. If S_n in all cases stand for the sum of the nth powers of the roots of the equation, we have

$$S_0 = n, \; a_0 S_1 + a_1 = 0, \; a_0 S_2 + a_1 S_1 + 2a_2 = 0$$
$$a_0 S_3 + a_1 S_2 + a_2 S_1 + 3a_3 = 0,$$

and so on up to

$$a_0 S_n + a_1 S_{n-1} + a_2 S_{n-2} + \ldots + na_n = 0$$

after which, in all cases,

$$a_0 S_{n+k} + a_1 S_{n+k-1} + \ldots + a_n S_k = 0.$$

Hence also the coefficients of the expression may be found in terms of $S_1 \, S_2 \ldots S_n$, as soon as a_0 is given.

12. All rational symmetrical functions of the roots may be easily expressed in terms of S_1 S_2, &c., and thence in terms of the coefficients of the expression.

13. If it be required to find a function ψy the roots of which shall be given functions of those of ϕx, so that in all cases $y = Fx$, proceed as in finding the highest common divisor of ϕx and $Fx - y$, and take for ψy the final remainder. But if this final remainder should be of a higher dimension than, from the known number of its roots, it ought to be, it will be a sign that some of the factors introduced in the process have affected the remainder, and these must be examined and removed. The treatment of this case belongs to the general question of elimination, but the following particular cases are almost all that are necessary.

14. To decrease all the roots of ϕx by a given quantity, or to make $y = x - a$, or $x = y + a$, observe that the resulting equation must be

$$\phi a + \phi' a . \, y + \frac{\phi'' a}{2} \cdot y^2 + \ldots + \frac{\phi^{(n)} a}{2.3\ldots n} \, y^n = 0;$$

where the coefficients ϕa, $\phi' a$, $\frac{1}{2}\phi'' a$, &c. may be most readily found by the process described in INVOLUTION (p. 7). The same process may be applied, by using $-a$ instead of a, to increase all the roots of ϕx by a given quantity. It is by this process that the second term of an equation is taken away: thus, the equation being $a_0 x^n + a_1 x^{n-1} + \ldots = 0$, assume

$$y = x + \frac{1}{n} \, \frac{a_1}{a}$$

the sum of the roots of the equation in x being $-a_1 : a_0$, that of the equation in y will be 0.

15. To multiply all the roots of an equation by m, multiply its successive terms, beginning from the highest, by 1, m, m^2, m^3, &c. And to divide all the roots of an equation by m, multiply all the terms by the same, beginning from the lowest. N.B. Terms apparently missing in an equation must never be neglected. Thus $x^7-2x^4+3x-1=0$ ought to be written

$$x^7+0x^6+0x^5-2x^4+0x^3+0x^2+3x-1=0.$$

This caution is of the utmost importance: in fact no process ought to be applied to any equation without a moment's thought as to whether all the terms are formally written down, and if not, whether the process about to be applied will not require it.

16. To change the signs of all the roots of an equation, change the signs of the coefficients of all the odd powers, or of all the even powers, as most convenient.

17. To change an equation into another whose roots shall be reciprocals of the former roots, for every power of x write its complement to the highest dimension. Thus in an equation of the seventh degree, for x^0 write x^7, for x write x^6, for x^2 write x^5, and so on; lastly, for x^7 write x^0. N.B. Consider the independent term of the equation as affected by x^0. From the reciprocal equation can be found the sums of the negative powers of the roots of the original.

18. The old methods of finding limits to the magnitude of the positive and negative roots of an equation are so rapid that they can hardly be said to be superseded by those of Sturm or Fourier. In enunciating them we speak of coefficients absolutely, without their signs, when mentioning any increase or decrease they are to receive.

If A be the greatest of all the quotients made by dividing the co-efficients by the first co-efficient, no root, positive or negative, is numerically so great as A+1. And if B be the greatest of all the quotients made by dividing the co-efficients by the last co-efficient, no root, positive or negative, is numerically so small as 1 : (B+1). Better thus: if L be the first co-efficient, M the greatest, and N the last, signs not considered, then all the roots, numerically speaking, lie between

$$\frac{\mathrm{M}+\mathrm{L}}{\mathrm{L}} \text{ and } \frac{\mathrm{N}}{\mathrm{M}+\mathrm{N}}$$

19. If L be the first co-efficient, and M the greatest co-efficient which has a different sign from that of L, no positive root is so great as (M+L) : L. And if L be the last co-efficient and M the greatest which has a different sign, no positive root is so small as L : (M+L). And to apply this to the negative roots, change the signs of all the roots of the original (§ 16), and find limits to the positive roots of the new one.

20. If L be the first co-efficient, M the *greatest* which has a different sign, and if the *first* which has a different sign be in the mth place from the first term exclusive, or belong to the $(m+1)$th term; then no positive root is so great as

$$1+\sqrt[m]{\left(\frac{\mathrm{M}}{\mathrm{L}}\right)}$$

21. If each co-efficient which differs in sign from the first term, be divided by the sum of all which precede and agree with the first term (the first term itself included), the greatest resulting fraction, increased by unity, is greater than any positive root of the equation.

22. Newton's method of finding a limit greater than the greatest positive root of any equation now merges in Fourier's theorem. It consists in finding a by inspection and trial, so that ϕa, $\phi' a$, $\phi'' a$, &c. shall all be positive.

23. Any mode of ascertaining a limit greater than the greatest positive root of an equation may be thus treated. Apply it to the reciprocal equation (§ 17), and the reciprocal of the result attained is less than the least positive root of the original. Apply both to the equation of roots with signs changed, and the results give limits for the negative roots of the original.

24. A celebrated mode of examining the roots of equations, but too complicated for ordinary use, consists in forming the equation whose roots are the squares of the differences of the roots of the original. Any quantity being found less than the least positive root of this new equation, its square root is less than the difference of any two roots of the original. If such a quantity could be readily found, the theoretical imperfection of Fourier's theorem would be greatly diminished, and, practically speaking, much advantage would be gained in numerical solution. What is wanted to add to both Fourier's and Horner's method, is a ready mode of finding out when two roots are nearly equal.

25. Lagrange's mode of approximation is as follows:—Having found that a root of an equation lies between the integers a and $a+1$, diminish all the roots of that equation by a, and take the reciprocal equation to the result. Find a root of the last lying between the integers b and $b+1$, diminish all the roots by b, and take the reciprocal equation of the result. Find a root of this last between c and $c+1$, and proceed in the same way. Then the continued fraction

$$\frac{1}{a+}\,\frac{1}{b+}\,\frac{1}{c+}\ \text{\&c.}$$

is a root of the original.

26. When an equation has equal roots, those roots can be found by an equation depending entirely on the different sets of equal roots. If ϕx have m roots equal to a, $\phi' x$ has $m-1$ of them, $\phi'' x$ has $m-2$ of them, and so on; finally, $\phi^{(m-1)} x$ has one of them. If then ϕx and $\phi' x$ be found to have a common measure, every root of that common measure enters in ϕx one time more than in the common measure itself.

27. When an equation has an integer root, which must be one of the divisors of the last co-efficient, it may be discovered by successive trial, as follows:—Suppose $a_0x^4+a_1x^3+a_2x^2+a_3x+a_4=0$, a_0, &c. being integers. Let k be a divisor of a_4, and let $a_4 : k=l$, an integer. Then if k be a root, we have $a_0k^3+a_1k^2+a_2k+a_3+l=0$, and a_3+l is divisible by k, giving m, an integer. Hence $a_0k^2+a_1k+a\ +m=0$, and a_2+m divided by k gives an integer, say n. Hence $a_0k+a_1+n=0$, and a_1+n divided by k gives $-a_0$. If all these conditions be fulfilled, k is a root. All the divisors of a_4 being tried in this manner, settle the question of the integer roots entirely.

28. If the co-efficients of an equation read backwards and forwards the same, both in sign and magnitude, every root has its reciprocal also among the roots. By reducing it to the form

$$p+q\left(x+\frac{1}{x}\right)+r\left(x^2+\frac{1}{x^2}\right)+\dots=0$$

which can always be done by division, when the dimension is even, and assuming $y=x+x^{-1}$, an equation of the $2n$th degree can be reduced to one of the nth and n quadratics. But when the dimension is odd, either -1 or $+1$ must be a root, and the equation can be depressed to an even degree by division by $x+1$ or $x-1$.

The student who is acquainted with the preceding results, namely, such as are either stated or referred to in this article, will find no difficulty either in reading on the history of this subject, or in its application. It is peculiarly a subject on which selection should be made for the beginner.

THERA (θήρα), an island in the Grecian Archipelago, and the chief of the group known by the name of Sporades, although called by some antient writers one of the Cyclades. Its modern name is Santa Thira, which is pronounced and usually written Santorini. It is said by Strabo (x. 484, Casaub.) to be 200 stadia in circumference, but by modern travellers thirty-six miles, and in figure exactly like a horse-shoe. It is opposite the Cretan island of Dia, and distant from Crete 700 stadia, and from the island of Ios, which lay to the north of it, 25 Roman miles. (Pliny, *Hist. Nat.*, iv. 23.) When it first emerged from the sea, it is said to have been called Calliste: Therasia, a small island to the west, and called at present by the same name, was torn away from it, according to Pliny. Volcanic action seems at one time to have been actively at work in this part of the sea. Strabo (i. 57) says, that on one occasion flames burst forth from the sea between Thera and Therasia, which lasted for four days, and that an island was formed in consequence, twelve stadia in circumference. The same phenomenon has also taken place in modern times, and is particularly described by J. Thévenot in his 'Travels in the Levant' (part i.) Pliny also speaks of an island which arose between Thera and Therasia, to which he gives the names of Hiera and Automate, and of another which appeared in his own age, called Thia. The former is now called Aspronisi, or 'the white island;' the latter Kaimeni, or 'the burnt.'

Thera was originally inhabited by the Phœnicians, who are said to have been left there by Cadmus. It was subsequently colonized by Theras with a mixed colony of Minyans and Spartans (Herod., iv. 147, 148), and always remained faithful to its mother-city Sparta. This island and Melos were the only islands of the Cyclades that remained faithful to Sparta at the beginning of the Peloponnesian war. (Thucyd., ii. 9.) But Thera has acquired its chief importance from having founded the colony of Cyrene in Africa, under the guidance of Battus, in B.C. 631. (Herod. iv. 150, &c.)

The Doric dialect was spoken at Thera, as we learn from inscriptions, and the government was in the hands of the descendants of Minyans and Spartans, who first settled there. We find mention in inscriptions of a senate and a popular assembly.

Coins of Thera are extant belonging both to the time of its independence and that of the Roman empire. Those of the former kind bear the letters ΘΗ, with the head of a youth on one side and three dolphins on the other.

In the present day the island is covered with pumice-stone; and though the soil is dry and barren, it produces a large quantity of cotton and wine. The wine is strong, and is exported to all parts of the Archipelago. There is no wood in the island; and as it has to be imported, and is dear, the inhabitants hardly ever have new bread, but eat biscuits, composed of wheat and barley, which they make only three or four times a year. They have hardly any cattle, and very little fruit except grapes, and there is only one spring in the island. It contains a few castles, surrounded by some houses; but the majority of the inhabitants live underground in caves cut out of the pumice-stone, which are arched over with very light stones of a reddish colour. The island has a very desolate appearance, the coast being craggy and rugged, and the rocks burnt and scorched. It has only one harbour, in the shape of a half-moon; but no ship can anchor in it, as no bottom has yet been found by the plumb-line.

In the beginning of the eighteenth century, when Tournefort visited the island, there were 10,000 inhabitants, and two bishops, one of the Greek and the other of the Latin church. About two-thirds of the inhabitants belonged to the Greek church. (Tournefort, *Voyage into the Levant*, vol. i., p. 202, &c.)

THERA'MENES (Θηραμένης) was a native of Ceos, and the adopted son of Hagnon, or Agnon, an Athenian. He acted a very prominent part about the close and after the end of the Peloponnesian war. He first appears in the history of Greece as taking a part in public affairs in B.C. 409, when, in conjunction with Antiphon, Phrynichus, and Pisander, he endeavoured to upset the democratical constitution of Athens. In B.C. 410 he took part with Thrasybulus in the battle of Cyzicus, and, in B.C. 406, in the celebrated battle of Arginusae. On this occasion, on which the Athenians gained a glorious victory, many lives were lost in the wrecks of their ships, which it was thought might have been saved if proper care had been taken. Theramenes and Thrasybulus had been commissioned by the Athenian generals to take care of the wrecks and to save the men, but they were prevented by a storm from accomplishing this object. The generals in their despatch to Athens concealed the commission they had given to Theramenes and his colleague, as it was clear that the latter would be severely punished for their apparent neglect. After the first report, the generals themselves were summoned to return to Athens, and in self-defence they were compelled to give an accurate account of the occurrence, and the more so as they had reason to believe that Theramenes and Thrasybulus were instigating the people against them. That their suspicion was not unfounded became evident afterwards, for when six of the generals were actually brought to trial, Theramenes was base enough to appear foremost among their accusers. The generals defended themselves; and the late hour of the day rendering it impossible to take the votes of the assembly, the business was adjourned to another day. During the interval, Theramenes and the other enemies of the generals exerted themselves to excite the indignation of the people. On the day appointed for the next meeting a number of persons hired by Theramenes appeared in the assembly dressed in mourning, to rouse the sympathies of the people for the loss of their friends and exasperate them against the alleged authors of their misfortune. After various debates eight of the generals were condemned to death, and six of them, who were present at Athens, were executed immediately. The blame of this act of cruelty falls mainly upon Theramenes, who 'had taken advantage of the uncommon forbearance and candour of his victims, and of his own reputation, which had never before been stained by any atrocious crime, to effect their destruction.'

Soon after the execution of the generals, the eyes of the Athenians were opened, it is said, by Thrasybulus, to their innocence, and it was decided that those who had misled the people should be proceeded against, and that they should give security for their appearance at the trial. Theramenes, however, either by his skill or by accident, not only avoided the prosecution, but retained his place in the popular favour. In the following year (B.C. 405), shortly after the battle of Aegos Potami, when an Athenian embassy had been rejected by the Spartan ephors, Theramenes, who, though he belonged to the oligarchical party, yet kept up the appearance of a friend of the people, offered to go as ambassador to Lysander, who was blockading the city, while famine was raging within. Theramenes promised to procure favourable terms, if the people would trust him. The majority readily acceded to his proposal, and he went to the camp of Lysander. Here he stayed for upwards of three months, hoping that in the meantime the city would be reduced to such a state of weakness as to accept any terms, or that in the interval the oligarchical party would gain the ascendency. There is moreover no doubt that he made Lysander acquainted with the plans of the oligarchs. When he returned to the city, he declared that he had been detained by Lysander, who himself had no power to decide upon the terms of peace with Athens, and that at last he had been directed by the Lacedaemonian general to apply to the government at Sparta. He was accordingly sent thither with nine colleagues, and invested with full power to negotiate peace on any terms. Deputies of the Spartan allies met the ambassadors, and several of them insisted upon the total destruction of Athens; but the Spartans, with an air of generosity, declared themselves willing to grant peace on condition that the long walls and the fortifications of Piraeeus should be demolished, that all ships of war with the exception of twelve should be delivered up to them, and that Athens should join the Peloponnesian confederacy, and follow Sparta both by land and sea. (Xenophon, *Hellen.*, ii. 2.) When Theramenes and his colleagues returned to Athens with these tidings, the famine had reached its height, but there were still some who refused to submit to the humiliating conditions. Theramenes and his party, anxious to get rid of these few before the report was laid before the assembly, gained over a man of the name of Agoratus to bring accusations against them and get them all arrested. The plan succeeded, and the assembly was held in the theatre of Piraeeus, where Theramenes urged the necessity of concluding peace on the terms proposed. Notwithstanding the opposition of some citizens to the treaty, and the taunts of others, who saw through the plans of Theramenes, peace was ratified, and Lysander entered Piraeeus. [LYSANDER.]

After the withdrawal of the Spartan general from Athens, Theramenes, Critias, and their associates, who had assumed the supreme power, wishing to upset the democratical constitution, but to maintain some appearance of decency, invited Lysander to attend the assembly in which alterations in the Attic constitution were to be discussed. Theramenes undertook the management of the business, and proposed that the supreme authority should for the present be placed in thirty persons who should draw up a new code of laws. The presence of Lysander and the neighbourhood of the Peloponnesian troops overwhelmed all attempts of the friends of the people to maintain their constitution, and the proposal of Theramenes was adopted. Theramenes himself was one of the Thirty, and he nominated ten of the others. The outrages and atrocities committed by these Thirty spread general alarm in Attica, and the future was looked to with fearful apprehensions. Theramenes, perceiving the state of feeling at Athens, remonstrated with Critias, the most cruel among his colleagues. This was not from a feeling of humanity, but simply because he saw that the measures of the Thirty would ruin them. Critias was unconcerned about all consequences, and Theramenes gave way. Repeated warnings on his part created some fear lest he should betray them and join the popular party, for he was notorious for his political inconstancy, from which he is said to have received the nickname of Cothurnus (the shoe which fits either foot). At the same time the Thirty became sensible of their dangerous position, and in order to strengthen themselves they made out a list of 3000 Athenians on whom a kind of franchise was conferred, while all the remaining Athenians were treated as outlaws. Theramenes again was dissatisfied with these proceedings, but the tyrants insisted upon disarming the Athenians, with the exception of the three thousand and the knights. The reckless cruelty and avarice of the Thirty grew worse every day, and it was determined that each of them should select out one rich alien who was to be put to death, and whose property should be taken by his murderer. Theramenes refused to have any share in this crime. This refusal increased the fears of his colleagues, and excited their hatred against him, and they resolved to get rid of him before he could become a dangerous enemy. An accusation was brought against him in the name of the Thirty by Critias before the council. He was charged with being hostile to the existing government, and with betraying its interests. Theramenes defended himself, and made such an impression upon the council, that it appeared willing to acquit him. Critias perceiving this, called into the council-chamber an armed band of his followers, whom he had kept in readiness outside, and conversed for a few moments with his colleagues. Hereupon he declared that with the consent of his friends he erased Theramenes from the list of the Thirty and of the three thousand, and that he might now be condemned to death without trial. Theramenes rushed to the Hestia (the altar of Vesta), and conjured the members of the council to protect him, and not to allow Critias to dispose of the lives of citizens; but the herald of the Thirty called in the Eleven (the executioners), who apprehended Theramenes and led him away to punishment. The council was struck with amazement at this bold movement, and Theramenes was hurried across the Agora by Satyrus and the Eleven to prison. When he had drunk the poison which was administered to him, he dashed the cup with the last few drops to the ground, and said, 'This is to the health of my dear Critias.' This happened in B.C. 404.

The manner in which Theramenes died has been admired by antient and modern writers. But his fortitude was not based on the consciousness of a virtuous life, and he no more deserves admiration than a criminal to whom death is a matter of indifference. Thucydides (viii. 68) says of him that he was not wanting in eloquence and ability. Whether he wrote any orations is uncertain. (Cicero, *De Orat.*, ii. 22; *Brut.*, 7.) He is said to have instructed Isocrates (Dionysius Hal., *Isocrat.*, i.), and to have written on rhetoric. It may be true therefore, as Suidas says, that he wrote declamations; but it is much more probable that Suidas confounds him with a late sophist, Theramenes of Ceos. (Eudocia, 231; Fabricius, *Biblioth. Graec.*, ii. 748; Ruhnken, *Hist. Crit. Orat. Graec.*, p. 40, &c.)

(Xenophon, *Hellen.*, ii. 3; Plutarch, *Nicias*, 2; Scholiast on Aristoph. *Nub.*, 360; *Ranae*, 47, 546; Diodorus Sic., xiii. 38, &c.; Thirlwall, *History of Greece*, vol. iv.; E. Ph. Hinrichs, *De Theramenis, Critiae, et Thrasybuli Rebus et Ingenio*, Hamburg, 1820, 4to.)

THERAPEUTICS constitute that department of medical science which relates to the composition, the application, and the modes of operation of the remedies for diseases. Its chief objects are the materia medica, or medicines properly so called [MATERIA MEDICA]; but it includes as subordinate parts hygiene and dietetics, of which the particular purpose is the application of diet and atmospheric and other ordinary non-medical influences, to the preservation or recovery of health.

THERESIENSTADT (*Maria-Theresienstadt*, *Maria-Theresianopel*, *Szent Maria Szabatka*, *Szuboticza*) is a very large town in the county of Bacs, in Hungary, 24 miles from Szegedin, in a plain called Telecska, on the high road to Semlin, in 46° 6′ N. lat., and 19° 40′ E. long. After the battle of Mohacs in 1526, the Turks built a fort on the place where the town now stands. The Turks being totally defeated at Zenta, in 1696, by Prince Eugene, the place was, by the emperor's order, surrounded with fourteen redoubts, and the defence of the frontiers towards Turkey confided to the inhabitants. In 1743, as a recompense for eminent military services, it was made a free market-town or borough, by the name of Szent-Maria, with many privileges; and the population continually increasing by the immigration of Roman Catholics and schismatic Greeks from Dalmatia and Bosnia, and this borough having distinguished itself by its loyalty to the empress (queen) Maria Theresa, it was raised to the rank of a free city the 22nd of January, 1779.

Next to Pesth and Debreczin Theresienstadt is the largest town in Hungary; yet it is not properly a town, but rather an assemblage of villages. It is new and clean, but built without any regularity, and so scattered that many houses might be erected in the vacant sandy spots in the streets. Pirch says it is a good quarter of an hour's walk from one end of the market-place to the other: but, though new and clean, it has a melancholy, desolate appearance. There are a few considerable buildings, viz. the principal parish church of St. Theresa, the Franciscan church, and the handsome Greek church, the Gymnasium, the town-house, and the barracks. The town possesses a more extensive territory than any other town in the kingdom, the area being 556, or, as some say, 756 English square miles in extent. (Stein makes it only 340 square miles.) The whole population does not exceed 40,000, of whom 35,000 are in the town; so that the territory is very thinly peopled, there being only three villages in it. The southern part of the territory produces wheat, barley, oats, and maize; the northern part is sandy, but trees of various kinds have been planted under the direction of a competent person. The breeding of cattle is very flourishing, and numerous herds and flocks, and studs of horses, constitute the riches of the inhabitants, who carry on a brisk trade in wool, cattle, horses, sheep, and raw hides. There are no manufactories, but the people work at their own houses, chiefly for the supply of the town itself. Many follow the business of weavers or tanners, and the women make linen and carpets. They are peculiarly skilful in the art of dyeing: they extract from a large weed or herb, the name of which is not known, the red, green, and black dyes for the worsted of which their carpets are made.

(Thiele, *Das Königreich Ungarn*; Blumenbach, *Die Oesterreichische Monarchie*: *Die Oesterreichische National Encyclopädie*; Jenny, *Handbuch*.)

THERI'ACA (Θηριακά) was the name given originally by the antients to all those medicines which were intended as antidotes to the bite of venomous animals (*θήρια*), as those which counteracted poisonous drugs were called ἀλεξιφάρμακα (Galen, *Comment. in Hippocr.* 'De Alim.,' lib. iii., cap. 7, tom. xv., p. 279, ed. Kühn; id., *Comment. in Hippocr.* 'De Morb. Vulgar. VI.,' lib. vi., cap. 5, tom. xvii., pt. ii., p. 337); afterwards however the word seems to have been somewhat restricted in its signification, or at least θηριακή (in the singular number) is applied to one particular compound, while at the same time this one drug was considered to be a safeguard not only against the bites of venomous animals, but also against poisonous drugs and unwholesome food. (Galen, *De Antid.*, lib. i., c. 1, tom. xiv., p. 1.) Many of these old preparations are preserved in the writings of the antient physicians, out of these it will be enough to mention here the two most famous, viz. the *Mithridatium* (Μιθριδάτειον, or Ἀντίδοτος Μιθριδάτειος), and the *Theriaca Andromachi*.

The Mithridatium received its name from the great Mithridates, king of Pontus, who had a strange affectation of superior skill in the powers of simples. He tried the effects of these upon condemned malefactors, and, finding that different drugs counteracted different poisons, he thought that, by putting all of them together, he should be able to make a compound that would render him secure against any poison that could be given him. (Galen, *De Antid.*, p. 2.) Accordingly he is commonly said to have so fortified his own body by the constant use of this antidote, that he afterwards tried in vain to put an end to his life; but this, if true, 'was probably,' as Dr. Heberden says (*Antither.*, p. 10), 'less owing to the strength of his antidote than to the weakness of his poison.' However, Pompey seems to have been possessed with the vulgar opinion; and, after he had conquered this king, he took uncommon care to secure his writings, in hopes of some mighty treasures of natural knowledge. He was soon convinced of what he might easily have foreseen; and is represented as laughing at the disappointment of his own credulity, when, instead of those great arcana, he only found one or two trifling receipts:

> 'Antidotus vero multis Mithridatica fertur
> Consociata modis: sed Magnus, scrinia regis
> Quum raperet victor, vilem deprendit in illis
> Synthesin, et vulgata satis medicamina risit;
> Bis denum rutae folium, salis et breve granum,
> Juglandesque duas, totidem cum corpore ficus:
> Haec oriente die parco conspersa Lyaeo
> Sumebat, metuens dederat quae pocula mater.'
> (Seren. Samon., *De Medic.*, cap. *de Venen. Prohib.*)

Soon after, however, there was published at Rome a most pompous medicine under the name of Mithridates, which was pretended to have been found among his papers: its principal virtue was made to consist in its being a most powerful preservative from all kinds of venom; and whoever took a proper quantity of it in a morning was insured against being poisoned during that whole day. (Galen, *De Antid.*, p. 3.) By these representations it gained so great a reputation that some of the Roman emperors prepared it for themselves with their own hands: several physicians among the antients employed their studies upon it in order to render it more perfect; and it has been the subject of many volumes among the moderns, as well as the occasion of many unaccountable medicines made in emulation of it. But, notwithstanding the supposed improvements of the antients, the original Mithridatium continued for a long time to be prepared according to a receipt of Servilius Damocrates, written in a short Greek iambic poem, which is preserved by Galen (*De Antid.*, lib. ii., cap. ii., tom. xiv., p. 115, sq.), and which has been published, together with his other poems, Greek and Latin, Bonnae, 1833, 4to., edited by C. F. Harless.

Andromachus the Elder (who was physician to the emperor Nero, and the first person who is known to have received the title of *Archiater*) made considerable alterations in the Mithridatium by omitting some of the ingredients, adding others (especially the dried flesh of vipers), and by increasing the proportion of opium. His receipt was embodied in a Greek elegiac poem, in order that it might be the more easily preserved without alteration; and this has been inserted by Galen in two of his works (*De Antid.*, lib. i., cap. vi., et *De Ther. ad Pison.*, c. 6), and has been frequently published in a separate form. Andromachus likewise changed the name of the Mithridatium thus reformed to γαλήνη; but in Trajan's time it obtained that of 'Theriaca,' either from the vipers in it, or from its good effects in curing the bites of venomous animals. (Galen, *De Antid.*, lib. i., cap. 6; *De Ther. ad Pison.*, cap. 5, tom. xiv., pp, 32, 232.) The reputation enjoyed by this drug was immense, and surpassed even that of the Mithridatium. The emperor Marcus Aurelius Antoninus was in the habit of taking a small quantity out of honey every morning, and was imitated in this practice by many of his courtiers (Galen, *De Antid.*, lib. i., cap. 4, p. 24); but at last, finding that it made him drowsy and lethargic, he left out the juice of the poppy. (Id., *ibid.*, cap. i., p. 4.) From that time to the present it has more or less maintained its credit, though upon no principle of combination can this heterogeneous farrago be vindicated; and though it has scarcely ever continued the same for a hundred years together. Celsus is the first who describes this medicine (*De Medic.*, lib. v., cap. 23); and according to him it consists of thirty-eight simples. Before Nero's time, five of these were struck out, and twenty others added. Soon after, Andromachus, leaving out six ingredients, and adding twenty-eight, increased the sum total to seventy-five. Aëtius, in the fifth century after Christ (*Tetrab.*, iv., Serm. i., cap. 87, sq., p. 648, ed. H. Steph.), and Nicolaus Myrepsus, in the twelfth (*De Compos. Medicam.*, sec. xxii., cap. i., p. 639, ed. H. Steph.), give us very different descriptions of it; and since that time it has been in a state of perpetual fluctuation, the alterations that it has undergone by accident being as great as those which have been designedly made in it. For of the simples that antiently composed it, several are utterly unknown; others are only guessed at with great uncertainty, and some very erroneously, as might easily be shown, and were so even in Pliny's time (*Hist. Nat.*, lib. xxiv., cap. 1). In the Pharmacopœia of the London College of Physicians both the Mithridatium and the Theriaca Andromachi retained their places certainly as late as the year 1771; and the edition of 1788 is the earliest in which the writer has found it to be omitted. Its rejection was proposed by the late Dr. Heberden (who wrote a little work on the subject, entitled ''Αντιθηριακά: an Essay on Mithridatium and Theriaca,' 1745, 8vo., pp. 19); and upon the College dividing on the question, there were found to be *thirteen* votes for retaining and *fourteen* for rejecting it. (Dr. Paris's *Pharmacologia*, vol. i., p. 49, 6th edit.) In the 'Codex Medicamentarius, sive Pharmacopœia Gallica,' published at Paris, 4to., 1818, this preparation appeared under the appropriate title of 'Electuarium Opiatum Polypharmacum.' It consisted of seventy-two ingredients, which were arranged under thirteen heads, viz.: 1, *Acria*, of which there were five species; 2, *Amara*, of which there were eight; 3, *Saporis Styptici*, vulgo *Astringentia*, five in number; 4, *Aromatica Exotica*, fourteen; 5, *Aromatica Indigena*, ten; 6, *Aromatica ex Umbelliferis*, seven; 7, *Resinosa et Balsama*, eight; 8, *Graveolentia*, six; 9, *Virosa*, 'seu quae Narcosin inducunt,' of which there was only one species, viz. Opium Thebaicum; 10, *Terrea insipida et inertia*, consisting also of only one species, viz. Terra Lemnia; 11, *Gummosa, Amylacea, &c.*, four in number; 12, *Dulcia*, consisting of Succus Glycyrrhizae and Mel Narbonense; and, 13, Vinum, or Sherry. An analysis of two ounces of this compound, by M. Guilbert, is given, pp. 324, 325, note; and we are told that one drachm of it contains rather less than one grain of opium. In the last edition of the 'Codex, Pharmacopée Française,' published at Paris, 4to., 1837, under the authority of a *commission de rédaction*, of which M. Orfila was the president, the medicine still appears, and under its old name *Theriaca:* and this, notwithstanding the many improvements that have been introduced, and the number of similar compounds that have been expelled. (Préface, pp. xvi., xvii.) The composition appears to be very nearly if not exactly the same as in the previous edition, but the ingredients are not divided into heads as before. In some parts of Europe the mode of preparing this drug was reckoned among the mysteries of the state, which it was forbidden to divulge: and for some centuries that which came from Venice was particularly valued.

For further information see Heberden's *Antitheriaca* (from which work great part of these observations are taken); Paris's *Pharmacologia;* and also Barth. à Maranta, *De Theriaca et Mithridatio Libri Duo*, &c., Francof., 1576, 12mo.; Nic. Stelliola, *Theriace et Mithridatia*, Neap., 1577, 4to.; Jo. Bapt. Sylvaticus, *De Compositione et Usu Theriacae Andromachi*, Heidelb., 1597, 8vo.; Anton. Berthiolus, *Idea Theriacae et Mithridatii*, Venet., 1601, 4to.; El. Bonvinius, *De Theriaca liber ex Andromachi Senioris Mente*, Vratislav., 1610, 8vo.; J. Assuerus Ampzing, *De Morborum Differentiis, et de Theriaca Senioris Andromachi*, Rostock, 1623, 8vo.; Angel. Bolzetta, *Theriaca Andromachi Senioris*, &c., Patav., 1626, 4to.; Charas, *Traité de la Thériaque*, Paris, 1668, 12mo., quoted by Choulant, *Handbuch der Bücherkunde für die Aeltere Medicin.*

THERIS'TICUS, Wagler's name for a genus of birds. Tantalus, Gm.

THERMÆ. [Baths; Roman Architecture.]

THERMO-ELECTRICITY is a name given to the fluid excited by heat in conducting substances, as wires or bars of metal, generally of different kinds, when they are placed in close contact with each other, end to end, and disposed so as to form a periphery or continuous circuit. Since the effects of heat applied to the ends, or junctions, of the bars are made manifest by a magnetized and balanced needle deviating from its usual position in consequence of the application, thermo-electricity is considered as a branch of electro-magnetism; and it may be said to be connected with the electricity which is excited by heat in tourmaline, boracite, and some other minerals. The discovery of the principle was made in 1822, by Dr. Seebeck of Berlin, while engaged in researches concerning electro-magnetism, which but two years before had been discovered by Professor Oersted of Copenhagen; and the name was given to the fluid by the latter philosopher in order to distinguish it from that which is produced by the usual galvanic apparatus, which he proposed to call hydro-electricity.

Some of the most simple experiments by which the effects of thermo-electricity may be illustrated are those which, soon after the discovery, were made by Professor Moll of Utrecht. (*Edinburgh Philosophical Journal*, No. xvii.) A slip of copper bent in the form of a semicircle was attached (in close contact), at its extremities, to the ends of a bar of antimony about fifteen inches long; and the bar being laid in the direction of the magnetic meridian with the wire above it, a small compass needle was suspended, or supported on a pivot between them. On heating the northern extremity of the bar by the flame of a lamp, the north end of the needle was observed to deviate towards the west. Again, when a slip of zinc and one of copper were bent so that, on the extremities being applied together, there was formed a parallelogram having the junctions of the slips in the middle of the shorter sides, and a compass needle was suspended within the circuit, on placing the apparatus in a plane coinciding with the magnetic meridian, with the longer sides parallel to the horizon (the copper slip being uppermost) and heating the northern point of junction, the needle deviated towards the west: the apparatus being inverted so that the zinc slip was uppermost, on heating the northern junction as before, the needle deviated towards the east. It follows from these experiments that the fluid current, if such it be, which affects the magnetism of the needle, circulates about the copper slip in such a manner that when the latter is in a horizontal position its direction is from west to east, passing above the slip, in a plane perpendicular to its length: this effect is similar to that which takes place, though in a contrary direction, when a magnetized needle is brought near a conducting wire joining the poles of an ordinary galvanic apparatus; for if the conducting wire be placed in a horizontal position in the direction of the magnetic meridian, with the copper, or the negative end of the apparatus towards the north, and the needle be below the wire, the north end of the needle deviates towards the east; if above the wire, towards the west.

Effects similar to those which result from the application of heat take place when one extremity of the bar of antimony, or one of the junctions of the zinc and copper, is made colder than the other by means of ice.

When both ends of the bar were heated, no deviation was produced in the needle; and after deviation had taken place by heating one end only of the bar, in proportion as the heat tended to a uniform diffusion, the needle gradually returned to the direction of the magnetic meridian.

Thermo-electric circuits may be formed in a ring consisting of two curved bars of different metals, as bismuth and copper, each being in the form of a semicircle, and the two being attached together in the direction of a diameter; or they may be produced in a rectangle made by placing in close contact four bars of metal, of two different kinds, following one another alternately. M. Oersted formed a hexagonal circuit with six pieces, three of bismuth and three of antimony, which were disposed in alternate order: on heating, by means of a spirit-lamp, one of the places of junction in the ring, or in the rectangle of four pieces, a compass-needle placed within or below the plane of circuit was found to deviate; and it deviated still more when the opposite angles of the rectangle were heated. In the experiment with the hexagonal circuit the deviation was greater in proportion to the number of alternate joints which were heated. Similar effects were produced when the alternate joints were artificially cooled; but the deviation was the greatest when the alternate joints were heated and the others were cooled.

By doubling the lengths of the bars in a rectangle composed of four, the deviation was less than that which was produced by the smaller rectangle; but when the larger rectangle was composed of eight pieces, the deviation was greater.

In this country the subject of thermo-electricity has been diligently pursued by Professor Cumming of Cambridge, who appears to have entered upon it without any other knowledge of the discovery of Seebeck than the simple fact that electro-magnetical action was produced by heating one end of a bar of antimony, to the extremities of which were made fast those of a brass wire; and the details of his researches are contained in a memoir which is published in the 'Cambridge Philosophical Transactions' for 1823. From these it appears that all perfect conductors of electricity, on being heated or cooled in any part, exhibit in general magnetical phenomena; but the intensity of the action, which is indicated by the amount of the deviations produced in a magnetized needle, is not the same in all substances, and with some the direction of the current is contrary to that which is produced in others. When a single bar, of symmetrical form, is heated in the middle, it produces no effect on the needle, probably because the opposing currents counteract each other; and in a ring formed of two metals, when heated at one of the points of junction, the fluid seems to pass from one metal to the other; so that one loses positive electricity, or becomes negative, while the other becomes positive.

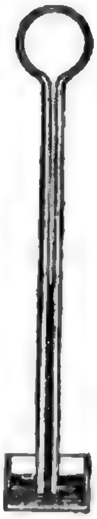
Professor Cumming having ascertained from experiments on bars of bismuth, which were made alternately hot and cold, and were placed in contact with each other (each pair of the hot and cold parts, and also the two extremities of the whole compound bar, being connected together by wires), that the action of the whole bar on a needle was greater than that of any two portions, one hot and the other cold, was led to the discovery that electro-magnetism may be exhibited by the mere juxtaposition of an indefinite number of small plates. He was also enabled to determine the thermo-electric relations of different metals by merely placing in contact with each other a small portion of each of the two kinds of metal to be examined, and touching first one of them, and then the other, with one end of a silver or copper wire which was connected with the heated bar. When the metals were bismuth and antimony, the former, on being touched, caused the compass-needle to deviate so as to indicate positive electricity, and the latter so as to indicate negative electricity; and in the memoir above quoted there is given a useful table of the electrical relations of metals in several different combinations. In the same memoir there is also an account of several curious anomalies which were observed in the magnetic action: one of these is, that when iron wire is used to touch the metals examined, of which one is iron, the needle deviates a certain number of degrees in the positive direction; then, as the heat of the wire is increased, the deviation in that direction gradually diminishes till it becomes zero; after which the deviation takes place in a negative direction, and it becomes a maximum in this direction when the wire acquires a red heat.

If two parallel bars of bismuth are connected at one extremity of each by a bar of antimony, so as to form three sides of a square, and the opposite extremities of the bars of bismuth are connected with the two extremities of the bent wire forming an electro-magnetic multiplier [ELECTRO-MAGNETISM, p. 342, vol. ii.], the needle of the multiplier deviates very little; but when those ends of the bars are connected by means of a fourth bar, the effect on the needle is considerable. Now the effect of the galvanic or hydro-electrical current, when produced by silver and zinc, with common water as a conductor, is very small; and hence it is inferred that the thermo-electrical current gives rise to a large quantity of that which is the cause of the magnetic action, the power being however in a low state of intensity.

THERMO'METER (from the Greek words *θερμός*, *hot*, and *μέτρον*, *a measure*) is an instrument by which the temperatures of bodies are ascertained. It consists of a glass tube with a capillary bore containing in general alcohol or mercury, which expanding or contracting by variations in the temperature of the atmosphere, or on the instrument being immersed in the liquid or gas which is to be examined, the state of the atmosphere, liquid, or gas, with respect to caloric is indicated by a scale which is either applied to the tube or engraven on its exterior surface.

The end proposed by a thermometer is the measurement of the temperature of any body with relation to the temperature of some other substance, as of water at the point of freezing: but the measure so obtained must not be understood to express the absolute quantity or density of caloric in any body, it being well known that different substances, though exhibiting the same apparent temperature, contain very different quantities of caloric according to their *capacities* for that element.

The thermometer must have been in use in the beginning of the seventeenth century, but it is not known, precisely, to whom the honour of the invention is due. A physician of Padua named Santorio, and Cornelius Drebbel of Alkmaar in Holland, are the persons to one of whom that honour is, with most probability, ascribed, and the former, in his 'Commentaries on Avicenna' (1626), actually claims it for himself: it may however have happened with this, as with other scientific discoveries, that the idea of the instrument occurred to two persons or more at the same time.


Original Air-Thermometer.

The first thermometers were intended to indicate variations in the temperature of the atmosphere merely; and the most simple of them consisted of a hollow glass-ball at one extremity of a long tube which was open at the opposite extremity: the air within the ball and tube being rarefied by the heat of a lamp, and the tube being in a vertical position, the open end was plunged into a vessel containing a coloured spirit; the pressure of the atmosphere on this spirit caused it to ascend in the tube till the expansive force of the air in the ball and the upper part of the tube became equal to the pressure. In this state, an increase of the temperature of the atmosphere caused the air in the ball to expand and press down the spirit in the tube; on the other hand a diminution of temperature, by causing that air to contract, allowed the external pressure to raise the spirit. A scale was adapted to the tube in order to express the degree of temperature by the number of the graduation at the upper extremity of the spirit.

An effort was made to render the instrument portable by bending the lower part of the tube upwards and terminating this branch also with a ball; and a small aperture was made in the latter in order that the external air might have access to the lower surface of the spirit. Mr. Boyle subsequently modified the air-thermometer by making the tube quite straight and open at both ends: the lower end was immersed in a small glass vessel containing both air and coloured spirit, and the vessel being formed with a neck which closely encircled the tube, it was hermetically sealed to the latter. The variations in the temperature of the atmosphere caused the air in the vessel to expand or contract, and thus to press with more or less force on the surface of the spirit; the latter was consequently made to ascend or descend in the tube.

The air-thermometer invented by Amontons (1702) consisted of a tube nearly 4 feet long, open at both ends and curved upwards at bottom, where it terminated in a ball: this tube carried a column of mercury about 29½ English inches high, so that the air in the ball was compressed by the weight of two atmospheres. A light body, in which was inserted the lower end of a wire, floated on the upper extremity of the column of mercury in the tube; and near the upper end of the wire was an index by which the number of the graduation on a scale was shown. The variations of the temperature of the air in the ball caused the mercurial column to ascend or descend in the tube; and thus were produced corresponding movements in the index. By this instrument it was proposed to measure high temperatures on a scale whose length was only half of that which was required with the simple air-thermometer.

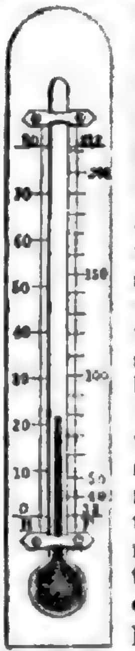
The defects inseparable from all the above thermometers are, that the dilatations of the air are not proportional to the increments of heat, that the length of the column of spirit or mercury varies with the temperature of the atmosphere, also that the air which is in contact with the surface of the spirit in the open vessel, in the first kind of instrument, or with the top of the column of the spirit or mercury, in the others, exerts more or less pressure according to its density; and thus the indications afforded by the thermometer are rendered erroneous, or require corrections which it is difficult to apply. The air-thermometer proposed by Dubuat, and of which the following is a brief description, possesses some advantages above those which have been mentioned; but not being portable, it has never been employed.

It consists of a column of mercury in a tube, like that of a barometer, hermetically sealed at the upper end, and bent below so as to form a short branch inclined at about 40° to the straight part of the tube; this branch terminating with a hollow ball. The mercury occupies the straight part of the tube to the height of about 29½ inches above the bend; and at this bend it terminates without entering into the ball, which, by the construction, is a little above the bend. The part of the tube which is above the column of mercury is free from air, and when the bend is plunged in boiling water the tube is to be in a slightly inclined position, so that a vertical line may pass through the two extremities of the mercurial column: then, upon the ball becoming cool, and the elasticity of the air in it being diminished, the weight of the mercury will cause it to descend in the long branch and rise in the other. The mercury is to be prevented from entering the ball by making the tube decline farther from the vertical position, so that the lower extremity of the mercury may remain in the vertical line before mentioned; and the temperature of the air is to be determined by the height of the top of the column of mercury above a horizontal line passing through the lower extremity, that is, by the cosine of the declination of the tube from the vertical. Since the air in the ball preserves constantly the same volume, the elasticity communicated to it by the caloric in the atmosphere, or by the fluid in which the instrument is plunged, is always in equilibrio with the pressure of the column of mercury, which is the force acting against it, and is proportional to the vertical height of that column.

About the middle of the seventeenth century the members of the Accademia del Cimento caused thermometers to be constructed in which, instead of air, alcohol or spirit of wine was employed. The fluid was introduced, as at present, into a glass tube terminating at bottom in a hollow ball, from which the air had been expelled by heat: the opposite extremity of the tube was then hermetically sealed, and a scale was applied for the purpose of expressing the temperature of the atmosphere, or of the liquid which was to be examined. Alcohol dilates and contracts considerably with the variations of temperature to which it may be subject, though not in so great a degree as air. It is also capable of measuring very low temperatures, but as it is brought to a boiling state sooner than any other liquid, it cannot be employed to ascertain a high degree of heat. Spirit-thermometers were introduced into this country by Mr. Boyle, and they are still used both here and on the Continent.

Sir Isaac Newton, being dissatisfied with the smallness of the range of spirit-thermometers, employed linseed-oil in tubes for the purpose of measuring degrees of heat: this liquid has nearly the same amount of expansibility by increments of caloric as alcohol; and it is capable of bearing very high degrees of heat and cold without either boiling or freezing; but from its viscidity it adheres so much to the interior side of the tube as to render accurate observations quite impossible, and on this account it has not since Newton's time been employed for thermometers.

The thermometer which is now in general use is a slender tube of glass terminating in a ball containing mercury, the air having been expelled and the tube afterwards hermetically sealed. The idea of employing this fluid for the purpose of measuring degrees of heat by its expansion is supposed to have first occurred to Dr. Halley; and the reason why it was not employed by that philosopher appears to have been that the range of its expansion is much less than that of alcohol. According to Boerhaave (*Elementa Chemiæ*, 1732), the honour of having been the first to recommend a mercurial thermometer is to be ascribed to Römer, the discoverer of the motion of light, who is said to have invented it in 1709; but it was not till the year 1724 that such a thermometer was known in this country. In that year an account of a mercurial thermometer which had been invented by Fahrenheit, of Amsterdam, in 1720, was read before the Royal Society, and was published in the 'Philosophical Transactions' (vol. xxxiii.). The advantages of mercury over alcohol and air, as a measure of temperature, are that its expansions are more nearly proportional to the increments of caloric than those which take place in either of the other fluids; it is easily deprived of air, and its power to conduct heat being considerable, the changes of its volume by changes of temperature in the surrounding medium take place more rapidly than those of any other fluid except the gases.



Fahrenheit's Thermometer.

At first the scales for measuring the degrees of heat were arbitrary, and consequently no two thermometers could be compared together: the scale of the Florentine thermometer was determined by marking the place where the top of the spirit column stood in the tube when the latter was immersed in snow, and the place at which it stood at the time of the greatest heats in Florence: the interval between the points was divided into 60 parts. Subsequently in this country, Mr. Boyle and Sir Isaac Newton formed scales for determining the expansion of the spirit or oil by making the space included in each degree of the tube equal to a certain portion of the whole volume: thus, supposing the ball of the thermometer and part of the tube to be divided into ten thousand equal parts, and to be wholly occupied by the oil when the instrument is plunged in melted ice, Sir Isaac found that by the heat of the human body the oil expanded 256 such parts, and by that of boiling water, 725 parts; then, considering the point at which the top of the column stood in the tube, when the latter was placed in ice, as the zero of the scale, he divided the interval between this point and that at which the top of the column stood when the ball of the thermometer was placed under the arm of a man, into 12 parts. Afterwards by proportion he found that the distance from the ice-point to that of boiling water was equal to 34 such parts (*Phil. Trans.*, vol. xxii.): this method, being of difficult execution, was soon abandoned.

The scale which has been in general use in this country since the year 1724, is supposed to have been invented by Fahrenheit. It is quite unknown on what ground he made choice of the fixed points on his scale, or of the number of graduations between them; but it is thought that one of the fixed points was that of boiling water, and that the other, which is the zero of the scale, was that at which the top of the column stood when the instrument was exposed to an intense cold in Iceland, in 1709. The extent of the scale between this last point and that of boiling water is divided into 212 parts, and the point of freezing water is at the thirty-second division from the zero point. See the scale on the right of the tube in the above figure.

M. Réaumur constructed a thermometer in which spirit of wine was employed, and he formed a scale in a manner nearly similar to that which had been put in practice by Sir Isaac Newton. He computed the volume of the glass ball, and graduated the tube so that the space between two divisions was equal to one-thousandth part of that volume: he then found the zero of the scale by marking the place where the top of the column stood when the thermometer was placed in water just freezing; and afterwards, plunging the instrument in boiling water, he observed whether or not the spirit rose exactly eighty divisions. If not, he strengthened or diluted the spirit till it did so; and the point at which the top of the spirit stood became the point of boiling water. Of this instrument an account was published in the 'Mémoires' of the Academy of Sciences for 1730, but the construction has been long since abandoned; for, besides the difficulty of giving a proper degree of strength to the spirit, it is well known that the latter cannot be made to take the temperature of boiling water, so that the determination of the upper point in the scale must be very erroneous. That which is now called Réaumur's thermometer is an improvement on the former, by M. Deluc, who determined the points of freezing and boiling water by experiment, and divided the distance between them into eighty parts, the zero of the scale being at the former point. See the scale on the left of the tube in the above figure.

A third scale, called 'Centigrade,' has been much in use among the philosophers of the Continent within the last fifty years: it was invented by Celsius, a Swede, and it differs from that of Réaumur or Deluc, only in the distance between the points of freezing and boiling-water being divided into 100 parts. The length of each degree in this thermometer, as well as in that of Réaumur, is greater than in the scale of Fahrenheit; and consequently the indications of temperature, when the top of the spirit or mercury is between the lines of division, are rather uncertain, from the difficulty of estimating them accurately by the eye: also, the temperatures required to be determined being often below the point of freezing-water, the employment of negative signs is of more frequent occurrence with these thermometers than with those of Fahrenheit.

The following formulæ will serve to convert any given number of degrees on Fahrenheit's scale into the corresponding number of degrees on Réaumur's and the Centigrade scales, and *vice versâ*.

Let F, R, and C express any corresponding numbers of degrees on the three scales respectively: then—

$$(F-32^\circ)\frac{4}{9}=R,\text{ and }(F-32^\circ)\frac{5}{9}=C:$$

$$\frac{4}{9}R+32=F,\text{ and }\frac{9}{5}C+32=F:$$

$$\text{also, }\frac{4}{5}C=R,\text{ and }\frac{5}{4}R=C.$$

N.B. When F is between zero and 32°, the values of R and C are negative, and express the required number of degrees below zero on Réaumur's and the Centigrade scale. Also, when F, R, or C expresses any given number of degrees below zero on its proper scale, it must be considered as negative.

The scale invented by De l'Isle of St. Petersburg, in 1733, being still occasionally in use, it may be necessary to mention that it is formed by making the space included in each degree equal to one hundred-thousandth part of the whole volume of the mercury: the zero of the scale is at the point of boiling-water, and between this point and that of freezing-water the space is divided into 150 parts.

It may be observed that the situation of the freezing-point on the scales of thermometers can be determined with great accuracy if the ball and part of the tube be immersed in pounded ice; for it is known that water containing ice and snow remains of the same temperature till the ice is entirely dissolved, every accession of caloric to the water being employed in promoting the dissolution. But the point of boiling water is far from being so precisely known, since it varies with the density of the atmosphere at the time of making the determination. Distilled water in an open vessel, and under a given pressure of the atmosphere, boils at an invariable temperature, except as far as the nature of the vessel may make some difference; for if the heat communicated to the water be increased, the only effect produced is that of driving off a greater quantity of steam in a given time: in a vessel exhausted of the air the water will boil at a temperature expressed by 98° or 100° of Fahrenheit's scale, while in a vessel constructed so as to prevent the steam from escaping it will remain in a liquid state at a temperature expressed by above 400°. In order therefore that the temperatures indicated by different instruments may agree together, it is recommended that this point should be found from water boiling in the open air at a time, if possible, when the height of the mercurial column in the barometer is 30 inches, and when the temperature of the air is indicated by 55° of Fahrenheit's scale.

This effect of the pressure of the atmosphere on the boiling of water was noticed by Fahrenheit in 1724, and M. Deluc, in his 'Recherches sur les Modifications de l'Atmosphère,' has investigated a formula for determining the height of the boiling-point above the freezing-point of the scale in terms of the height of the mercury in the barometer; but the English artist Bird was the first who applied a correction on account of the state of the barometer, for the purpose of fixing the point of boiling water on the scales of thermometers.

The Royal Society having, in 1776, appointed a committee to consider the best means of adjusting the fixed points of thermometers, the formula of Deluc was verified and reduced to English measures for the benefit of artists in the event of their being obliged to make the instruments under different states of the atmosphere with respect to density and temperature; and the following are some of the corrections which are given by Sir George Shuckburgh for determining the true place of the boiling-point of water. The first column contains the height of the barometer in inches; and the second, the correction which is to be applied with its proper sign to the number 212 on Fahrenheit's scale, in order to give the correct number of

Inches.	°
26	− 7·09
27	− 5·27
28	− 3·48
29	− 1·72
30	0
31	+ 1·69

degrees at which the water will boil under the pressure expressed by the height of the mercurial column. The committee observe that in trying the heat of liquors, the quicksilver in the tube of the thermometer should be heated to the same degree as that in the ball; or if this cannot be done, a correction should be applied on that account. (*Phil. Trans.*, vol. lxvii.)

Thermometer-tubes should have their bores very slender, and, if possible, perfectly equable in the whole of their length. When there is any inequality in the transverse sections, the best artists make the graduations of the scale vary so that they may correspond to the equal divisions of a cylindrical tube; and in order to ascertain the relative dimensions of the sections, they cause a small quantity of mercury, about an inch in length, to slide along the interior of the tube, measuring its length in different places; then, since the lengths are inversely proportional to the areas of the sections, the variations of the former will immediately show the corresponding variations of the latter. It is usual to give to the bore an oval form with the broader side towards the front, in order that the mercury or spirit may be easily distinguished at a certain distance, as by approaching very near the instrument, the heat of the observer's person may affect the length of the column.

It is of course essential that the extent of the thermometer-scale should be great enough to comprehend all the temperatures at which the substances generally required to be examined exist in a state of fluidity; and this extent may be obtained when mercury is employed. According to the experiments of Mr. Dalton, mercury does not boil till it has acquired a temperature equal to 660° of Fahrenheit's scale; and it does not freeze till it is subject to a degree of cold expressed by 39 divisions below the zero of that scale, or 71° below the freezing-point of water. Pure alcohol, on the other hand, has never been frozen, though it has been exposed to a degree of cold exceeding that which is expressed by 91° below the zero of Fahrenheit; and therefore a spirit-thermometer is to be preferred to one of mercury when it is intended to ascertain the temperature of the air in high northern or southern latitudes: but since the spirit boils in air with a degree of heat expressed by 175° of Fahrenheit, it is unfit for many of the purposes for which a thermometer is required. For instruments capable of measuring very high temperatures, see PYROMETER.

In the construction of a thermometer, the air should be carefully expelled from the tube, and even from the mercury or spirit within it: the variations in the density of the atmosphere cannot of course affect the instrument, since the tube is hermetically sealed. It must be observed however that the indications of temperature are not precisely expressed in terms of the dilatation of the mercury or spirit only, but in terms of the excess of that dilatation above the dilatation of glass. The apparent dilatation of mercury in a glass tube is equal to $\frac{1}{64\cdot8}$ of its volume, between the temperatures of freezing and boiling water; and its true dilatation between the same limits is $\frac{1}{55\cdot5}$ of its volume.

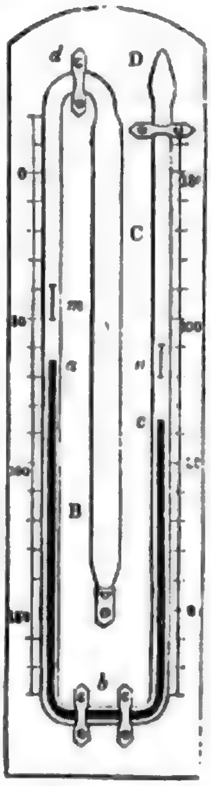
A perfect thermometer would be one in which the expansions of the fluid in the tube were exactly proportional to the increments of heat which it might receive from the substance whose temperature is to be determined; but it cannot be said that any of the fluids which as yet have been employed in the construction of thermometers strictly possess this property. Mercury is the fluid in which it exists in the greatest degree; but from the accurate experiments of Deluc it has been ascertained that, between the points of freezing and boiling-water, the temperature indicated by the mercurial thermometer is lower than the true temperature, the greatest difference, which however is only equal to 1°.4 of Réaumur's scale or 3°.15 Fahrenheit, being in the middle between those two points on the scale. From the same experiments it is also found that when thermometers are regulated so as to agree at the points of freezing and boiling water, whether the liquid be oil, spirit, or water, the indications are always below those of mercury; the difference being the greatest at the middle between those points. With oil of olives the difference is 1° of Réaumur's scale (2°.25 Fahr.); with highly rectified alcohol, 4°.9 Réaumur (11°.02 Fahr.); with half alcohol and half water, 6°.7 Réaumur (15°.07 Fahr.); and with water, 19°.5 Réaumur (43°.87 Fahr.). It must be observed that great irregularities take place in the expansion of all fluids when near their boiling state, and that mercury contracts very suddenly when at the point of its congelation. The deviations of the spirit-thermometer from the true indications of heat are known to be rather greater than those of the mercurial thermometer: it may be added that the alcohol in a thermometer-tube loses, in time, part of its strength; and that in consequence, the degree of expansion by a given increment of heat is not the same as when the instrument was made. The expansion of alcohol for temperatures greater than about 175° Fahr., at which the spirit boils, cannot be ascertained practically, because the spirit at that temperature passes into a state of vapour; and the comparison between the mercurial and the spirit thermometer ought not to be carried higher than that temperature; or the scales for mercury and spirit ought to be regulated so as to agree with one another at the freezing-point of water and at the temperature of 175° Fahrenheit: if this were attended to, the differences between the indications of the mercurial and spirit thermometers, above that point, would be less than they appear to be by the tables of Deluc.

Water, like other substances, suffers a diminution of volume by the abstraction of caloric, but when it is cooled to a temperature between 39° and 40° of Fahrenheit's scale, it seems to have attained the maximum of density; and if the process of cooling be continued, it then increases in volume till it is converted into ice. Therefore if a thermometer were made with water, and the top of the column were at 50° Fahr., it would be impossible to know whether the temperature were 50° or 30°, the expansion being nearly equal at equal distances within ten degrees above and below 40° of the scale. The cause is uncertain, but it is probably owing to a partial crystallization, which may begin to take place in water when at a temperature expressed by about 8 degrees above its freezing-point.

The mercurial and spirit thermometers, regulated as before said, differ very considerably at temperatures below that of freezing water; and at 39° below the zero of Fahrenheit, or 32° below the zero of Réaumur, when the mercury is frozen, the difference has been computed to be about 10° Réaumur (22°.5 Fahr.), by which the spirit stands too low. By observations made during Sir Edward Parry's second voyage, the differences between the indications of the spirit and mercurial thermometers varied from 3°.05 to 8° Fahr. between the temperatures +58° and −30°, the alcohol being always too low.

Register Thermometers.—It is of great importance in meteorology that the observer should be able to ascertain the highest or lowest point of a thermometer scale at which the column of mercury may have stood during his absence; and several contrivances have been adopted by artists in order to obtain this end. Of these, one, which is still preferred, was invented by Mr. Six, whose name the instrument bears, and is described in the 'Philosophical Transactions' for 1782. It consists of a long tube bent so as to form three parallel branches, A, B, and C: the part A is an elongated bulb, and the rest of the tube has a capillary bore. The lower portion, *b*, contains mercury, which rises in B and C to certain points, as *a* and *c*, and the bulb is filled with spirit of wine, which passing over the bend at *d*, descends to the upper extremity of the mercury in B: above *c* the branch C is also filled with spirit to near the upper extremity, which is hermetically sealed.

Two small indices of steel coated with glass, which are represented at *m* and *n*, are introduced in the branches B and C: these are capable of being forced upwards by the rising of the column of mercury in either tube, and they have about them a fine wire or a thread of glass; so that they will remain stationary where they happen to be when the heads *a* and *c* of the columns recede from



Six's Register Thermometer.

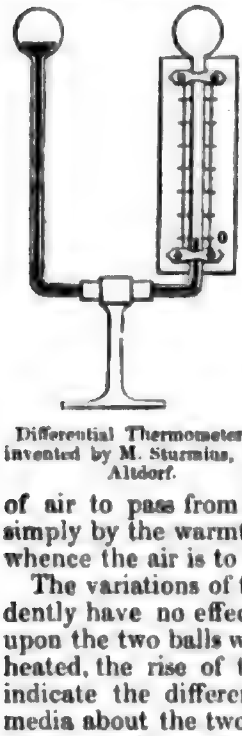
them. Their lower extremities consequently indicate the points at which the ends of the columns may have stood before such recess.

It is evident that the expansion of the spirit in A by increments of heat, will cause that which is in B to press down the column of mercury in that branch and force up the extremity c, moving the index n before it, while by its friction the index m is prevented from descending. On the other hand, the contraction of the spirit in A allows the elasticity of the air in the ball D to force the column in C downwards, the index n remaining at the highest point to which it had been previously raised; the mercury in B then rises up, carrying the index m before it, till an augmentation of temperature causes the spirit in A to expand, and again force the mercury in B downwards.

The graduations on the scale belonging to the branch C are numbered upwards; while the graduations on the scale belonging to B are numbered downwards. The points a and c should always indicate the same degree on the two scales; and by means of a magnet the indices m and n may be brought down to those points: from thence afterwards the former ascends by a decrease, and the latter by an increase of temperature.

An instrument of this kind is generally used for ascertaining the temperature of the ocean at considerable depths, or of the atmosphere at great heights.

Differential Thermometer.—This instrument, which was invented by M. Sturmius, of Altdorf, before the year 1676, and was revived by Professor Leslie in 1804, consists of two thermometer tubes, terminating, at one extremity of each, in a hollow glass ball, and containing coloured sulphuric acid: the opposite extremities are united by the flame of a blow-pipe, and an enlargement of the bore is made at the place of junction. The tube is then bent so as to form three sides of a rectangle, the two balls, which are of equal diameter, forming the upper extremities of two sides; and the instrument is on a stand with the branches of the tube in vertical positions. When the temperature of the air in the two balls is the same, the acid occupies one side and the base, and rises a little way up the other side of the rectangle. To the latter side is attached a graduated scale, with the zero of which the upper extremity of the acid in that branch should coincide. In the event of this adjustment being deranged, it may be restored by causing a small quantity of air to pass from one ball to the other, which is done simply by the warmth of a hand applied to that ball from whence the air is to be driven.



Differential Thermometer, invented by M. Sturmius, of Altdorf.

The variations of temperature in the apartment will evidently have no effect on the instrument, since the action upon the two balls will be equal: but if one ball alone be heated, the rise of the acid in the other will immediately indicate the difference between the temperatures of the media about the two balls by the excess of the expansion of the air in one ball above the expansion in the other. The delicacy of the instrument is such that the least difference of temperature is immediately made sensible by the movement of the acid.

Radiating Thermometer, or Actinometer.—For the purpose of measuring the intensity of solar or terrestrial radiation, an instrument, called an Actinometer, has been used. It consists of a hollow cylinder of glass, which is united at one end to a thermometer-tube, the latter being terminated at the upper extremity by a ball, which is drawn out to a point, and broken off so as to leave a very small orifice: this is stopped up with wax, which is to be removed when the instrument is to be cleaned. The other end of the cylinder is closed by a silver cap furnished with a screw of the same metal, which turns tightly in a collar of waxed leather. The cylinder is filled with a deep blue liquid, and is enclosed in a box, which is blackened on three sides interiorly, and has a thick glass in front. The use of the screw is to diminish or increase the capacity of the cylinder if necessary, driving a portion of liquid into the ball, or withdrawing some from thence so as just to fill the cylinder and the whole stem of the thermometer with the liquid in an unbroken column. When the instrument is to be used, it is placed in a horizontal position with the glass face of the box upwards.

In making the observations, the instrument is disposed so that the sun may shine directly upon its face, when the liquid will mount rapidly in the thermometer stem: it should be allowed to do so for three or four minutes, after which, by turning the screw, the extremity of the liquid must be brought to the zero of the scale. At ten seconds before a complete minute is indicated by the watch, the sun shining on the instrument, the observer begins to follow with his eye the top of the rising column of spirit, and, counting by his ear the beats of the watch, when the sixtieth second has beat, he registers in a book the number of the graduation corresponding to the top of the column; then, waiting till the watch is at ten seconds before the next minute, the observer follows the rising column as before, and, counting the beats by his ear, at the end of the minute he registers separately the height of the column of liquid. The instrument being then drawn into the shade, or covered with a screen, a pair of observations, at the interval of one minute, are made and registered as before, the liquid descending in the tube between the last two observations. The instrument is again placed so that the sun may shine on it, and afterwards in the shade, when two other pairs of observations are made, and so on.

A mean of the two differences between the readings at two nearest observations while the sun shone on the instrument, added to the difference between the readings at the intermediate observations while the instrument was in the shade, is taken as a measure of the intensity of the sun's radiation at the middle time between the first and third observations; and a mean of such results for all the triplets of observations is considered as the general mean.

An approximation to the measure of solar radiation may be obtained by simply exposing a register thermometer with a blackened ball to the direct action of the sun's rays. [Radiation.] The thermometer should be placed a few inches above the ground, and be screened from currents of air; and the graduations should be made on the stem of the thermometer, in order to avoid the errors arising from the expansion or warping of the scale.

The force of terrestrial radiation may be measured by the minimum temperature of a register thermometer, whose ball is placed in the focus of a parabolical mirror: the face of the mirror is to be turned towards the face of the sky, but away from the rays of the sun.

THERMOMETER, DIFFERENTIAL. [Thermometer.]

THERMO'PYLÆ. [Zeitoun, Gulf of.]

THERMOSTAT, or *heat-governor*, an apparatus invented and patented in 1831 by Dr. Ure, for regulating temperature in the processes of vaporization and distillation, in heating baths and hothouses, in adjusting the draft of stoves and furnaces, in ventilating apartments, &c. It acts upon the principle that, when two thin metallic bars, of different degrees of expansibility, are riveted or soldered together side by side, any change of temperature will cause a sensible flexure in the compound bar; the side consisting of the least extensible metal becoming concave, and the other convex. By this flexure of the compound bar, which takes place with considerable force, a movement is effected, which, by the intervention of levers, may be made to open or close stop-cocks, dampers, ventilators, or any description of valves, and thereby to regulate the flow of heated liquids or the admission and emission of air. The compound bars frequently consist of thin pieces of steel and hard hammered brass, riveted together; but various other metals may be employed, and in some cases wood may be used for one part of the bar. The principle of the thermostat may be applied in many different ways, of which the following may serve as examples. In *Fig.* 1, a is the compound bar, which is firmly fixed at b, and, when exposed to the ordinary temperature of the atmosphere, remains in the straight horizontal position shown in the cut. To the other, or free end of the compound bar, is attached, by means of a connecting rod, the short end of a lever mounted upon the axis of a circular revolving valve, or ventilator, c; and from the longer end of the lever is suspended a sliding valve, or damper, d. By increasing the temperature of the chamber or vessel in which the thermostat is placed, the compound bar will assume the curved form indicated by the dotted lines, by which means the position of the lever will be altered, the valve *c* will be turned on its axis, and the damper will be raised. *Fig*. 2 shows another arrangement, in which two compound bars, *a*, *a*, fixed at *b*, are made to open and close a valve *c*, in a pipe through which air, water, or any other fluid is passed. By increasing the temperature of the apparatus, the upper or moveable ends of the bars would recede from each other, and, consequently, alter the position of the valve. A similar contrivance may be placed in a chimney, to modify the position of a damper-plate moving upon its axis, and thereby to regulate the draft. The application of such an arrangement of compound bars to the admission of water to a water-bath is described in the article DISTILLATION, vol. ix., p. 26. *Fig*. 3 shows the principal part of a thermostatic apparatus in which three pairs of compound bars, *a*, *a*, *a*, are used to give motion to a sliding-rod *d*, *d*, with which any kind of valve may be connected by a rack and pinion, a chain and pulley, or otherwise. *b*, *b*, in this figure, is a straight guide-rod, which is fixed at one end by a screw-nut *c*; a milled head being added for the purpose of adjusting the apparatus, so that it may act at any required temperature. The thermostatic bars, in this as well as the previous cases, are nearly or quite straight when cold, and become more or less curved by the action of heat; but in some modifications of the thermostat the bars are always curved, and the action of the apparatus depends upon the increase or decrease of the ordinary flexure. *Fig*. 4, for example, represents a thermostatic hoop, *a*, *a*, which may be immersed horizontally beneath the surface of the water-bath of a still. The hoop is fixed at *b*, and to its free ends are attached short links *c*, *c*, which impart longitudinal motion to the rod *d*. *e* is a lever-handle moved by the sliding-rod, and turning a valve on its axis *f*. The outer end of this lever carries an index, which moves against a graduated scale. *g* is a screw-nut, moveable upon the sliding-rod, to adjust the apparatus before graduating the scale or arc traversed by the index. Some other forms of the apparatus are given in Dr. Ure's 'Dictionary of Arts,' &c., pp. 1237-1239; and on p. 643 of the same work is described a contrivance in which the same natural principle is differently applied.

Fig. 1.

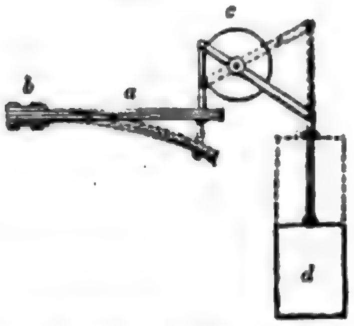


Fig. 2.

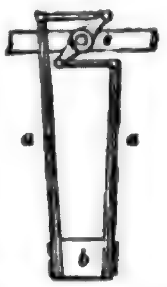


Fig. 3.

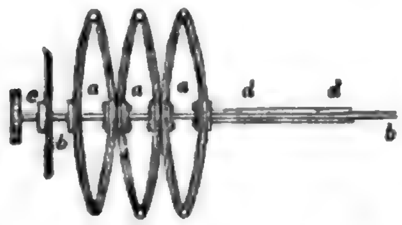
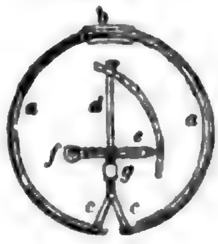


Fig. 4.



THEROUENNE. [PAS DE CALAIS.]

THESEIUM (Θησεῖον), the temple of Theseus at Athens, was situate in the north-west part of the city, at no great distance from the gate which led to Eleusis, and immediately above the gymnasium of Ptolemy. It was built in honour of Theseus, soon after his bones had been brought from Scyros to Athens by Cimon, B.C. 469. (Plutarch, *Theseus*, 36; *Cimon*, 8; Diod. Sic., iv. 62.) It possessed an inviolable asylum, where runaway slaves in particular were accustomed to take refuge, and was equalled in sanctity only by the Parthenon and Eleusinium. (Plutarch, *De Exsilio*, p. 607 A; Hesychius, and *Etymolog. Mag.*, under Θησεῖον.) Its sacred enclosure was so large as to serve sometimes as a place of military assembly. (Thucyd., vi. 61.)

The temple of Theseus is in a state of greater preservation than almost any of the antient monuments of Athens, and is used in the present day as a Christian church, dedicated to St. George. It is built entirely of Pentelic marble, and stands upon an artificial foundation formed of large quadrangular blocks of limestone. Its architecture is of the Doric order. It is a peripteral hexastyle, or surrounded by columns, having six in each front. There are thirteen columns on each side, including those at the angles, which are also reckoned among the six belonging to each front, so that the whole number surrounding the temple is thirty-four. It consists of a cella forty feet long, having a pronaos to the east and a posticum to the west. The pronaos and the portico are together thirty-three feet in depth, and the posticum with its portico twenty-seven feet. The breadth of the temple is forty-five feet. The columns are three feet four inches in diameter at the base, and rather more than eighteen feet and a half high, with an intercolumniation of five feet four inches. The height of the temple from the summit of the pediment to the base of the columns is about thirty-one feet. The platform upon which it is built, and which consists of only two steps, is about two feet four inches in height.

The eastern front of the temple was the principal one. This is shown not only by the greater depth of the pronaos, but still more decisively by the sculpture. In the eastern pediment only are there any traces in the marble of metallic fastenings for statues; and the ten metopes of the eastern front, with the four adjoining ones on each side, are exclusively decorated with sculpture, all the others on both sides and on the western front being plain. The only other parts of the temple adorned with sculpture are the friezes over the entrance of the pronaos and the posticum. In the British Museum there are casts of the greater portion of these friezes, and also of three of the metopes from the northern side, being the first, second, and fourth, commencing from the north-east angle. They were made at Athens, by the direction of the earl of Elgin, from the sculptures which then existed upon the temple, where they still remain. The marbles have been greatly injured since the time when Pars made the drawings for Stuart, but enough remains to show that they belong to the highest style of Grecian art: they are almost equal, and, by some, considered even superior, to those of the Parthenon. The relief is bold and salient, approaching to the proportions of the entire statue, the figures in some instances appearing to be only slightly attached to the table of the marble. It appears that all the sculptures were painted, as was the case in many other Grecian temples. Col. Leake says that vestiges of brazen and golden-coloured arms, of a blue sky, and of blue, green, and red drapery, are still very apparent.

The subjects of the sculptures are the exploits of Theseus, and those of his friend and companion Hercules. The metopes in front of the temple relate to the labours of Hercules, and those on the two sides to those of Theseus. On the frieze of the posticum is represented the combat of the Centaurs and the Lapithæ, in which Theseus was engaged; but the subject of the frieze of the pronaos is very doubtful, owing to the mutilated condition of the sculptures. Stuart supposes that it represents part of the battle of Marathon, and especially the phantom of Theseus rushing upon the Persians. Col. Leake thinks it probable that the pannel over the pronaos relates to the exploits of Hercules, in the same way as the other frieze relates to those of Theseus; and he supposes it to represent the battle of the giants, who are said to have been subdued chiefly through the exploits of Hercules. Müller (*Denkmäler der alten Kunst*, p. 11) conceives it to represent the contest of Theseus against the Pallantidæ, who wished to destroy him when he was acknowledged by Ægeus as his successor. Mr. Hawkins (*Description of Antient Marbles in the British Museum*, part ix.) however is of opinion that not one action alone is intended to be represented, but three or four achievements are here recorded, the subjects being separated from one another by groups of seated divinities.

The interior of the temple originally contained three paintings on the walls by Micon, which Pausanias saw and describes (i. 17, § 2). One represented the battle of the Athenians with the Amazons, the second that of the Centaurs and the Lapithæ, and the third an action of Theseus in Crete. The stucco upon which these paintings were executed is still apparent, and shows that each painting covered the whole wall from the roof to two feet nine inches short of the pavement.

There was also a sanctuary of Theseus in the Peiræeus, as appears from an inscription. (Böckh, *Corp. Inscr.*, No. 103.)

(Stuart's *Athens*, vol. iii.; Leake's *Topography of Athens; Description of Antient Marbles in the British Museum*, part ix.; Forchhammer, *Topographie von Athen*, Kiel, 1841.)

THESEUS (Θησεύς), the great national hero of Athens, is said to have been born at Trœzen, where his father Ægeus, king of Athens, slept one night with Æthra, the daughter of Pittheus, king of the place. Ægeus, on his departure, hid his sword and shoes under a large stone, and charged Æthra, if she brought forth a son, to send him to Athens with these tokens, as soon as he was able to roll away the stone. She brought forth a son, to whom she gave the name of Theseus, and when he was grown up, informed him of his origin and told him to take up the tokens and sail to Athens, for the roads were infested by robbers and monsters. But Theseus, who was desirous of emulating the glory of Hercules, refused to go by sea, and after destroying various monsters who had been the terror of the country, arrived in safety at Athens. Here he was joyfully recognised by Ægeus, but with difficulty escaped destruction from Medea and the Pallantids, the sons and grandsons of Pallas, the brother of Ægeus. These dangers however he finally surmounted, and slew the Pallantids in battle.

His next exploit was the destruction of the great Marathonian bull, which ravaged the neighbouring country; and shortly after he resolved to deliver the Athenians from the tribute that they were obliged to pay to Minos, king of Crete. Every ninth year the Athenians had to send seven young men and as many virgins to Crete to be devoured by the Minotaur in the Labyrinth. Theseus volunteered to go as one of the victims, and through the assistance of Ariadne, the daughter of Minos, who became enamoured of him, he slew the Minotaur and escaped from the Labyrinth. He then sailed away with Ariadne, whom he deserted in the island of Dia or Naxos, an event which frequently forms the subject of antient works of art. The sails of the ship in which Theseus left Athens were black, but he promised his father, if he returned in safety, to hoist white sails. This however he neglected to do, and Ægeus seeing the ship draw near with black sails, supposed that his son had perished, and threw himself from a rock.

Theseus now ascended the throne of Athens. But his adventures were by no means concluded. He marched into the country of the Amazons, who dwelt on the Thermodon, according to some accounts in the company of Hercules, and carried away their queen Antiope. The Amazons in revenge invaded Attica, and were with difficulty defeated by the Athenians. This battle was one of the most favourite subjects of the antient artists, and is commemorated in several works of art that are still extant. Theseus also took part in the Argonautic expedition and the Calydonian hunt. He assisted his friend Pirithous and the Lapithæ in their contest with the Centaurs, and also accompanied the former in his descent to the lower world to carry off Proserpine, the wife of Pluto. When Theseus was fifty years old, according to tradition, he carried off Helen, the daughter of Leda, who was then only nine years of age. But his territory was invaded in consequence by Castor and Pollux, the brothers of Leda; his own people rose against him; and at last, finding his affairs desperate, he withdrew to the island of Scyros, and there perished either by a fall from the cliffs or through the treachery of Lycomedes, the king of the island. For a long time his memory was forgotten by the Athenians, but he was subsequently honoured by them as the greatest of their heroes. At the battle of Marathon they thought they saw him armed and bearing down upon the barbarians; and after the conclusion of the Persian war, his bones were discovered at Scyros by Cimon, who conveyed them to Athens, where they were received with great pomp, and deposited in a temple built to his honour. [THESEIUM.] A festival also was instituted, which was celebrated on the eighth day of every month, but more especially on the eighth of Pyanepsion.

The above is a brief account of the legends prevailing respecting Theseus. But he is moreover represented by antient writers as the founder of the Attic commonwealth, and even of its democratical institutions. It would be waste of time to inquire whether there was an historical personage of this name who actually introduced the political changes ascribed to him: it will be convenient to adhere to the antient account in describing them as the work of Theseus.

Before his time Attica contained many independent townships, which were only nominally united. Theseus incorporated the people into one state, removed the principal courts for the administration of justice to Athens, and greatly enlarged the city, which had hitherto covered little more than the rock which afterwards formed the citadel. To cement their union he instituted several festivals, and especially changed the Athenæa into the Panathenæa, or the festival of all the Atticans. He encouraged the nobles to reside at Athens, and surrendered a part of his kingly prerogatives to them, for which reason he is perhaps represented as the founder of the Athenian democracy, although the government which he established was, and continued to be long after him, strictly aristocratical. For he divided the people into the tribes or classes of Eupatridæ, Geomori, and Demiurgi, of whom the first were nobles, the second agriculturists, the third artisans. All the offices of state and those connected with religion were exclusively in the hands of the first class. Each tribe was divided, either in his time or shortly afterwards, into three phratriæ, and each phratria into thirty gentes (γένη). The members of the separate phratriæ and gentes had religious rites and festivals peculiar to themselves, which were preserved long after these communities had lost their political importance by the democratical changes of Cleisthenes. [CLEISTHENES.]

(Plutarch's *Life of Theseus*; Meursius, *Theseus, sive de ejus Vitâ Rebusque Gestis Liber Postumus*, Ultraject., 1684, where all the authorities are quoted; Thirlwall's *History of Greece*, vol. ii., p. 8, &c.)

THESMOPHO'RIA (Θεσμοφόρια), a festival with mysteries in honour of Demeter (Ceres), to whom all the institutions of civilized life, especially of civil and religious laws, were attributed. The festival of the Thesmophoria especially referred to this part of the character of the goddess, as is clear from several of the ceremonies observed at its celebration, and from the surname of the goddess, 'Thesmophoros,' from which the festival derived its name. It was celebrated in various towns in Greece, and in the Greek colonies, as Sparta, Thebes, Eretria, Ephesus, Syracuse, Agrigentum, and others. But the place where it was held with the greatest solemnity, and where the particulars of its celebration are best known, was Athens. It was introduced at Athens, according to some writers, by Orpheus, and according to Herodotus (ii. 171) by the daughters of Danaus from Egypt. Its celebration was confined to women, especially married women. It commenced every year on the 11th of Pyanepsion, and lasted according to some writers for four, and according to others for five days. The discrepancy in this case, as well as in that of other Greek and Roman festivals, seems to have arisen from the circumstance that the real festival was in many instances preceded by one or more days devoted to preparations and purifications, and that some writers reckoned these days as belonging to the festival. Now that the Thesmophoria were preceded by such preparatory days is expressly stated, and during these days the Athenian women underwent various kinds of purifications. Wellauer, in his little work cited below, has rendered it more than probable that the festival itself did not last more than three days.

Previous to its celebration the women of each demos elected from among themselves two matrons to conduct the solemnities, whose husbands, provided they had received a dowry of not less than three talents, had to pay the expenses of the festival as a liturgy. (Isaeus, *De Cironis Heredit.*, p. 208.) The first day of the festival was called ἄνοδος or κάθοδος, that is, the procession, because the women went from Athens to Eleusis in a procession in which they carried on their heads certain laws (θεσμοί) written either in books or upon tablets. During the night between the first and second day the women solemnized their mysteries at Eleusis. The second day, called νηστεία, or 'the Fast,' was a day of mourning, on which the women were not allowed to take any other food than cakes of sesame and honey, and the greater part of it they spent sitting in mournful attitudes on the ground around the statue of the goddess. Meursius and others think that the procession to the Thesmophorion (the temple of Demeter Thesmophoros) at Athens, which is alluded to by Aristophanes (*Thesmophor.*, 276, &c.), and in which the women walked behind a waggon laden with baskets containing mystic symbols, took place in the afternoon of this day, the whole of which was a sacred day at Athens, on which neither the senate nor the people were allowed to hold their usual meetings. The third day was called *καλλιγένεια*, a surname of Demeter, by which she was invoked on this occasion. (Aristoph., *Thesmophor.*, 296, with the Scholiast.) On this day the women made up for the day of mourning, and indulged in various kinds of merriment in imitation of Iambe, who was believed to have created a smile on the face of the goddess during her grief. Hesychius mentions a sacrifice called Zemia (*ζημία*) in connection with the Thesmophoria, which was offered to propitiate the goddess for any neglect or fault that might have been committed during the celebration of her festival; but whether this sacrifice was offered at the close of the third day or after the festival, cannot be decided.

(Meursius, *Graecia Feriata*, s. v. θεσμοφόρια; *Dictionary of Greek and Roman Antiq.*, s. v. *Thesmophoria*; Wellauer, *De Thesmophoriis*, Breslau, 1820, 8vo.)

THESPE'SIA (from *θεσπέσιος*), the name of a genus of plants belonging to the natural order Malvaceæ. The species are trees with large entire leaves. The calyx is truncate, and girded by a 3-leaved deciduous involucel; the fruit is a capsule with 5 cells, each cell is semi-parted, with 4 seeds at the base.

T. populnea, Poplar Thespesia, has roundish, cordate, pointed, 5-7-veined leaves, with dot-like scales beneath, with the peduncles equal in length to the petioles. This plant is a native of the East Indies, Guinea, and the Society Islands; and is known, where it grows amongst British colonists, as the umbrella-tree. It attains a height of about 40 feet, and has large yellow flowers with a dark red centre. In the tropics it has gained for itself a sacred regard, and is planted about monasteries and convents; hence the name Thespesia (divine). There are two species natives of South America: they are all trees, with handsome, showy flowers. In their cultivation they will thrive well in a mixture of loam and sand, and cuttings will strike freely in sand or mould under a hand-glass in a hot-bed. (Don's *Miller*, vol. i.)

THESPIS (Θέσπις), a native of Icaria in Attica, who lived in the time of Solon and Pisistratus, about 535 B.C. The antient traditions unanimously represent him as the inventor of tragedy. The manner in which this invention is said to have originated is stated differently. According to one account, which is also adopted by Horace, it arose from Thespis travelling during the festival of Dionysus through Attica upon a waggon, on which he performed comic plays. This tradition however is based upon a confusion of tragedy with comedy, the invention of which is not ascribed to Thespis by any antient authority. The invention of Thespis consisted in nothing else than in introducing a person who at the Dionysiac festivals in the city of Athens entered into conversation with the chorus, or related a story to it. The designation of this actor was Hypocrites (*ὑποκριτής*), that is, the 'answerer,' because what he said or acted answered or corresponded with the songs of the chorus. By means of masks, the invention of which was likewise ascribed to Thespis, he was enabled to act different characters one after another. Some writers who considered the chorus itself as a second actor, speak of two actors in the time of Thespis, and consequently state that Æschylus introduced a third actor. (Themistius, *Orat.*, xxvi., p. 382, edit. Dindorf.) Whether Thespis wrote his plays is not quite certain, although Donatus (*De Comoed. et Tragoed.*, in Gronovius's *Thesaurus*, viii., p. 1387) expressly says so, but the tragedies bearing the name of Thespis in the time of the Alexandrines cannot be considered as genuine. It is an historical fact that Heraclides Ponticus forged tragedies under the name of Thespis; and the few fragments of Thespis quoted by antient writers are unquestionably passages of such supposititious works. The tragedies of Thespis must have fallen into oblivion and have perished at the time when the Attic drama reached its perfection: some of his choral songs however appear to have been known as late as the time of Aristophanes, as we may infer from the concluding scene of the 'Wasps.' We know the titles of four of his tragedies: 'Pentheus,' 'The Funeral Games of Pelias or Phorbas,' 'The Priests,' and 'The Youths;' but of their construction nothing is known, except that each seems to have commenced with a prologue. (Themist., *Orat.*, p. 382.)

Respecting the history of Thespis very little is known. Solon was present at the performance of one of Thespis's plays, and highly disapproved of dramatic performances, as tending to lead men to falsehood and hypocrisy. Towards the end of the career of Thespis tragic contests were introduced at Athens, and Thespis probably contended for the prize with Choerilus and Phrynichus, who is called his disciple. Thespis is also said to have distinguished himself in orchestic, or the art of dancing (Athenaeus, i., p. 22), which however can only refer to his skill in instructing the chorus.

(Bode, *Geschichte der Dramat. Dichtkunst der Hellenen*, i., pp. 40-57; Müller, *Hist. of the Lit. of Greece*, i., p. 292, &c.)

THESPRO'TIA (Θεσπρωτία), a district of the antient Epirus, around the river Acheron. Its boundaries are not distinctly stated by antient writers, but the district seems to have included the coast from the mouth of the Ambracian Gulf northwards to the river Thyamis, and the country inland as far as Mount Tomarus. The south-eastern part of Thesprotia, south of the river Acheron, was called Cassopaea, and is sometimes reckoned as a distinct district; but the other statement appears more correct, since Herodotus makes the Thesproti neighbours of the Ambraciots and Leucadians. (Herod., viii. 47.)

Thesprotia was one of the chief abodes of the Pelasgi. This is intimated by the legend which makes Thesprotus the son of Lycaon. In Thesprotia was the oracle of Dodona (Herod., ii. 56), the chief seat of the old Pelasgic religion. [Dodona.] In Thesprotia Aristotle found the Hellenes under their antient name of Graeci (*Γραικοί*, Aristot., *Meterolog.*, i. 14.) From this country the Thessali migrated to take possession of Thessaly, about sixty years after the Trojan war, having previously left their original seats in Thessaly, and proceeded into Thesprotia, about eight generations before the Trojan war. (Herod., vii. 176; Thucyd., i. 12; Plutarch, *Pyrrh.*, c. i.; Velleius, i. 3; Clinton's *Fasti Hellen.*, i. 19-20, 28.)

Its chief cities were Nicopolis, built by Augustus on the peninsula opposite the promontory of Actc, or Actium, in commemoration of his victory over M. Antonius; Charadra, on the west of the Charadrus; Bucheta, or Buchetima, on the coast. The above are on the south-eastern side of the Acheron. Above the Acheron were,—Cichyrus, formerly Ephyra, on the Acherusian Gulf; Pandosia, higher up the Acheron; Elatria or Elatia, and Batiae, inland; Chimerium, on a promontory of the same name, west of the mouth of the Acheron; north-west of this, Sybota: the positions of Bolurus and Torone are unknown. [Epirus.]

(Leake; Pouqueville; Cramer; Hoffmann's *Griechenland.*)

THESSALONIANS, *Epistles of St. Paul to the.* Christianity was introduced among the Thessalonians in A.D. 50, by St. Paul, when he first passed over from Asia Minor into Europe to preach the gospel. According to the account in the *Acts of the Apostles* (ch. xvi.), St. Paul was engaged in communicating to the churches in Asia Minor the decree of the first council of the 'Apostles and elders which were at Jerusalem,' when on his arrival at Troas a vision appeared to him in the night, in the figure of a man of Macedonia, 'who prayed him, saying, Come over into Macedonia, and help us.' In obedience to this call, St. Paul, together with Silas and Timothy, visited the cities of that country, and among the rest Thessalonica, which was at that time the residence of the Roman governor of the province of Macedonia, and a city of great resort. St. Paul found there a synagogue of the Jews, 'and went in unto them, and for three Sabbath days reasoned with them out of the Scriptures,' endeavouring to convince them that Jesus was the Christ or Messiah expected by them. Though some of them believed, his success with the Jews does not appear to have been great: but a considerable number of the 'devout Gentiles' were converted, and many women of distinction: so that the Christian church at Thessalonica was composed both of Jews and Gentiles, of whom the latter were the more numerous. The *Acts of the Apostles* (ch. xvii.) informs us that St. Paul only spent three Sabbath days in preaching to the Jews; but from some expressions in his own letters to the Thessalonians, coupled with the fact of his receiving money from Philippi more than once while he was at Thessalonica (*Philipp.*, iv. 16), it would seem that he remained for some time in that city. Still he was unable to carry his designs into execution: the unconverted Jews stirred up a persecution against him, so that himself and his companions 'were sent away by night by the brethren' to the neighbouring city of Beroea. Here again the Jews of Thessalonica stirred up a tumult against St. Paul, so that he was obliged to retire to Athens, leaving however Silas and Timothy at Beroea. At Athens he was subsequently joined by them, and being naturally anxious about his recent converts at Thessalonica, and 'when he could no longer forbear' (1 *Thes.*, iii. 1), he sent Timothy from Athens 'to establish them, and to comfort them concerning the faith.' St. Paul then visited Corinth, and on the return of Timothy with 'good tidings of their faith and charity, and that they had a good remembrance of him always' (1 *Thes.*, iii. 6), he wrote his first epistle to them, A.D. 52, from Corinth, and not from Athens, as the subscription of the epistle imports.

It was one of the earliest, if not the very first, of all St. Paul's epistles, and in chap. v., ver. 27, he expresses his desire that it should be read not at Thessalonica only, but in all the churches of Macedonia. Its genuineness has always been admitted: together with the second epistle, it is quoted and recognised as the work of St. Paul, by Irenæus, Clement of Alexandria, Tertullian, Origen, and all subsequent ecclesiastical writers. (Lardner, as quoted in Horne's *Introduction*, vol. iv., p. 372.) The immediate occasion of St. Paul's writing this Epistle was the favourable intelligence brought by Timothy of the steadiness with which the Thessalonians adhered to Christianity in spite of the persecution with which they were assailed by their own countrymen. Besides being exposed to direct persecution, there can be little doubt that they were also in danger of being moved by the reasonings of their religious adversaries, to which the sudden disappearance of St. Paul from Thessalonica, and his apparent desertion of them at a critical moment, might give some plausibility and apparent confirmation. To counteract the natural result of all this was one of the chief objects of Timothy's mission, and the First Epistle to the Thessalonians was written with the same design. Accordingly in chap. i., after a short introduction, in which he couples the names of Timothy and Sylvanus (the Roman form of Silas) with his own, he expresses his thankfulness for their 'work of faith and labour of love, and patience of hope in our Lord Jesus Christ,' and then (vers. 5-10) reminds them of the proofs 'of power and of the Holy Ghost' with which the preaching of the gospel among them was accompanied, as evidences of its truth, and commends them for the constancy of their faith.

In chaps. ii., iii., as a further confirmation of the truth of the gospel, he reminds the Thessalonians of the conduct and character of himself and the other preachers of Christianity. That as a missionary and apostle of Christ, 'he had suffered, and been shamefully entreated'—that in preaching the gospel, he had sought neither temporal profit, nor favour, nor honour. He also explains and vindicates his own conduct in leaving them, and says that although taken from them in presence, he was not in heart,—that he had endeavoured to see them again with great desire, but had been hindered; till at last, when he could no longer forbear, he sent Timothy to them, at whose good tidings of them he expresses the greatest satisfaction and joy.

In chap. iv. St. Paul exhorts them to persevere in the observance of the duties and practical virtues of Christianity, in conformity with the commandments he had given them at first: and further enjoins them not to sorrow or lament over those that were dead, but rather (even as they believed that Jesus died and rose again) to look forward to their resurrection, when the day of the Lord Jesus, that is, the day of judgment, should come.

In chap. v. (1-5) St. Paul warns the Thessalonians of the uncertainty of this event, and concludes the epistle with a variety of precepts and admonitions addressed partly to the whole church, partly to its pastors and teachers, coupled with some reproofs, which, as we may suppose, were called for by the irregularities and failings from which the Thessalonians were not yet exempt.

The undesigned coincidences between this Epistle and the 'Acts of the Apostles' are commented upon by Paley in his 'Horæ Paulinæ,' pp. 293-311.

The Second Epistle to the Thessalonians was written soon after the first, and from the same place. Silvanus and Timothy being joined with the apostle in the inscription of this Epistle, as well as of the former; and as in chap. iii., ver. 2, he requests the prayers of the Thessalonians for his deliverance from wicked men, it is not improbable that he wrote it soon after the insurrection of the Jews at Corinth, when they dragged him before Gallio, and accused him of persuading men to worship God contrary to the law.

This Epistle seems to have been occasioned by the information which St. Paul received on the state of the church at Thessalonica from the messenger who conveyed his first letter to the elders of the church, and his report of the effect produced by its contents. From some expressions in that Epistle (iv. 15; v. 4-6), compared with chapter ii. of the Second, it would seem that a number of Thessalonians had come to the conclusion that the day of judgment was at hand, and would happen in their generation. To correct this misapprehension, and to prevent the anxiety and the neglect of secular affairs which resulted from it, appears to have been the main object and design of St. Paul in writing this Second Epistle to them.

Accordingly, in chap. i., after a short introduction, the apostle proceeds to commend the growing faith and charity of the Thessalonians, and to express his joy at their patience under tribulation, of which he had heard from the messenger who carried his first letter, and he assures them of his constant prayers for their welfare.

In chap. ii. he rectifies their mistake about the day of judgment, and warns them against those who might attempt to deceive them on that subject. By way of setting their minds at rest about it, he assures them that the event would not come to pass until 'a great apostacy' had overspread the church, and the revelation of 'the man of sin, the son of perdition,' should have taken place. These phrases have been variously interpreted, but the generality of Protestant commentators have agreed in referring them to the Roman pontiffs and the Romish church. Some indeed understand them to apply to the rise of Mohammedanism, and others to the revolt of the Jews from the Romans. The Romish church contends that one person only is meant, and not a series or succession of persons.

Whatever the apostle meant by these phrases, he informs the Thessalonians that this mystery of iniquity was already secretly at work, though its full operation was prevented by a restraining power (*κάτεχον*), which the early Fathers of the Church generally understood to be that of the Roman emperors and empire. (Tertullian, *Apolog.*, p. 31.)

In chap. iii. the apostle desires their prayers for himself and his fellow-labourers, and then reproves some of the Thessalonians for their idleness and irregular life. He concludes with his apostolic benediction, and writes the salutation with his own hand, which, as he informs them, was a token of the genuineness of that and other Epistles similarly authenticated.

This Second Epistle to the Thessalonians is the shortest of all St. Paul's Epistles, but not inferior to any of them in style or spirit, and it is also remarkable as containing a distinct prophecy of the corruptions and delusions which were to arise in the Christian church.

The undesigned coincidences between this Epistle and the 'Acts of the Apostles' are given in Paley's 'Horæ Paulinæ,' pp. 312-322.

(Macknight, *On the Apostolical Epistles*, vol. iii., pp. 1-124; Horne, *Introduction to the Critical Study of the Scriptures*, vol. iv., p. 372; Collyer, *Sacred Interpreter*, vol. ii., p. 275; Percy's *Key to the New Testament*; Whitby, *On the New Testament*.)

THESSALONI'CA (now *Saloniki*), an antient city of Macedonia, in the district of Mygdonia, was formerly called Therme or Therma: it is in 40° 38′ N. lat. and 22° 56′ E. long., about ten miles east of the antient river Echedorus, at the head of the modern Gulf of Saloniki, formerly called the Thermaic Bay, from the antient name of the city. It was at first an inconsiderable place under its old name of Therme, by which it was known in the days of Herodotus and Thucydides, Æschines, and Scylax, who, in his 'Periplus,' makes mention of the Thermaic Gulf. Herodotus, in his 'History' (vii. 128), speaks of it as a place where Xerxes made some stay on his march into Greece, and from which he had a commanding view of the mountains of Olympus and Ossa in Thessaly. A short time previous to the commencement of the Peloponnesian war (B.C. 432) it was taken and occupied by the Athenians, but it was soon afterwards restored to Perdiccas, the king of Macedonia. According to an account in Strabo (*Epit.*, vii. 330), the name of Thessalonica was given to it by Cassander, the son of Antipater, in honour of his wife Thessalonica, who was the daughter of Philip, king of Macedon, and the sister of Alexander the Great. With a view to its aggrandisement, Cassander collected together (about B.C. 315) the population of several adjacent towns, so as to make it one of the most important cities of Northern Greece. (Strabo, *l. c.*, p. 330.) After the battle of Pydna (B.C. 168), in which the Romans defeated Perseus, the then king of Macedonia, Thessalonica, with the other Macedonian towns, surrendered to the Romans, and was made the capital of the second of the four regions into which Macedonia was divided by them. (Livy, lib. xliv., c. 10 and 45; lib. xlv., c. 29.) Livy speaks of it as being then a very celebrated city, to which its admirable position materially contributed. It possessed an excellent harbour, peculiarly well situated for commercial intercourse with the Hellespont and the Ægean; and it had the additional advantage of lying on the great Roman military road, the Via Egnatia, which, commencing at Dyrrachium, on the western side of Greece, and extending to Byzantium, afforded the easiest land communication with Thrace, Asia Minor, and the shores of the Euxine. In St. Paul's time it was much frequented by people of different nations for commercial and other purposes, as appears from the fact of there being a synagogue of Jews there; and it was also the seat of the Roman government. Pliny (iv. 10) calls it a free city; and Lucian (*Asin.*, 46) speaks of it as the largest of the Macedonian towns. In later times, under the empire, it continued to be so flourishing and important a city, that it was selected as the residence of the prefect of Illyricum, and the metropolis of the Illyrian provinces. (Theodoret, *Hist. Eccl.*, v. 17.) In the reign of the emperor Theodosius it was the scene of a deplorable calamity: it was then protected against the assaults of the Goths by strong fortifications and a numerous garrison. Their commandant, Botheric, with his principal officers, was inhumanly murdered by the people of the town, in consequence of his having thrown into prison one of the popular characters of the circus, to the games of which the Thessalonians of that time (A.D. 390) were passionately devoted. The emperor Theodosius, in the excitement of his indignation, gave orders for the punishment of the people; and, according to the most moderate accounts, no less than 7000 persons were massacred by barbarian soldiers in a promiscuous carnage, which lasted for three hours (Gibbon, *Roman Empire*, c. xxxvii.), a deed, the guilt of which, as Gibbon observes, was aggravated by the long and frequent residence of the emperor at Thessalonica. [THEODOSIUS; AMBROSE.]

For an account of the ruins and antiquities of Thessalonica, see Clarke's and Holland's *Travels*, vol. ii., p. 50; Dodwell's *Tour in Greece*, vol. ii., c. 19, p. 190; Cramer's *Antient Greece*, i. 238.

THE'SSALUS (Θεσσαλός), an antient Greek physician, son of the celebrated Hippocrates, appears to have lived at the court of Archelaus, king of Macedonia, about 360 years before Christ. He was one of the founders of the sect of the Dogmatici, who also took the name of the *Hippocratic* school, because they professed to follow the doctrines of that great man. However, both he and his brother Dracon, and his brother-in-law Polybus, are accused by Galen in several passages of not only mixing up with the opinions of Hippocrates the principles of later philosophers, but also of altering and interpolating his writings. Several of the works that go under the name of Hippocrates are by many critics supposed to have been written by Thessalus, viz. 'De Morbis,' the second, fifth, sixth, and seventh books 'De Morbis Vulgaribus,' and the second book of the 'Praedictiones,' or 'Prorrhetica;' but this conjecture is uncertain.

(Le Clerc, *Hist. de la Méd.*; Fabricius, *Biblioth. Græca*; Haller, *Biblioth. Medic. Pract.*; Sprengel, *Hist. de la Méd.*; Ackermann, *Hist. Literar. Hippocr.*; Choulant, *Handbuch der Bücherkunde für die Aeltere Medicin.*)

THE'SSALUS (Θεσσαλός), one of the founders of the antient medical sect of the Methodici, was born at Tralles in Lydia, and lived in the reign of the emperor Nero, in the first century after Christ. He was the son of a weaver, and followed the same trade himself during his youth, by which means he lost the opportunity of receiving a good education, and was never afterwards able to overcome this disadvantage. He appears however to have soon given up this employment, and applied himself to the study of medicine, by which he acquired a great reputation, and amassed a large fortune. His whole character however, both intellectual and moral, is everywhere represented by Galen in a very unfavourable light; but it must be confessed that Galen himself appears to very little advantage in these passages, and goes beyond all bounds in his abuse of him.

Thessalus adopted the principles of the Methodici, but modified and developed them so much that he attributed to himself the invention of them. In fact on all occasions he appears to have tried to exalt himself at the expense of his predecessors; lavishing upon the antients the most insulting epithets; calling himself by the title *ἰατρονίκης* (conqueror of physicians), because he thought that he himself surpassed all his predecessors as much as medicine is superior to all other sciences; boasting that he could teach the art of healing in six months; and telling the emperor Nero, in the dedication of one of his works, that none of those who had been before him had contributed anything to the advancement of medical science. By his boasting he attracted a great number of pupils, whom he took with him for six months to visit his patients; but most of them are said to have been common artisans and persons of very low extraction. Galen accuses him of knowing nothing of the action of drugs, though he had written on the subject. He did not care for inquiring into the causes of diseases, and was satisfied with certain problematical analogies; nor did he admit the value of prognostic signs. He did not recommend tapping in cases of ascites. A further account of his opinions may be found in Le Clerc, *Hist. de la Méd.*; Haller, *Biblioth. Medic. Pract.*; Sprengel, *Hist. de la Méd.*

THESSALY (Θεσσαλία), one of the principal divisions of Northern Greece, and the cradle of many of the inhabitants of Greece in general, is an extensive and generally unbroken plain, about 80 miles in extreme length and 70 in breadth, comprising an area of about 5300 square miles, and forming an irregular sort of square. This description applies only to what may be called Thessaly Proper, which is bounded on the west, towards Epirus and Athamania, by the range of Pindus; on the north, towards Macedonia, by the Cambunian Mountains; on the south by the range of Mount Othrys; on the east by a range of mountains running along the coast nearly parallel to Pindus, and including the summits of Pelion and Ossa. The basin of Thessaly is thus surrounded by mountain-barriers, broken at the north-east corner only by the valley and defile of Tempe (or the Cut), which separates Mount Ossa from Olympus, and presents the only road from Thessaly to the north which does not lead over a mountain-pass. At the eastern base of the mountain-range which runs from Tempe to the bay of Pagasæ, now the Gulf of Volo, there is a narrow strip of land called Magnesia, between the hills and the sea, interrupted in several places by lofty headlands and ravines, and without any harbour of refuge from the gales of the north-east. South of Othrys, the southern boundary of Thessaly Proper, lies a long narrow vale through which winds the river Spercheius, and which, though generally considered as a part of Thessaly, is separated from it by the range of Othrys, and is very different from it in physical features. It is bounded on the south by the range of Œta, which runs from Pindus to the sea at Thermopylæ in a general direction nearly parallel to the Cambunian Mountains; and on its eastern side by the shores of the bay of Malia, now the Gulf of Zeitoun. According to Greek traditions, Thessaly was known in remote times by the names of Pyrrha, Æmonia, and Æolis. The two former names belong to the age of mythology; the last refers to the time when the country was inhabited by the Æolian Pelasgi, previous to the occupation of any part of it by the Thessalians, who, according to Herodotus (vii. 176; Strabo, ix., p. 444), originally came from Thesprotia, a region in the west of Epirus, and settled in the country, which from them derived its future name. At what time it received the name of Thessaly cannot be determined. The name does not occur in the poems of Homer, although the several principalities of which it was composed at the time of the Trojan war are there enumerated, together with the different chiefs by whom they were governed: it is from Homer (*Iliad*, ii. 700) that we derive the earliest information about this part of Greece.

From very early times Thessaly was divided into four districts, or tetrarchies. These tetrarchies were, according to Strabo (ix., p. 430), Hestiæotis, Pelasgiotis, Thessaliotis, and Phthiotis: and the division, though it was a very antient institution, existed in the Peloponnesian war (B.C. 404).

The first of these tetrarchies, *Hestiæotis*, was the mountainous country between Pindus and Olympus; having generally for its southern limit the river Peneus, though this river did not form an exact boundary through all its course. Herodotus (i. 156) applies this name to the country in the neighbourhood of Ossa and Olympus, the original abode of the Dorians before they settled in Peloponnesus. From a statement in Strabo (ix., p. 437), it would seem that the name of Hestiæotis was derived from a district in Eubœa, whose inhabitants were transplanted to this part of Thessaly by the Perrhæbi. The Perrhæbi themselves however only occupied a small part of the territory, and as they are said to have been the original inhabitants of the country of the Lapithæ, they must at one time have been established in the lower valley of the Peneus. (Strabo, p. 441.) In historical times they dwelt in the valley of the Titaresius under Olympus, where they had shrunk into a small mountain-people. The north-western part of Hestiæotis was in ante-historical times (Homer, *Il.*, ii. 774) occupied by a mountain-tribe of uncertain origin, called the Æthices. In the time of Strabo (ix., p. 434) scarcely any trace remained of them.

The most remarkable towns of Hestiæotis were as follows:—Phaleria, or Phaloria, the first town of any importance on entering Thessaly from Epirus by the passes of Pindus (Liv., xxxii. 15); Oxyneia and Æginium, the latter of which Livy describes as a place of great strength, and almost impregnable. Gomphi (the Wedges), an antient fortress, situated on the Peneus to the south of Phaloria: it was a place of great strength, and might be said to be the key of Thessaly on the side of Epirus to the north: it commanded the communication by the gorge of Clinovo, between this part of Thessaly and the Ambracian Gulf. In the time of Cæsar (*Bel. Civ.*, iii. 80) it was a large and opulent city: it is supposed to be represented by the modern Stagous. Tricca, now Trikhala, on the left bank of the Peneus, about 12 miles south of Gomphi: it is celebrated by Homer (*Il.*, ii. 729), and placed by him under the rule of the sons of Æsculapius, who was said to have been born in the neighbourhood. According to Strabo (ix. 437), there was a temple of Æsculapius there, which was held in great veneration: about 12 miles to the north of it is now situated the convent of Meteora, whose name (the Hanging) is descriptive of its situation upon lofty columns of rock. Metropolis, a town to the north of the Peneus, which contained within its territory the lands of three other places not so famous, but more antient, and which contributed to the formation of the new city. Metropolis, with Gomphi to the north-west, Tricca to the south-west, and Pelinna to the south-east, formed a square of fortresses, in the middle of which was the antient Ithome, called by Homer the 'precipitous.' Pelinna, more commonly Pelinnæum, was an important city on the north of the Peneus, and about 10 miles east of Tricca. Ithome has been supposed to have occupied the site of the convents of Meteora: but it seems to have been farther south. Œchalia, a city celebrated in mythology, is coupled by Homer with Tricca and Ithome. Gonnus, or Gonni, was a town of considerable importance and antiquity. It was situated on the left or north bank of the river Peneus, about 20 miles from the great city of Larissa, and close to the entrance of the gorge of Tempe. Gonnocondylon, a stronghold in the windings of the valley, was situated in the defile above Gonnus, probably not far from the fortress of Roman construction called Horaeo-Castro. The Pelagonian Tripolis, also, a district which included the three towns of Pythium, Azorus, and Doliche, was situated in the north-east of Hestiæotis, and is also reckoned under Perrhæbia by Livy.

Pelasgiotis was in the southern part of the lower valley of the Peneus, and includes the Pelasgian plains which stretch from Larissa to Pheræ, near Pelion, having for its boundary on the east the range of Pelion and Ossa. According to Strabo (ix., p. 441) this part of Thessaly was originally occupied by the Perrhæbi, an antient tribe of apparently Pelasgic origin. It was however wrested from them by the Lapithæ, another Pelasgic nation, whose original abode was in Magnesia. They forced some of the Perrhæbi to retire northwards and across Pindus, while those who remained in the plains were incorporated with themselves, under the common name of Pelasgiots. The principal towns of Pelasgiotis were as follows:—Larissa: this was one of the most antient and flourishing towns of Thessaly, though not mentioned by Homer; it was situated in the most fertile part of the old country of the Perrhæbi. The constitution of the city was democratical, the magistrates being elected and removeable by the people. (Aristot., *Politic.*, v. 6.) Accordingly in the Peloponnesian war, the Larissæans supported the Athenians against the Lacedæmonians. The Aleuadæ, mentioned by Herodotus as princes of Thessaly at the time of the Persian invasion, and one of the most distinguished and antient families of the country, were natives of Larissa. The territory of this city was extremely rich and fertile, but it frequently suffered by the inundations of the Peneus. Modern travellers are of opinion that the present Larissa stands on the site of the old town. The name is Pelasgian. Cranon, or Crannon, to the south of Larissa, was one of the most antient and considerable towns of this part of Thessaly. The inhabitants of this town are supposed by the antient commentators to be designated by Homer (*Il.*, xiii. 301) as the Ephyri. The Scopadæ, a distinguished and princely family of Thessaly, belonged to it. The inhabitants supported the Athenians in the Peloponnesian war, and therefore they may be supposed to have been under a democratical form of government. Scotussa, to the east of Cranon, though noticed by antient authors, does not appear to have been known to Homer. (Strabo, ix., p. 441.) Within its territory was the hill of Cynoscephalæ, or Dogs'-Heads, where a victory was gained by the Romans over Philip of Macedon (B.C. 197). It is one of the hills which separate the plain of Larissa from that of Pharsalia. According to some authors, the Thessalian Dodona was also within the district of Scotussa. Pheræ was near the southern extremity of the lake Boebeis. In the Peloponnesian war the Pheræans assisted the Athenians, whence it is probable that they then had a republican form of government. Subsequently Jason made himself master of Pheræ, his native town, and was succeeded in his authority by his brothers. In later times it fell into the hands of Alexander, who continued for eleven years to be the scourge of his native city, and the whole of Thessaly, till he was checked by the Thebans, under Pelopidas and Epaminondas. He was at last assassinated by his wife and her brothers, who continued to tyrannise over the country till it was liberated by Philip of Macedon. (Diodorus, xvi. 517.) After many changes of fortune, it was taken by the Romans under the consul Acilius. (Livy, xxxvi. 14.) Strabo says of it, that the continued tyranny under which it had laboured hastened its decay. Its territory, according to Polybius (xviii. 2), was most fertile, and the suburbs were surrounded by gardens and walled enclosures. Its port was Pagasæ, about 11 or 12 miles distant. With respect to its modern features, 'Pheræ,' says Dodwell, 'has hardly preserved any traces of antiquity: a few scattered blocks of stone and some Doric frusta are the only antiquities remaining.' The fountain Hypereia, mentioned by Homer (*Iliad*, vi. 457), 'is in the suburbs of the modern town of Belestina, at the foot of the antient Acropolis. A small lake of about 100 yards in diameter, and with water as clear as crystal, bubbles up out of the ground.' Sir W. Gell adds, that it runs through a coffeehouse, or kiosk. The Dotius Campus is also in Pelasgiotis, on its eastern side: it is a considerable plain encircled by hills to the north, and terminated to the south by the lake Boebeis, the most extensive in Thessaly, and included within the limits of Pelasgiotis.

Thessaliotis was so called, according to Strabo, from its having been first occupied by Thessalians, who came from Thesprotia, and inhabited the plains below Hestiæotis, having the district of Pelasgiotis on the east. This tetrarchy contained towards the south-east the city of Pharsalus, celebrated for the battle fought in its plains between Pompey and Cæsar. It is situated not far from the junction of the Enipeus and the Apidanus, and was a city of great size and importance, though no mention is made of it previous to the Persian invasion of Greece. During the Peloponnesian war, the Pharsalians generally favoured the Athenians. Xenophon (*Hellenic.*, vi. 1) speaks of it as an independent republic, but it afterwards fell into the hands of Jason, tyrant of Pheræ. There is a modern town called Phersale not far from, if not on, the site of the old Pharsalus; but there are only a few antiquities there. South-west of it there is a hill surrounded with antient walls, and on a lofty rock above it are other ruins of greater magnitude, showing a considerable portion of the walls of an antient Acropolis and remains of the Propylæa. Other towns of Thessaliotis were—Cierium, supposed by Müller to be identical with the antient Arne, the chief town of the Æolian Bœotians; Ichnæ, or Achnæ, where the goddess Themis was especially worshipped; Proerna, not far from Pharsalus, mentioned by Strabo (ix., p. 434). Sir W. Gell observed between Pharsalia and Thaumako the ruins of an antient city, which he supposed might belong to Proerna. They are situated upon the projecting branch of a mountain, where there are many vestiges and walls.

Phthiotis, according to Strabo, included all the southern part of Thessaly, stretching lengthwise from the Maliac Bay on the east to Dolopia and Pindus on the west, and in breadth from Mount Œta on the south as far as Pharsalus and the Thessalian plains on the north, an average distance of about 30 miles. Homer comprised within its limits the districts of Phthia and Hellas properly so called, and the dominions of Achilles. Its inhabitants were the Achæans (᾽Αχαιοὶ Φθιῶται), a double name under which they were generally enumerated in the lists of the Amphictyonic nations. The principal cities of Phthiotis were Halos or Alos, on the west side of the Gulf of Pagasæ, usually called the Phthiotic or Achaian, to distinguish it from a city of the same name in Locris. It contained a temple sacred to Jupiter Laphystius, which was visited by Xerxes as he passed through the city; some remains of the town are thought to be still existing. Iton, about six miles west of Halos, on the river Cuarius (Strabo), celebrated for a temple of Minerva Itonis, who was worshipped under the same name in Bœotia. The district of Arne, from which the Æolian Bœotians were expelled by the Thessalians, is by some supposed to have been near these towns and on the shores of the Pagasæan Bay; but Müller (*Dorians*, ii. 475) adduces satisfactory reasons for believing that the Arne, which the Thessalians first occupied, lay to the north-west in Thessaliotis, and that it was identical with the antient Pierium. North of Halos and Iton lay Thebes, the most important town of this part of Thessaly. It was called Phthiotic, to distinguish it from the Thebes of Bœotia. In a military point of view it possessed considerable importance, as it commanded the avenues of Magnesia and the upper parts of Thessaly. It was once in the occupation of the Ætolians, but was wrested from them by Philip, the son of Demetrius, who changed its name to Philippopolis. According to Livy (xxxix. 25) it was once a city of great commercial importance. Some ruins between the modern towns of Armiro and Volo are supposed by Sir W. Gell to be those of Thebes. They consist of an Acropolis, with very antient walls constructed with very large blocks; some towers also are still standing. The port of Thebes appears to have been Pyrasus, about two miles and a half distant. A little south of Thebes was Larissa Cremaste, or the Hanging, so called from its position on the side of a hill; it was also called the Pelasgian. It lay in the dominions of Achilles, whence he is called Larissæus by Virgil (*Æneid*, ii. 198). The ruins of it still exist, and Sir W. Gell says of it, 'The form of Larissa was, like that of many very ancient Greek cities, a triangle, with its citadel at the highest point. In the Acropolis are the fragments of a Doric temple; and from it is seen the magnificent prospect of the Maliac Gulf, the whole range of Œta, and over it Parnassus.' Melitia was situated at the foot of Mount Othrys, on the river Enipeus. Its antient name was Pyrrha, and it boasted of possessing the tomb of Hellen, the son of Deucalion. It was about a whole day's march from Pharsalus. (Thucyd., iv. 78.) To the north-west of Melitia lay the town of Thaumaki or Thomoko, so called (the Wonderful) from the singularity of its position on a lofty and perpendicular rock. It was on the great road leading from Thermopylæ by Lamia to the north of Thessaly. 'After a rugged route over hill and dale,' says Livy (xxxii. 4), 'you suddenly open on an immense plain like a vast sea, which stretches below as far as the eye can reach.' Dodwell says of it, 'It is about five hours from Pharsalia. It must always have been a place of importance. The view from it is one of the most wonderful and extensive I ever beheld.'

On the west of Phthiotis, and close to it, but still separated from it, lay the territories of the Dolopians. According to Homer (*Il.*, i. 480), Dolopia was at the extremity of Phthiotis; but it does not follow that it was included in that district; nor are the Dolopians in early times ever mentioned as the vassals of the Thessalians. They occupied the extreme south-west angle of Thessaly, formed by the chain of Tymphrestus, a branch of Pindus, on one side, and Mount Othrys on the other. They were a very antient nation, as appears from their sending deputies to the Amphictyonic council. At a later period they were subjects of Jason, the tyrant of Pheræ. (Xenophon, *Hell.*, vi. 1.) Afterwards the possession of Dolopia was frequently contested between the Ætolians and the kings of Macedon, but it was finally conquered by Perseus, the last king of that country. The limits of Dolopia were different at different times. Thucydides (ii. 102) seems to have extended it to the west of Pindus. It was a rugged mountainous district, with few towns of note. Ctemene, or Ctimene, was perhaps the most important.

The Æinianes lived in the upper valley of the river Spercheius, being separated from the Dolopes by the hills of Tymphrestus and Othrys. They were also called Œteans from their position on the slopes of Mount Œta. They were a tribe of great antiquity and of some importance, as appears from the fact of their belonging to the Amphictyonic council. Their origin is uncertain, and they made many migrations from one part of Thessaly to another. Plutarch says of them that they occupied in the first instance the Dotian plain; after which they wandered to the borders of Epirus, and finally settled to the south of the Dolopes, with Mount Œta for their boundary on the south. In Strabo's time they had nearly disappeared, having been exterminated by the Ætolians and Athamanes, their neighbours on the west. Their chief town was Hypata, on the banks of the Spercheius.

The Malians, or Melies, as they were called in the Attic dialect, were the most southern tribe connected with Thessaly. They occupied principally the shores of the Maliac Gulf (the Bay of Zeitoun), from the Pass of Thermopylæ on the south to the northern boundary of the valley of the Spercheius. Their country is generally flat; the plains in some parts are extensive, in others narrow, where they are confined on one side by the shores of the Maliac Gulf, and on the other by the mountains of Trachinia. Thucydides divides them into three tribes, the Paralii or Shore-men, the Hierenses or Sacerdotal, and the Trachinians. The second of these classes probably dwelt near the Amphictyonic temple at Thermopylæ; the third on the rocky declivities of Mount Œta. They were always a warlike people, and those persons only who had served as heavy-armed soldiers were admitted to a share of the government. (Aristot., *Polit.*, iv. 100.) The Amphictyonic council was held in their country, and the Malians are included in the lists of the Amphictyonic states. They always maintained friendly relations with the Dorians of Lacedæmon. The principal towns of the Malians were as follows:—Anticyra, at the mouth of the Spercheius: it was said to produce the genuine hellebore, considered by the antients as a cure for insanity. Lamia, four or five miles north of Anticyra: it was celebrated as the scene of the Lamian war, carried on between the Athenians and their confederates against the Macedonians under Antipater. It is generally supposed to have occupied the site of the modern Zeitoun. Trachis, or Trachin (the 'rough'), was so called from the mountainous character of the surrounding country: it was once the chief town of the Trachinians, who were in such close alliance with the Dorians that Diodorus (xii. 59) speaks of Trachis as the mother-town of Lacedæmon. The friendship between Ceyx, a Trachinian hero, and Hercules, together with that of his sons, is the mythological expression for this connection. In later times Heraclea was the most important town of Trachinia. It was a colony from Lacedæmon, founded (B.C. 426) at the request of the Trachinians, about three miles from the sea. Their object in making the request was to gain additional strength against the Æinianes, or Œteans, with whom they were at war: there was also an old enmity between the Œteans and the Lacedæmonians, who were on this account the more readily induced to found the colony. It soon became an object of jealousy with the other Thessalian tribes, who frequently harassed it, and the Lacedæmonians often sent reinforcements to its support. It was seized by Jason of Pheræ, who caused the walls to be pulled down; but it again became a flourishing city under the Ætolians, who sometimes held the general council of their nation there. It sustained a long siege from the Roman consul Acilius Glabrio, after the defeat of king Antiochus at Thermopylæ (B.C. 191). The surrounding country was marshy and woody, but the vestiges of the city itself, according to Sir W. Gell, are observable on a high flat on the roots of Mount Œta. On the coast of Trachis, close to the mouth of the small river Asopus, which runs through a gorge in the mountain enclosing the Trachinian plain, was the village of Anthele, near to which was the temple of the Amphictyonic Ceres, and the place of meeting of the Amphictyons. This locality was also famous for the celebrated Pass of Thermopylæ.

Magnesia is a country physically distinct from Thessaly, but in historical times was subject to it, and politically included within it. It is a narrow strip of country between the mouth of the Peneus and the Pagasæan Bay on the north and south, with the chain of Pelion and Ossa on the west, and the sea on the east. The people of this district were called Magnetes, and they were in possession of it from very early times. (*Iliad*, ii. 756.) They were an Amphictyonic state. In the time of Thucydides they were dependent on the Thessalians, but they subsequently, with the rest of that nation, became dependent on the kings of Macedon, and continued so till the battle of Cynoscephalæ, when they were declared independent by the Romans. The extreme northern point of Magnesia was Mount Homole, a limb of Ossa, celebrated by the poets as the abode of the antient Centaurs and Lapithæ, and a favourite haunt of the god Pan. (Virgil, *Æneid*, vii. 674.) To the south, at the foot of Ossa, was Meliboea, a town on the coast, ascribed by Homer (*Iliad*, ii. 716) to Philoctetes. Still farther south was the promontory of Sepias, off which the fleet of Xerxes was wrecked. Beyond the southern promontory of Magnesia, now called Hagios Georgios, the coast takes a south-westerly direction to the entrance of the Pagasæan Bay, the Gulf of Volo. Among the principal towns of Magnesia were Iolcos, Demetrias, and Aphetæ. The first of these was a place of great antiquity, and the birthplace of the mythological hero Jason and his ancestors. It was situated at the foot of Pelion, near the small river Anaurus: it was once a powerful city, but according to Strabo, its downfall was hastened by civil discord and bad government: its ruin was completed by the foundation of Demetrias in the neighbourhood. The adjoining shore was still called Iolcos in the days of Strabo, though the town no longer existed. Pagasæ, the port of Iolcos, and afterwards of Pheræ, was famed in Grecian story as the harbour from which the ship Argo set sail on her voyage to Colchis: the name, according to Strabo (ix., p. 436), was derived from the number of springs (Παγαί) near it. The site is nearly occupied by the present castle of Volo. Demetrias owed its name and origin to Demetrius Poliorcetes. It was founded about B.C. 290, and the first population was derived from the neighbouring towns of Nelia, Pagasæ, &c., all of which were eventually comprised within its territory. It soon became a flourishing city, and was one of the most important fortresses in Greece, being well situated for defending the approaches to the Pass of Tempe, both on the side of the mountains and of the plains. Its maritime position also contributed to its importance, Eubœa, Attica, and Peloponnesus being easily accessible from it. After the battle of Cynoscephalæ it became the chief town of the Magnesian republic, and the seat of government: subsequently it was attached to the house of Macedon, until the battle of Pydna, when it fell under the Romans. (Livy, xliv. 13.) In the time of Strabo it had lost much of its splendour, but it was still the most considerable town of that part of Thessaly. Sir W. Gell thus speaks of its modern state:—'Pass the ruins of a gate and the walls of an antient city. Many other ruins mark the site of a large place (Demetrias).' The Magnesia of Asia Minor was a colony from the Thessalian Magnesia. [ANATOLIA.]

The principal mountain-ranges of Thessaly were—the Cambunian, on the north; Pindus, on the west; the ridges of Othrys and Œta, on the south; and those of Pelion and Ossa, on the east.

The Cambunian range was a branch from Mount Pindus, running in a direction nearly at right angles to it, and separating Thessaly from Macedonia. Herodotus includes this chain under the name of Olympus. The principal road between the two countries over the mountains was by the Pass of Volustana, marked in modern maps as Volutza. Another important defile, leading from Thessaly into Macedonia, passed by Pythium, a village with a temple sacred to the Pythian Apollo, situate on Mount Olympus, at the north-east extremity of the range.

Through this latter defile many armies marched in antient times. Thus Xerxes is said by Herodotus (vii. 132) to have crossed over Mount Olympus from Upper Macedonia into the country of the Perrhæbi in Thessaly. The road which led through Thessaly to this Pythium was called the Via Pythia; and, as Pouqueville states the shrine of Apollo may have been succeeded by a chapel, erected on the highest summit of Olympus (A.D. 1100), and dedicated to the prophet Elias. The defile is still much frequented by travellers going to Larissa from the north-western parts of Macedonia. Mount Olympus itself is one of the most celebrated mountains of Greece, especially in mythology, the stories of which represented it as being the habitation of the Gods, where Jupiter sat shrouded in cloud and mist from the eyes of mortals. It divides the north-east of Thessaly, or Perrhæbia, from Pieria, the extremity of Macedonia on the south-east. It rises to the height of about 6500 English feet, and the highest parts of it are scarcely ever entirely free from snow. The part of the Cambunian range which lies to the west of Olympus was called Mount Titarus, an outlier or limb of which, Mount Cyphus, rises in the upper valley of the Peneus.

Mount Pindus, the western boundary of Thessaly, was part of the range of mountains which issues from the Thracian Scomius, and forms what may be called the Greek Apennines. On the north it joins the Illyrian and Macedonian ranges, and to the south it is connected with the branches of Œta and the Ætolian and Acarnanian mountains. It separates the waters which fall into the Ionian Sea and the Ambracian Gulf (now the Gulf of Arta), from those which empty themselves into the northern part of the Ægean. The most frequented pass over Pindus from Thessaly into Epirus lay over a part of it called Mount Cercetius, probably not far from the modern town of Metzovo. One of the highest points of Mount Pindus was Tymphrestus, forming its southern extremity, from which branched the ridge of Mount Othrys, closing the great basin of Thessaly on the south, and separating the waters which flow into the Peneus from those which run into the southern Spercheius. Its eastern extremity separates the Maliac from the Pagasæan Gulf, sinking gently toward the coast. It is often celebrated by the poets of antiquity. It is now known by the different names of Hellovo, Varibovo, and Goura. To the south of Othrys lay the ridge of Œta, which however has no connection with Thessaly Proper. It is a huge pile of mountains stretching from Pindus to the sea, which it meets at the Pass of Thermopylæ; it forms the inner barrier of Greece, as the Cambunian range does the outer, to which it is nearly parallel in direction and equal in height. On the west it branches out into the country of the Dorians and into Ætolia. On the south-east, beginning from Mount Callidromus, the highest summit of the range, it is continued without interruption along the coast of the Eubœan Sea, till it sinks into the valley of the river Asopus. By means of another branch to the south-west, it is connected with Parnassus, and after skirting the Corinthian Gulf under the names of Cirphis and Helicon, it forms the northern boundary of Attica, under the names of Cithæron and Parnes.

Pelion is a chain of some extent, running from the south-east extremity of the lake called Boebeis to the extreme south of Magnesia, forming a part of the boundary of Thessaly on the east. Homer (*Iliad*, ii. 743) alludes to it as the seat of the Centaurs, and it was associated with many remarkable events in Grecian story. A fragment of Dicæarchus contains a description of Mount Pelion, and its botanical productions, which appear to have been very numerous. It was exceedingly well wooded. To the north of Pelion and following the line of the coast lies the chain of Ossa (now Kissovo), the roots of which unite with one of the branches of Mount Pelion. At its northern extremity it towers into a steep conical peak, and according to the songs of the country, rivals its neighbour Olympus in the depth and duration of its snows, though it is 1100 feet less in height. Between Ossa and Olympus lies the celebrated Vale and Pass of Tempe (or the Cut), the Turkish name of which is Bogaz (or the Pass). [Tempe.]

The two principal rivers of Thessaly into which the smaller streams fall are the Peneus and the Spercheius. The Peneus rises in the north-west of Thessaly under Pindus, between the lower ridges of which and the outliers of the Cambunian range its upper valleys are confined. Near Meteora, not far from the rocky Ithome of Homer, its basin opens somewhat towards the south. At Tricca it makes a turn to the east, and its valley expands into a vast plain towards the south-east, on the right of the river, though it is still confined by the hills on the left, till within about 10 miles from Larissa, where there is a considerable flat on the north, the soil of which is said to be alluvial. After leaving Tricca the course is generally north-east, and passing along the Vale of Tempe, the only outlet for the waters of Thessaly, it empties itself into the Ægean Sea. Though fed by the most considerable rivers of Thessaly, it is a very small stream, and generally sluggish and shallow, except after the melting of the snows, when it sometimes floods the surrounding plains. The Marsh or Lake Nesonis, on the road between Larissa and Gonnus, is said to be caused by the floods of the river. The principal tributary of the Peneus on the north is the Titaresius, now the Saranta Poros. It was said to rise in Mount Titarus, a part of the Cambunian range, and it joins the Peneus a little above the Vale of Tempe. The waters of the two rivers did not however mingle; those of the Titaresius being impregnated with a fat unctuous substance, which floated like oil on the surface. (Strabo, ix., p. 441.) This river was also called the Eurotas, and supposed to be a branch of the Styx, one of the rivers of the Infernal Regions. At the present day the inhabitants of its banks are remarkable for their healthy complexion, while the Peneus is surrounded by a sickly population. Its waters also are said to be clear and dark-coloured, while those of the Peneus are muddy and white. (Müller, *Dorians*, b. i., c. 1, s. 6.) On the south the affluents of the Peneus were more numerous. The principal of them were, the Pamisus, the Onochonus, the Enipeus, and the Apidanus. The Pamisus joins the Peneus to the east of Tricca, and is probably the modern Fanari. The Enipeus, rising in Mount Othrys, flowed from the south-west of Phthiotis and fell into the Apidanus. It is now called the river of Goura. The Apidanus is now the Vlacho Iani. Herodotus describes it as one of the largest rivers of Achaia, but still inadequate to the supply of the Persian army with water.

The second great river of Thessaly was the Spercheius, now the Hellada. It flows from Tymphrestus, a branch of Pindus, and after winding through a long narrow vale between the ridges of Othrys and Œta, it falls into the Maliac Gulf. It was much celebrated by the antient poets, and Homer mentions it as belonging to the territory of Achilles round the Maliac Gulf. Its bed and mouth have undergone many changes from the deposit of alluvial matter. (Gell, *Itiner.*, p. 246.)

Roads of Thessaly.—The principal road was that which led from Larissa to Thermopylæ, by Pharsalus, Thaumaki, and Lamia. From the same point another road branched off to Crannon, Pheræ, Demetrias, and along the shores of the Pagasæan and Maliac bays, terminating likewise at Thermopylæ. From Larissa again there was another route by the valley of the Peneus as far as Gomphi, the general direction of which was from east to west. From Gomphi it crossed the chain of Pindus by the Pass of Clinovo to Ambracia and Nicopolis.

The islands connected with Thessaly are very few. They consist of a group lying off the Magnesian coast, and stretching in a north-easterly direction towards Mount Athos and the isle of Lemnos.

The plains of Thessaly, with the exception of those of Bœotia, were amongst the most fertile and productive of Greece in wine, oil, and grain, but more especially in grain, of which it exported a considerable quantity. The Thessalians consequently became very rich, and luxurious in their mode of life (*Athen.*, xii. 624); and so notorious were they for it, that they were charged with having encouraged the Persians to invade Greece, with a view of rivalling them in sensuality and extravagance. Thessaly was also famous for its cavalry, the best in Greece: its plains supplied abundance of forage for horses.

The lands of Thessaly were not cultivated by the Thessalians themselves, but by a subject population, the Penestæ. The account given of them is, that they were the descendants of the Æolian Bœotians, who did not emigrate when their country was conquered by the Thessalians, but surrendered themselves to the conquerors on condition that they should remain in the country and cultivate the land for the new owners of the soil, paying, by way of rent, a portion of its produce. Many of them were richer than their lords. (Athenæus, vi., p. 264.) They sometimes accompanied their masters to battle, and fought on horseback as their knights or vassals. They formed a considerable portion of the population, and frequently attempted to emancipate themselves.

History of Thessaly.—The earliest information about the history of Thessaly is given by Homer (*Iliad*, ii. 710), who describes the country as divided into several independent principalities and kingdoms, and enumerates the chiefs to whom they were subject at the time of the Trojan war. This arrangement however was not of long continuance, and a new constitution, dating probably from that epoch, was adopted, as it would seem, by the common consent of the different states. They agreed to unite in one confederate body, under a president or Tagus, elected by the members of the confederacy. Strabo (ix. 429) informs us that this confederacy was the most considerable as well as the most antient society of the kind established in Greece. Whether it was in any way connected with the Amphictyonic body cannot be determined with certainty, but it is deserving of remark that the majority of the Amphictyonic states were either Thessalian or in some way connected with Thessaly. It does not however seem that this confederation was productive of any great benefit to the country; for, except during a very short period, under Jason of Pheræ, Thessaly never assumed that rank among the states of Greece to which it was by its position and extent entitled. Many of the cities moreover were from time to time in the power of usurpers, or under the sway of powerful families, so that the nation had no means of acting as a body. One remarkable instance of this occurred at the time of the Persian war, when the Thessalian house of the Aleuadæ, the princes of Larissa (Herodotus, vii. 6, calls them kings of Thessaly), either because they thought their power insecure, or with a view to increase it by becoming vassals of the Persian king, invited Xerxes to the conquest of Greece. That the Thessalian nation was in general opposed to their schemes appears from the fact that the Thessalians applied to the other states of Greece for assistance against Xerxes, and wished them, in conjunction with themselves, to oppose him at the Pass of Tempe. The confederate Greeks did not think it expedient to do this, believing it impossible to make any effectual resistance to the north of Thermopylæ; and the Thessalians, being left to their own resources, submitted to the invaders, to whom they proved active and zealous allies. A few years before this they had sustained a severe defeat from the Phocians, which aggravated the rancour of an old enmity. The Thessalians, who were eager to take vengeance for this defeat, availed themselves of their influence with Xerxes to direct his march through Phocis, and to stimulate his fury against the inhabitants (B.C. 480). After the Persian invasion, the Greek historians take little notice of the affairs of Thessaly, except on the occasion of the expedition undertaken by the Athenians for the purpose of reinstating Orestes, son of Echecratidas, a king of Thessaly, as Thucydides (i. 111) calls him, who had been banished from his country. The Athenian general Myronides marched on that occasion as far as Pharsalus; but he was checked in his progress by the Thessalians, who were superior in cavalry; and he was forced to retire, without having accomplished the objects of his expedition. In the Peloponnesian war the Thessalians did not as a nation take any part, though several of the towns were in favour of the Athenians, between whom and the Thessalians there was an old alliance. It would seem moreover that the bias of the nation was in favour of the Athenians, for Brasidas, the Spartan general, was obliged to march through Thessaly (B.C. 424) with secrecy and dispatch when traversing that country on his march towards Thrace. (Thucyd., iv. 78.) Not long afterwards, some troops which were sent out by the Lacedæmonians to reinforce their army in that quarter, were so vigorously opposed by the Thessalians, that they were compelled to return home without having reached their destination. In B.C. 394 the Thessalians were in league with the Bœotians and their allies, who had formed a hostile confederacy against Sparta. The Spartans thought it necessary to recal from Asia their great commander Agesilaus, and on his way home he had to march through Thessaly. The Thessalians, with their cavalry, endeavoured to harass and obstruct him on his march. His skilful manœuvres however thwarted their designs, and Agesilaus gained considerable credit by defeating on their own ground, with horsemen of his own training, the most renowned cavalry of Greece. But while Sparta was struggling against the coalition of which Thebes was the head, Thessaly was assuming a new position among the states of Greece. To explain this we must observe, that though a kind of political and national unity was nominally acknowledged among the states of Thessaly, still the country had very seldom been united under one government. A few great families, such as the Scopadæ and the Aleuadæ, were sometimes able to extend their influence even beyond the cities of Larissa, Crannon, and Pharsalus, about which their possessions lay. Occasionally one of them was raised to the dignity of Tagus; but their power was always liable to be overthrown, even in their own cities. Towards the close and after the end of the Peloponnesian war, most of the cities acknowledged the ascendency of Pharsalus or Pheræ, the latter of which was, about B.C. 400, under the dominion of Lycophron. This prince endeavoured to extend his power over all Thessaly; and Xenophon (*Hellen.*, ii. 4) mentions a victory which he gained over the Thessalians of Larissa as one of the events which happened in the year of the fall of Athens (B.C. 404); but he does not state what were the results of it. Ten years afterwards Lycophron was still engaged in a contest with Larissa, then subject to Medius, who was probably one of the Aleuadæ. Lycophron was supported by Sparta, and Medius by the Bœotian confederacy, by the assistance received from which he was enabled to make himself master of Pharsalus, then occupied by a Lacedæmonian garrison.

The success of Agesilaus on his return from Asia produced some change in the affairs of Thessaly, for Pharsalus soon recovered its independence, and rose to such eminence as to become a rival of Pheræ. It did not however continue, as of old, under the power of the Scopadæ: it was divided between contending factions, which, for the sake of peace, agreed to place themselves under the power of a person named Polydamas, whose character and virtue had gained the confidence of all parties. (Thirlwall, *Hist. of Greece*, vol. v., p. 56.) Polydamas was accordingly entrusted with the citadel and the administration of the revenues of the city, a trust which he discharged with the strictest integrity.

At Pheræ the supreme power passed into the hands of Jason, who was probably the son of Lycophron, and certainly the inheritor of his ambitious views, which however he enlarged into more comprehensive schemes, and, with superior energy and talents, possessed greater means of realizing. He kept a standing army of 6000 mercenaries, all picked men; and, notwithstanding the opposition of Pharsalus, he compelled most of the principal Thessalian cities to enter into alliance with him: moreover, his sway was acknowledged by several of the neighbouring tribes. The leading states of Greece were wasting their strength in a protracted warfare, and whichever way he turned his eyes he perceived, or imagined that he perceived, facilities for gaining the objects of his ambition, namely, the supremacy of Greece, and the overthrow of the Persian empire in the East; the same schemes in fact as were subsequently executed by Alexander, king of Macedon. The first objects which he had to gain were the title of Tagus, and the union of Thessaly under his authority. To accomplish the latter project it was necessary to gain by persuasion, or overpower by force, Polydamas, the governor of Pharsalus. Jason adopted the former method, and, after a frank statement of his views, prevailed upon Polydamas to second them. A compact was then made between them; and Polydamas exerted his influence so successfully in Jason's behalf, that the Pharsalians were induced to enter into an alliance with him, and to join in a general pacification, which immediately followed. Not long afterwards Jason was either elected Tagus, or assumed the title, without any opposition, and, by his influence and talents, several important cities were induced to join the confederacy. He then fixed the contingents of infantry and cavalry to be furnished by the different states, and raised them to a greater amount than they had ever been before. The army which he could bring into the field consisted of 8000 cavalry and more than 20,000 heavy-armed infantry; and his light troops, as Xenophon (*Hellen.*, vi. 1, 6) observes, were enough to oppose the world. For their maintenance he revived the tribute which had been imposed on the subject tribes of the Thessalians by Scopas one of his predecessors. The extensive coasts of Thessaly, its forests of excellent ship-timber, and his large revenues, also enabled him to raise a considerable fleet, which he had no difficulty in manning from the Penestæ, or subject population of the country. His resources in fact were in every respect so great, that Thessaly seemed destined, under him, to become both by sea and land the leading power of Greece, and even his projected conquest of Persia no longer impracticable. But these schemes were too vast for the ordinary duration of a human life, though he kept them constantly in view, and made all his actions subservient to them. An instance of this occurs in his conduct after the battle of Leuctra, in which the Thebans defeated the Lacedæmonians, and then invited him to join them in overpowering Lacedæmon. Jason joined them with his forces, but he did not comply with their request. His policy was to keep an even balance between the two states, so as to ensure the dependence of both on himself, and therefore, instead of annihilating the power of Sparta, he offered his services as a mediator between the contending states, and obtained a truce for the Lacedæmonians, under favour of which the remnant of their forces decamped by night (B.C. 371). In the following year Jason's career was terminated. He had made preparations for an expedition to the south of Greece, and had ordered a levy of troops, declaring at the same time his intention of marching to Delphi and presiding over the Pythian games: but before the time came he was assassinated by seven young men; and the honours which were paid in many of the Grecian cities to the assassins, showed the alarm which his ambition had excited. On the death of Jason, Thessaly relapsed into its former insignificance, though his dynasty survived him, and two of his brothers, Polydorus and Polyphron, for a short time shared his authority between them. Polydorus was soon assassinated, and Polyphron became sole Tagus. By his administration the office was changed into a tyranny, and he put to death Polydamas and eight other principal citizens of Pharsalus. After a reign of one year, he was murdered by his nephew Alexander, who thus gained the government, in which he became infamous for his cruelty. The atrocities which he committed filled all his subjects with terror, but especially the antient families, who were likely to be the objects of his jealousy. The Aleuadæ of Larissa accordingly applied to Alexander, the then king of Macedon, who, on being thus invited by the Thessalians, complied with their request. He defeated the tyrant, and took possession of Larissa and its citadel, and afterwards of Crannon, and garrisoned both with his troops. The affairs of his own kingdom however obliged him to withdraw from Thessaly, and the Thessalians, being thus exposed to the vengeance of Alexander, solicited aid (B.C. 368) from the Thebans, who accordingly sent Pelopidas to assist them. The tyrant granted him an interview, which ended in Pelopidas settling the affairs of the country on an apparently firm footing. But the order which he had established was soon deranged by the conduct of Alexander; and the Thebans, on being applied to again, sent out Pelopidas, with his friend Ismenias, but simply in the character of ambassadors, and without troops. They imprudently put themselves into the power of the tyrant, who threw them into prison. To rescue them and avenge the insult, Thebes sent out an army, which however was reduced to such a strait by his cavalry, that it was obliged to retreat, and but for the interference of Epaminondas, who accompanied it, though not as general, it would have been destroyed.

In the following year (B.C. 367) an army was again sent out under Epaminondas, through fear of whom the prisoners were released. Subsequently Alexander renewed his attacks on the liberty of the Thessalian cities, and greatly extended his dominion in the tributary districts. The Thessalians again appealed to the Thebans, and Pelopidas was sent out to aid them (B.C. 364), who fell in his first battle, in which however Alexander was defeated. The campaign ended in the tyrant being obliged to resign his conquests, withdraw his troops from Phthiotis and Magnesia, and enter into alliance with Thebes. Still Alexander did not cease to be an object of hatred and dread to his subjects and foreigners, by his cruelties and piracies, and at last his wife Thebe conspired with her three half-brothers to murder him. (B.C. 359.) They effected their purpose, and one of them, Tisiphonus, under the direction and with the sanction of Thebe, assumed the government. But his reign lasted a very short time: for towards the end of B.C. 353, we find Lycophron, another of the brothers, at the head of affairs. The new dynasty however seems to have been as unpopular with the Thessalians as the old one, and accordingly, with the Aleuadæ at their head, they applied to Philip, king of Macedon, and requested his assistance. Lycophron applied to his allies, the Phocians, the antient enemies of the Thessalians, at that time under the command of Onomarchus. Philip invaded Thessaly, and, after gaining some success, was obliged to retire; but he shortly afterwards returned at the head of a large army, and made himself master of the whole country, Lycophron withdrawing into Phocis. Philip wished to be considered as a liberator; and accordingly he restored popular government at Pheræ (Diodorus, xvi. 38), though he kept possession of its port Pagasæ, and garrisoned Magnesia with his own troops. The important services which he thus rendered to the Thessalians secured their attachment to his interests, and, in addition to this, afforded him the opportunity of gaining a strong footing in the country, of which he did not fail to avail himself. It would appear however (Thirlwall, *Hist. of Greece*, vol. vi., p. 12) that about B.C. 344, either the tyrants of Pheræ or their party there had regained their ascendency, and Philip was again invited to dislodge them. This he effected with ease, and then availed himself of the opportunity to make Thessaly entirely subservient to his interests, and in fact to render it virtually a province of Macedonia. After expelling the dynasty of the tyrants, he garrisoned the citadel of Pheræ with his own troops, to prevent, as he gave it out, any chance of their restoration to power. He also strengthened his own authority by effecting what was professedly a return to the antient order of things in Thessaly. This was the revival of the tetradarchies as political divisions of the country, for though this antient division into four districts still subsisted, it had long been rather a geographical than a political arrangement. At the head of the four governments he placed his devoted adherents, the chiefs of the Aleuad party, so that they were in reality his viceroys or deputies. The result is described by Demosthenes (*Olynth.*, i. 23) as amounting to a total subjection of the land to Philip, whom it supplied with excellent and numerous troops; besides which, he not only received the harbour duties and customs of the country, but also appropriated to himself the tribute which had always been paid to Larissa by her subject Perrhæbian cantons. (Strabo, ix., p. 440.) On his death the states of Thessaly passed a decree confirming to his son Alexander the supreme station which Philip had held in their councils, and also signified their intention of supporting his claim to the title of commander-in-chief of the whole Grecian confederacy. Immediately after the death of Alexander (B.C. 323), a confederacy was formed against the Macedonians by the Athenians and other states of Greece, which the Thessalians were induced to join. Antipater, the viceroy of Macedonia, was unable to raise an army sufficiently large to cope with the confederacy, and after a battle, in which some Thessalians deserted him and caused his defeat, he retired to Lamia, a town of Thessaly, where he was besieged for some time by Leosthenes, the Athenian general. The siege was however raised by Leonnatus, an eminent Macedonian general, and some additional reinforcement under Craterus enabled him to bring to a successful issue what was called the Lamian war, in which the Thessalians took a very prominent part, and which nearly proved fatal to the Macedonian influence not only in Thessaly, but over the whole continent of Greece. Thessaly was thus preserved to the Macedonian crown till the reign of Philip, son of Demetrius, from whom it was taken by the Romans after the battle of Cynoscephalæ (B.C. 197). All Thessaly was then declared free (Liv., xxxiii. 32) by a decree of the Roman senate and people, but from that time it may be considered as under the dominion of Rome, though its possession was disputed by Antiochus (Liv., xxxvi. 9), and again by Perseus, son of Philip, between whom and the Romans it was the arena of more than one conflict. It was already a Roman province when the fate of the empire of the universe was decided by the battle between Pompey and Cæsar on the plains of Pharsalus.

The slave-merchants of Greece were generally Thessalians. (Aristophanes, *Plutus*, 517.) Their chief slave-market was Pagasæ, the port of Pheræ.

(Clarke, Dodwell, and Gell's *Travels;* Leake's *Travels in Northern Greece;* Thirlwall, *History of Greece;* Cramer, *Antient Greece*, vol. iii., p. 343; Wachsmuth, *Hellenische Alterthumskunde*, vol. i., p. 65.)

THETFORD, a small parliamentary borough, partly in the hundred of Grimshoe, in the county of Norfolk, partly in Lackford hundred, in the county of Suffolk, 88 miles from London by the Norwich mail-road through Woodford, Epping, Bishop Stortford, Newmarket, and Bury St. Edmunds; and 30 miles from Norwich by Attleburgh. It has been confidently asserted that Thetford existed in the time of the Romans, or even antecedent to their arrival; but it cannot be identified with any of their towns that have been mentioned in antient records. Plot and Blomefield attempted to fix here the Sitomagus of the 'Antonine Itinerary;' others have proposed to fix here the Iciani of the 'Itinerary,' but without any solid ground for their opinion. The Ikeneld or Icknield Street or Way, and a road called the Peddar or Ieddar Way, crossed the Little Ouse above Thetford, but not very near it. Blomefield describes some traces of fortifications as existing in his time, but it is not clear that they were Roman. Some coins of the earlier emperors, from Claudius to Antoninus Pius, have been found. Under the East Angles it was a place of importance: a synod was held here A.D. 669. When the Danes invaded England in the reign of Ethelred I., they fixed their head-quarters, A.D. 870, at Thetford (called in the Saxon Chronicle, Theodford, Theotford, and Theotforda; and by other old writers Tedford and Thedford), which they sacked: and it is likely that the battle in which they defeated Edmund, king of the East Angles, was fought not far off. There appears to have been an abbey near the town at an early period, for king Edred, the grandson of Alfred the Great (A.D. 952), 'ordered a great slaughter to be made in the town of Theotforda, in revenge of the abbot, whom they had formerly slain.' (*Saxon Chronicle;* Florence of Worcester.) In the reign of Ethelred II. the town was burnt by the Danes (A.D. 1004) under Sweyne, but on their return to their ships they were intercepted by the Anglo-Saxons under Ulfkytel, and did not make good their retreat without serious loss. They burned the town again A.D. 1010. In A.D. 1075 the bishopric of the East Angles was transferred from North Elmham to Thetford, but remained there not twenty years, being transferred (A.D. 1094) to Norwich. At this time Thetford was a town of considerable size and importance; it was a burgh with 944 burgesses in the time of Edward the Confessor; but at the time of the Domesday Survey there were only 720 burgesses, 224 houses being uninhabited. It gave name to the hundred in which it stood. After the removal of the bishopric to Norwich, or perhaps before, a Cluniac priory was founded here, the revenues of which at the dissolution were 418*l*. 6*s*. 3*d*. gross, or 312*l*. 14*s*. 4½*d*. clear. There was also a house of canons, which was afterwards a nunnery, a Dominican friary, and several smaller religious houses or hospitals. Thetford was the seat of one of the suffragan bishoprics established by Henry VIII. There have been as many as twenty churches; thirteen are mentioned in Domesday.

The borough of Thetford, according to the Population Returns for 1831, comprehends three parishes, with an area of 8270 acres, and a population of 3462. The parishes of St. Cuthbert and St. Mary are very much intermingled, and are partly in Suffolk and partly in Norfolk: the whole of the other parish (St. Peter) is in Norfolk. The town is chiefly on the north-east or Norfolk bank of the Little Ouse; a smaller part is on the opposite or Suffolk bank. The town is irregularly built, and is neither paved, watched, nor lighted, but has a neat and clean appearance. It has no manufactures, but there is a good deal of malting, and the trade of the place is favoured by the river being navigable up to the town, by means of which an export of agricultural produce and an import of coal are carried on. St. Peter's church consists of a nave with two aisles, chancel, and tower; the last rebuilt A.D. 1789. The antient part is built chiefly of flint, whence it has obtained the name of 'the black church.' St. Cuthbert's church is of ordinary structure: it has an embattled tower. Both these churches are in Norfolk. St. Mary's is on the Suffolk side of the river, and is meanly built. There are meeting-houses for Wesleyans, Independents, and Quakers; and a Roman Catholic chapel. Considerable remains of the Cluniac priory, especially the antient gateway, still exist on the north-west side of the town. There are also some considerable remains of the nunnery, comprehending the chapel and the ruins of some other parts, at what is called Thetford-place Farm, on the Suffolk side of the river, south of the town; and some relics of other religious structures of the middle ages. The grammar-school is an antient building.

The borough, as we have seen, is as old as the time of Edward the Confessor: under the Municipal Reform Act it has four aldermen and twelve councillors, but is not to have a commission of the peace, except on petition and grant. It first sent members to parliament in the time of Edward VI., and still returns two: the borough limits were not altered by the Boundary Act. There were 156 voters in 1835-6, and 160 in 1839-40.

The livings of St. Mary and St. Peter are rectories, of the clear yearly value of 83*l.* and 55*l.* respectively; that of St. Cuthbert is a perpetual curacy, of the clear yearly value of 50*l.*: all are in the rural deanery of Thetford, and the archdeaconry and diocese of Norwich. There were in the borough in 1833, thirteen day-schools, with from 357 to 367 scholars, namely, 123 boys, 69 to 79 girls, and 165 children of sex not stated; and three Sunday-schools, with 393 scholars, namely, 180 boys and 213 girls.

(Blomefield's *History of Norfolk;* Martin's *History of Thetford; Parliamentary Papers.*)

THETIS, Mr. Sowerby's name for a genus of fossil shells, said to resemble *Mactra*, but not to have the internal ligament. It is described as having several small acuminated teeth, but no lateral teeth; so that it in some degree resembles *Tellina* without the posterior plication.

THE'VENOT, MELCHISEDEC, is said by all his biographers to have died at the age of 71; and as his death happened in 1692, this places his birth in the year 1621. An entry in the printed catalogue of Thévenot's library informs us that he was uncle of the traveller Jean Thévenot, but beyond this we know nothing of his family or circumstances. It is probable however, from the respectable missions to which he was appointed at an early age, from the large library he collected, and from his being able to devote himself to literary pursuits while apparently in the receipt of no pension, that his family was wealthy and well connected.

It is stated that in his youth he visited several countries of Europe, but the earliest incidents of his life concerning which we have positive and authentic accounts are those mentioned in the brief autobiographical sketch prefixed to the printed catalogue of his library. He tells us that on his return from travelling in 1647, he was nominated resident at Genoa, but that the troubles of the Fronde interfering to prevent his taking possession of the post, he continued to follow the court till 1652. He was then sent to Rome, where he continued nearly three years; and being there at the commencement of the conclave which elected Alexander VII., the royal instructions respecting the part France intended to take on that occasion were addressed to him till the time of M. de Lionne's arrival. Thévenot alludes in mysterious phrase to a delicate and dangerous commission with which he was intrusted after the termination of the conclave, which he says he discharged to the perfect satisfaction of Mazarin and the other ministers. He attended Mazarin during the campaign in Flanders, 1655.

On his return to Paris, Thévenot devoted himself entirely to study. Frenicle, a mathematician, and Stenon, a naturalist, resided with him; and in the house adjoining his own he entertained a person to conduct chemical experiments. The meetings of scientific men which had been held in the houses of Père Mersenne and Montmort were transferred to Thévenot's mansion. The expenses thus incurred proved too heavy for his means, and he proposed to Colbert the establishment of a public and permanent association of scientific men under the patronage of the king. The suggestion accorded with the minister's inclinations, and a grand academy was projected, intended to embrace every branch of knowledge. The king's library was to be the place of meeting: the historians were to assemble there on the Mondays and Thursdays of every week; the amateurs of the belles-lettres on the Tuesdays and Fridays; the mathematicians and natural philosophers on the Wednesdays and Saturdays; and general assemblies of all the three classes were to be held on the first Thursday of every month. The historical class was allowed to drop, it being feared that its inquiries might occasion dangerous discussions; the Académie Française, instituted by Richelieu, remonstrated against the foundation of another literary academy; and the only part of Colbert's plan that was realised was the 'Académie des Sciences,' which commenced operations in the month of June, 1666. Thévenot did not become a member of the Academy till 1685.

He had in the mean time however been diligently prosecuting his favourite studies. 'Each of our company,' he says, 'had his task and occupation: mine was to collect and publish in French whatever useful arts were practised among other nations. About this time I invented an air-level, of which I caused the description to be printed, and it is now acknowledged to be the most accurate that has yet been tried. To render geography more perfect, I collected and published three large volumes of a collection of voyages, upon which I had been working for some time. I had the honour to present them to the king, who examined them for nearly half an hour, and, after asking several questions, commanded me to continue the work. M. Colbert informed me that he had his majesty's orders to furnish me with everything necessary to carry out the design.' This distribution of tasks took place about 1659, before the Academy had received its definitive constitution. The first volume of Thévenot's Voyages was published at Paris, in 1662. The author's preface announces a translation of the Voyages and Travels published by Hakluyt and Purchas, with the addition of some translations from the Oriental languages. The second volume appeared in 1664: the preface intimates that for the use of the numerous trading companies that have of late been formed in the kingdom, he has added an account of the present state of the Indies, noting the principal commercial establishments and places of resort of the Dutch and Portuguese; a report from one of the factors of the Dutch East India Company to the directors; and an extract of a letter from the governor-general of the East India Company of France. The third volume was published in 1666, and the fourth in 1672. In the preface to the fourth volume Thévenot informs the reader that the constant discovery of travels which had escaped his research has obliged him to abandon the attempt to classify the voyages inserted in his collection, so that all relating to one quarter of the world should appear together. These four volumes were in folio; and during the remainder of his life Thévenot published in the same form a number of separate accounts of voyages, which, together with some left half printed at his death, were bulky enough to form a fifth volume. The edition of his collection printed after his death at Paris, in 1696, professes to contain all these miscellanea, but a complete copy is rarely to be met with. In 1683 Thévenot published a small book in 12mo., entitled 'Recueil de Voyages de M. Thévenot.' It contains 'A Discourse on the Art of Navigation, with some Problems which may supply in part the deficiencies of this useful art.' Among these problems he has inserted an account of the level above alluded to. The same volume contains an account of the museum of Swammerdam, with some memoirs by that naturalist, said on the special title-page to be 'Extracted, together with the travels which precede it, from the Transactions of the Society which met at the house of M. Thévenot.' It will be advisable to conclude the narrative of Thévenot's life before attempting to pronounce judgment on the merits of his publications.

Colbert died in 1683, and Louvois succeeding to the office of superintendent of buildings, succeeded likewise to the management of the royal library, which was regarded as belonging to that minister's department. Louvois appointed his son, afterwards known as the Abbé Louvois, who was then only nine years of age, librarian. It was necessary to find a deputy for so juvenile an officer: the Abbé Varés was first appointed, but he dying in September, 1684, the office was conferred upon Thévenot, on the understanding that such of his books as were not already in the royal library were to be purchased for it. The zeal which Colbert had manifested at the outset of his ministerial career for the augmentation of the royal collection had abated for some years before his death: from 1673 till his death no important acquisitions had been made. Thévenot found the library extremely deficient in English, German, and Dutch works, and he obtained permission to make arrangements for procuring from those countries their histories, laws, and accounts of their customs; in short, everything calculated to convey information regarding their governments and transactions. The inquiry after Greek and Oriental MSS. in the Levant, begun by Colbert, was continued by Louvois; and Thévenot, by that minister's directions, prepared and transmitted instructions to Messrs. Girardin and Galland and the Père Besnier for the prosecution of the search. It was also at his suggestion that a native of China, who had brought some Chinese books to Rome, was induced to visit Paris, and his books acquired for the king's library. On the death of Louvois a new arrangement was made for the management of the king's library, and about the same time Thévenot resigned or was dismissed from his appointment. There is reason to doubt whether he had given satisfaction as librarian: the historical memoir in the first volume of the printed catalogue of the king's library, which does ample justice to other officials, merely notices his appointment and resignation; and the notice of his life found in his own writing among his papers after his death, has very much the appearance of a defensive statement of his own merits.

Thévenot did not long survive the termination of his connection with the king's library: he died on the 29th of October, 1692.

Thévenot, in addition to most European languages, was able to read Hebrew, Syriac, Arabic, Turkish, and Persian. He commenced a series of observations on the variation of the magnetic needle in 1663, and prosecuted them with great perseverance till 1681. He suggested, in 1669, the measurement of several degrees of the meridian along the Gulf of Bothnia: he invented his air level about 1660, and recommended its adoption to facilitate observations of the latitude at sea, and he endeavoured to discover a natural unit of linear measurement for all nations. He possessed however rather the taste than the talent for strict scientific observation and reasoning, and this peculiarity was the cause in the first place of his anxiety to have men of science for his habitual visitors, and of his eagerness to collect books of travels, printed or in MS., such works being calculated to gratify a mind which, without a capacity for severe labour, was fond of acquiring knowledge. In books of travels he found information regarding statistics, history, commerce, natural history, and science; and he could relish all these branches of knowledge and appreciate their importance, though he could not task himself to master any one of them. He undertook to publish a systematic collection of voyages and travels, as the task best suited to his turn of mind; but even this required more continuous effort than he was capable of: in the fourth volume the systematic arrangement was abandoned, and only some fragments of the fifth part were published at long intervals. Thévenot was one of those who promote science by imparting a contagious spirit of activity to others more than by anything they accomplish themselves. His taste for collecting books has been the means of supplying the king's library at Paris with some of its not least valuable MSS., some of which have yet to be turned to account. His collection of voyages too has been the means of preserving some curious and valuable narratives. If he did not make a good practical librarian, he at least pointed out the way in which the library might be rendered more complete; and besides preserving materials for geographers to work upon, he directed attention to the means of rendering the science more perfect. Some of his suggestions mentioned above were not without their influence in promoting the application of mathematics and astronomy to geographical research; and he was the first, by directing attention to the line of communication between the Caspian and China, and to the literature of China, to commence that series of investigations which has been so brilliantly carried on by the Jesuits of the seventeenth, and by the Remusats and Klaproths of the past and present century.

Sources from which this sketch has been compiled:— 1, 'Mémoire sur la Collection des grands et petits Voyages, et sur la Collection des Voyages de Melchisedec Thévenot,' par A. G. Camus, Paris, 1802, 4to. Owing to the incomplete condition of most copies of Thévenot's collection, this work is necessary to enable the reader to know what he has published. 2, 'Bibliotheca Thevenotiana sive Catalogus Impressorum et Manuscriptorum Librorum Bibliothecae viri clarissimi D. Melchisedecis Thevenot,' Lutetiae Parisiorum, 1694, 12mo. This volume contains the autobiographical sketch above referred to: the catalogue of Thévenot's library throws light upon his studies. 3, 'Recueil de Voyages de M. Thévenot,' Paris, 1681. This volume contains the discourse on navigation, in which there are some incidental notices of Thévenot's pursuits. 4, 'Relations de divers Voyages curieux qui n'ont point été publiées ou qui ont été traduites de Hakluyt,' &c., Paris, 1663-1672. The 'Avis' prefixed to the different volumes of this edition contain matter for the biography of Thévenot. 5, 'Histoire de l'Académie des Sciences.' Tome i. contains a corroboration of Thévenot's assertions regarding his share in the institution of the Académie des Sciences. 6, 'Catalogue des Livres Imprimez de la Bibliothèque du Roi: Théologie, première partie,' à Paris, 1739: supplies the dates of Thévenot's appointment as librarian, and of his demission of the office. 7, Le Long et Fontette; 'Bibliothèque Historique de la France,' iv. 66.

THE'VENOT, JEAN, was born at Paris the 7th of June, 1633. In the dedication of the first volume of his travels to his mother, he attributes to her exclusively the great care bestowed upon his education; and from this circumstance it may be inferred that his father died while he was a child. Thévenot distinguished himself as a student at the college of Navarre. The author of the sketch of his life, prefixed to the second volume of his travels, states that his attainments in the languages, physics, geometry, astronomy, and all the mathematical sciences, were respectable, and that he had studied with particular attention the philosophy of Descartes. But it is doubtful whether all these are to be understood as having been his college studies.

He left the college of Navarre before he had completed his eighteenth year. Possessing an independent fortune, his attention was for some time afterwards engrossed by the manly exercises which were then deemed indispensable accomplishments in a gentleman; but having contracted a taste for reading books of travels, he caught the contagious spirit of adventure, and commenced traveller himself in 1652. He visited in succession England, Holland, Germany, and Italy; and, making a prolonged stay at Rome (1654-55), witnessed the solemnities of the installation of Alexander VII. He had taken the pains to prepare an account of his observations during this tour, but judiciously resisted all persuasions to publish it, partly on account of his youth and partly on account of the want of novelty in the subject.

At Rome he became acquainted with the celebrated Orientalist d'Herbelot, who, being a good many years his senior, and already distinguished for his learning, acquired considerable influence over him. D'Herbelot freely communicated to his young friend the information he had collected regarding the East and its inhabitants, and the result of their conversations was that Thévenot determined to devote himself to exploring Asia. D'Herbelot proposed at one time to accompany him, but being prevented by some family matters, Thévenot set out alone.

Thévenot began his first journey from Malta on the 1st of November, 1655: he arrived at Leghorn, on his return, on the 8th of April, 1659. Having reached Constantinople in the beginning of December, 1655, he remained there till the end of August, 1666. Travelling through Brusa and Smyrna, and visiting Chio, Samos, and Rhodes, he arrived at Alexandria on the 29th of December. He proceeded without loss of time to Cairo, which he made his head-quarters for two years, making in the course of that time two excursions, the first to Suez and Mount Sinai, the other to Jerusalem and some of the adjoining districts of Syria. During his stay at Constantinople and Cairo he made himself master of the Turkish and Arabic languages. On his way from Egypt to Italy he touched at Tunis.

From Leghorn Thévenot visited several parts of Italy which he had not previously seen, and in particular resided for a short time at the court of Savoy, before he returned to France. The first volume of his travels, he says, was prepared for the press to gratify his friends, and especially his mother; and these were not with him mere words of course, for he was more intent upon travelling and observing than publishing. Before his book had passed through the press, and without giving his friends any warning of his intention, he left Paris to renew his researches in the East, and sailed from Marseille on the 6th of November, 1663.

This time his object was to visit Persia and the Indies. He arrived at Alexandria on the 4th of February, 1664: from Alexandria he sailed in a few days to Sidon; and from Sidon he visited Damascus. After a stay of twenty-four days in that city he went to Aleppo, where he remained two months; and then, travelling by Bir and Orfa to Mosul, descended the Tigris to Bagdad. From Bagdad he travelled to Ispahan by the way of Hamadan. Having remained five months at Ispahan, he left it, in company with Tavernier, for Schiraz and Gombroon, intending to sail for India from that port, but the jealousy of the Dutch agents obliged him to return to Schiraz. After examining the ruins of Tshelminar (Persepolis) he proceeded to Basrah, and embarked at that port for Surat, where he arrived on the 12th of January, 1666. Surat continued his head-quarters till February, 1667, during which time he made excursions to Guzerat, the court of the Mogul, and to the Deccan. On his return to Persia he spent five months at Ispahan. He had several attacks of illness in India, and having been wounded by the accidental discharge of one of his own pistols at Gombroon, his cure was tedious. His constitution was probably undermined; for, attacked by fever on his way from Ispahan to Tabriz, he died at Miana, on the 28th of November, 1667. During this journey he had acquired a knowledge of the Persian language.

The narrative of Thévenot's first journey to the East was prepared for the press by himself, but was not published till after his departure from Persia. The account of his travels in Persia, and that of his travels in India, were published (the former in 1674, the latter in 1684) by an editor who is called, in the 'Privilége du Roi,' the Sieur Luisandre, and who states that he was Thévenot's executor, and employs expressions which would lead us to believe that he had married the traveller's mother. The editing of these two volumes has been respectably performed.

Thévenot possessed a natural talent for observation, and the power of expressing himself accurately and unaffectedly. Nothing of importance appears to have escaped his notice: his manner of telling his story impresses the reader with a confidence in his good faith, and his statements have been corroborated on many material points. His mastery of the Turkish, Arabic, and Persian languages gave him an advantage that scarcely any other Oriental traveller of his day possessed. His practice of residing for some time in the principal towns of the countries he visited familiarised him with the customs of the natives. His descriptions of external objects are distinct, and his routes accurate. He had collected a Hortus Siccus in India, and had laid beside each specimen an account of the habitat and characteristics of the plant, along with its name in the Portuguese, Persian, Malabar, and (what his biographer terms) the Indian and Banian languages. This collection came into the possession of Melchisedec Thévenot, and is mentioned in the printed catalogue of his library. Jean Thévenot had also made a collection of Persian and Arabic manuscripts, of which Tavernier says the cadi of Miana kept the best to himself. The matured judgment, and talent for observation and description, displayed in Thévenot's works, are astonishing in one who had been a wanderer from his twentieth year, and who died in his thirty-fourth. His travels, originally published in three volumes, in quarto, which appeared respectively in 1665, 1674, and 1684, were reprinted at Amsterdam, in five duodecimo volumes, in 1689, and at the same place, in the same form, in 1705, 1725, and 1727. A Dutch translation of them was published in 1681, an English translation in 1687, and a German translation in 1693.

This sketch has been compiled from the account of Thévenot's life prefixed to the second volume of his travels, from the travels themselves, and from some incidental notices in Tavernier.

THEW, ROBERT, was the son of an innkeeper in the small town of Patrington, in the East Riding of Yorkshire, where he was born, in the year 1758. His education was neglected, and at a suitable age he was bound apprentice to a cooper. After the expiration of his apprenticeship Thew continued for a time to work at the business to which he was brought up; and Chalmers states that, during the American war of independence, he served as a private in the Northumberland militia. According to the 'Gentleman's Magazine,' his attention was first directed to engraving about the age of twenty-six; when, it is stated, he happened to see an engraver at work, and although he had never practised drawing, he procured a copper-plate, and engraved an old woman's head, from a picture by Gerard Douw, with such extraordinary skill that he was, on the recommendation of Charles Fox, the Duchess of Devonshire, and Lady Duncannon, appointed historical engraver to the Prince of Wales. Whatever foundation there may be for this story, it must be received with some allowance, because a considerable degree of mechanical dexterity is indispensable for the production of a good copper-plate engraving. A more probable account is that about 1783 he settled at Hull, and became an engraver of shop-bills, cards, &c. Chalmers states that he engraved and published a plan of Hull, which is dated May 6, 1784; and that shortly afterwards he solicited subscriptions for two views of the dock at that place. The latter are large aquatint prints, drawn and engraved by Thew, with the assistance of F. Jukes in the aquatinting department; and they were published in London by Thew himself, in May, 1786. Copies of them are preserved in the collection of George III., now in the British Museum. In 1788 Thew was introduced to Alderman Boydell by the marquis of Caermarthen (afterwards duke of Leeds), whose patronage he had obtained by the construction of a camera-obscura on a new principle; and Boydell immediately commissioned him to engrave Northcote's picture of the interview between the young princes, from 'Richard III.,' act iii., sc. 1. This plate was published in 1791, at which time Thew held the appointment above alluded to, of engraver to the Prince of Wales. He subsequently engraved eighteen other plates for the Shakspere Gallery, and part of a nineteenth. Several of these are among the best in the collection, and display a high degree of mechanical skill, as well as an unusual amount of spirit and expression. That of Cardinal Wolsey entering Leicester Abbey ('Henry VIII., act iv., sc. 2), from a picture by Westall, is particularly and deservedly celebrated as a fine specimen of the style known among artists as stipple engraving; and in consequence of its superior beauty, proof-impressions of it were, according to the 'Gentleman's Magazine,' charged double the price of any other in the whole work. Thew died in July, 1802, at Stevenage (or Roxley, according to the 'Gentleman's Magazine') in Hertfordshire. (*Gent. Mag.*, Oct., 1802, p. 971; Chalmers's *Biog. Dict.*)

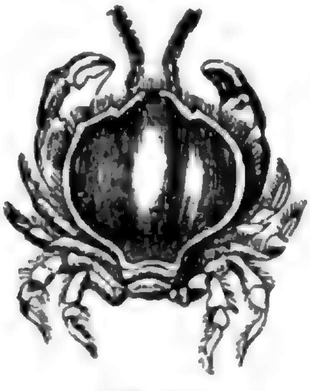
THIA, Dr. Leach's name for a genus of crustaceans, placed by M. Milne Edwards under the tribe *Corystians*, in the family *Oxystomes*.

Generic Character.—*Carapace* nearly cordiform, a good deal narrowed behind; its upper surface very smooth, and nearly horizontal from before backwards, but much curved transversely, and presenting no distinct regions. *Front* wide, lamellar, and rather advanced; the lateral borders of the carapace delicate and arched. *Orbits* very small. Internal *antennæ* bent transversely under the front; external antennæ inserted in the gap which separates the front from the floor of the orbit, large and strongly ciliated. Disposition of the *buccal apparatus* nearly the same as in *Atelecyclus*, a genus which immediately precedes it in the arrangement of M. Milne Edwards. Third joint of the external *jaw-feet* advancing to the base of the internal antennæ, but much less elongated, and giving insertion to the succeeding joint by a large notch at its internal angle. *Sternal plastron* very narrow. Anterior feet short and compressed, but less than in *Atelecyclus*; the succeeding feet still shorter, and terminated by a straight and very sharp point. *Abdomen* nearly of the same form in both sexes; only that of the male is rather narrower, and the three joints which precede the last are anchylosed together. (M. E.)

Habits of the Genus.—*Thia* lives buried in the sand at a small distance from the shore. M. Milne Edwards states that but one species is known with any certainty, namely—

Thia polita.—Colour rosy; length ten lines; localities the British Channel and the Mediterranean.

M. Milne Edwards remarks that the aspect of these small crustaceans is very peculiar, and approximates them a little to the *Anurous* section. In other respects, he observes, they bear a strong analogy to *Atelecyclus*, and, as well as that genus, establish a passage between the *Oxystomes* and the *Cancerians*.



Thia polita.

THIAN SHAN MOUNTAINS. [SONGARIA.]

THIAN SHAN NANLU is the name of a Chinese government situated nearly in the centre of Asia. European geographers generally call it Eastern or Chinese Turkistan, and also Little Bucharia. The name of Turkistan is applied to it because the bulk of the inhabitants in that part of Asia is composed of Turkish tribes; and as these tribes are frequently designated by the collective name of Bucharians, from the town of Bokhara, Eastern Turkistan is also called Little Bucharia, or rather Bokharia, to distinguish it from Western or Proper Turkistan, which is called Bucharia without any epithet. Thian Shan Nanlu, in Chinese, signifies the 'southern road of the Thian Shan Mountains,' and has been applied to the countries south of that mountain-system, because they are traversed by the southern of the two great commercial roads which connect China Proper with the countries of Western Asia, whilst the countries north of the Thian Shan are traversed by the northern commercial road, and on that account are called Thian Shan Pelu, 'the northern road of the Thian Shan.' The last-mentioned countries constitute the government of Ili, or Songaria. They have been described under SONGARIA.

Thian Shan Nanlu lies between 36° and 44° N. lat., and extends from 71° to 96° E. long. From west to east it extends about 1250 miles, and its width from north to south varies between 550 and 300 miles. Its area probably exceeds 500,000 square miles, so that it is ten times as large as England without Wales, and twice and a half as large as France. It is mostly surrounded by countries belonging to the Chinese empire: on the north is Songaria, or Thian Shan Pelu, east the province of Kansi, and south Tibet. Only its western side is enclosed by countries independent of China. On the south-west is Ladakh, on the west Kunduz, including Badakshan and Bokhara, and on the north-west Khokan. The three last-mentioned countries are within Western Turkistan, or Great Bucharia.

Thian Shan Nanlu is a country entirely isolated from the rest of the world. On the north, west, and south it is enclosed by mountain-ranges of such extent and elevation, that the places which are permanently inhabited can only be reached by passing for several days over mountains, which are not inhabited except for two or three months in the year, when they are visited by a few families of wandering tribes of mountaineers. On the east of Thian Shan Nanlu is an extensive desert, which appears to be uninhabitable. The country enclosed by the three ranges and the desert receives an abundant supply of water from the mountains, a considerable portion of which is always covered with snow, and the numerous rivers which descend from them form a large river, called the Tarim, which Ritter compares with the Danube, but which does not reach the sea; it terminates in an extensive lake situated on the western edge of the desert. The basin of the river Tarim is the largest closed river-basin on the globe, if that of the Caspian Sea and the rivers falling into it is excepted.

Mountains.—At the south-western angle of Thian Shan Nanlu stands an extensive mountain-knot, called Pushtikhur, which occupies the space between 36° and 37° N. lat., and between 71° and 74° E. long. From its western side issues that elevated chain which is known in Afghanistan by the name of Hindu Kush; from its northern edge another range, called the Tartashling, or Bolor Tagh, which extends northward; and in the eastern part there begins a third range, which traverses the whole of Central Asia, and extends through China Proper to the shores of the Pacific. This last-mentioned range is called by the Chinese Kuenluen, but that portion of it which is contiguous to the mountain-knot of Pushtikhur goes by the name of Thsungling.

The Thsungling may be considered as that portion of the Kuenluen range which extends from the Pushtikhur on the west (72° E. long.) to the mountain-pass of Karakorum on the east (between 76° and 77° E. long.), and occupies nearly the whole of the space between 35° and 37° N. lat. Very little is known of this mountain-region, which cannot surprise us, when we learn that, according to an intelligent Mohammedan traveller, an eternal mass of snow occurs in these parts, which occupies 200 cos (equal to more than 300 English miles) in length. An extraordinary phenomenon is stated to occur on the northern declivity of the mountains, where the Thsungling and Pushtikhur are contiguous—the continuance of rain for three successive months. That portion of the Kuenluen range which is east of the Pass of Karakorum is still less known. As far as the Keriya Pass (84° E. long.) its snow-covered summits lower towards the north with a moderate descent, and a hilly tract of moderate width extends along their base, which is fertilized by the rivers descending from the range; but east of the Keriya Pass no watercourses are found along the base, which leads to the supposition that the declivities of the mountains are extremely steep, and that they are in immediate contact with the sandy desert which extends north of them.* Two roads traverse the Kuenluen range. The most western leads through the Karakorum Pass from Hindustan and Cashmir by the way of Leh in Ladakh, to Khoten in Thian Shan Nanlu. The road runs from Leh north-north-east over a mountain-chain, and descends to the valley of the river Shayuk, the course of which it follows upwards between the mountain-masses of the Kuenluen nearly to the source of the river. It passes by a narrow valley over the highest part of the mountains (between 36° and 36° 30′), and descends on the north into the valley of the river Misar, which is a tributary of the Tarim. In the narrow valley of the Misar the road runs to Khelasten (north of 37° N. lat.), where the mountains disappear, and cultivation begins to be general. This mountain-road certainly does not rise to such an elevation as those which traverse the Himalaya Mountains, for it is quite free from snow in summer, and, with the exception of the highest portion, it does not rise above the line of vegetation, or even that of trees, as may be inferred from the fact that fire-wood and fodder for beasts of burthen are generally abundant, and permanent habitations are met with in the valleys of the Shayuk and Misar up to the immediate vicinity of the mountain-pass. The highest part of the pass probably does not exceed 12,000 feet above the sea-level. This road however is much more frequented in winter than in summer, because the melting of the snow on the mountains adjacent to the road renders travelling in summer almost impossible. We have no account of the eastern mountain-road that traverses the Kuenluen range. We only know that it connects the town of Lhassa in Tibet with Khoten in Thian Shan Nanlu, and that it traverses a very mountainous country of great extent, passing near the large lake of Tengri-Nor, and issuing from the mountains by the narrow valley in which the town of Keriya is built. From Keriya it runs north-west through a hilly country to Khoten.

The western districts of the Thian Shan Nanlu are occupied by several ranges, belonging to the Tartashling or Bolor Tagh. This mountain-system extends north of the mountain-knot of Pushtikhur, from 37° to near 41° N. lat., where it descends with long slopes towards the valley of the river Sihoon or Jaxartes. Its extent from south to north therefore does not much exceed 260 miles. It is difficult to determine its extent from east to west, as nearly the whole country from 69° to 74°, between the upper courses of the Sihoon or Jaxartes and that of the Jihoon or Oxus, is almost entirely unknown, and appears to be occupied by widely-spread rocky masses of mountain-ranges, between which only narrow valleys occur, that are visited by the wandering tribes of the Kirghis only during the summer. It does not appear that any of the sovereigns of the contiguous countries have extended their authority over this extensive mountain-region, or over any part of it, which may be considered as a certain proof that no portion of it is cultivated; and this supposition is supported by the fact, that it is not traversed by any commercial road, and that the two roads which connect Thian Shan Nanlu with Western Turkistan run along the southern and northern base of the Tartashling in the upper valleys of the two rivers Jihoon and Sihoon. We have some account of the mountains enclosing these valleys, which penetrate upwards of 200 miles into the mountain-region, but as these portions of the region are within Turkistan, they are noticed under that head. We shall only observe, that in the interior of the mountain-region, and within the boundary-line of Thian Shan Nanlu, an extensive elevated plain occurs, which is called the Table-land of Pamir. According to Marco Polo it takes ten days to traverse it from west to east; and, according to a Chinese traveller, it is 1000 li (equal to about 350 miles) long, and in some places 100 li (or 35 miles) wide, whilst in others it narrows to 10 li (or between 3 and 4 miles). The elevation of this table-land is so great, that no trees are found on it, and travellers feel their respiration rendered difficult by the rarefaction of the air. The nomadic Kirghis, who visit this elevated region in summer on account of its excellent pastures, keep herds of camels and sheep, and of kashgow or yaks, which latter are to the Kirghis what the rein-deer is to the Laplander of Northern Europe, serving them as animals of burden, and supplying them with food. Their milk is richer than that of the common cow, but the quantity which the yak yields is less. The tail is the well-known chowry of Hindustan. On the table-land of Pamir its hair, which is clipped once a year in the spring, is made into ropes, which for strength do not yield to those manufactured of hemp. It is also woven into mats, and into a strong fabric which makes excellent riding-trowsers. Among the wild animals peculiar to this region are the kutch-kar and the rass. The kutch-kar, or wild sheep, attains the height of a two-year-old colt, and has two fine curling horns: it congregates in herds of several hundreds, and is hunted by the Kirghis for its hide and flesh. The rass is a different animal, having straight spiral horns; it is less numerous than the kutch-kar, but equally prized as food.

The Thian Shan range extends along the northern boundary-line of Thian Shan Nanlu, which is separated by it from the government of Ili. This mountain-range has been noticed under SONGARIA, vol. xxii., p. 242, where also the range is described which forms the southern border of the Sihoon river-basin, and connects the Thian Shan Mountains with the Tartashling range, and where also the road is mentioned which, leading over the Thian Shan Mountains, connects Thian Shan Nanlu with the government of Ili.

Rivers.—The largest supply of water is derived from the Tartashling, in which three of the great branches of the Tarim river rise. The principal branch originates within the mountain-region in a large lake, called Karakol, which is situated near 39° N. lat., and receives the drainage of a considerable country which surrounds it on all sides. The river issuing from this lake runs eastward, and is called Yaman-yar. It leaves the mountain-region below Tashbalik, near 73° 30′ E. long., and is soon afterwards joined from the north by the Kashgar Daria, which brings to it the drainage of the north-eastern part of the Tartashling. Near the point of confluence the rivers are met by a third river, which flows in a direction from east to west, and brings down the waters collected on the mountain-chain which unites the Tartashling to the Thian Shan. This river, which is called Kezyl Daria, runs about 200 miles. After the union of these three branches the river continues to be called Kashgar Daria, and to flow eastward for 300 miles, without receiving any supply of water, until, between 80° and 81° E. long., it is nearly at the same point joined from the north by the Aksu Daria, from the west by the Yarkiang Daria, and from the south by the Khotan Daria. The Aksu Daria brings down a large volume of water, collected on the southern declivity of the western portion of the Thian Shan, and runs about 200 miles. The sources of the Yarkiang Daria are near those of the Jihoon, or Oxus, south of 37° N. lat., and the upper course of the river is within the mountain-region of the Tartashling, where it runs eastward, but it issues from it about 70 miles above the town of Yarkiang by a northern course. Its course in the plain is first north-east, but below the town of Yarkiang nearly due east, and parallel to the Kashgar Daria for nearly 200 miles. After passing 80° E. long. it turns northward, and soon afterwards joins the Kashgar Daria. Its course exceeds 400 miles; and among its numerous tributaries is the Misar river, which brings down water derived from the northern declivity of the Thsungling. The Khotan Daria collects its waters from the northern declivity of the Kuenluen range, east of 74° and west of 80° E. long., and runs more than 300 miles in a general north direction. In this river, and the mountains which are drained by its upper branches, the yew-stone or oriental jasper is found, which is held in great esteem in China, and exported in large quantities: it is mostly bought by the court of Peking, as the wearing of this stone distinguishes the higher classes of the mandarins from the lower.

After the confluence of these several branches the river is called Tarim, or Tarim-gol, and continues to flow in a nearly due east direction for 400 miles more, when, near 88° E. long., it is lost in an extensive lake, Lop Nor, which is surrounded by still more extensive swamps. It appears that this lower part of its course is skirted by swamps, which extend to a considerable distance from its banks. The extent of Lop Nor from west to east is said to exceed 70 miles, but its width does not appear to be half these dimensions. No river joins the Tarim from the south, east of 81° E. long., but it receives a considerable supply of water from the Thian Shan Mountains, by two rivers, the Ukiat, or Chagar Daria, and the Barun Yulduz, or Kaidu River. The Ukiat Daria, which rises in that part of the Thian Shan Mountains which encloses Lake Issekul on the east [SONGARIA], runs more than 200 miles in a south-east direction, and joins the Tarim near 84° E. long. The Kaidu River is probably the largest of the confluents of the Tarim, as it collects the drainage of the Thian Shan Mountains between 80° and 87° E. long. Its upper course for about 100 miles is in an elevated valley, parallel to the Thian Shan range from east to west: issuing from the valley it turns abruptly to the east, and draining another parallel valley about 200 miles long by an eastern course it falls into a large lake, which is called Bostu Nor or Bosteng Lake, the dimensions of which are stated to be hardly inferior to those of Lop Nor. This lake is surrounded on the north and south by chains of high hills, but on the east by a sandy desert. In the hills which enclose the lake on the south is a break by which the Bostu Nor discharges its waters into the Tarim. The channel by which this is effected is also called Kaidu, and reaches the Tarim about 80 miles above its influx into Lop Nor. The extensive swamps surrounding Lop Nor seem to begin at the conflux of these two rivers. The whole course of the Tarim amounts, according to the estimate of Ritter, to nearly 1200 miles in a straight line, and if its windings are taken into account, and the Yarkiang Daria considered as its principal branch, it cannot fall short of 1500 miles. The upper parts of this river and its tributaries are probably too rapid for navigation, and the lower parts of most of the tributaries of the Tarim, and of this river itself, lie through countries which are probably uninhabited. It is also probable that during the latter part of the summer, and in autumn and winter, the quantity of water is very small, the rains being very scanty, and the whole supply of water being derived from the melting of the snow on the mountains on which its branches originate. But the water of all these branches is used for irrigation, though that of the Tarim itself is not.

The *Plain* is of great extent, measuring on an average more than 300 miles from north to south, and about 900 from west to east. Its elevation is not known; but considering the peculiarities of its climate and its productions, it is presumed that it can hardly be less than 2000 feet above the sea-level. The largest portion of it is quite unfit for cultivation, and cannot even be used as pasture-ground. This is especially the case with the eastern districts, which are a complete desert. This desert occupies the whole country east of 88° E. long., and surrounds the lakes of Lop Nor and Bostu Nor on the east. South of the river Tarim it extends westward to the banks of the Khotan Daria (81° E. lat.), so that it covers about one-half of the plain. The worst part is that which lies east of 88°, and is called Han-hai, or the Dry Sea: according to an hypothesis of the Chinese, it is the bed of a lake, which has dried up at some remote period. Its surface is covered with a very fine sand, which is frequently raised into the air by the wind, so that the traces of the caravans soon disappear, except where they are marked by the bones of the beasts of burden which have perished in this desert, through which the nearest road leads from China to Hami in Thian Shan Nanlu. It is however asserted that there are a few places, generally two days' journey from one another, in which drinkable water is found by digging. That part of the desert which lies west of 88°, between the Tarim river and the Kuenluen range, is called the Desert of Lop. Though equally unavailable for agriculture or as a pastoral country, the surface is in many places diversified by large tracts of rocky and stony soil, in which a few animals, as wild horses and wild camels, find a scanty subsistence, and which are overgrown with low shrubs. Water however is scarce, except in spring time. On the north, where it approaches the Thian Shan range, this vast extent of desert is skirted by a narrow tract of hilly ground, which is fit for cultivation or used as pasture-ground. Its width may vary between 20 and 30 miles, and it is in many places abundantly watered by rivers which descend from the mountains on the north, but which as soon as they have traversed the hilly region are lost in the sand of the Han-hai. Only a small portion of this tract can be irrigated, but it is cultivated with the utmost care. It produces rice, wheat, millet, and several kinds of vegetables, especially pulse: it is famous all over China for its excellent fruits, especially pomegranates, oranges, peaches, plums, but above all for its melons and grapes, which are sent in large quantities to Peking. In many places cotton is grown on a large scale. The greater part of this tract however is used as pasture-ground for horses, camels, cattle, and sheep.

The country west of 88° E. long., and between the Tarim river and the Thian Shan Mountains, contains a much larger portion of cultivable ground, especially in the valleys of the Barun Yulduz, or Kaidu river. The upper valley, where the river runs from east to west, is probably very high, as it is mostly used as pasture-ground for cattle and horses, which thrive exceedingly well. The pure and fresh air of this valley is much commended. The lower valley, where the river flows from west to east, is more extensive, and a large portion of it is under cultivation, producing rice, wheat, millet, and sesamum, and containing large plantations of fruit-trees. The hills enclosing the valley rise probably more than 1000 feet above their base, and are used as pasture-ground. Along the base of the southern ridge of hills are also considerable tracts of cultivated land which are irrigated by the streams that descend from the hills, but at the distance of a few miles their waters are lost in the sandy plain which extends along the banks of the Tarim river.

Farther west, between 84° and 80° E. long., the hilly country is not so wide, extending only to the distance of 40 to 50 miles from the Thian Shan Mountains. The hills also have less elevation, and yield only a scanty supply of water for irrigation. The country is only well cultivated in the vicinity of the great mountain-chain, and grows more barren as it recedes from it, except along the banks of the Chagar Daria, or Ukiat River, where cultivation extends to about 70 miles from the Thian Shan. A large portion of it is used as pasture-ground, but in approaching the Tarim the sandy desert occurs. Farther west (between 80° and 77° E. long.) is the valley of the Aksu Daria, which is enclosed by high hills, and in its upper part contains very extensive tracts of fertile land, which are cultivated with great care. They produce every kind of grain, especially wheat, millet, and barley, lentils and beans, also cotton, melons, and several kinds of vegetables. The orchards yield peaches, apricots, pears, pomegranates, grapes, and mulberries, and the rich pastures feed herds of horses, sheep, camels, and cattle. The lower course of the Aksu Daria however lies through the desert and the swamps, which extend along the Tarim river and along the lower course of its principal branches. A few tracts are cultivated on the banks of the Lower Aksu Daria.

In the plain, west of the Aksu Daria, which extends between the Kashgar Daria and the Thian Shan Mountains, the cultivated land seems to be almost entirely limited to the bottom of the Kezyl Daria, where considerable tracts produce rice and other grain in abundance, as well as rich crops of cotton. The uplands, which are north of the river, have a stony and rocky soil, covered with a thin layer of earth, sufficient to produce abundance of grass during some parts of the year, and consequently they are used as pasture-grounds by the Kara Kirghis, or Black Kirghis, who go in summer with their herds of horses and camels to the Thian Shan Mountains. The uplands between the Kezyl Daria and the Kashgar Daria have a sandy soil, which for the greater part of the year is quite destitute of vegetation, and can only be used as pasture for a few weeks.

The western districts of the Thian Shan Nanlu, or those which extend at the base of the Tartashling, are not more favourable to cultivation than the northern districts which we have just noticed. Though the general direction of the Tartashling is from north to south, it seems that the ranges which compose it generally extend in the direction from west to east, and their wide rocky masses advance far into the plain, leaving only narrow and elevated valleys between them, which do not admit of cultivation. These high ranges extend much farther to the east near the Kuenluen, than in the vicinity of the Thian Shan Mountains, and terminate rather abruptly in the plain, so that only a very narrow hilly tract separates them from the level country. Cultivation is limited to this narrow tract, and even here to the banks of the several rivers which drain it. The cultivated grounds are most extensive on the Kashgar Daria and Yarkiang Daria, where these rivers issue from the mountains, and always yield an abundant supply of water for irrigation, especially in the countries surrounding the towns of Kashgar and Yarkiang. Farther down the country is not cultivated, the soil being sandy, and the means of irrigation scanty and uncertain. The principal objects of agriculture are rice, wheat, barley, and millet, with beans and vetches. Several plants are raised from which oil is extracted, among which is sesamum. The mulberry plantations are very extensive, and large quantities of silk are collected at Yarkiand, which is partly exported, and partly used in the manufactures of the country; cotton, hemp, and flax are also cultivated. Fruit-trees are abundant, and their produce, consisting of grapes, pomegranates, quinces, peaches, apricots, and apples, constitutes an article of internal commerce. Melons and cucumbers are of excellent quality. The greater part of the country, though unfit for agricultural purposes, is covered with grass, especially those tracts which are mountainous, and accordingly it abounds in domestic animals, among which the horses and sheep are distinguished. The wool collected in these parts is hardly inferior to that of which the shawls of Cashmir are made. There are also numerous herds of cattle and camels.

We are less acquainted with the productive powers of the countries which extend along the base of the Thsungling, where our knowledge is limited to the tracts that surround the town of Khotan, where a large district is under cultivation, and produces rice, wheat and millet, cotton, hemp and flax; large quantities of silk of the first quality are collected. The vineyards are extensive, and the grapes grown here are much prized. Some plants are raised, which yield dyeing-stuffs, which are exported to China. Among the domestic animals the yak is numerous, and also the horses and sheep; cattle are rather scarce. North of this cultivated tract is a desert, in which many bare rocks occur, but whose surface is mostly covered with sand. This desert, which extends westward to the vicinity of Yarkiang, and northward to the banks of the Yarkiang Daria, is known by the name of Kara-kitai or Rikistan. From this rapid survey of the productive powers of Thian Shan Nanlu it is evident that probably not more than one hundredth part of its surface is available for agricultural purposes. The deserts, and those tracts which are described as such, cover at least three-fourths of the area, and the remainder is mainly occupied with high mountains, which produce a few trees and good pasture. The utter sterility of the Han-hai seems to depend on the soil, but that of the other desert tracts appears partly to be the effect of climate.

Climate.—The climate of the Thian Shan Nanlu is distinguished by that dryness which is characteristic of all table-lands which are considerably elevated above the sea. As its elevation perhaps does not differ much from that of the table-land of Castile in Spain, there would probably be a great similarity between the climates if the table-land of Spain was not surrounded by a sea, which is not far distant from it, whilst the Thian Shan Nanlu is 1500 miles from the Pacific, which is the nearest sea. The climate of Thian Shan Nanlu is consequently much drier than that of Spain. Though abundant rains are experienced in the mountain-ranges which enclose the plain, and snow falls every winter to the depth of several feet, the quantity of snow and rain which descends on the plain is very small. In the deserts no rain occurs, and it is observed that when the atmosphere is charged with vapour, and distant objects are indistinctly visible, it does not produce any other effect than that of generating extremely heavy gales, which are often so strong as to throw down travellers and their beasts of burden. In the Han-hai they raise a large quantity of sand to a considerable height above the surface. Along the Thian Shan Mountains only two or three showers of rain are annually experienced, and generally they do not continue above an hour. The rain is very minute, and it hardly moistens the surface of the ground. A little snow falls in the western districts, but seems never to occur east of the valley of the Kaidu river. The moisture required for the growth of plants is therefore entirely derived from the mountains. The supply of water from this source is indeed very abundant, but only for about two or three months of the year, and it would only be sufficient for a very limited agriculture, if the inhabitants had not acquired a peculiar art in husbanding this supply. In the districts south of the Thian Shan Nanlu Mountains very large reservoirs have been made, which are filled by the watercourses after the melting of the snow, and from these reservoirs the greater part of the supply is taken, by which many tracts are enabled to produce abundant crops. The western districts do not materially differ from the northern, except that a larger quantity of snow falls, though it is moderate in the plain. The temperature of these districts however is much colder in winter, and it is a remarkable fact that at Yarkiang the river is for three months covered with thick ice, and caravans pass over it with their beasts of burden. The heat in summer is very great all over the country, but the cold of the winter seems to decrease as we proceed from west to east, as frost is hardly known at Hami. The Chinese however state that the difference between the temperature of the summer and winter is very considerable. The country is subject to earthquakes, and several districts suffered greatly from them in 1832, when they were felt on both sides of the Tartashling Mountains. It is probable that this phenomenon also occurs along the Thian Shan Mountains, as an extinct volcano exists in that range, and traces of volcanic action are frequently met with.

Productions.—It is remarkable that Thian Shan Nanlu, though without doubt considerably elevated above the sea-level, produces all the grains and fruits which are cultivated in the most southern parts of Europe, which are situated at the same distance from the equator, and are less elevated. The olive-tree however has not been noticed as growing there. Sesamum, which is cultivated in most parts to a great extent, supplies the place of the olive-tree. The plain, as well as the mountains which surround it, are almost entirely destitute of trees, and even of shrubs. In a few places only some species of trees cover a small extent of surface, but they are short and crooked, and only good for fire-wood. It is not certain, though it is so stated by some travellers, that the true rhubarb-plant grows on the mountains of the Thsungling.

All the domestic animals of Europe abound, with the exception of hogs, which are only kept by the few Chinese settled in the country: all the other inhabitants, being Mohammedans, hold this animal in abhorrence. Camels are kept in the plains and on the mountains. The ranges of the Tartashling are considered the native place of the double-humped camel. In the same mountains the yak is reared by the Kirghis; the larger species of the domestic animals are found in a wild state in the deserts of Thian Shan Nanlu. This is expressly stated of the horse, the camel, black cattle, and the ass; the last is probably the dshikketei, or Equus hemionus of Pallas; of the wild sheep there appear to be several kinds, but the species have not yet been ascertained. On the Thian Shan Mountains the argali is found, and on the Tartashling the kutch-kar and the rass above mentioned. The jackal is found in great numbers, and there are also tigers, wolves, lynxes, and foxes. On account of the want of natural forests, birds are not numerous, except water-fowl, which abound in the lakes of the desert and the swamps of the Tarim river. On the Thian Shan Mountains a black eagle of great size is met with, and on the Tartashling a still larger kind, called syrym.

Gold is said to be found in the affluents of the Khotan Daria, where some quantity is stated to be collected. It occurs also, according to the account of the Chinese, in the eastern portion of the Thian Shan Mountains, where however it is not collected. Copper and iron are certainly found at several places, and are worked, but the localities are not known. From the volcanic portion of the Thian Shan Mountains sulphur and sal-ammoniac are obtained, and near the same places asbestos and saltpetre. Diamonds are said to exist in the eastern part of the last-mentioned range. Several other precious stones are abundant, and two of them, the yew and the agate, form considerable articles of commerce to China. The agate is only found in the eastern districts of Thian Shan Nanlu.

Inhabitants.—The bulk of the population is of Turkish origin, and it seems that this nation must be considered as the aboriginal stock of the country, as Thian Shan Nanlu constituted the principal portion of the powerful empire of the Hiongnu, which was destroyed by the Chinese in the first century after Christ, and as the history of almost all the different Turkish tribes, however widely spread over Asia and Europe, may be traced to this country. Travellers generally call the Turkish inhabitants of Thian Shan Nanlu, Uzbecks, as they resemble them exactly in the formation of their body [BOKHARA, vol. v., p. 71], and speak the same language. It is however observed, that the Turkish language of Thian Shan Nanlu is not intermixed, as that of the other Turkish tribes, with terms derived from the Persian and Arabic languages, and it is therefore considered the purest of the Turkish dialects. The Memoirs of Sultan Baber are written in this language. The Turks of Thian Shan Nanlu are decidedly superior in civilization to the Uzbecks of Bokhara. They exhibit no less industry than ingenuity in the cultivation of the land, and the articles which are made in their manufactories are of good quality and much prized. Many of them are also engaged in commerce.

They are at present divided into two tribes, Ak-tak and Kara-tak, which hate one another, and frequently make war on each other, which circumstance is considered the principal reason of their inability to resist successfully the invasions of the Olöths and of the Chinese. Each of these two tribes was governed by hereditary chiefs, who were independent of one another. When the Chinese occupied the country, they left the internal affairs in the hands of these chiefs, reserving for themselves only the military department and the police, as far as regarded the neighbouring independent states. The army which the Chinese keep in the country, and which amounts to between 20,000 and 30,000 men, is commanded by Mantchoo officers; and at the places through which the caravan-roads pass to foreign countries the custom-officers are composed half of Chinese and half of Turks. But all the other officers are appointed by the Hakim Begs, as the chiefs are called, but the Hakim Begs themselves are chosen or confirmed by the court of Peking. The tribute which the Chinese government levies upon the inhabitants is small, but is somewhat increased by the duty on the merchandise which is imported, and which, according to the latest information, is 3½ per cent. The inhabitants however are much oppressed by their native chiefs, as the Chinese government appears to take no notice of the way in which they are governed. For this reason they are ill-disposed against the Chinese, and this hatred is still increased by the extensive fortifications which have lately been erected by the gratuitous labour of the natives. The Chinese merchants who are settled here are not permitted to go to the neighbouring countries which are independent of China, and the foreign commerce is therefore carried on partly by the Turks, but mostly by the Tajicks. The Turks are Mohammedans.

The Tajicks, or Tadjicks, are that nation which considers the Persian as its native language, and which is widely spread over all the central countries of Asia, but inhabits only a few mountain valleys exclusively. In other countries their industry is mostly directed to the cultivation of the soil, but in Thian Shan Nanlu they are chiefly engaged in trade, and therefore many of them are met with in all commercial places. They are known to Europeans by the name of Bokharians, as the merchants from Bokhara who visit the fairs of Nishnei Novogorod and other places are Tajicks. They are permitted even to trade in the western provinces of China Proper, in Shensi and Shansi, and some of them visit Kiachta. They conform in their dress and costume to the Turks, but preserve their language. They are Mohammedans.

Though Thian Shan Nanlu was subject to the Khalkas Mongols for a considerable length of time, no traces exist of this nation ever having formed settlements in the country. The Olöth Calmucks, when governed by the Galdan and his successors [SONGARIA, vol. xxii., p. 245], occupied it for a short time, and as they expelled the Khalkas wherever they met them, the total absence of Mongol colonies may be accounted for. There are however in the eastern districts, especially in the town of Hami and its vicinity, a considerable number of Olöth Calmucks, who after the defeat of the Galdan quietly submitted to the sway of the Mantchoos. The number of Chinese is not large. Besides the officers of government, a small number are established in the large commercial towns as merchants; some of them also exercise other trades; but it does not appear that agricultural settlements have been made by them in this country, as in Songaria.

In the mountains at the north-west corner of Thian Shan Nanlu is a tribe of Kirghis, called the Kara Kirghis, and another tribe of that nation is met with in the ranges of the Tartashling. Both are nomadic tribes, occupying during the summer the highest portion of the mountain-region with their herds of camels, yak, horses, and sheep, and descending in winter to the lower regions.

Commerce, Towns, and Manufactures.—Nearly 1800 years ago a commercial road was established, which traverses this country in its length from east to west, and by which the commerce between China and Western Asia has been carried on nearly without interruption. After the downfall of the empire of the Hiongnu under the dynasty of Han, when the dominion of the Chinese extended to the shores of the Caspian Sea, and nearly met the eastern boundary of the Western or Roman empire, this road was first used for the purposes of commerce, and silk and other articles were thus brought to Western Asia. This road passes through the countries which lie along the base of the Thian Shan Mountains. Another road, which has probably been used for an equal length of time, connects Thian Shan Nanlu and China with the northern parts of India, especially with Cashmir, and is also much used at the present day. As almost all our knowledge of the towns of this country and their manufactures is derived from the accounts of the merchants who have passed along these roads, we shall follow their track in noticing them.

The caravans of China, bound for the western countries, or Siyu, as they are called there, after leaving the town of Shatsheou and the gate of Kia-yu-kooan [TANGUT, vol. xxiv., p. 32], pass through the desert of Han-hai and arrive after 20 days' journey at Hami (42° 53′ N. lat. and 93° 50′ E. long.). Hami, or Khamil, as it is called by the natives, is a fortified place, being surrounded by high walls, which enclose a space about two miles and a half in circuit. The town is surrounded by large suburbs, where the caravans stop before they proceed for the west, and is populous. The streets are straight and regular, but the houses low and built of dried clay. The country which surrounds the town is not distinguished by fertility, but it is cultivated with extraordinary care and industry. Grapes, melons, and other fruits are sent to China in great quantities.

About 240 miles west of Hami is Pidshan, a fortress which is nearly two miles in circuit, and near which the caravan road passes. About 60 miles farther is Turfan, a considerable place, which however suffered much in the wars of the last century. Karashar is 290 miles west of Turfan. Its fortress is not large, not exceeding one mile in circuit. The town is rather populous, and built on the banks of the Kaidu river, which is said to be navigable at this place. Its commerce is considerable, but manufactures are not mentioned, except that the inhabitants excel in the art of embroidery. Kurli, or Kurungli, is situated on that portion of the Kaidu river which connects the Bostu Nor with Lop Nor, and contains a population of about 4000 individuals. The country round the town is very fertile. The town is 50 miles distant from Karashar to the south-west. Bukur or Bugur, nearly 200 miles distant from Kurli, contains 2000 families, or 10,000 individuals, and has a considerable commerce in copper, oil, sheep-skins, butter, and furs, especially lynx-skins.

Kutshe, which is 100 miles distant from Bugur, is a large town which is three miles in circumference, and contains a great population, of which 6000 are Turks. The mountains north of the town contain several mines, from which copper, saltpetre and sulphur, and sal ammoniac, are obtained. At this town begins the road which leads across the Thian Shan Mountains to Kuldsha in Ili, by the mountain-pass called Mussur Dabahn. Before it reaches the mountain-pass, it runs through the town of Sailim, which is built in an elevated valley, and near some mines. South-west of Kutshe is the town of Shayar, in a district producing abundance of rice, melons, and fruit. It contains a population of 4000 individuals.

In the valley of the Aksu Daria are the towns of Aksu and Ushi. Aksu is a large commercial and manufacturing town, which, according to one statement, contains 6000 houses, and, according to another, a population of 20,000 families. It is not fortified. Its commercial importance is not only derived from its being one of the largest places of depôt on the great caravan-road from China, but also from another road, which leads in a north-eastern direction to the mountain-pass of Mussur Dabahn, by which it communicates with Kuldsha, the capital of Ili, and by which it not only receives the produce of that country, but also several articles brought from Russia. [SONGARIA, vol. xxii., p. 245.] Bucharian merchants from Tobolsk sometimes proceed as far as this place, and it is likewise visited by traders from Khokand, Tashkend, and Bokhara. Its manufactures are numerous, especially those of cotton-stuffs, among which one called *bumaseya* is in great request in Siberia and Turkistan, and a kind of stuff, half silk and half cotton. Several articles made of leather, especially those of deer-leather, as harness and saddles, which are embossed with great art, are also highly valued, and exported to distant places. There are also some potteries, and many persons are employed in cutting and polishing precious stones. The Chinese garrison, consisting of 3000 men, inhabits a separate quarter of the town. Ushi, which lies higher up in the valley of the Aksu Daria, is built in the centre of an extensive country of great fertility, and is stated to contain 10,000 families. This place has a mint, in which copper coin is made, and it appears to carry on a considerable commerce.

The town of Kashgar is situated in the north-western angle of Thian Shan Nanlu, and at the commencement of the mountain-road which, traversing the chain that connects the Thian Shan with the Tartashling, leads to Ferghana and the towns of Khokand and Tashkend. This road runs in a north-north-western direction. At this place also begins the other caravan-road, which, running south-east and passing along the eastern declivity of the Tartashling, and passing through the towns of Yarkiang and Khotan, leads over the Karakorum Pass to Leh, Gertope, and Cashmir. Besides these two lines of communication and the great caravan-road to China, a fourth road, commencing at Kashgar, runs north-east over the Thian Shan Mountains by the Rowat Pass, and, skirting the western shores of Lake Issekol, leads to Kuldsha and the banks of the Irtish river. This last road appears to be much frequented by Russian merchants. The advantages derived from all these roads concentrating at Kashgar render this town one of the most commercial in the interior of Asia. It is said to contain 15,000 houses, and a population of 80,000 individuals. In the Chinese geography the population is said to consist of 16,000 persons paying a capitation-tax, which would carry it to rather more than is stated by Russian travellers. The Turkish and Bucharian merchants of Kashgar visit the countries north of Hindustan, Bokhara, and Tobolsk; and numbers of merchants who are settled in the neighbouring independent states are always found in the town. All those who are of Turkish origin have free access to it; but the entry of Europeans is prevented by the Chinese authorities. In the middle of the town is a large square, from which four extensive bazars branch off. The Chinese garrison consists of 8000 men, who are stationed here to repress any invasion from the side of Khokand, and are quartered in a strong fortress, which is contiguous to the town. The manufactures are numerous and extensive: the largest are those of silk, in which several kinds of stuffs, as satin, damask, &c., are made, and some of them are interwoven with gold and silver thread. The manufactures of cottons are less important, but their colours are much praised. The jewellers are very expert in cutting ne yew and in working gold. Many articles are exported o China. The latest accounts however state that Kashgar and its commercial and manufacturing industry had suffered much by the invasion and rebellion of the Kodjas (1827), and that Yarkiang had become a much more commercial place than Kashgar. It is very probable that the town has recovered its former importance. South-west of Kashgar is the town of Tashbalig, which seems to be an important place, built on the banks of the Yaman-yar river, where it issues from the mountain-region of the Tartashling. On the road leading from Kashgar to Yarkiang is Yengi Hissar, a place of considerable extent.

Yarkiang, or Yarkand, may be considered the capital of Thian Shan Nanlu, as the Chinese military governor generally resides here. It consists of the city or fortress, which is surrounded by a high wall of stone, and is more than three miles in circumference, and numerous suburbs which lie round it. In the fortress a garrison of 7000 men is kept. The houses are mostly built of sun-dried bricks; but as rain is very rare in this country, they may be considered substantial. The river Yarkiang Daria is divided into two arms, and numerous canals have been made from them, by which all the streets are abundantly supplied with water. There are numerous public buildings, especially mosques and medrasses, or colleges: the number of the medrasses is stated to exceed ten. There are two large bazars, one in the city and the other in the suburbs, which are more than three miles long, and contain a great number of shops, well supplied with various articles of merchandise. Most of the shopkeepers are Chinese. There are also several large caravansaries. The country surrounding the town supplies it with three important articles of commerce, silk, fine wool, and horses, of which last great numbers go to other places, and as far as China. These horses are mostly of the Kirghis breed, rather small, but very strong, and much prized. The commerce with the countries north of Hindustan and with Tibet is very considerable. It is stated that there are several kinds of manufactures, but only cotton-stuffs are specified. The number of inhabitants who pay capitation-tax is stated to be between 30,000 and 40,000, which would give a population of between 180,000 and 240,000. Many foreigners are settled in this place. The number of Chinese merchants is only 200, but there are many others engaged in trade and manufactures. A great number of merchants from Shensi and Shansi visit Yarkiang. There are also a considerable number of natives of Cashmir settled here; but only a small number of Hindus, and no Jews or Armenians. The foreign merchants, who are met with in considerable numbers, are from Ferghana, Tibet, and Cashmir.

Khotan appears to have been formerly the name of the town which at present is called Ilitsi or Eelchi, whilst the name of Khotan is applied to the country which extends along the northern base of the Thsungling. This country contains, according to the latest information, 700,000 persons who pay capitation-tax, which would give a population of between 3,500,000 and 4,000,000 individuals. Thus it appears that this country is by far the most populous and important part of Thian Shan Nanlu. A large number of the inhabitants are Buddhists, and it appears that among them are numerous descendants of Chinese, who settled there at a very early period. The town of Ilitsi is described as large and populous; but we have no peculiar account of it. It derives its commercial importance partly from the productions of the country, and partly from the circumstance that the great roads meet at this place. The eastern road passes from Ilitsi to Keriya, and through the pass of Keriya into Tibet, and seems to be the principal line of communication between the last-mentioned country and the northern provinces of China. The western road joins the great caravan-road which leads from Yarkiang to Leh and Cashmir. The principal articles which the country supplies for exportation are the yew-stone and silk, the last of which is grown in large quantities. It seems also that there are mines of copper in the neighbourhood, as vessels of copper are named among the articles manufactured in this place. Silk and cotton stuffs are also made to a great extent, and there are glass-houses. Every week a fair is held, which is sometimes attended by 20,000 persons. Horses are exported in great numbers, and are not less prized than those of Yarkiang. Near the town of Keriya, through which the road passes to Tibet, are some gold-mines.

The articles which are sent from Yarkiang to Cashmir are silver, goats' and sheep's wool, leather tanned in the manner of what is called Russian leather, embroideries of gold and silver, rice, and some few articles of Chinese manufacture; there are taken in return shawls of different qualities, cotton stuffs, sheep-skins and goat-skins, and some minor articles.

Only one caravan goes annually from Yarkiang to Badakshan, which carries a large quantity of tea and some silver, and brings back slaves and precious stones, especially rubies. It appears from Wood's 'Journey' that this intercourse has of late been interrupted by the unsettled state of Badakshan and of Wakhan. [TURKISTAN.]

The intercourse with Khokand, which had also been interrupted for several years has lately been re-established. The articles exported to that country are silver, china-ware, tea in boxes, and pressed tea, of which large quantities are consumed by the inhabitants of Turkistan. The imports from Khokand are raw silk and different kinds of cotton stuffs.

The Bucharian merchants settled in Russia have succeeded in advancing as far as Kutsh, Aksu, and Kashgar, to which places they bring broad-cloth, brocades, silver, gold coin, copper, iron, steel, and fur; and they take back several kinds of cotton stuffs, tea, rhubarb, and sal ammoniac.

We are very imperfectly acquainted with the commercial intercourse between China Proper and Thian Shan Nanlu. It does not however appear that the government puts any difficulties in the way of it, and it is stated that the commerce of Yarkiang with the northern provinces is very active. The principal articles which are sent to China are raw silk, great numbers of horses and cattle, the yew and other precious stones, and some dyeing stuffs; in return there are sent to Yarkiang tea, china-ware, and several manufactured articles.

History.—The country of Thian Shan Nanlu has never in any way been connected with the political events of Europe and Western Asia, but frequently with those of Proper China, and it is only from the Chinese and Mongol historians that we learn the political changes to which it has been subject. Thus we are informed that before and at the beginning of our æra this part of Central Asia formed a portion of the powerful empire of the Hiongnu, a Turkish race, which for more than two centuries made war on China and sometimes laid waste the northern provinces; but in the first century after Christ was overthrown by the dynasty of the Han emperors. It seems that the Chinese thus for the first time got possession of the country, and they soon afterwards succeeded in extending their conquests over Ferghana and the deserts lying round the Aral, so that at that period their empire extended to the Caspian Sea. But in the fifth century after Christ the Chinese were dispossessed of this country by the Tang-hiang, a Tibetan race; and this and other races of the same origin continued to govern Thian Shan Nanlu up to the time of Gengis Khan. From the tenth to the thirteenth century it formed a part of the extensive empire of the Hia or of Tangut [TANGUT, p. 33], the overthrow of which, in 1227, was the last of the numerous and great exploits of the Mongol conqueror. [GENGIS KHAN, vol. xi., p. 117.] As the Mongols soon afterwards got possession of China, Thian Shan was again united to that country, and remained so as long as the descendants of Gengis Khan were masters of China. But when the Yuan dynasty was over thrown, in the fourteenth century (1366), by the Ming dynasty, and the Mongol empire was split into several states, Thian Shan became independent, and several small sovereignties arose under chiefs of Turkish origin. The Ming emperor would probably have succeeded in subjecting them, but for the conquests of Timur Beg, or Tamerlane, who entered the country towards the end of the fourteenth century, and brought it under his dominion. After his death the Turkish chiefs gradually resumed their independent station, and preserved it to the middle of the sixteenth century, when the Galdan or emperor of the Olöth Calmucks, who subjected to his sway all the tribes north of the Thian Shan Mountains, began to extend his conquests to the south of that range. The petty Turkish sovereigns, not being able to make resistance, yielded, and became tributary to the Olöth Calmucks. When the Galdan had been defeated by the Chinese, and had died (1697), the power passed from the Olöth Calmucks to the Songares [SONGARIA, vol. xxii., p. 245], who soon established their authority among the Turkish princes in Thian Shan Nanlu, and even subjected Tibet. They kept it until their widely extended empire was destroyed by the Chinese in 1756, and their sovereign, Amursana, fled to Tobolsk, where he died (1757). The most powerful of the Turkish princes, the Kodjas of Yarkiang and Kashgar, considered this event favourable to the establishment of their independence, as they thought it impossible that the Chinese could send an army sufficiently numerous for the subjection of Thian Shan Nanlu through the wide desert which separates Proper China from their country, and they refused to submit to the authority of the Mantchoo emperor. But the emperor sent two armies from Ili over the Thian Shan Nanlu Mountains. The first was only partly successful, and took Kutshe; but the other, under the command of Tshaohoei, subjected the whole of the country, and in 1759 the Kodjas were obliged to retire to Badakshan.

In 1765 an insurrection broke out in the town of Ushi, but it was soon put down. In 1826 the descendants of the Kodjas, having insinuated themselves into the favour of the Khan of Khokand, and obtained from him the support of a small army, entered Thian Shan by the Terek Pass, and succeeded in taking Kashgar, Aksu, Yarkiang, and Khotan; but a Chinese army of 60,000 men being sent against them, they were defeated in three battles, and again retired to Badakshan, where Wood, in his journey to the source of the river Oxus, found one of these Kodjas living in exile.

(Du Halde's *History of China;* Mailla's *Histoire Générale de la Chine;* Klaproth's *Magasin Asiatique;* Wathen's *Memoir on Chinese Tartary and Khokan*, in *Journal of the Asiatic Society of Bengal*, vol. iv.; Wood's *Narrative of a Journey to the Source of the River Oxus;* Ritter's *Erdkunde von Asien*, vol. i., ii., and v.)

THIBAUT V., count of Champagne, and first king of Navarre of that name, occupies a respectable rank among the Troubadours. It has been pretty satisfactorily shown by recent writers on the subject that the scandalous stories told of this king by Matthew of Paris and others rest upon no satisfactory evidence. They have however been more successful in disproving the tales of their predecessors than in substituting anything in their place. They have rendered Thibaut's biography in a great measure negative.

He was born about the beginning of the year 1201, and has been called Theobaldus Posthumus, on account of his father having died before his birth. His mother, Blanche, daughter of Sancho the Wise, king of Navarre, took charge of and governed his extensive territories as regent for twenty years. A taste for literature was hereditary in the family of Thibaut. His grandmother, Marie of France, held, about the middle of the twelfth century, one of the most celebrated 'Courts of Love,' and some of her judgments have been preserved by André le Chapelain. His mother Blanche induced by her commands Aubein de Sezane to compose several songs, after he had solemnly renounced the practice of poetry. With such examples before him it was natural enough that the young count of Champagne should contract a taste for rhyming.

An attempt was made in the year 1214 to wrest the territories of Champagne from the widow and her son. The father of Thibaut was a younger son: his elder brother Henry followed Philippe Auguste to the Holy Land, and, marrying there a sister of Baldwin IV., king of Cyprus and Jerusalem, had by her two daughters, Alice, queen of Cyprus, and Philippa, who married Airard de Brienne. The father of Thibaut V., after his brother's departure for Palestine, took possession of Champagne and Brie, which were held without challenge by him, and by his widow in name of her son, till 1214. Airard de Brienne then claimed them in right of his wife. Philippe Auguste decided in favour of Thibaut, and the sentence was confirmed by the peers of France, in July, 1216, on the ground that Henry, when departing for the East, had ceded all his lands in France to his brother, in the event of his not returning. In November, 1221, the seigneur of Brienne was persuaded to abandon his claims upon receiving a compensation.

In the same year Thibaut took upon himself the management of his domains, which rendered him, by their extent, and the title of count palatine, which they conferred upon their holder, the most powerful vassal of the crown. During the brief and troubled reign of Louis VIII. (July, 1223, to November, 1226), Thibaut distinguished himself by nothing but the pertinacity with which he insisted upon his feudal rights. At the siege of Rochelle he consented to remain till the town was taken, but exacted in return a declaration from the king that by so doing he did not render himself liable on any future occasion for more than the 40 days' service in arms due by the vassals of the crown. In the crusade against the Albigenses (induced probably by regard for the count of Toulouse, who was his kinsman) he resisted every entreaty of the king to remain with the army after the 40 days had expired; and his departure from it was one of the foundations for the stories afterwards circulated to his disadvantage.

On the death of Louis VIII. a league was formed by a number of the most powerful French nobles to prevent the queen from acting as regent. Thibaut was at the outset a party to this confederacy. There are extant letters of Pierre, duke of Bretagne, and Hugues de Lusignan (dated March, 1226, which, as the year is now made to commence, would be called 1227), authorizing him to conclude in their name a truce with the king. The regent however found means to detach the count of Champagne from his allies; for an attempt which they made soon after to obtain possession of her person and the king's was frustrated by the opportune arrival of Thibaut at the head of a strong body of horse.

The duke of Bretagne and his coadjutors were much incensed at the desertion of the count of Champagne, and appear to have soon after formed the project of harassing him by supporting the claims of the queen of Cyprus upon Champagne and Brie. He was however, on account of his wealth, too desirable an ally to be lost without an endeavour to regain him. Overtures of reconciliation were made, in consequence of which count Thibaut engaged, in 1231, to take to wife the daughter of Pierre of Bretagne. Thibaut had been twice married before; in his 18th year, to Gertrude, daughter of the count of Metz, from whom he was divorced, and afterwards to Agnes de Beaujeu, by whom he had a daughter. The regent, fearing the consequences of this reconciliation, interfered to break it off. The marriage-day had been fixed, and the bridegroom was already on his way to the place where it was to be celebrated, when letters from the king, forbidding him to conclude the engagement, were delivered to him. He obeyed the royal mandate.

This insult determined the confederates to carry into execution their original project. They sent for the queen of Cyprus, and invaded Champagne, avowedly for the purpose of putting her in possession of it. The king marched to the assistance of Thibaut, and under his auspices a compromise was arranged. Thibaut ceded to the queen of Cyprus lands to the value of 2000 livres yearly, and paid her in addition 20,000,000 of livres in money. This sum was advanced by the king, who received in return the estates of Sancerre and others which Thibaut's father had held before he acquired Champagne.

Here seems the proper place to notice the stories told by Matthew of Paris regarding the loves of Thibaut and queen Blanche, and the poisoning of Louis VIII., laid to the charge of the former. Matthew only mentions the accusations as a rumour he had heard. No other historian of equal antiquity mentions them. Had Thibaut been suspected of being the murderer of the king, the charge would probably have been urged against him by one or other of the rival factions, with whom he played fast and loose immediately after. There is not a passage in his poems that can be interpreted into a declaration of attachment to Blanche, who was moreover thirteen years his senior. But it is easy to see how the rumour mentioned by Matthew of Paris arose. A rhymed chronicle, apparently of the age of Thibaut, represents him as going about (1230) in disguise to learn how men spoke of him, and discovering he had no friends. About this time there were violent disputes between the university of Paris and the papal legate, and, the queen supporting the legate, the wild students made and sang ribald songs attributing this report to a guilty passion for his person. In times of civil dissension it is generally found that parties otherwise totally unconnected catch up and spread each others' lies when it suits their purpose. The queen, the legate, and the count of Champagne were all unpopular; the dissolute students had circulated imputations against the chastity of the two former; and the interference of the king to prevent the marriage of the last-mentioned with the daughter of the duke of Bretagne would, under such circumstances, be easily interpreted into a plot of the queen-mother to keep him for herself. It was amongst the students that the first story was invented, and that is the quarter whence Matthew of Paris most probably obtained much of his information regarding French affairs.

In 1232 Thibaut married a daughter of Archambaud VIII. of Bourbon. In April, 1234, he succeeded to the throne of Navarre, on the death of Sancho the Strong. In 1235 he quarrelled with Saint Louis about the territories he had ceded to the king at the time of the arrangement with the queen of Cyprus, representing them as merely transferred to the king in security for the money he advanced, while the latter asserted that they had been sold to him for that sum. It came to blows, and Thibaut was beaten.

In 1239 Thibaut took the cross, and set out at the head of an expedition to the Holy Land. He displayed none of the talents of a general. Unable to procure ships to transport his forces to the scene of action, he marched through Hungary and Thrace. Arrived in the neighbourhood of Byzantium, his treasure was so completely expended, that his followers had to support themselves by plunder. In an engagement near Caesarea the division of the army under his immediate command was beaten, although the other was victorious. He got involved in the defiles of Taurus, and lost two-thirds of his men. Lastly, at the final defeat near Ascalon, he fled ingloriously before the battle was ended, leaving his followers to their fate.

He returned to Pampeluna, which he had made his capital, in 1242, and died in 1253, having done nothing worthy of notice in the interim, leaving a widow and six children.

The poems attributed to Thibaut are in number sixty-six, and there appears no reason for questioning the authenticity of any of them. Thirty-eight are devoted to the expression of passionate complaints and ecstasies; three recount his amorous adventures with peasant-girls; twelve are what may be called rhymed law-cases in matters of love; the rest are exhortations to engage in the Crusade, or invectives against the immorality of the age. The passion of the amorous poems is not very intense: there scarcely needed the few lines appended to most of them, addressed to some brother-troubadour, to show that they are mere displays of the author's cleverness. The cases for the Court of Love are ingenious and insignificant, like all other compositions of that kind. The fifty-fourth song, an exhortation to join the Crusade, is spirited. The sixty-fifth, in which the God of Christians is compared to the pelican feeding its young with its blood, is characterised by a blended tone of toleration and enthusiasm. In the sixty-sixth he starts a theory that the law of God is ripe and wholesome fruit, and that Adam sinned by eating unripe fruit. Thibaut's versification is correct and sweet. There is a spirit of generosity about his poems that is creditable to himself: the neatness and finish of his verses are more attributable to the degree of perfection to which the art had been previously carried by others than to the author's own talents. Altogether his literary productions leave a more favourable impression of his character than the part he played as a warrior and politician. There is tergiversation and something worse in his public conduct, but the disposition evinced by his writings leads to the conclusion that he sinned more through want of firmness than from ill-will.

(*Les Poësies du Roy de Navarre*, par Levesque de la Ravalière, Paris, 1742, 12mo; *Histoire de S. Loys, IX. du nom, Roy de France*, par Messire Jean, Sire de Joinville; par M. Claude Menard, à Paris, 1617, 4to; *De Bello Sacro Continuatae Historiae Libri VI.*, Basilio Johanne Herede authore, Basiliae, 1560, fol.; Bayle; Moreri; and *Biographie Universelle*, in voce 'Thibaut.')

THIBET. [Tibet.]

THIEL, or TIEL, is the chief town of a district in the province of Gelderland in the kingdom of the Netherlands. It is situated in 51° 50′ N. lat. and 5° 26′ E. long., on the river Waal, about 15 miles from Nimegen, in the tract called the Betuwe, which is celebrated for its fertility. The town of Thiel contains 5000 inhabitants; the district of which it is the chief place, 48,200. The chief occupations of the inhabitants are agriculture and the breeding of cattle; they have also manufactures of woollen, linen, and water-colours. (Stein, *Lexicon*; Hassel; Cannabich.)

THIELEN, JAN PHILIP VAN, was born at Mechlin in 1618. He was of a noble family, and lord of Cowenburg. Though he received an education suitable to his rank, and was instructed in every branch of polite literature, his predilection for the art of painting induced him to become a disciple of Daniel Segers.

Having voluntarily placed himself under so able an instructor, his improvement, as might have been expected, was rapid. His subjects were usually in the taste of Segers, garlands of flowers, with some historical design in the centre, or festoons twining round vases enriched with representations in bas-relief. He always copied from nature, and chose his flowers in the entire perfection of their beauty, grouping them with great taste. His pictures are very highly finished, with a light touch, perhaps less spirited than the works of Segers; but it is sufficient praise to say that his performances rivalled those of his master.

He was much employed by Philip IV., king of Spain, and most of his finest performances are (or at least were[*]) in the Spanish royal collection. Two of his capital pictures were at Mechlin; they represented garlands and flowers, and many insects of different kinds on the leaves, all finished with exquisite delicacy. The figure of St. Bernard is in the centre of the one, and that of St. Agatha in the other. Weyermann also highly commends one, which has in the centre a nymph sleeping, watched by a satyr, the figures being painted by Poelemburg.

Von Thielen seldom inscribed his name on any of his works; he generally marked them J. or P. Couwenburg.

THIELT is the chief town of the district of the same name in the province of West Flanders, in the kingdom of Belgium. It is about 15 miles south-west of Bruges, on the road from Ghent to Dixmuden. Thielt is a cheerful town, with two churches, 1700 houses, among which are many handsome modern buildings, and 12,000 inhabitants, and is the chief market for the flax-trade of Flanders. At the weekly market there is a great sale for linen, corn, cattle, and butter. The inhabitants have several establishments for bleaching wax and linen, six breweries, and many flourishing manufactories. There are an academy, several literary societies, a musical society, and several schools. [Flanders, West.]

(Stein, *Lexicon*; Cannabich, *Lehrbuch*; Hoffmann, *Deutschland und seine Bewohner*, vol. iii.)

THIERS, a town in France, capital of an arrondissement in the department of Puy de Dôme, 273 miles from Paris by Nevers, Moulins, and Roanne, and 24 from Clermont-Ferrand, the capital of the department: it is in 45° 51′ N. lat. and 3° 33′ E. long. Thiers originated in the middle ages. There was a strong castle here in the earlier periods of the French monarchy, which became under the feudal system the head of one of the principal fiefs of Auvergne. The town stands on the crest and side of a hill sloping down to the northern or right bank of the Durole, a little stream flowing into the Dore, which itself flows into the Allier. It is in a picturesque situation, amid wild scenery, and commanded by lofty and well-wooded hills on the north, down the side of which the road from Lyon to Thiers runs by a remarkably steep slope. The houses at this entrance of the town present a pleasing appearance, from their being painted in fresco in a manner similar to those of Nice; but on proceeding into the town the steep, narrow, dark streets, bordered by gloomy houses, disappoint expectation. There is no public building worthy of notice, and no public square or place except one at the entrance of the road from Lyon: the town is inhabited by workpeople, and presents very few ('not a score,' says one of our authorities) decent houses. The chief manufactures are of paper and playing-cards, fine cutlery and hardwares, leather, and candles. The paper-mills are on the Durole, in the steep rocky banks of which excavations have been made for the sites of the mills: this branch of industry has been established in the town from the sixteenth century. The quality of the paper manufactured here is good, and a large portion of it is sent to Paris. The razors, knives, and scissors, though of ordinary quality, command a good sale, and are exported to Spain, Italy, the Levant, and the East and West Indies: the iron is brought from Nivernais, Berry, and Franche Comté. There are in and round the town 600 manufactories or workshops for cutlery, employing, it is said, 6000 persons. The candles are made from the fat of the goats reared on the surrounding hills. There is a large poor-house, in which woollen cloths, lace, and trimmings are made, and other manufactures are carried on. These various manufactures employ three-fourths of the population of the town and the villages for many miles round. The population of the commune of Thiers, in 1826, was 11,613; in 1831, 9836, of whom 6586 were in the town itself; and, in 1836, 9982. There are an inferior court of justice, a tribunal de commerce, a chamber of manufactures, a council of prud'hommes; some fiscal or administrative government offices, an hospital or poor-house, and a high school, or college. There are eight yearly fairs.

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[*] So many valuable pictures were carried off or destroyed, not only during the French occupation, but in the disorders of late years, that it is difficult to speak positively. Thus the French king, Louis-Philippe, a few years ago sent the Chevalier Taylor to Spain to purchase pictures, at a time when the rage of the populace was directed against the convents. The chevalier accordingly went to Spain, and purchased four hundred and seventy-four pictures; many of which were thereby saved from destruction. The Chevalier Taylor says that he saw some fine pictures by Paul Veronese destroyed, in spite of his urgent entreaties and offers to purchase them.

The arrondissement of Thiers has an area of 332 square miles, and comprehends only 39 communes, with a population, in 1831, of 67,870; in 1836, of 70,657: it is divided into six cantons or districts, each under a justice of the peace.

(Vaysse de Villiers, *Itinéraire Déscriptif de la France;* Malte-Brun, *Géographie; Dictionnaire Géographique Universel.*)

THIMBLE, a metallic cap, in the shape of a hollow truncated cone, worn on the finger in sewing, in order to allow the needle to be pressed through the work with adequate force, without injury to the finger. Thimbles used by sempstresses usually have slightly convex tops, which, as well as the upper part of the circumference of the cone, are pitted with numerous small indentations symmetrically arranged, which serve to prevent the end of the needle from slipping; but those used by tailors, upholsterers, and *needle-men* generally, have no tops, but have the like indentations upon the sides of the cone, with which alone the necessary pressure is applied to the needle. Although occasionally made of other materials, as porcelain and ivory, for ornamental purposes, thimbles are most commonly formed of sheet silver, steel, white alloys, or brass; or of silver and steel so combined as to retain the advantage of the superior hardness of the latter metal for the parts which come in contact with the needle, while those which are in contact with the finger are of silver. This is sometimes done by making the cap and upper part of the cone of steel and the lower part of silver; and sometimes by making the body of the thimble entirely of iron or steel, and lining it with silver or gold. As thimbles form an indispensable part of the furniture of a lady's work-table, much ingenuity is often displayed in their decoration by embossing, engraving, and inlaying with gold. They are usually formed by means of a stamping-machine, but the following process, for the description of which we are indebted to Dr. Ure's 'Dictionary of Arts,' &c., p. 1239, has been practised by MM. Rouy and Berthier, of Paris:—Sheet-iron, one twenty-fourth part of an inch thick, after being cut into strips of convenient size, is passed under a punch-press, by which it is cut into circular discs of about two inches diameter. These discs are then made red-hot, and laid in succession upon a series of mandrils, with hollows of successively increasing depth, into which the softened discs are forced by striking them with a round-faced punch, about the size of the finger. After being thus brought to the required shape, the thimble is placed in a lathe, when the inside is polished and the outside is turned, cut with circles for the reception of gold ornaments, and indented or pitted with a kind of milling-tool. After this the thimbles are annealed, brightened, and gilt inside with a very thin cone of gold-leaf, which is firmly united to the surface of the iron simply by the strong pressure of a smooth steel mandril. Gold fillets are then fixed by pressure in the grooves turned to receive them.

Sail-makers, in those coarse kinds of sewing which require the application of considerable force to the needle, employ, in lieu of thimbles, circular plates of cast-iron, indented or pitted on the surface. These are called *palms*, and are secured to the palm of the hand by straps.

The name 'thimble' is applied to the metallic eyes, in the form of rings with a groove in their circumference to receive a rope, which are used in rigging where it is desired to form a loop or eye at the end of one rope, through which another may slide with very little friction.

THINOCORI'NÆ, Mr. G. R. Gray's first subfamily of the family *Chionididæ*, containing the genera *Attagis*, J. Geoff. and Less.; *Ocypetes*, Wagl.; and *Thinocorus*, Eschsch.

THINO'CORUS, Eschscholtz's name for a genus of birds placed by Mr. G. R. Gray in his subfamily THINOCORINÆ.

THION DE LA CHAUME, CLAUDE-ESPRIT, an eminent French physician, was born at Paris, January 16, 1750. His father, who was a banker, gave him an excellent education, and destined him originally for the bar, but he himself preferred the study of medicine. He commenced his studies at Paris with great success, but, for some unknown reason, took his doctor's degree at Rheims. In 1773 he was appointed physician to the military hospital at Monaco in Italy, which was then occupied by a French garrison; and in 1778 to that at Ajaccio in Corsica. His zeal and talents were rewarded by the rank of chief physician to the troops destined to lay siege to Minorca and shortly afterwards to Gibraltar. Here he had to treat a fatal epidemic which prevailed among the combined French and Spanish forces in a typhoid form, the description of which same disease immortalised the name of Pringle towards the middle of the last century. This same squadron had already put ashore and left at Cadiz a great number of Frenchmen that had been attacked by the disease, when, in the beginning of September, 1782, it came to the bay of Algesiras. Here the naval hospital could only receive fifty of their sick, while as many as five hundred were in want of admission; and to place these in private houses was not only a very difficult, but also an undesirable proceeding. In these embarrassing circumstances Thion de la Chaume conceived the happy idea of making the sick encamp under tents as soon as they landed, an arrangement which was dictated by the climate, the season, and the nature of the disease, and of which the boldness was justified by success. La Chaume himself was attacked by the epidemic, and a great number of medical officers of all ranks, as well as the nurses, were carried off by it. When peace was concluded La Chaume returned to France, and was received with distinction by the Comte d'Artois (afterwards Charles X.), who had been a witness of his self-devotion and success at Algesiras, and who appointed him to be one of his own physicians. Shortly afterwards he married, but in the winter of 1785-6 he found that, in consequence of the rapid progress made by a pulmonary disease which had for some time threatened him, it was necessary for him to go to the south of France. Here he met with the kindest attentions from the officers of the regiment which he had formerly taken charge of at Ajaccio, who were at this time in garrison at Montpellier; at which place he died, October 28, 1786, at the early age of thirty-six. Thion de la Chaume wrote but little, though he is said to have carefully noted down every night whatever he had seen during the day worth recording; he nevertheless occupies a high rank in the list of army surgeons. His writings consist almost entirely of articles in medical dictionaries and periodicals, of which the most interesting is the account of the epidemic at Algesiras, which was published in the second volume of the 'Journal de Médicine Militaire.' (*Biographie Médicale.*)

THIONURIC ACID. When nitric acid is made to act upon uric acid, both are decomposed, and *alloxan*, a compound of hydrogen, carbon, oxygen, and azote, is o tained in crystals. If sulphurous acid gas be passed through a saturated solution of alloxan in water, brilliant white crystals are obtained, which are thionurate of ammonia; these are to be decomposed by acetate of lead, and the thionurate of lead formed is to be decomposed by hydrosulphuric acid. By separating the sulphuret of lead, and evaporating the liquor, thionuric acid remains.

Its properties are, that it is a white semi-crystalline mass, readily soluble in water, and the solution reddens litmus strongly; it contains the elements of two equivalents of sulphurous acid, one equivalent of ammonia, and one of alloxan, or—

Seven equivalents of hydrogen . .	7
Eight equivalents of carbon . .	56
Fourteen equivalents of oxygen .	112
Three equivalents of azote . .	42
Two equivalents of sulphur .	32
Equivalent . .	249

When heated, it is decomposed, much sulphuric acid remains in solution, and a crystalline compound is formed, which is termed *uramil*.

Thionuric acid combines with bases to form salts, which are termed *thionurates;* they are not however of sufficient importance to require description.

THIONVILLE, an important town in France, capital of an arrondissement in the department of Moselle, 208 miles east-north-east of Paris, by Meaux, Château Thierry, Châlons-sur-Marne, Ste. Ménéhould, Verdun, and Metz: it is in 41° 29′ N. lat. and 6° 11′ E. long.

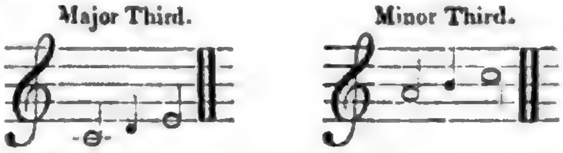
Thionville (Latinized, Theodonis Villa) was a place of consequence in the time of the kings of France of the Carlovingian dynasty, who had a palace here: several important councils were held at Thionville in the reign of Charlemagne and his son Louis le Débonnair. After the extinction of the Carlovingian dynasty, the place came successively into the hands of the counts of Luxembourg, the dukes of Bourgogne, and the house of Austria, passing to the Spanish branch of that family. The duke of Guise took it from the Spaniards, A.D. 1558, but it was restored the following year. In A.D. 1639 it was besieged by the French, who were entirely defeated by an army sent to its relief: it was however taken by the prince of Condé, A.D. 1643, after the battle of Rocroy, and has ever since remained in the power of the French. It was bombarded by the Austrians in A.D. 1792, and again by the allies in A.D. 1814. Thionville is surrounded by strong fortifications, and is a fortress of the third class, and one of the barriers of France toward the Rhenish provinces of Prussia. The town is on the left or west bank of the Moselle; the citadel on the right bank: the two communicate by a bridge, the piers of which are of stone, and the upper part of wood, removeable at pleasure. The town is skirted on the south-east side by the canal of Yutz, over which are two bridges of stone and one of wood. The entrance into the town is by six gates: the houses have little worthy of notice: there are a good parade, a parish church which deserves examination, a riding-school, a corn-market, a theatre, an arsenal, a college or high school, which occupies the ex-convent of the monks of St. Augustine, an hospital, and a military prison. There are some manufactures of hosiery, woollen cloth, hats, household furniture, and candles: there are breweries, tan-yards, and oil and bark mills. There is one yearly fair.

The population of the commune of Thionville, in 1826, was 5821; in 1831, 5645 (of whom 4142 were in the town); in 1836, 5680. There are a subordinate court of justice, several fiscal and administrative government offices, and a society for the encouragement of agriculture and industry.

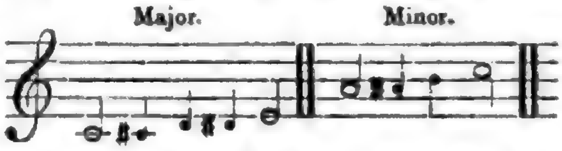
The arrondissement of Thionville has an area of 405 square miles, and comprehends 117 communes: it had, in 1831, a population of 83,227; and, in 1836, of 87,520: it is divided into five cantons or districts, each under a justice of the peace.

(Malte-Brun, *Géographie Universelle; Dictionnaire Géographique Universel.*)

THIRD, an interval in music, classed among the imperfect concords, because liable to alteration; that is, the third may be either *major* or *minor*. The ratio of the Major Third is 5 : 4; of the Minor Third, 6 : 5. The former comprises one major and one minor tone, as C E. The latter comprises a major tone and a semitone, as A C. Example:—



Or, according to the mode of description adopted by many writers on the subject, the Major Third comprises, inclusively, five semitones; the Minor only four. Example:—



THIRLAGE, a tenure or custom formerly very common in Scotland, by which the owners or occupiers of certain lands were compelled to take their corn to a particular mill, to which the lands were said to be thirled or astricted, and to pay a certain proportion of it, varying in different cases, as a remuneration for the grinding, and for the expense of the erection and maintenance of the mill. Covenants of thirlage also bound the occupiers of the astricted lands to the performance of certain services for the maintenance of the mill and mill-dam, the carriage of millstones from the place at which they were purchased, &c. Thirlage was of three kinds, of which the least oppressive was the thirlage of grindable grain, by which the tenants or possessors of the astricted lands were merely compelled to carry to the mill such of their corn as they might require to use for food. The thirlage of growing corn extended to all the corn raised upon the thirled lands, with the exception of seed-corn, and such as might be used as food for horses on the farms in the state of grain. In some cases this kind of thirlage was modified by a provision to enable the farmer, on payment of a certain proportion of corn as compensation, to sell the remainder of his grain without taking it to the mill to be converted into meal. The third kind of thirlage, called thirlage of *invecta et illata*, required that all corn brought within the thirled district, wherever it might have been raised, should be taken to the dominant mill, that is to say, the mill to which the district is astricted or bound. This kind of servitude, having become in many cases exceedingly oppressive, has fallen into disuse, an annual payment in grain being substituted for it. Further particulars respecting this tenure may be found in Rees's 'Cyclopædia,' art. 'Thirlage;' and in the article 'Law' (clxx., 12-18) in the fourth edition of the 'Encyclopædia Britannica.'

THIROPTERA, Spix's name for a genus of CHEIROPTERA which, according to Cuvier, seems to have many characters in common with *Molossus:* its thumb carries a small concave palette which is peculiar to it, and enables it to hook itself better than it otherwise could.

Example, *Thiroptera tricolor*, Spix, 36, f. 9.

Cuvier remarks that he places this subgenus with doubt, because the description is incomplete.

THIRSK. [YORKSHIRE.]

THIRST is the peculiar sensation which excites the desire to drink. Water is the proper object of this desire. Of all the warm-blooded animals which are subject to thirst, man alone is either disposed, or, by the circumstances of his artificial mode of life, compelled, to satisfy it with any other liquid; and in all the variety of beverages which man has invented, the water with which other ingredients are combined is the only part which is essential to the satisfaction of thirst.

The times and degrees in which thirst is felt during health are, in general, such that, by satisfying it, the body is provided with the quantity of water necessary for the repair of its tissues and the maintenance of their proper moisture, and for the replacement of the fluid which is constantly lost by perspiration and other discharges. But the quantity of water necessary for this purpose varies greatly, according to the different circumstances of age, sex, and temperament, and still more according to the nature of the food taken, the state of the atmosphere, the mode of life, and the custom of the individual. Dry and hard or salted food excites great thirst, probably because a large quantity of fluid is abstracted from the blood for its digestion; but fruits and soft vegetables assist, by the quantity of water which they contain, in quenching thirst; and infants, receiving their food and drink at once from the milk which is naturally provided for them, are perhaps not sensible of thirst as a healthy sensation different from that of hunger. Strong drinks, again, excite thirst, but in a peculiar manner; either by their irritation of the nerves of the digestive canal, or by the great quantity of fluid which, by exosmosis, they withdraw from the blood.

As a general rule, the degree of thirst during health is directly proportioned to the rapidity of the exhalation of fluid from the skin and lungs. Hence the naturally greater thirst in summer, and the desire for the fresh fruits of the season, which both supply water and produce moisture of the mouth by exciting a flow of saliva; hence also the less natural thirst which is produced by remaining in hot and crowded rooms, and that which is so painfully felt by those who work about iron-forges and steam-engines, and which they can satisfy only by frequent and enormous draughts of water. Of the same kind is the thirst which many have felt in ascending high mountains, on which, as the atmospheric pressure diminishes, the evaporation from the skin is increased; and that which is produced by exposure to a dry brisk wind.

The sensations and other circumstances accompanying ordinary thirst need not be described. The sensation of dryness of the mouth and throat, which most strongly characterizes it, is not always the result of those parts being really deficient in moisture, nor is it removed by supplying the mouth alone with fluid. It is an example of that class of local sensations which are indicative of peculiar general conditions of the body, or of the state of some other part in which no sensation is perceived. These have been called reflex sensations; and one of the characters common to many of them, as well as to thirst, is that the animal perceiving them is impelled to actions which tend to the health of the body. For example, the irritation which is felt at the upper part of the throat, and which induces one to cough, is often due, not to a direct excitement of that part, but to the existence of some irritating substance, such as mucus, in a distant and insensible part of the air-passages. From the latter part an impression is conveyed to the nervous centre; thence, without directly giving rise to a sensation, it is supposed to be reflected to the sensitive nerves of the glottis; and the sensation which is perceived through these excites the desire to cough, and thus leads to the expulsion of the irritating substance. In like manner the sensation of dryness in the mouth induces one to drink, and so to remove not merely the sensation, but the more important condition, such as a deficiency of water in the blood, of which it is a sign.

But as cough may be produced by a direct irritation of the upper part of the larynx, so a sensation similar to that of thirst is often due only to a rapid evaporation from the mouth and throat, as in long speaking or singing; but this may be removed by merely washing the mouth and throat, or by exciting a flow of saliva; means which are insufficient for the remedy of real thirst. That the introduction of water into the blood is necessary for quenching thirst has been often proved in persons who in attempting suicide have divided the pharynx or œsophagus, so that they could no longer swallow in the ordinary mode. Repeated washing of the mouth has been altogether unavailing to relieve their thirst; but the injecting of water through the wound into the stomach has quickly removed the sensation of dryness in the mouth, though none of the water passed through it. Similar facts have been observed in those who, being unable to swallow or to have liquids forced into their stomachs, have been long immersed in baths, and in shipwrecked sailors who have had no fresh water and have relieved their thirst by keeping their clothes soaked with sea-water.

The thirst of many diseases, such as acute fevers and important inflammations, affords another proof of the sensation peculiar to it being chiefly a sign of some general condition; for in these the sensation often continues not only when the mouth is moist, but after large quantities of water have been imbibed, being here probably dependent on some condition of the blood which dilution does not remedy. In certain cases also the sensation seems to be entirely subjective, and dependent on a peculiar condition of the nervous system. This is remarkably the case in a disease of which the true pathology is unknown, and which has been named polydipsia, from its chief symptom being an excessive and insatiable thirst. Several examples have been recorded, in some of which the thirst probably depended on a constant discharge of fluids from diabetic blood, or by dropsical effusions, or otherwise: but in many it could not be traced to such an origin. One of the most remarkable of them is described by Mr. Ware, in the 'London Medical and Physical Journal' for 1816: the patient was a man 22 years old, whose health was in other respects good, but who was compelled to drink six gallons of water daily. He had been accustomed to drink nearly as much from his childhood; and, if deprived of a sufficient supply, his head was always affected, and fainting and dullness of the senses ensued. Nearly all the cases of the same kind which have been published are collected in a paper by M. Lacombe, in the French medical journal 'L'Expérience,' for May and June, 1841, and references to several are given by Tiedemann, in his 'Physiologie des Menschen,' Band iii., p. 71.

If thirst be long unallayed, it produces one of the most dreadful states which a man can be compelled to bear. Those who have attempted suicide by starvation have been unable to resist the desire to drink, though they have endured many days of abstinence from food, and have been compelled thus for a time to protract their lives. The same tortures have been endured by sailors wrecked far from land. As the thirst increases, the mouth and throat become painful and burning hot, the respiration grows difficult, and the expired air feels hot and dry. The voice becomes hoarse, the speech thick and indistinct, and the pulse small and rapid. All secretion diminishes or is suppressed, the skin is hot and dry, and the eyes become painful and inflamed. The sensibility of every part of the body seems exalted, at the same time that the power of the muscles fails; the mind passes slowly from restlessness and anxiety to despair, and at last, as the body grows weaker, begins to wander in a low delirium. At the close of life there is an utter prostration of strength, and, in general, insensibility; but the inflammation of the mouth and eyes, and of all the parts that are not protected from the air by a thick cuticle, increases, and proceeds sometimes to gangrene. The time during which so miserable a state can be endured varies with the strength of the sufferer. Haller (*Elementa Physiologiæ*, t. vi.) has collected examples of men who lived for at least fifteen days without drinking; but the more ordinary period is eight or ten days.

THIRTY TYRANTS (*of Athens*). In the year 404 B.C., when, after the Peloponnesian war, Athens had fallen into the hands of Sparta through the treacherous designs of the oligarchical party, the Spartans themselves did not interfere in any direct way with the political constitution of Athens (Diodorus, xiv. 4), but their negotiations with Theramenes and others of the same party had convinced them that even without their interference the democracy would soon be abolished. In this expectation they were not disappointed, as this was really the object of the oligarchical party. But as this party did not sufficiently trust its own power, Lysander, who had already sailed to Samos, was invited to attend the Assembly at Athens, in which the question of reforming the constitution was to be considered. The presence of Lysander and other Spartan generals with their armies, and the threats that were uttered, silenced all opposition on the side of the popular party, and on the proposition of Theramenes a decree was passed that thirty men should be elected to draw up a new constitution. (Xenophon, *Hellen.*, ii. 3, 2.) Lysias (*in Eratosth.*, p. 126, ed. Steph.) gives a more satisfactory account of the proceedings on that memorable day than Xenophon. These thirty individuals were invested with the sovereign power of the republic. Theramenes himself nominated ten, the Athenian ephors ten others, and the election of the remaining ten was left to the people. The names of the Thirty are preserved in Xenophon (*Hellen.*, ii. 3, 2). Their government, a real reign of terror, which fortunately did not last more than one year, was called in Athenian history the year of anarchy, or the reign of the Thirty Tyrants. From the moment that they had thus acquired an apparently legal power, they filled the vacancies in the senate and the magistracies with their own friends and creatures. The new code of laws which they were to draw up was never made, that they might not put any restraints upon themselves, and might always be at liberty to act as they pleased. A similar board, consisting of ten men, perhaps appointed by Lysander himself, was intrusted with the government of Piræeus. The object of the tyrants was to reduce Athens to the condition of an unimportant town, and to make the people forget the greatness to which it had been raised by Themistocles and Pericles. The splendid arsenal of Athens was sold and pulled down, and several of the fortresses of Attica were destroyed. To establish their tyranny the Thirty found it necessary to get rid of a number of persons obnoxious to them. The first that were put to death were the sycophants, who during the time of the democracy had contributed most towards its overthrow by their shameful practices; and the senate, as well as every well-meaning citizen, was glad to see the republic delivered of such a pestilence. The senate acted in these trials as the supreme court of justice, and the Thirty presided in it. All the votes of the senators however were given openly, that the tyrants might be able to see which way each senator voted. This mode of proceeding, though it was at first only directed against individuals equally obnoxious to all parties, became alarming when all the distinguished men, who had been imprisoned before the day on which the new constitution was established, in order that they might not frustrate the plans of the oligarchs by their opposition, were in like manner sentenced to death. The apprehensions of the people were but too well founded, and Critias, the most cruel among the Thirty, gave sufficient indications that the Tyrants did not mean to go on with the same moderation. That they might always have at hand an armed force to support them, they sent an embassy to Sparta to ask for a garrison to occupy the Acropolis. This was granted, and came under the command of Callibius as harmostes. His arrival rendered the Thirty secure. They courted the Spartan harmostes in the most obsequious manner, and he in return placed his troops at their disposal for whatever purpose they might wish to employ them in establishing their dominion more firmly. The assistance of the senate in the trials for political offences began to be dispensed with, and the number of the unhappy victims increased at a fearful rate. Not only persons who opposed or showed any dissatisfaction with the rule of the Tyrants, but all who by their merits had gained favour with the people, were regarded as dangerous persons, who, if they could choose, would prefer a popular government, and were condemned to death in a very summary manner. The reign of the Thirty now began to display all its horrors, and no one could feel safe. To be possessed of wealth, especially in the case of aliens, was sufficient to bring a man to ruin, for the tyrants, independent of all political considerations, began to murder for no other purpose than that of enriching themselves by the confiscation of the property of their victims. The remonstrances of Theramenes against this reckless system of bloodshed were not followed by any other consequences than that the Thirty selected 3000 Athenians who were to enjoy a kind of franchise, and who could not be put to death without a trial before the senate. The rest of the citizens were compelled to give up their arms, and were treated as outlaws. By this expedient the Thirty hoped to strengthen themselves, and to become more independent of the Spartan garrison. The opposition of Theramenes to this arrangement involved his own destruction. [THERAMENES.] The horrors which were now perpetrated became every day more numerous and fearful, and numbers of Athenians fled from their native country to seek refuge at Argos, Megara, Thebes, and other places, where they met with an hospitable and kind reception. The tyrants soon began to be uneasy at the crowds of exiles who thus gathered round the frontiers of Attica, and applied to Sparta to interfere. The Spartans issued a proclamation empowering the Thirty to arrest the exiles in any part of Greece, and forbidding any Greek state to interfere on their behalf. This command was entirely disregarded by the Greeks, especially the Thebans, who even declared that the Athenian fugitives should be received and protected in all the towns of Bœotia. Thebes, whose mode of action was not dictated by a generous and humane feeling towards the unhappy Athenians, but rather arose from jealousy of Sparta, thus became the rallying point for a great number of exiles, among whom Thrasybulus was the most enterprising. In what manner the rule of the Thirty Tyrants was at last overthrown, and the democratical constitution was restored at Athens, is related in the article THRASYBULUS.

(Xenophon, *Hellen.*, ii. 3; Diodorus, xiv. 3, &c.; Thirlwall, *History of Greece*, iv., p. 174, &c.)

THIRTY TYRANTS (*under the Roman Empire*). This name has been given to a set of usurpers who sprung up in various parts of the Roman empire in the reigns of Valerian (A.D. 253-260) and Gallienus (261-268). This appellation of the Thirty Tyrants, in imitation of the Thirty Tyrants of Athens, is highly improper, and bears no analogy to the Thirty of Athens. They rose in different parts, assuming the title of emperor, in irregular succession, and were put down one after another. Their number moreover does not amount to thirty, unless women and children, who were honoured with the imperial title, are included. Trebellius Pollio, who, in his work on the 'Triginta Tyranni,' describes the adventures of each of them, has taken great pains to make out that their number was thirty. There were however only nineteen real usurpers,—Cyriades, Macrianus, Balista, Odenathus, and Zenobia, in the eastern provinces; Posthumus, Lollianus, Victorinus and his mother Victoria, Marius, and Tetricus, in Gaul, Britain, and the western provinces in general; Ingenuus, Regillianus, and Bureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achaia; Aemilianus, in Egypt; and Celsus, in Africa. The majority of these usurpers were persons of low birth, without any talent or virtue, and scarcely any one of them died a natural death. The best among them were Piso and Odenathus, and the latter, who maintained himself at Palmyra, received the title of Augustus from the Roman senate, and was enabled to bequeath his empire to his widow, the celebrated Zenobia.

(Trebellius Pollio, *Triginta Tyranni;* Gibbon, *Hist. of the Decline and Fall*, chap. x.; Manso, *Leben Constantin's des Grossen*, p. 433, &c.)

THIRTY YEARS' WAR is the name of that memorable contest which lasted from 1618 to 1648, between the emperor and the Roman Catholic states of Germany on one side, and the Protestant states, with their allies, Denmark, and afterwards Sweden and France, on the other side. Spain, Holland, and Transylvania also took part in it, but their interference was less direct. This long struggle has generally been considered a religious war. It had indeed its origin in religious differences, but political ambition afterwards became the real motive of the contending parties, and religion was used to veil the designs of the leaders, and to keep up the enthusiasm of the people. The Thirty Years' War arose out of the state of political and religious confusion into which the German empire was thrown by the Reformation, and which in the beginning of the seventeenth century had become so inextricable, that a civil war, without foreign interference, became apparently the shortest if not the only means to save Germany from ruin.

In order to facilitate the understanding of the history of the Thirty Years' War, we shall first give a short view of the state of religious and political affairs in Germany during the latter part of the sixteenth century.

When the war between Charles V. and Maurice elector of Saxony was terminated by the treaty of Passau (1552), and after the conclusion of the Second Peace of Religion (1555), the memory of the dangers from which Germany had escaped preserved the empire during a long period from the calamity of a new religious war. The Protestant religion was propagated, without any violence, in many provinces which had until then been faithful to Rome. As early as 1580 the most powerful hereditary princes of the empire, except the archdukes of Austria and the dukes of Bavaria and of Cleves, were all converted to the doctrines of Luther; the Roman Catholic princes, and even the emperors Ferdinand I. and Maximilian II., were obliged to make many concessions in religious matters in order to keep their subjects in obedience.

By the Second Peace of Religion the princes had acquired the 'jus reformandi,' that is, the right of protecting their subjects in religious affairs, which right was gradually considered by them as a right of reforming the state of religion. For this purpose the Roman Catholic princes employed the Jesuits and the Capuchins; the Jesuits were active in the conversion of men distinguished by birth, by knowledge, or by their social position, and the Capuchins worked upon the mass of the people. Their zeal and success occasioned bitter complaints among the Protestants, who however gave causes of complaint equally numerous and equally well founded to the Roman Catholics. The dissatisfaction of the people was augmented by the selfish policy of their princes.

The ecclesiastical dignity of a bishop having lost all its signification in the Reformed religion, the Protestant bishops became mere temporal princes. Among their number were the archbishops and bishops of Bremen, of Magdeburg, of Verden, of Lübeck, of Osnabrück, of Ratzeburg, of Halberstadt, and of Minden. There being, at the same time, some hope that the Protestant bishops might become hereditary princes in their bishoprics, the Roman Catholic bishops of Münster, of Paderborn, of Hildesheim, and the elector archbishop of Cologne, manifested their intention to adopt the Protestant faith. Availing themselves of the privilege granted them by the 'jus reformandi,' they encouraged their subjects to adopt the Protestant religion. The Roman Catholic princes tried all in their power to prevent such changes, but the Protestant princes favoured them, and each party had its motive for doing so, as the younger sons of the princes and nobles of both parties were usually appointed bishops, abbots, and canons.

The Roman Catholic party recovered its political influence towards the end of the sixteenth century. The Protestant elector archbishop of Cologne, Gebhard, count of Truchsess, was driven from his see, and his successor, Ernst, duke of Bavaria, who held together the bishoprics of Cologne, of Liège, of Münster, and of Hildesheim, oppressed the Protestants in all his extensive dominions. The bishops of Würzburg and of Bamberg, assisted by the Jesuits, compelled their Protestant subjects to emigrate, and the archbishop of Salzburg treated the Protestants with unheard-of cruelty. In Strassburg there were at the same time a Protestant and a Roman Catholic bishop, who, after a bloody feud, were both sustained by the emperor Rudolph II. in those parts of the bishopric which they had conquered (1593). The Roman Catholic people were equally persecuted by the bishops of Halberstadt and of Osnabrück, and the troubles were increased by the differences which arose in the Protestant party itself between the Lutherans and the Calvinists.

The leader of the Calvinists was the elector palatine Frederick IV., who, with a small number of Calvinist princes, refused to appear at the diet of Regensburg (1594), which was assembled by Rudolph II. for the purpose of obtaining the assistance of the empire against the Turks. Frederick and his party declared that they would not assist Rudolph in the Turkish war, unless he satisfied all the claims of the Protestants, and at the same time they promised a subsidy of 400,000 gulden to Henri IV. of France if he would restore the Protestant bishop of Strassburg to the entire bishopric. The Lutheran princes expressed the utmost indignation at the treacherous conduct of Frederick IV., and they sent their contingents to the Turkish war. But from that moment there was a French party among the princes of the empire, and we shall afterwards see how dexterously France managed her influence over Germany.

The diet at Regensburg was dissolved in 1608 without any results with respect to the peace of the empire. The Roman Catholic states claimed the restitution of all the territories, bishoprics, abbeys, and churches, which had been seized by the Protestants since the treaty of Passau (1552); but so far were the Protestant, and especially the Calvinist, princes from yielding to these claims, that they resolved to resist them by every means in their power. For that purpose they concluded the 'Protestant Union' on the 4th of May, 1608, of which however the elector of Saxony declined to become a member. The elector palatine Frederick IV., a Calvinist, was the leader of the Union. The members of the Union immediately levied troops, and sent ambassadors to England, France, and Venice, thus giving the example of a well-organized rebellion, and showing that they would resist the emperor and break the constitution of the empire with the assistance of foreigners.

The confusion of political and religious interests increased after the death of John William duke of Jülich, Cleves, and Berg (1609), one of the most powerful princes of the Roman Catholic party. The succession to his rich and extensive territories was disputed between John Sigismund, elector of Brandenburg, a Lutheran; the count palatine of Neuburg, Philip Louis, a Calvinist; and Christian II., elector of Saxony, a Lutheran, but a friend of the emperor. Alarmed by this latter circumstance, the elector of Brandenburg and the count palatine resolved to govern those duchies in common, until they could find an opportunity to settle this affair; and they immediately took possession of Jülich, Cleves, Berg, and the dependent counties. This act was declared by the emperor to be a breach of peace; he ordered the vacant inheritance to be sequestrated, and he appointed Leopold of Austria, bishop of Strassburg and Passau, to carry the measure into effect. He was assisted by the whole Roman Catholic party, which, alarmed at the loss of such a powerful member as the duchy of Cleves, concluded a union, to which they gave the name of the 'Liga' (11th July, 1609). This Liga was afterwards the strongest support of the emperor during the Thirty Years' War; Maximilian, duke of Bavaria, was at the head of it. But as early as the 11th of February, 1610, the Union concluded an alliance with Henry IV. of France, and occupied the bishoprics of Würzburg and Bamberg. French troops entered the duchy of Jülich. King Henry seemed to have found an opportunity of carrying into effect his plans of a European republic, but he was murdered on the 14th of May, 1610. Frederick IV. died only five months later, and the Union concluded a peace with the Liga at Münich on the 24th of October, 1610. In the mean time a deadly personal animosity had broken out between the elector of Brandenburg and Wolfgang William, the son and successor of the count palatine Philip Louis, owing to their common government in the states of the late duke of Cleves. Wolfgang William, in order to obtain assistance against Brandenburg, adopted the Roman Catholic religion; and the elector of Brandenburg made himself a Calvinist for the purpose of obtaining the assistance of the Union, which was chiefly composed of Calvinist princes. The confusion which arose from these sudden changes became still greater by the interference of the king of Spain, Philip III. This king became afraid of new religious troubles in his provinces of the Netherlands, situated on the boundaries of the duchies of Cleves and of Jülich, and he therefore ordered his general, Spinola, to occupy them for the count palatine with a body of 30,000 Spaniards. But no sooner had his army entered these territories than the United States of the Netherlands, then at war with Spain, sent troops into the same countries under the pretence of occupying them for the elector of Brandenburg (1614). This was the first example of a war between foreign powers being carried on in Germany.

The empire was now on the eve of a general war. It was generally expected that it would begin on the banks of the Lower Rhine, but, on the contrary, it broke out in Bohemia.

By a solemn declaration of the emperor Rudolph II., liberty of religion had been granted to the Utraquists, a numerous Protestant sect in Bohemia (9th of July, 1609). The document containing this declaration had the name of the 'Majestäts-Brief.' Civil troubles having broken out in Bohemia, and Rudolph II. having taken arbitrary measures to put an end to them, the Bohemians deposed him, and chose his brother Matthias king in his stead, in 1611. Rudolph II. died of grief in the following year, and Matthias likewise succeeded him on the Imperial throne (1612). The number of Lutherans and Calvinists having greatly increased in Bohemia, they claimed the same religious liberties with the Utraquists. Matthias refused to yield to these claims, and serious differences arose between him and the Lutheran and Calvinist Bohemians. They were joined by the Utraquists, who were afraid the emperor might abolish the 'Majestäts-Brief.' Matthias sent commissioners to Prague, who assembled the deputies of the Bohemian states in the royal castle of the Hradshin, and declared to them that their king and emperor would not extend the 'Majestäts-Brief' to the Lutherans and

Calvinists. Suddenly an armed party of Bohemian nobles, who belonged to the Utraquists, rushed into the room where the commissioners and the deputies were assembled. They seized two of the commissioners, the counts Martinitz and Slawata, who were detested in Bohemia, and they and their secretary Fabricius were precipitated from the windows, a height of eighty feet; but a heap of dung preserved them from being dashed to pieces, and they all escaped and hastened back to Vienna.

This happened on the 21st of May, 1618, and this day is justly regarded as the beginning of the Thirty Years' War.

The conduct of the Bohemians towards the Imperial commissioners was by no means an act of rashness or anger. The party of the Utraquists had previously resolved upon it, because they wanted to give the signal for an insurrection which had been secretly prepared among all the Protestants of Bohemia and her dependent provinces Moravia, Silesia, and Lusatia, as well as among those of the archduchy of Austria. The insurgents immediately organized a regular administration of the kingdom. They also levied an army, which was commanded by the count of Thurn, and which was reinforced by a body of the troops of the Union, commanded by Christian, prince of Anhalt, one of the greatest intriguers of his time. The emperor Matthias died soon afterwards (20th of March, 1619), and Ferdinand II., archduke of Austrian Styria, succeeded him as emperor. Previously to the event of the 21st of May, 1618, Ferdinand had been crowned as future successor of Matthias in Bohemia.

The leaders of the Union encouraged the Bohemians to further resistance. Although Ferdinand II. promised religious liberty to all the Protestants of Bohemia, they nevertheless sent their troops against him, and declared the throne vacant. Frederick V., elector palatine, the son-in-law of James I. of England, was chosen king of Bohemia, and he was crowned at Prague on the 4th of November, 1619. In the mean time the count of Thurn had made great progress in Austria. In the month of July, 1619, he was under the walls of Vienna, and, although this city was relieved, he remained with his army in the adjacent country. There he was joined by Betlen Gabor, the sovereign prince of Transylvania, who had overrun Hungary and who took up his winter-quarters in Moravia, together with the count of Thurn. In the same winter (1619-1620) the new king of Bohemia made a defensive and offensive alliance with the Protestant insurgents of Hungary, and he proposed a similar alliance to Sultan Ahmed I. This imprudent and unpatriotic policy made his cause unpopular among all parties in Germany.

Ferdinand II. took vigorous though arbitrary measures to recover Bohemia and her dependencies, those extensive and rich countries which are now inhabited by upwards of ten millions of inhabitants. The pope, Spain, Bavaria, and even the Protestant elector of Saxony, promised their assistance to the emperor. In the autumn of 1620 the Lower Palatinate was occupied by the Spaniards under Spinola; the duke of Bavaria overran the Upper Palatinate and entered Bohemia; John George, elector of Saxony (since 1611), conquered Lusatia; and Austria was rescued by the emperor himself, who had made peace with Betlen Gabor. At last the Bavarians, commanded by their duke and the celebrated Tilly, forced the Bohemians to make a stand on the Weisse Berg under the walls of Prague. There they were completely defeated on the 8th of November, 1620. Frederick fled from his capital, and after a short stay in his second capital, Breslau, he abandoned his kingdom and took refuge in Holland. Towards the close of 1621 Bohemia, with all her dependencies, was in the hands of the emperor, who rewarded his ally, the elector of Saxony, with the province of Lusatia. He punished the Bohemians severely. A great number of nobles were beheaded, and their estates, as well as those of a still greater number of fugitives, were confiscated; but an amnesty ('quoad vitam et honorem') was given on the 4th of May, 1622, to all those who had not been condemned before that day. The Lutheran and Calvinist ministers were banished, and their churches were shut up; but not those of the Utraquists, notwithstanding the 'Majestäts-Brief' was abolished. The Roman Catholics were restored to all their rights; and the university of Prague and the whole national education were put under the direction of the Jesuits. The emperor then put king Frederick under the ban of the empire, declared his electorship to be forfeited, and proposed the duke of Bavaria to be chosen elector. This proposition however gave dissatisfaction to the other electors, who considered the banishment of Frederick as illegal because the council of the electors had not formally pronounced it according to the constitution of the empire.

The power of the emperor increased so much by his conquest of Bohemia, and the Roman Catholic states were so much encouraged, that they claimed those bishoprics, abbeys, and churches which had been reformed by the Protestants since the Second Peace of Religion.

Before the fate of Bohemia was decided, Christian IV., king of Denmark and duke of Holstein, several princes of northern Germany, and the ambassadors of England, Sweden, and the United States of the Netherlands, held a congress at Segeberg in Holstein for the purpose of forming an alliance against any ambitious schemes of the emperor. After the battle on the Weisse Berg, king Frederick also came to Segeberg, and claimed the assistance of the northern princes in order to recover his electorate. These princes however had assembled exclusively for their own interests. The bishoprics of Lübeck, of Bremen, of Verden, of Schwerin, of Halberstadt, and several others, had been bestowed on younger sons of the reigning house of Holstein and of Brunswick, and they were sure to lose them if the Roman Catholic party had power enough to take them. Frederick therefore found only one friend. This was Christian, duke of Brunswick and bishop of Halberstadt, an unprincipled man, who loved Elizabeth of England, the wife of the unhappy king of the Bohemians, and swore he would die for her. With a strong body he entered the Palatinate. He was beaten by Tilly at Höchst (6th June, 1622). Christian now joined the count of Mansfeld, a man not less unprincipled than himself, and they retired to northern Germany as far as East Friesland. They plundered and robbed friends as well as enemies, but, pressed by Tilly, they disbanded their troops, and fled to England (December, 1623). Maximilian of Bavaria having been chosen elector at the diet of 1623, and Tilly being then in possession of several northern bishoprics, king Christian concluded an alliance with England and the United States of the Netherlands for the purpose of obtaining subsidies for the war which he intended to declare against the emperor. Christian of Halberstadt and the count of Mansfeld promised their assistance. The former went to France and levied troops there, and Mansfeld, who had obtained a commission as an English general, levied a strong force in England. They united in the Netherlands, and, after many adventures and dangers, Mansfeld succeeded in joining the duke of Mecklenburg, who was an ally of the king of Denmark. Meanwhile the latter king had been appointed commander-in-chief of the united forces of the circle of Lower Saxony, and, though the greater part of the princes of this circle shortly afterwards made their peace with the emperor, the king advanced into Hanover, where Tilly was ready to receive him (1625).

The emperor was then in a very embarrassed situation. The war in northern Germany was carried on by the troops of the Liga, and principally by those of Bavaria, commanded by Tilly, who was at the same time commander-in-chief of the forces of the Union. The duke of Bavaria had consequently an immense influence in public affairs; the emperor was obliged to cede to him the revenues of a part of his archduchy of Austria as an indemnification for his expenses in the Bohemian war, and to appoint him his high commissioner in the electorate of the Palatinate. On the other side, Ferdinand II. was threatened by the count of Mansfeld, who was then at the head of a strong army in the duchies of Mecklenburg, and who was ready to invade Lusatia and Silesia, and to join Betlen Gabor, prince of Transylvania. This prince had again taken arms against Austria, and there was only a small body of Imperial troops to check him.

Albrecht of Waldstein [WALLENSTEIN], the hero of the Thirty Years' War, saved the emperor and preserved the empire. Known as a skilful general, and in possession of very large estates, he was created duke of Friedland in 1624. In 1625 Ferdinand II. appointed him commander-in-chief of an Imperial army which did not exist, but which was created by Waldstein in a very short time.

Waldstein advanced towards the Lower Elbe, and took a fortified position at Dessau. There he was three times attacked by Mansfeld. On the 1st and on the 11th of April, 1626, Mansfeld was beaten; on the 25th of the same month he was put to the route. He reinforced his army in Mecklenburg, and in June invaded Silesia with 20,000 men, in order to join Betlen Gabor. Waldstein marched in a parallel direction, and weakened his enemy by skirmishes. On the 8th of September Mansfeld was on the banks of the Waag in north-western Hungary, with only one-fourth of his army, while Waldstein with fifty thousand men stood between him and Betlen Gabor. This prince made peace with the emperor, and Mansfeld, leaving the remainder of his army to the command of John Ernst, duke of Saxe-Weimar, fled to Venice, but died on his way, in a village in Dalmatia. Christian of Halberstadt, his fellow-adventurer, had died before him, in the 27th year of his age.

While Waldstein was victorious in eastern Germany, Tilly carried on the war in the country west of the Elbe against the king of Denmark. In consequence of a fall from his horse, which had affected King Christian's mind to an alarming degree, he firmly believed that God had chosen him to be the champion of the Protestant religion. But half of his army was destroyed by the skilful manœuvres of Tilly, and at last the king was obliged to make a stand at Lutter am Barenberg, between Goslar and Hildesheim. A battle ensued, in which the Danes were completely defeated (17th of August, 1626), and Christian fled beyond the Elbe into his dominions.

Tilly employed the following year (1627) in besieging and taking the towns on the left side of the Elbe, which were occupied by Danish garrisons. In the month of July he was joined by Waldstein, who, after his victories over Mansfeld, had driven the Danes from the countries east of the Elbe. Waldstein, after having put the dukes of Mecklenburg to flight, attacked the king of Denmark, who had assembled a new army (1628), and in one campaign his troops conquered all the continental possessions of Christian IV., who was compelled to beg for peace before the end of the year. A congress assembled at Lübeck, and on the 22nd of May, 1629, Waldstein granted peace to the king of Denmark, on conditions unexpectedly favourable: Jutland, Sleswik, and Holstein were restored to Christian, who promised not to interfere in the German affairs nor to make any further claim on bishoprics on behalf of his kinsmen. Immediately after the peace of Lübeck, Waldstein was invested with the duchies of Mecklenburg, the dukes having previously been dispossessed and put under the ban of the empire for their adherence to the king of Denmark.

One of the most remarkable events in the Danish war was the siege of Stralsund on the Baltic, a town which belonged to the Hanseatic confederacy, though it was subject to the duke of Pomerania. Stralsund being occupied by a Danish garrison, it was besieged by the troops of Waldstein, who conducted the siege during the months of June and July, 1628. On the 14th of July the town capitulated; but before the Imperial troops had taken possession of it, a Swedish fleet appeared off Stralsund, and landed a strong body of troops, who took possession of the fortress. Although the inhabitants of Stralsund had promised obedience to the emperor, the Imperial troops were not allowed to enter the town, which remained under the command of a Swedish general. Of this most unfair and insulting interference on the part of the Swedes, Waldstein was previously aware; and this was one of the reasons why he allowed such favourable terms to the king of Denmark at the peace of Lübeck; another cause was a daring design of the emperor on the liberty of the Protestant religion. Encouraged by the success of his armies, and misled by imprudent counsellors, Ferdinand II., on the 6th of March, 1629, issued the 'Edictum Restitutionis.' By this edict he deprived the Calvinists of their religious liberties; and he declared that, conformably to the Second Peace of Religion, all the bishoprics, abbeys, and churches which had been taken from the Roman Catholics since that peace should be restored to them; and that the Roman Catholic possessors of Protestant territories should not be hindered from the enjoyment of the privileges granted by the 'Jus Reformandi.' The ecclesiastical states which had been ceded to members of the house of the elector of Saxony, who was still an ally of the emperor, were alone excepted from this ordinance. If the 'Edictum Restitutionis' had been executed, a general civil war would have been the immediate consequence; but it met with much opposition. Only a few Protestant bishoprics were conferred upon Roman Catholic princes, and the legal execution of the Edict was made dependent upon the arbitration of a general meeting of all the states. This meeting was called the 'Day of Composition,' and was fixed for the month of February, 1631.

The religious troubles seemed now to be nearly at an end. All the states of Germany wished for peace; and all hoped that this peace was to be settled on the 'Day of Composition.' The Protestant party was still powerful enough to obtain favourable conditions for their religion. The emperor's power had much increased, but the ambition of his counsellors and the haughtiness of his generalissimo, Waldstein, met with vigorous opposition among the members of the Liga, who obliged the emperor to deprive Waldstein of his rank as commander-in-chief of the Imperial forces (1630). Foreign interference was not at all necessary. But foreign interference was nevertheless prepared by France and Sweden.

Gustavus Adolphus, king of Sweden, was master of all the countries which lie around the northern and eastern parts of the Baltic, and his favourite plan was to make this sea into a Swedish lake. He was also a pious man, and sincerely attached to the Protestant faith. Deeply afflicted by the dangers to which this religion was exposed in Germany, he formed the plan of becoming its protector, and he pursued this plan with the more zeal and perseverance, as he was convinced that by becoming protector over the Protestant religion he would also become master of the Baltic. Immense influence in Germany, and the possibility of being raised to the dignity of emperor, would have been the consequence of success in either of his ambitious designs. (Extracts of documents contained in Breyer, *Beiträge zur Geschichte des Dreissigjährigen Krieges*, pp. 210, 219, 221, 252.) France, then weakened by civil troubles, was unable to interfere directly in the German war, and her minister, Richelieu, employed every means in his power to persuade the king of Sweden to make the first attack. Gustavus Adolphus being then at war with the Poles, Richelieu tried to negotiate a truce between the belligerent parties; but the emperor, anxious to prevent any such peace, sent his general, Arnheim, to Poland, with those troops who had been employed in the siege of Stralsund. Although the Swedes had first violated the German territory by occupying that fortress, they nevertheless considered the assistance which the emperor gave to the Poles as a declaration of war. But, instead of attacking the hereditary states of the emperor on the Polish frontier, Gustavus Adolphus, by the mediation of the French ambassador, Charnacé, made a truce with the king of Poland for six years, at Altmark, in the month of September, 1629. He then made great preparations for an attack on the German countries along the Baltic, and ordered his fleet to blockade the towns of Wismar and Rostock in Mecklenburg, which were occupied by the troops of Waldstein. The king of Sweden was the more active because he was checked in his designs on the Baltic by Waldstein, who had assumed the title of Imperial admiral of the Baltic, and who, by means of the Hanseatic towns, wished to restore the supremacy of the German navy in the northern seas. But, having been deprived of his military command by the emperor in 1630, Waldstein saw himself compelled to defer the execution of these gigantic plans.

French subsidies enabled Gustavus Adolphus to be ready for the new war as early as the spring of 1630. On the 24th of June he landed 16,000 men on the island of Usedom, on the coast of Pomerania. He styled himself Protector of the Protestant Faith, and came to Germany at a moment when the princes were assembled at Regensburg for the purpose of settling their religious affairs, and when the Protestant party itself had sufficient power to protect its faith. The first act of Gustavus Adolphus was to compel Bogislav XIV., duke of Pomerania, a Protestant prince, to appear in his camp, and to surrender to him his capital, Stettin, a town equally important by its fortifications and by its situation near the mouth of the Oder. He then gradually occupied all Pomerania, and on the 13th of January, 1631, concluded a treaty with France, by which he engaged himself to carry on the war against Austria with 16,000 cavalry and 30,000 foot, on the condition of an annual subsidy of 400,000 thalers. Meantime he summoned the Protestant princes to join him, but when assembled at Leipzig (10th of February to 12th of April, 1631) they declared the king of Sweden an intruder, and they promised to assist the emperor with all their forces. George, duke of Brunswick Lüneburg, was the only prince who joined the Swedes, in the hope of obtaining some ecclesiastical territory as an addition to his hereditary states. Thus deceived in his hopes, the protector of the Protestant faith attacked George William, elector of Brandenburg, who was his brother-in-law and one of the first Protestant princes of the empire. He compelled him to surrender his fortress of Spandau, and he then made an alliance with the city of Magdeburg.

This rich and populous Imperial town joined the Swedish party for the purpose of escaping the danger of being occupied by the Imperialists, who were ordered to defend that fortress against the Swedes. For this conduct Magdeburg was put under the ban of the empire. Tilly having been charged to execute the ban, and to take the town by force, the citizens of Magdeburg hoped to be rescued by the king of Sweden, who had promised his assistance, but Gustavus durst not advance as far as the Elbe, unless his rear was secured by an alliance with the electors of Brandenburg and of Saxony. Magdeburg was taken by storm by Tilly and Pappenheim, whose troops plundered the town during three days and destroyed it by fire (20th of May, 1631). The unhappy fate of this opulent town was made the subject of a charge against the king of Sweden, who however had gained such influence over the princes of northern Germany, that his political credit was in no way weakened by this event. He forced the elector of Brandenburg to conclude an alliance with him; he drove the Imperial garrisons from Mecklenburg, and restored the dukes; and he ravaged the electorate of Saxony until the elector surrendered his towns, and concluded a defensive and offensive alliance with Gustavus Adolphus (14th of September, 1631). Previously to this, William V., landgrave of Hesse-Cassel, had voluntarily attached himself to the Swedes, for the sole purpose of profiting by the confusion into which the empire was thrown by their interference. Bernhard, duke of Saxe-Weimar, offered his services as general to Gustavus Adolphus, and he was immediately put at the head of a part of the Swedish army.

While the king of Sweden thus had his power increased by the forced or voluntary adherence of the princes, Tilly reinforced his army, and occupied Leipzig. But on the 17th of September, 1631 (N. S.), Tilly lost the battle of Leipzig against the united forces of the Swedes and Saxons; and such was the disorganization of the Imperial army, that Gustavus Adolphus found no enemy to oppose his march to southern Germany. However, instead of invading the hereditary states of the emperor, the king of Sweden conquered the bishoprics of Würzburg and Bamberg in Franconia, which he intended to keep for himself. He then took the archbishopric of Mainz and the Palatinate, but did not restore it to its legitimate master, the banished king of Bohemia, Frederick V. At last he marched to Bavaria, and forced his way across the Lech after a bloody victory over the Bavarians, who lost ther general, Tilly (5th of April, 1632). Augsburg, a free Imperial town, was forced to pay homage to Gustavus Adolphus, who on the 7th of May made his entrance into Münich, the capital of Bavaria. During this time the Saxons, the compulsory allies of the Swedes, had occupied a considerable part of Bohemia and Silesia. The great designs of Gustavus Adolphus now became manifest. He proposed to George William, elector of Brandenburg, that Frederick William, the elector's son, should marry his only daughter Christina. Frederick William was thus to become master of Sweden, Finnland, Ingermannland, Esthonia, Livonia, Curland, Prussia, Brandenburg, Mecklenburg, Pomerania, of the bishoprics of Bamberg, Würzburg, Mainz, Magdeburg, Halberstadt, Speier, and Worms, of the Palatinate, and of all the countries which the king hoped to conquer in southern Germany. But this brilliant offer was refused by George William. It is said that this prince, who was a zealous Calvinist, would not allow his son to become a Lutheran. But another condition of this marriage being to assist the king of Sweden in his designs on the Imperial crown, it seems that the elector refused the proposals, because he would not make himself the instrument of Swedish ambition.

The emperor was then in the utmost extremity. He had no army to oppose to the Swedes, and if he had had one, the only general who, after Tilly's death, was able to lead it with success against Gustavus Adolphus, Waldstein, had been deprived of his rank as commander-in-chief, and had become a deadly enemy of the emperor. Ferdinand was obliged to humiliate himself before his vassal, and at last Waldstein consented to resume the command of the Imperial army, not as its general, but as its supreme and independent master. This army however did not exist, but was to be created by Waldstein.

When Gustavus Adolphus occupied Münich, Waldstein had already levied a strong body of troops, with which he expelled the Saxons from Bohemia. The defeat of his ally obliged the king of Sweden to relinquish the attack on Austria, to leave Bavaria, and to hasten to the assistance of Saxony, then exposed to the victorious Imperialists. He made a stand at Nürnberg, in order to observe the Imperial army (January, 1632). In the month of July Waldstein arrived at Fürth, near Nürnberg, and took up a strong position, by which he checked the king, and intercepted the supplies of provisions which were destined for the Swedish camp. Gustavus Adolphus assaulted the camp of his adversary on the 24th of August, but his troops were driven back with great slaughter; and the king, seeing his army exposed to hunger and disease, left his camp on the 8th of September, and retired to Saxony. Waldstein followed him, and in the month of October both the armies were in Saxony. Waldstein divided his army into two bodies, in order to enter into winter-quarters, thinking that the king of Sweden had renounced hostilities for that winter. But on the 6th of November he was suddenly attacked by the Swedes at Lützen, a small town in the environs of Leipzig, and he lost the battle in consequence of a part of his army having been separated from the main body. This victory however was fatal to the Swedes, on account of the death of Gustavus Adolphus, who was killed; and the battle was gained by Bernhard, duke of Saxe-Weimar, who immediately took the command of the Swedish army. Waldstein retired to Bohemia, where he remained, strangely inactive, although he soon repaired his losses at the battle of Lützen.

The death of Gustavus Adolphus did not lessen the power of the Swedes, nor change their politics: the chancellor Oxenstierna directed their affairs with the same views and the same skill as the late king; and the new generalissimo, Bernhard of Saxe-Weimar, was one of the most distinguished captains of his time. In 1633 Oxenstierna concluded an alliance with the states of the circles of Suabia, of Franconia, of the Upper Rhine, and of the Lower Rhine, and duke Bernhard got possession of Regensburg. Waldstein however destroyed the Swedish army in Silesia, conquered Lusatia, and entered into negotiations for the purpose of concluding a separate peace with Brandenburg and Saxony, those compulsory allies of the Swedes, who were afraid of the dangers to which Germany was exposed by the Swedish protection of the Protestant church. But Waldstein, whose pride became insupportable, and whose policy was crooked, was accused of high treason by his numerous enemies; and he was assassinated in the midst of his army, on the 25th of February, 1634. Ferdinand of Austria, the son and heir of the emperor, succeeded Waldstein as commander-in-chief of the Imperial and Bavarian armies: his lieutenants were Gallas and John von Werth, both experienced generals. Reinforced by a corps of Spaniards, he attacked the Swedes at Nördlingen, on the 7th of September, 1634. The Swedes were routed, their general, Horn, was made prisoner, and southern Germany fell into the hands of the Imperialists, who, though they exacted heavy contributions from the Protestant inhabitants, respected the liberties of the Protestant church. The Protestant princes of southern Germany, who hoped to aggrandize their states by means of the Swedes, were disappointed by the defeat of their protectors; but they found another powerful ally, who was always ready to encourage the German princes in their rebellious undertakings against the authority of their emperor. This ally was France. Löffler, the vice-chancellor of the duke of Würtemberg, and Streif, a privy counsellor of the margrave of Baden, negotiated an alliance between their sovereigns and France (11th of November, 1634). The king of France being one of the first Catholic princes, he durst not assume the title of protector of the Protestant church, as the king of Sweden had done, and he therefore styled himself the protector of the liberties of the states of Germany against the tyranny of the emperor. His policy was nevertheless severely blamed by his fellow-believers. Jacob Keller, a German Jesuit, wrote a book concerning the policy of Louis XIII., who, at the same time, protected the Protestants in Germany, and persecuted them in his own kingdom; but this book was burnt in Paris by order of the Sorbonne. Duke Bernhard of Saxe-Weimar at the same time having sold himself and his army to France, Saxony and Brandenburg saw at last that any longer adherence to the Swedish alliance would be the ruin of themselves and of all Germany. Saxony concluded peace with the emperor on the 30th of May, 1635, at Prague; and Brandenburg gave in its adherence to this peace on the 27th of August following: the favourable conditions which they obtained proved that the emperor had given up all schemes of oppressing the Protestant church. The landgrave of Hesse-Darmstadt, the dukes of Mecklenburg, of Brunswick, and of Saxe-Weimar (duke William), the cities of Frankfort, of Erfurt, &c., the Hanse towns, and at last the whole circle of Lower Saxony, became parties to the peace of Prague in the course of the same year. Among all the Protestant states of importance, Hesse-Cassel, Würtemberg, and Baden were the only states which continued their alliance with the foreign invaders. This fact also proves that the Swedes had not armed for the sake of the Protestant religion, as they pretended; and that their sole purpose was conquest. If they had taken arms for the liberty of their faith, they would have made that liberty a principle, and they would have withdrawn from Germany as soon as this principle had ceased to be interfered with. Such disinterested conduct is indeed rare in history, and is often regarded as contrary to the substantial welfare of that nation which adopts it. But is the rarity of the fact a proof of its absurdity? To veil ambition with moral or religious pretexts is a common practice, but it deserves to be stigmatized with the name of public hypocrisy; and such was the Swedish interference in the Thirty Years' War.

The most important event from the year 1635 to 1639 was the conquest of Alsace by duke Bernhard of Saxe-Weimar, who hoped to possess that Austrian province as an hereditary duchy. His plans however were contrary to the policy of France, who herself aimed at the possession of Alsace, and had bribed the duke for the sole purpose of employing him as an instrument. No sooner had the duke's intentions become manifest, than he fell suddenly ill, and died on the 8th of July, 1639. His army, a strong and experienced body, was bought by France, who immediately occupied Alsace. The Imperialists however, reinforced by the Saxon troops, gained a victory at Haselünne over the Swedish general Knyphausen, who was killed (December, 1635); and they forced Magdeburg to surrender (1636). They and the Saxons were beaten in their turn at Wittstock by the Swedish general Banér (24th of September, 1636); and duke Bernhard defeated them at Rheinfelden (21st of February, 1638), and made prisoners generals Savelli and the celebrated John von Werth. Previously to this the emperor Ferdinand II. died (15th of February, 1637), and was succeeded by his son Ferdinand III., who had been king of the Romans since 1636. Leopold William, the brother of Ferdinand III., was appointed generalissimo of the Imperial army; and as early as the spring of 1640 he succeeded in driving the Swedes, under Banér, from Bohemia, and he pursued them as far as Hesse and Hanover. In the autumn of 1640 the emperor issued a proclamation, granting to the rebellious Protestant princes a general amnesty and the sovereignty over their temporal dominions on the status quo of 1630, and over their ecclesiastical territories on the status quo of 1627. But these princes treated the proclamation with neglect, still hoping that by their alliance with the foreigners they would acquire some privileges and some little territory more. They sent new contingencies to the army of Banér, who, in January, 1641, advanced as far as Regensburg. He was reinforced by a French corps, commanded by the Marshal de Guébriand, but their united forces were defeated by the Imperialists, and on their retreat they lost half of their troops. Banér died in the month of May, 1641, and his successor was Torstenson, who led the Swedes to new triumphs.

The war had now lasted for twenty-three years. Swedes, Danes, Spaniards, Dutchmen, Frenchmen, half-savage warriors from Hungary, Transylvania, and Croatia, had ravaged Germany from one sea to the other. Adventurers from all the countries of Europe flocked to Germany to learn warfare, and to enrich themselves by the plunder of the country. The foreigners pretended to protect the churches, but the churches were laid in ruins; they professed to defend the liberties of the cities, but the cities were deserted; they promised to maintain the privileges of the princes, and they robbed them of their dominions, and led them to disobedience and anarchy.

Before the war commenced, the people were told that they were on the eve of a religious contest, but they hesitated to believe it; no deep religious hatred, no fanaticism disturbed their domestic peace. After the war had lasted some years, their passions were roused, and their warlike spirit excited them to take up arms, some for the defence of their hearths, and others to follow Waldstein or any other leader of the time. The pretext which the princes made of religion was shown by their attacks on the property of the church, and thus the people lost their respect for religion. The example of Christian of Halberstadt, of Mansfeld, of Waldstein, who supported their armies by robbing indifferently Roman Catholics and Protestants, corrupted both peasants and citizens; and commerce and industry being ruined, and agriculture becoming an uncertain means of living, they formed bands of robbers, who ravaged the country. From these bands the Swedes recruited their troops, who, after the death of Gustavus Adolphus, were chiefly composed of Germans. The armies presented an aspect like those of the Goths when they invaded the Roman empire. One-third and often only one-fifth of them were soldiers: the remainder were vagabonds, women, and children, who followed the army, carrying with them on carts the property which they had stolen on their march. The greater part of the women were prostitutes, who, in the army of Waldstein, had a perfect military organization. They were divided into regiments, companies, and sections, each body being commanded by a prostitute, and the women having the same rank among these female adventurers which their lovers had in the army. The provinces which were the principal theatre of war were laid waste, and the inhabitants fled, or were killed, or died of hunger and disease. Of 500,000 individuals, the population of the duchy of Würtemberg in 1618, only 48,000 remained at the end of the war in 1648.

Torstenson, the new generalissimo of the Swedes, conquered, or rather traversed, in the spring of 1612, Saxony, Silesia, and Moravia, and his light horse appeared in the neighbourhood of Vienna. At the same time the Marshal de Guébriand penetrated into Suabia, in hope of joining the Swedish army under the walls of the emperor's capital. The Imperial generals however succeeded in delivering the hereditary states of Ferdinand; and while Torstenson retired to the north, where his presence became urgent on account of a new war with Denmark, the French army was compelled to cross the Rhine. Guébriand was killed in an engagement near Rotweil, and his successor, the count of Rantzau, a German nobleman in the French service, who had again appeared on the right bank of the Rhine, was surprised by the Imperialists under John von Werth, Mercy, and the duke of Lorraine. The battle was fought on the 24th of November, 1643, near Duttlingen, and the French army was almost annihilated. Christian IV. of Denmark was not more fortunate in his war with the Swedes than he had been against Tilly and Waldstein; but while he was fighting with Torstenson in Jutland, Gallas, the general of the emperor, suddenly appeared in Holstein, with the view of placing the Swedes between two fires. From this dangerous position Torstenson escaped by a bold manœuvre, which he executed with his usual rapidity. He advanced as if to attack Gallas, but suddenly turned to the right, crossed Holstein, and penetrated by rapid marches into the heart of Germany, thus obliging the Imperial army to follow him in order to protect the hereditary states of the emperor. The Swedes often made a stand to engage in skirmishes which proved disastrous to the Imperialists, and Gallas brought only half his army back to Austria. In the mean time

France had levied a new army, which was put under the command of Turenne, and which was reinforced by a body under Louis d'Enghien, afterwards prince of Condé. They attacked the Imperialists under Mercy, who, after a gallant resistance and various success, was at last obliged to retire to the east of the Black Forest, leaving the Palatinate, Alsace, and Baden in the hands of the French (autumn, 1644). The Imperialists were still more unfortunate in eastern Germany. Torstenson defeated them and the Saxons at Jankau in a bloody battle (6th of March, 1645), and their general, Hatzfeld, was made prisoner. In one campaign Torstenson made himself master of Silesia and Moravia, and encamped near Vienna; and his lieutenant, Königsmark, conquered the bishoprics of Bremen and Verden. The elector of Saxony, and the elector of Brandenburg, Frederick William, who had succeeded his father George William in 1640, renounced their alliance with the emperor, and made their separate peace with Sweden; and their example was followed by Maximilian, elector of Bavaria. This hitherto faithful ally abandoned the emperor in 1647, after the victory of Turenne at Allerheim, and after the conquest of Suabia by Turenne, who advanced towards Münich. The defection of the elector of Bavaria excited the discontent of his army, and was considered an act of high treason by his generals. John von Werth, the idol of the soldiers, conceived the plan of putting the Bavarian army under the command of the emperor, and of seizing the elector and his ministers for the purpose of confining them in order to secure their fidelity. The plot was betrayed at the moment when it was to have been carried into effect. But John von Werth escaped, and Ferdinand created him a count of the empire. This event was followed by a victory of the Swedes at Susmarshausen, near Augsburg (7th of May, 1648). Königsmark, their general, now invaded Bohemia, and on the 31st of July conquered that separate part of Prague which is called the Kleinseite. This conquest was the last important event of the Thirty Years' War, which began and ended at Prague.

Peace of Westphalia.—As early as 1640 the Diet at Regensburg was occupied in putting an end to this awful war, and in 1641 preliminaries were prepared at Hamburg under the mediation of Denmark. Münster and Osnabrück were afterwards chosen for the places of congress, and the meeting was to be held in the spring of 1642, but it was not organised before the spring of 1643. The count of Auersberg was the emperor's ambassador at Osnabrück, where he was to negotiate a peace with the Swedish ambassador, John Adler Salvius; and the count of Nassau met at Münster the count d'Avaux, the ambassador of the king of France. The states of Germany sent likewise ministers or agents to both these towns; ambassadors of Venice and of the pope came as mediators; and Spain and the United States of the Netherlands sent their plenipotentiaries for the purpose of settling their private differences, and interfering in those of Germany. The negotiations lasted three years: the various chances of the war prevented the parties from acting upon an invariable principle, and the troublesome intervention of the German States were an obstacle to private interests being made subordinate to the general interest. At last the count of Trautmannsdorf, 'the most honest among all the ambassadors,' arrived from Vienna with full powers, and on the 14-24th of October, 1648, a double peace was concluded at Münster and at Osnabrück, which was legally considered as one, under the name of the Peace of Westphalia. Previously to this Spain and the United States of the Netherlands had likewise made peace at Münster, on the 20-30th of January, 1648. These are the principal conditions of the peace of Westphalia:—

I. *Conditions concerning the cession of territories and rights to foreign powers.*

1, Sweden, as 'an indemnification for her expense in the war and for ceding several of her conquests to their former possessors,' acquired Pomerania, except a part of Pomerania Citerior (duke Bogislav XIV. had died in 1637); the town of Wismar in Mecklenburg; the archbishopric of Bremen, and the bishopric of Verden, as hereditary duchies; a sum of five millions of thalers, which was not to be paid by the emperor, but by those circles where Gustavus Adolphus had promised to protect the Protestant church. In respect of these territories Sweden became a member of the empire.

2, France acquired the sovereignty over the bishoprics of Metz, Toul, and Verdun, the possession of which had been ceded to king Henry II. in 1556; the sovereignty over Pignerol; the town of Breisach, and the right of keeping a garrison in Philippsburg; the landgraviate of Upper and Lower Alsace, the Suntgau, and the Imperial rights over ten free towns in Alsace, but not over Strassburg. These territories were ceded to France in full sovereignty, and the king of France consequently did not become a member of the empire.

3, The United States of the Netherlands and the confederacy of the cantons of Switzerland were acknowledged by the emperor as independent states; legally speaking, these countries were parts of Germany until the peace of Westphalia.

II. *Conditions concerning the cession of territories and rights to members of the empire.*

(These indemnifications were effected by secularising bishoprics and other ecclesiastical territories.)

1, Hesse-Cassel acquired the abbey of Hersfeld, some of the fiefs of Schauenburg, and six hundred thousand thalers which were to be paid by Roman Catholic bishops.

2, Brandenburg acquired the bishoprics of Halberstadt, of Minden, and of Camin, as hereditary principalities; and the archbishopric of Magdeburg as an hereditary duchy.

3, Mecklenburg acquired the bishoprics of Ratzeburg and of Schwerin as hereditary principalities, and the commanderies of Mirow and Nemerow, which were taken from the Knights of St. John.

4, Brunswick acquired the convents of Walkenried and Groningen, and the privilege of appointing a prince of the reigning house bishop of Osnabrück; on this condition, however,—that the bishopric was to be governed alternately by a Protestant bishop of the House of Brunswick, and by a Roman Catholic bishop, who was to be chosen by the chapter.

5, The duke of Bavaria was confirmed as elector, and rewarded with the Upper Palatinate and the county of Cham.

6, Charles Louis, the successor of the banished elector palatine Frederick V., was restored to his dominions, except that part of them which was ceded to Bavaria; and as the electorship of his father was forfeited, an eighth electorship was created and bestowed upon him.

III. *Conditions concerning religion and the constitution of the empire.*

The principle of these conditions was, a general amnesty with regard to those who had rebelled against the emperor, though the word 'rebel' was not employed; and the maintaining of the status quo of 1618, before the beginning of the Bohemian war, with regard to the restitution of bishoprics, churches, &c., which had been seized by either of the parties.

A. *Religion.*

1, The treaty of Passau and the Second Peace of Religion were confirmed.

2, The religious quality of a territory or state was to be decided after the status quo of the 1st of January, 1624 (N.S.).

3, Equality of political rights between the Roman Catholics, the Lutherans, and the Calvinists or Reformed.

4, The Jus Reformandi was reduced to its original meaning as a mere protection of religion. This principle was checked by numerous and complicated exceptions, which afterwards led to many complaints.

5, The ecclesiastical jurisdiction of the bishops was conferred upon the Protestant princes as a right of sovereignty; in the Roman Catholic territories it remained in the hands of the bishops.

B. *Constitution of the empire.*

1, The princes acquired the right of concluding separate defensive and offensive alliances with foreign states; and they became almost sovereign with regard to their subjects.

2, The German empire was changed into a kind of confederacy of almost sovereign states, the emperor becoming a mere director of the public affairs.

IV. *Conditions concerning the relations between Germany and foreign powers.*

1, The peace of Westphalia was guaranteed by Sweden and France.

The Thirty Years' War was the Peloponnesian War of Germany, and by the Peace of Westphalia the German princes prepared the destruction of their independence and the downfall of the empire. The German princes were originally rich landowners appointed by the emperors as high judges (graven, comites) and military commanders (herzoge, duces). From the eleventh century they endeavoured to obtain possession of these functions as hereditary rights. During five centuries they carried on a system of rebellion against the Imperial authority, and gradually usurped rights and privileges which the emperors were compelled to confer upon them in due form. Thus both legislation and administration became hereditary in the princes. Having succeeded with regard to political rights, they considered the Reformation of Luther as an opportunity of usurping ecclesiastical legislation. It was granted to a great number of them by the Peace of Westphalia. Luther's reforms gave birth to the Protestant faith, but this faith required to be supported by a church. A Protestant church did not exist before the Peace of Westphalia, nor was it established by this peace, nor is there now any general Protestant church in Germany. The princes considering themselves as legal successors of the bishops, the episcopal rights became a part of political sovereignty, and the ministers of the faith gradually became functionaries of the princes. Their first duty was to obey them; they not only obeyed, but they crouched before them and their ministers; their abject behaviour is shown by numerous works published during the latter part of the seventeenth century and the eighteenth century. When the people saw the dependence of the ministers on the temporal authority, they confounded the commands of their faith with the laws of their princes, and, not discovering any divine character in these laws, they forgot the divine origin of their religion. Thus they fell into that remarkable indifference concerning religious matters which now prevails in the greater part of the Protestant countries of Germany. This religious state is a consequence of the Thirty Years' War.

The political consequences of that war are still more evident. Germany was a wilderness—its material strength was ruined—its political power was broken—its intellectual development was checked—and the fierce and manly spirit of the nation was broken by their thousand arbitrary rulers, who themselves became slaves of the French. Divided into factions by the private interests of the princes, Germany became the theatre where the armies of all Europe met to settle the differences of their kings. This state of things lasted a hundred and fifty years, and ended with the destruction of the German empire by Napoleon.

(K. A. Menzel, *Geschichte des Dreissigjährigen Krieges*, 2 vols. 8vo., Breslau, 1835-37; Breyer, *Geschichte des Dreissigjährigen Krieges nach ungedruckten Papieren*, 1st vol., München, 1811, 8vo.; Breyer, *Beiträge zur Geschichte des Dreissigjährigen Krieges aus bisher ungedruckten Papieren*, München, 1812, 8vo.; Schiller, *Geschichte des Dreissigjährigen Krieges:* this work, distinguished by the beauty of its style, contains the most interesting description of the Thirty Years' War; but its historical value is not very great; Leo, *Lehrbuch der Universal Geschichte*, vol. iii.: the author's description is remarkable for the application of philosophical principles to history; Eichhorn, *Deutsche Staats- und Rechts-Geschichte*, vol. iv.: the author starts from a legal point of view, but he treats political and religious rights rather as a lawyer than as a publicist; Woltmann, *Geschichte des Westphälischen Friedens*, Leipzig, 1808-9, 2 vols. 8vo.; Meiern, *Acta Pacis Westphalicae publica, oder Westphälische Friedenshandlungen*, Göttingen, 1734-6, 6 vols. fol.)

THISTLE, the common name of *Carduus*, a genus of plants belonging to the large natural order Compositæ. From the time of Theophrastus down to that of Caspar Bauhin, all plants that possessed a spiny involucre were comprehended in the genus Carduus. The artichoke (Cynara) and the teasel (Dipsacus) were included in it by Tragus and Lobelius. Morison confined the genus to those plants that had spiny scales of the involucre and a crown of feathery down (pappus) surmounting the seed. Plants resembling them, but without a spiny involucre, he called *Cirsium*, and those without the feathery pappus *Carduus impropriè dictus.* Tournefort adopted these distinctions. Vaillant defined Carduus more accurately, giving it to plants with a globular involucre composed of spiny scales, with compound flowers, tubular florets, stamens united by the anthers, a hairy receptacle, and a hairy pappus on the seeds. If the pappus was feathery, he called the genus *Acarna*; and when the receptacle was not hairy, but honeycombed, he used the term *Onopordon*, a name previously applied to thistles by Pliny. When the scales and receptacles were fleshy, he named the genus *Cynara*. Linnæus adopted these genera, but changed Vaillant's *Acarna* into *Cnicus*, a name which had been previously employed by Tournefort for another genus.

The genus *Carduus*, Common Thistle, consists of upwards of 30 species, most of which are inhabitants of Europe. None of them are found in the New World.

C. nutans, Musk-Thistle, has decurrent spiny leaves, with handsome drooping flowers; the scales of the involucre cottony, the outer ones spreading. It is a common plant on waste ground, in dry, stony, or chalky soils, in Great Britain. It gives out, especially in the evening in warm weather, a strong smell of musk.

C. marianus, Milk-Thistle, has spinous leaves embracing the stem; the scales of the involucre leaf-like, recurved and spinous at the margin. It is a native of England; scarce in Scotland. The leaves are distinguished by the milky whiteness of their veins. This milkiness is said, according to an absurd story, to have been produced by a drop of the Virgin Mary's milk, just as the Milky-Way was supposed to arise from that of Juno. This plant is an esculent, and may be eaten young as a salad, or boiled and eaten as greens. The young stalks, when peeled and soaked in water, are also excellent.

The root may be prepared like salsify and skirret, and the receptacle may be cooked and eaten as the artichoke. When cultivated, the seeds should be sown in spring, and the plants kept at a foot and a half distance from each other, and the earth thrown up round them till they are etiolated.

The genus *Cnicus*, Plume-Thistle, is known by the feathered down that crowns the seeds. It is a large genus: nine of the species are inhabitants of Great Britain.

The Cotton-Thistle is the *Onopordon*, which is known by its honeycombed receptacle. The *O. Acanthium* is a British species. The leaves are ovato-oblong, sinuated, spinous, decurrent, and woolly on both sides. It attains a height of from four to six feet. It is cultivated in Scotland as the Scotch Thistle; but it is doubtful whether this national badge has any existing type, as the representations of the Scotch Thistle on ancient wood-carvings, coins, and armorial bearings, differ more from each other than any known species of thistles. The receptacle and stalks of the Cotton-Thistle are sometimes eaten, in the same manner as the artichoke and cardoon. [CYNARA.]

The Carline Thistle forms the genus *Carlina*, which obtained that name from a tradition that the root of the Common Carline (*C. vulgaris*) was shown by an angel to Charlemagne as a remedy for the plague which prevailed in his army. The genus is known from the others by the inner scales of the involucre being spreading and membranous, and of a yellow colour. The Common Carline is a frequent plant in Great Britain on dry hilly pasture and in fields. It is about one foot high.

The Blessed Thistle is the *Centaurea benedicta*, the *Carduus benedictus* of old writers. The involucre of the genus Centaurea is not spiny, and the seeds have a very simple pappus, or none. The Blessed Thistle is a native of the Levant, and in the middle ages was held in extravagant estimation on account of its supposed virtues. It is still cultivated in some places on account of its medical properties.

For Sow Thistle, see SONCHUS.

Some of the species of thistles are admitted into gardens. They form a pretty variety for borders, and require little care in their cultivation. They sow themselves very extensively by means of their winged seeds. On this account they are great pests to the farmer. In fields the annual kinds may be got rid of by the weeding hook, but the perennial kinds must be ploughed and the roots picked out. The *Carduus arvensis* has got the name of Cursed Thistle, on account of the difficulty of eradicating it where it has once grown. Although injurious to man, by exhausting the soil of that nutriment which plants supplying food require, their seeds are generally eaten by birds, and the larvæ of many insects live entirely on their leaves.

THISTLE. The thistle, with its strong prickly leaves and stem, establishes itself in the meadows and corn-fields, when it is not very carefully eradicated, and occupies the place of more useful plants. There are many varieties of the thistle, some of which are not destitute of elegance when in full blossom. Considered as a weed in our fields, our principal object is to eradicate it, which, in consequence of the ready dispersion of the seeds by the wind, is not easily done, as a slovenly farmer may seed the whole country around; and where the thistles are not eradicated from the hedges and sides of roads and paths, it is impossible to destroy them entirely: wherever the soil is newly turned up, especially when it is of a nature where wheat will grow well, thistles invariably arise: hence the saying of the blind man in choosing land, 'Tie me to a thistle.'

Those crops which are usually hoed can readily be cleared of thistles: but where the seed is sown broadcast, the labour of weeding them out is much greater. If they are not extracted with the root, they will soon grow again with redoubled vigour. In a moist season they may be pulled up by means of a wooden or iron forceps, which grasps them strongly near the crown of the root, and, as it has a projection which serves as a fulcrum, a pressure on the handles draws the root out when they are brought together. When a field has been long infested with thistles, the best way of clearing it is to watch when the thistle is in full bloom and the seed is just forming; if it be then cut off at the root it will die. Thus in two years a field may be entirely cleared of thistles.

It is chiefly in arable land that thistles are most troublesome. In pastures it is sufficient to eradicate them once, and to permit none to grow along the hedges and ditches. The seed does not readily vegetate, unless it finds a loose soil; and little birds are so fond of it, that they will leave none that is not covered with earth, especially in the beginning of winter. In some countries there are penalties inflicted on those who allow thistles to remain in their hedges or along the high road which borders their land; and a man may complain to a magistrate of a neighbour who will not destroy the thistles on his land, when the delinquent will be admonished or fined, as the case may require. Such a law would be very advantageous in many parts of the country, where no attention is ever paid to the weeds which grow in the hedges or in waste spots.

THISTLE, ORDER OF THE, an antient Scottish order of knighthood, sometimes called the order of St. Andrew. The early history of this order is involved in some obscurity, and the most absurd attempts have been made to establish its claim to high antiquity, of which it is sufficient to allude to the legendary account recited in the warrant for the restitution of the order in 1687, and given most minutely by several Scottish antiquaries, attributing its formation to Achaius, king of the Scots, in commemoration of a victory obtained by himself and Hungus, king of the Picts, over Athelstan. Nicolas observes, as a fitting illustration of this legend, that Achaius died upwards of a century before the reign of Athelstan; and he further shows that the thistle was not the acknowledged badge or symbol of Scotland until the latter part of the fifteenth century. Even after it became a national ornament, and formed a distinguishing feature of a collar resembling that now worn by Knights of the Thistle, it is by no means certain that it was considered the badge of an order of knighthood; and the searching investigation of Sir Nicholas Harris Nicolas, which is detailed at great length in the third volume of his recently published 'History of the Orders of Knighthood of the British Empire,' leads him to the conclusion that it is difficult to believe in the existence of the Order of the Thistle, as an organized fraternity, until the reign of James VII. of Scotland and II. of England. Whether it had any such prior existence or not, 'it is admitted,' he adds, 'even by the assertors of the antiquity of the order themselves, that, after the Reformation orders of knighthood being considered in Scotland as relics of popery, it fell into desuetude; and consequently it is not pretended that there were any "knights of St. Andrew," or "of the Thistle," after the accession of King James VI., in 1567.' The warrant of James II. for the re-institution of the 'most ancient and honourable order of the Thistle,' which is printed at full by Nicolas, and which asserts that by authentic proofs, documents, and records, the order 'continued in great glory and splendour for many hundreds of years,' bears date Windsor, May 29, 1687; but, although statutes were issued, and eight knights were nominated by James II., the patent or diploma for the restitution of the order never passed the great seal. Owing to the abdication of James, the order again fell into abeyance, until it was finally revived by Anne in 1703. In the warrant of 1687 it is stated that the order consisted originally of the king and twelve brethren (in allusion to the Saviour and the twelve apostles), and the same number was ordained as the full complement by Anne, although it was not filled up for several years. This continued without alteration until July 16, 1821, when, in consequence of the coronation of George IV., an ordinance was issued for the appointment of four extra members, who should become regular knights as vacancies should occur; and in May, 1827, the number of knights brethren was permanently extended to sixteen. Originally none but Scottish noblemen were admitted to the order; but since the time of George I. it has also been conferred upon several English peers. No foreigners have been admitted to the order; nor have any commoners, excepting a few who were heirs-apparent to dukedoms. It is usual for knights of the Thistle to resign the ensigns of the order when elected into that of the Garter, although the statutes contain no express provision to that effect; but in a few instances this custom has been dispensed with, as a special mark of royal favour. The decorations worn by the knights consist of a collar of enamelled gold, composed of sixteen thistles, interlaced with sprigs of rue, fastened to the mantle by a white riband; a small image of St. Andrew, also of enamelled gold, suspended from the collar; a medal or badge of gold, having an image of St. Andrew within a circle containing the motto of the order, 'NEMO ME IMPUNE LACESSIT' (No one provokes me with impunity'), and a thistle; a green riband, to which the medal is attached, and which is thrown diagonally over the left shoulder; and a star, consisting of a thistle enamelled in its natural colours upon a ground of gold, and surrounded by the motto and rays of silver. The star is worn on the left shoulder, on a mantle of green velvet, which, with other parts of the dress, are minutely described by Nicolas. Although the original statutes of the order, which were printed by Sir N. H. Nicolas in 1828, do not strictly define the method of admission, it was ordained by George I., in 1717, that vacancies should be filled up by election in a chapter of the order; but the usual practice has been for the sovereign to appoint to vacancies without summoning a chapter. His late Majesty, William IV., re-established the practice of election in a chapter of the knights brethren, but it has been again dispensed with by her present Majesty. The officers of the order are the dean, the chancellor, the secretary, the king-at-arms, and the usher, each of whom receives an annual salary, and a fee on the election of a knight, excepting only the chancellor, that officer never having been appointed, although he is mentioned in the statutes of 1687, 1703, 1717, and 1833: his duties are performed by the secretary. A complete list of knights of the Thistle, from the revival or creation of the order in 1687 to 1840, is given in the work above cited, from which this brief account is condensed.

THLASPI'DEÆ, a tribe of plants of the natural order Cruciferæ, having for its type the genus Thlaspi. It is also called Pleurorhizæ, from having the radicle of the embryo at the side of the cotyledons. The silicle opens with a very narrow dissepiment, and has keeled navicular valves. The seeds are oval, with flat accumbent cotyledons. The principal genera of this tribe are, *Thlaspi*, the Bastard Cress; *Iberis*, the Candy-tuft; *Hutchinsia*; and *Biscutella*, the Buckler-Mustard. They are most of them insignificant plants, possessing the acrid biting properties of the whole order. The genus Thlaspi is known by its silicles being emarginate at the apex with the valves winged at the back; the petals are equal, the pedicels bractless, and the flowers are white. Some of them, as the *Thlaspi arvense*, Penny Cress, have a strong alliaceous odour. They grow on rocks and barren places, and are frequently found amongst collections of rubbish from mines, &c., and are inhabitants of most parts of the world in cold and temperate regions.

Hutchinsia was named by Sir J. E. Smith after Miss Hutchins of Belfast, who contributed many observations on marine plants to the 'English Botany.' It has an elliptical silicle with wingless valves, equal petals, entire leaves, bractless pedicels, and variously-coloured flowers, but never yellow. All the species are mountainous plants. They possess no active properties, but are pretty little plants, and will grow on rock-work or in small pots. They are best grown in a soil composed of sand, loam, and peat. The annual kinds may be propagated by seeds; the perennial, by dividing the roots or by cuttings.

The Candy-tuft is known by two of its petals being larger than the other two; they are of a white or purplish colour, but never yellow. They are mostly mountainous plants, but grow well in gardens; and, if the seeds are sown at different periods, will blossom all the summer, and even through a mild winter. The shrubbery species are also well adapted for rock-work, and may be propagated by cuttings. [IBERIS.]

Biscutella has a flat silicle with one-seeded cells, a long permanent style, a compressed seed, and yellow scentless flowers. They are also alpine plants. In the garden they form a pretty variety with the other plants, on account of their yellow flowers. A dry sunny situation in a light sandy soil suits them best. They are best propagated by seeds, and may be kept in blossom during the summer by sowing at different periods of the year.

THOA, a genus of Polypiaria; included by Linnæus in Sertularia.

THOMAS, θωμᾶς, תאֹמָא (in Greek, Δίδυμος; John, xl. 16; xx. 24), one of the twelve apostles of Christ. (*Matt.*, x. 3.) The Hebrew and Greek names both signify *a twin*. St. Thomas is presumed to have been a Galilean; but no particulars of his birth-place or call to the apostleship are given, and the first notice of him individually is in *John*, xi. 40. Christ having expressed an intention of returning to Judæa, in order to raise his friend Lazarus from the dead, Thomas encouraged the other apostles to attend him, although he regarded death as the certain consequence of this step. The impulsiveness of character thus indicated was not long after very differently displayed. Thomas happened to be absent when Christ, after his resurrection, first appeared to the apostles; and when made acquainted with the fact, he expressed an incredulity which could only be satisfied by the manual evidence of inserting his finger in the holes which the spear and the nails had made in the body of his crucified master. Eight days after, when Christ again appeared, Thomas was present; and the reaction in his mind was very strongly expressed by him, when he was pointedly called upon by Jesus to stretch forth his hand and take the desired proof. (*John*, xxi. 24-29.) Thomas is not again mentioned in the New Testament. Doubtless he laboured, like the other apostles, in the propagation of the Christian doctrines: and ecclesiastical traditions make him one of the apostles of the Gentiles. It is alleged that he travelled eastward, and laboured among the various nations which then composed the Parthian empire. (Euseb., iii. 1; Rufin., x. 9; *Recognit.*, ix. 29.) There is a singular concurrence of Oriental and Western testimony (which may be seen in Assemanni and Baronius), to the effect that St. Thomas extended his labours farther eastward, and then southward, until he reached the coast of India and Malabar, where, having exercised his apostolic labours with success, he passed on to the coast of Coromandel; and having made great conversions to the faith in those parts, he proceeded over to some coast on the east, called China (which may possibly have been the country now called Cochin-China), and afterwards returned to Coromandel, where, having suffered martyrdom, he was buried in the mount since called St. Thomas's Mount.

In the quarters indicated there are Christian churches which bear the name of St. Thomas, and claim him for their founder. If they derive their existence as a church uninterrupted from the apostolic age, this fact may be taken as a corroboration of the above traditions. But if the effects which resulted among them from the labours of Mar Thoma and other Nestorian missionaries, at the commencement of the sixteenth century, were really an original conversion, or at least a re-conversion, and not, as is often supposed, the revival of a fallen but not extinct church—then this claim is to be regarded only as an echo of the tradition which has always prevailed in the Syrian churches, and which must be estimated by its intrinsic probability and value.

(Besides Assemanni and Baronius, see Tillemont, i. 397, sq.; Cave's *Antiq. Apostolicæ;* Winer's *Biblisches Realwörterbuch*, art. *Thomas;* Buchanan's *Christian Researches;* Yeate's *Indian Church History;* and Principal Mill's *Letter to the Society for the Propagation of the Gospel* (July 29, 1822), inserted in *Christian Remembrancer* for Nov., 1823.)

THOMAS A' KEMPIS. [KEMPIS.]

THOMAS AQUI'NAS. [AQUINAS.]

THOMAS, ANTOINE LE'ONARD, was born at Clermont in Auvergne, on the 1st of October, 1732. His father, it has been generally believed, died while Thomas was an infant, leaving a widow with three sons and a daughter. The eldest son, Joseph Thomas, who embraced the clerical profession, died in 1741: he composed a dramatic piece, entitled 'Le Plaisir,' which was acted with success in 1740. The second, Jean Thomas, died in 1755, professor in the college of Beauvais: he published some Latin verses, and introduced into his college an improved method of teaching Latin. It appears therefore that the taste for literature was common to the whole family.

Antoine Léonard was educated at home till he had completed his ninth year, and was then sent to prosecute his studies at Paris, where his brothers preceded him. In a letter which he addressed, in 1767, to Madlle. Moreau, he mentions that his second brother had taken great pains with his education. They were an attached family: Antoine retained all his early devotion for his mother till her death, in 1782; and his sister, the only member of the family who survived him, lived with him till his death.

Antoine Léonard Thomas distinguished himself at the university. In 1747 he carried off two of the prizes distributed in his class in the college of Duplessis: in 1748 and 1749 he studied rhetoric in the college of Lisieux, and obtained four prizes: from October, 1749, to August, 1751, he studied philosophy with equal distinction, at first in the college of Lisieux, subsequently in that of Beauvais. When he finished his university career, his friends wished him to study for the bar, and he did so far comply with their desire as to attend law classes and the office of a solicitor. This continued till the death of his second brother, in 1755, at which time he had retired, apparently on account of his health, which was always infirm, to his native district. A short time after he accepted the offer of a professorship in the college of Beauvais. He continued to discharge the duties of his appointment till 1761, when, finding them injurious to his health, he resigned, and was appointed private secretary to the Duc de Praslin.

Thomas commenced his career as author in 1756 by publishing 'Reflections Philosophiques et Littéraires sur le Poëme de la Religion Naturelle.' This was throwing down the gauntlet to the whole school of Voltaire: the patriarch himself took no notice of the publication, and Grimm spoke of it as the work of 'a silly lad just escaped from the school of the Jesuits.' In the same year Thomas addressed an ode, full of hyperbolical compliments, to Sechelles, controller-general of finance: the flattery was successful; it obtained from the minister an addition to the revenues of the college. In 1757 Thomas composed, on the occasion of the great earthquake at Lisbon, a 'Mémoire sur les Causes des Tremblemens de Terre,' which was crowned by the Academy of Rouen. In 1759 he published 'Jumarville,' a poem in four cantos, on the death of a French officer, killed, as the French alleged, under circumstances of peculiar atrocity, in the war between the French and English, in the backwoods of America. Fréron praised this poem in the 'Année Littéraire,' a tribute of thanks to the young author who had ventured to attack Voltaire. These early works of Thomas are remarkable only for their turgid style, commonplace ideas, and for the eagerness of the author to avail himself of the popular topic of the day.

About this time the French Academy, with a view to render the prize-essays of its members more popular, began to propose the éloges of great men as the subjects. Thomas entered the lists three successive years, and was successful every time. His 'Eloge de Maurice, Comte de Saxe,' was crowned in 1759; his 'Eloge de Henri François d'Aguesseau,' in 1760; and his 'Eloge de Réné du Guay-Trouin,' in 1761. In 1760 he also competed for the prize of poetry: his 'Epître au Peuple' was declared next in merit to the poem of Marmontel, to which the medal was assigned. In these compositions a marked improvement can be traced. There is no greater originality of thought than in his first productions—nothing of genius in them; but more matter, more of artistical finish, and less of boyish inflation of style.

The connection with the Duc de Praslin was less advantageous to Thomas than it promised to be at the outset. The duke procured for him the sinecure appointment of secretary-interpreter to the Swiss cantons. But a vacancy occurring soon after in the Academy, this minister, who had a personal quarrel with Marmontel, sought to obtain it for his secretary. Thomas had the magnanimity to refuse the appointment, urging the superior claims of Marmontel. This act of honesty lost him the favour of the Duc de Praslin, and closed the career of office which was opening to him. The admission to the Academy was not however long deferred. He delivered his inaugural address to that body on the 22nd of January, 1767.

Between 1761 and 1767 he composed—'Eloge de Sully,' crowned in 1763; 'Eloge de Descartes,' crowned in 1765; in 1766, 'Eloge de Louis, Dauphin de France,' composed and published at the request of the Comte d'Angiviller; and his inaugural discourse. In October, 1767, his opera of 'Amphion' was brought out, but without success. These works are all characterised by a progressive improvement in execution. They differ also from his juvenile productions in an attempt to adopt the sparkling and antithetical style of the Encyclopædists, and in the complete appropriation of their bold satirical tone in respect to politics, although much of the author's juvenile respect for religion remained with him to the last. As a natural consequence of the change, Grimm had by this time begun to praise Thomas, and Fréron had cooled in his admiration of him: Voltaire had written a complimentary letter on the 'Eloge de Descartes,' but had on the other hand remarked to his friends that they ought now to substitute the word *galithomas* for *galimathias:* Diderot continued implacable. It was rumoured that the court, enraged at the free strain of the 'Epître au Peuple,' and the sarcasms launched against itself and the feudal system in the 'Eloge du Dauphin,' threatened the liberty of Thomas.

The principal publications of Thomas, from the time of his admission into the Academy till his death, are—'Eloge de Marc Aurèle,' read to the Academy in 1770, and published in 1775. His reply, as director of the Academy, to the inaugural discourse of the archbishop of Toulouse, also in 1770. 'Essai sur le Caractère, les Mœurs, et l'Esprit des Femmes, dans tous les Siècles,' 1772. 'Essai sur les Eloges; ou l'Histoire de la Littérature et de l'Eloquence appliquées à ce genre d'Ouvrage,' published in 1773, in an edition of his collected works. He commenced a poem on the czar Peter I.; but only four books and part of a fifth were completed at the time of his death. The increased technical skill of the author continues to show itself in these works; but the increased boldness of his attempts serves also to show the natural meagreness and feebleness of his genius. He was utterly devoid of impassioned imagination. His 'Eloge de Marc Aurèle' is an attempt to personify a Stoic of the age of that emperor. it is alike deficient in interest and dramatic truth. His essay on the character and manners of women is a collection of passages which would have swelled his didactic essay on 'éloges' to too great a bulk. It was said at the time that this panegyrical essay on the sex pleased them less than the vituperations of Rousseau. No wonder the treatise of Thomas is cold and unimpassioned; it was forced work; but the ravings of Rousseau are the scoldings of a jealous man who has been anxious but unable to please. The treatise on 'éloges' is a worthy consummation of the author's labours in that empty and artificial branch of literature which has all the falsehood of oratory without the interest which attaches to the eloquence of the bar or senate from its power of producing great practical effects. The partially completed poem of 'The Czar' is sensible and the versification smooth, but the four books are four separate poems, in the manner (though not so good) of Goldsmith's 'Traveller.' They never could have been made parts of an epic.

Thomas died on the 17th of September, 1785. His health, always delicate, had been undermined by incessant study. His end is supposed to have been hastened by the shock he received from an accident which happened to one friend and the death of another. That he was capable of generous feeling and disinterested action he showed when he forfeited the favour of the Duc de Praslin by refusing to accept a seat in the Academy to the exclusion of Marmontel. That he was capable of sincere affection is proved by the footing on which he stood with his family and friends. The insinuations against his sincerity and veracity thrown out by Diderot seem to have no better foundation than the change of tone in his later from his earlier publications. The truth is, that, like many other inferior *littérateurs*, Thomas was a mere echo of the society by which he was surrounded. He took his colouring in youth from his preceptors, most of whom were ecclesiastics; in after-life, from the sceptical literary conversation of the salons of Paris. His éloges are his most characteristic works, a kind of composition too inaccurate to have value as history, too cold and remote from the real business of life to impress as oratory. He stands however high among his class of writers. The high finish and some of the brilliancy of the French school cannot be denied him; though for this he was indebted quite as much to the company he kept as to natural talent, or even his unquestionable painstaking.

(*Œuvres* de M. Thomas, Paris, 1792; *Œuvres Posthumes* de M. Thomas, Paris, An x. (1802); 'Sketch of Thomas,' by Saint Surin, in the *Biographie Universelle.*)

THOMAS, ST. (Santo Thome), an island in the Gulf of Guinea, extends from 1′ to 25′ N. lat., and from 6° 25′ to 6° 43′ E. long. It is about 140 miles west-north-west from Cape Lopez. The island is of an oval shape: its greatest length is about 30 miles, and its greatest breadth about 18 miles. Its area may be estimated at about 420 square miles. It is of basaltic formation, and mountainous: the Pico de Santa Anna de Chaves is 7000 feet high. The mountains are mostly covered with wood, and there are numerous streams well supplied with fish. The vegetation is abundant. The chief exports are sugar, indigo and cotton. The island belongs to the Portuguese; and the inhabitants, who are chiefly composed of Portuguese and of negro slaves, amount to about 18,000. A number of runaway negroes live in the mountains. The chief town is called Santo Thome.

THOMAS, ST., Island. [Virgin Islands.]

THOMASIN, or TOMASIN, surnamed Tirkelüre, Clür, or Zerkler, a German poet of the thirteenth century. He was a native of the Italian province of Friuli, and born about the year 1186. Being thus an Italian by birth, or, as he himself says, a Walich, he wrote in his earlier days an Italian work, probably a didactic poem, 'On Courteous Manners,' which is no longer extant. In the course of the year 1216, when he had just reached his thirtieth year, he wrote in the space of ten months a great didactic poem in German, which from his native country he called 'The Welsh Guest' (Der Welsche Gast), and which consists of ten books. This poem, of which there exist many excellent manuscripts, is one of the most splendid productions of German literature during the thirteenth century and, although the author is a foreigner, the work breathes throughout a pure German spirit, and displays all the depth and intensity of German thought and feeling. In the beginning of his poem Thomasin admits that he is not a perfect master of the language which he used; but still the peculiarities are so few and slight, that it requires a profound knowledge of the old German language to discover the foreigner. Eschenburg therefore supposes that the author's statement respecting his native country is a mere fiction. But this supposition, as well as another, that the 'Welsh Guest' is merely a German translation of the Italian work 'On Courteous Manners,' is without foundation, and contradicted by numerous passages of the former work. The object of this poem is to show in what virtue, piety, and good conduct consist, and why man should strive after them. It shows that a remarkable progress had taken place in the mind of Thomasin during the interval between the composition of the Italian and that of the German work. In the former, as he himself states, he had proceeded from the idea that courteous conduct and nobility of birth were always combined with a noble mind, or, in other words, that the changeable rules respecting good manners were of greater value than the eternal law of morality which is implanted in every man's heart. This prejudice is altogether given up in his German poem, where he declares that a man is foolish who thinks himself great because he is of noble birth and possesses courteous manners, and that it is only a man's heart and real character that make him worth anything. Virtue with him is now a fundamental principle, and not a mere expedient. He describes virtues and vices, and their respective consequences, with a truly Socratic spirit and dignity. Thomasin was well acquainted with the history of antiquity, and it is among the antients that he found his best models of really virtuous men. The whole poem is a sublime and altogether practical system of morality: it is a philosophy in the garb of poetry and occasionably embellished by figurative language. But he does not write in the spirit of any particular school; his object is in general to instruct man on matters concerning his physical and spiritual welfare.

This masterpiece of early German poetry and philosophy has never yet been published entire, but it is said that Frommann is preparing an edition of it. Fragments of it are printed in Eschenburg's 'Denkmäler Altdeutscher Dichtkunst,' p. 121, &c.; compare Gervinus, 'Geschichte der Poetischen National Literatur der Deutschen,' vol. i., p. 456, &c.

THOMA'SIUS, CHRISTIAN. The real name of this author is Thomas, and in the works which he published in his mother tongue he always calls himself Christian Thomas. He was born at Leipzig, on the 12th of January, 1655, and was the son of Jacob Thomasius (1622-1684), a distinguished professor of philosophy, and some time rector of the celebrated Thomasschule at Leipzig, under whose auspices Leibnitz was educated. The education of Christian Thomasius was conducted by his father, whose knowledge of philosophy and its history gave his mind at an early age a decided turn. Christian had scarcely attained his fourteenth year when he was found sufficiently prepared to enter the university. In his sixteenth year he obtained the degree of bachelor of arts, and the year after that of master of arts. The chief subjects of his studies were philosophy and law, more especially the law of nature, which he regarded as the basis of all other laws. The instruction of his father and his own experience at the university had convinced him that the methods of teaching then followed were pedantic and deficient, and he determined to remedy these defects as much as was in his power. In 1675 he went to Frankfort-on-the-Oder, where he began a course of lectures on law, but they do not appear to have been well received by his colleagues, and a few years after, in 1679, after having obtained the degree of doctor of laws, he left Frankfort, and made a literary journey to Holland. On returning to Leipzig he commenced the practice of the law. But this occupation did not offer sufficient scope for him, and he again became an academical teacher, in which capacity he brought about the most beneficial reforms. The law of nature, which had until then been almost entirely neglected in the universities, continued to be the principal subject of his studies. The older professors, who found themselves disturbed in their routine of teaching by the energy and boldness of the young man, began to clamour against him. So long as his father lived, violent outbreaks were prevented, partly because he restrained his son's eagerness for reforms, and partly because the other professors esteemed him too much to hurt his feelings by open attacks upon his son. When however his father died, in 1684, the bitterness and boldness with which young Thomasius attacked antiquated prejudices of all kinds together with their champions, involved him in numerous disputes. This enmity was not only provoked by the matter and the manner of his teaching, but also by several publications which tended to destroy established opinions. One of them, on polygamy, especially gave great offence; he asserted that polygamy was at least not contrary to any law of nature.

Up to this time it had been the general custom in all German universities to deliver lectures in Latin, and to make all public announcements of them in the same language. In the year 1687 Thomasius published his program in German, and announced that he would deliver a course of lectures in German, and on a subject which appeared altogether foreign to a university,—viz. on the manner in which the Germans should follow the example of the French ('Discours, welcher Gestalt man denen Franzosen im gemeinen Leben und Wandel nachahmen soll,' published at Leipzig, 1687, 4to.). This daring innovation was regarded by his colleagues as a perfect heresy, though, after the example was once set, it was gradually followed by other professors, until it became the universal practice in all German universities to lecture in German. It was a necessary consequence of this that books of a scientific character now began to be written in German. Notwithstanding both the open and secret attacks to which Thomasius had thus exposed himself, he continued to combat prejudice, pedantry, and error. He was unsparing in his censure, which was usually combined with wit and satire, and even his former teachers did not escape. In the year after, 1688, he established a German Monthly Review, under the title, 'Freimüthige, jedoch vernunft- und gesetzmässige Gedanken über allerhand, fürnemlich aber neue Bücher,' which he conducted from 1688 till 1690, and which gave him immense influence in all parts of Germany, and the means of chastising his enemies. His enemies in their turn tried every means to avenge themselves; and although Thomasius at first succeeded in averting the danger that was gathering around him, yet the disputes became daily more vehement and serious, especially with two divines, Pfeifer and Carpzovius, who charged him with atheism. The theological faculty of Leipzig was likewise gained over to their side. H. G. Masius, court preacher to the king of Denmark, who had been rather severely dealt with by Thomasius in his Journal, and who made a reply, to which Thomasius answered in a very energetic manner, persuaded the king of Denmark to have all the published parts of Thomasius's Journal burnt in the market-place of Copenhagen by the hangman, 1689. Such proceedings in a foreign country were treated by Thomasius with contempt; but the storm was gathering over his head. In the same year he became involved in disputes with the Pietists, and also came forward to justify marriages between two persons of different religions, which enraged the divines of Wittenberg to such a degree, that the chief consistory was induced by various charges which were made against him to issue an order for the apprehension of Thomasius. He escaped the danger and fled to Berlin, where he met with a kind reception and the protection of Frederick III., the great elector of Brandenburg (afterwards King Frederick I.), who not only permitted him to settle at Halle, but also to lecture in the Ritteracademie (academy for young noblemen) of that place. He began his lectures here in 1690, and met with the same approbation on the part of the students as at Leipzig; and the increase in the number of students induced the elector in 1694 to found the university of Halle, in which he appointed Thomasius professor of jurisprudence, and conferred upon him the title of councillor, with a salary of 500 thalers. In this new position too Thomasius continued to be annoyed by numerous disputes, partly with his former adversaries and partly with others. In the year 1709 he had the satisfaction to receive an invitation to the chair of jurisprudence in the university of Leipzig, which however he refused. King Frederick I. of Prussia, pleased with the determination of Thomasius not to leave his service, rewarded him with the title of privy-councillor. In 1710 Thomasius was elected rector of the university of Halle, and dean of the faculty of jurisprudence. He died on the 23rd of September, 1728, in the seventy-third year of his age.

If ever a man exercised a beneficial influence upon his age and country, an influence which will extend to the latest posterity, it is Thomasius. He was one of the few men, like Luther and Lessing, who now and then rise up in a nation, give it an impulse, and determine its course. At the time when Thomasius began to make himself known, philosophy and theology were studied and taught in such a manner that it was evident that the spirit which had been created by the Reformation would soon vanish altogether. All philosophical and scientific works were written in Latin, which formed an inadequate medium for communicating new thoughts and ideas, which were frequently crippled and imperfect on that account, or the language itself was barbarous. In the universities also Latin was the ordinary language for communicating knowledge, which thus remained in the exclusive possession of a small number, and without influence upon the nation at large. Thomasius prepared the way for better things, first by communicating knowledge in his native language, and by extending the sphere within which speculation had until then been carried on. At the same time he urged the necessity of writing in a clear and intelligible style, which many of his countrymen in recent times have greatly neglected. His own style, though not always pure, is precise and vigorous. As in places of learning Thomasius destroyed old prejudices and pedantry, he also boldly combated superstition and hypocrisy in the affairs of common life, such as the belief in ghosts, spectres, and witchcraft; and it is almost entirely owing to his exertions that trials for witchcraft and torture were abolished in Germany. In reference to this, Frederick the Great says of Thomasius, 'He denounced trials for witchcraft so loudly, that persons began to be ashamed of them, and from that time the female sex has been permitted to grow old and die in peace.' All this would alone be sufficient to immortalize his name, even if he had no claim to it by what he did in philosophy. Here he indeed found things in such a state, that it required all his energy to clear the field from the weeds with which it was overgrown, before it was fit to receive the seed, and accordingly his philosophy is more of a destructive than of a constructive character. But in this negative way he has done incalculable service to his nation, and Frederick the Great justly says, that, among all the philosophers of Germany, none have contributed more to render its name illustrious than Leibnitz and Thomasius.

The number of works of Thomasius is considerable. Besides those mentioned above, the following must be noticed: 'Einleitung zu der Vernunftlehre, worinnen durch eine leichte, und allen vernünftigen Menschen, waserlei Standes oder Geschlechts sie seyn, verständliche Manier, der Weg gezeiget wird, ohne die Syllogistica, das Wahre, Wahrscheinliche und Falsche von einander zu entscheiden und neue Wahrheiten zu erfinden,' Halle, 1691, 8vo. The fifth and last edition of this work appeared at Halle, 1719, 8vo.; it was the first readable book that had ever been produced in Germany on logic. 'Von der Kunst vernünftig und tugendhaft zu lieben, als dem einzigen Mittel zu einem glückseligen, galanten, und vergnügten Leben zu gelangen, oder Einleitung der Sittenlehre,' &c., Halle, 1692, 8vo.; an eighth edition of it appeared in 1726. This work contains a system of ethics better than any that had appeared before him. 'Historie der Weisheit und Thorheit,' in three parts, Halle, 1693, 8vo. 'Weitere Erläuterung durch unterschiedene Exempel, anderer Menschen Gemüther kennen zu lernen,' Halle, 1693, 8vo., reprinted in 1711. 'Der Kern wahrer und nützlicher Weltweisheit,' Halle, 1693, 8vo.: this is a translation of Xenophon's 'Memorabilia of Socrates,' which Thomasius strangely enough took from the French translation of Charpentier, although he himself was well acquainted with the Greek. 'Versuch vom Wesen des Geistes, oder Grundlehren die einem Studioso Juris zu wissen und auf Universitäten zu lernen nöthig sind,' Halle, 1699, 8vo., reprinted in 1709. 'Ernsthafte aber doch muntere und vernünftige Gedanken und Erinnerungen über allerhand auserlesene juristische Händel,' 4 vols., Halle, 1720-21. His miscellaneous and smaller essays appeared in a collection under the title 'Kleine Deutsche Schriften mit Fleiss zusammengetragen,' Halle, 1701, 8vo. A complete list of his works is given in Luden's *Christian Thomasius nach seinen Schicksalen und Schriften dargestellt*, with a preface by Johannes von Müller, Berlin, 1805, 8vo.; and in Jörden's *Lexikon Deutscher Dichter und Prosaisten*, vol. v., p. 37-59.

THOMA'SIUS, JACOB. [Thomasius, Christian.]

THOMASTON. [Maine, p. 307.]

THOMOND, THOMAS, an architect who practised at St. Petersburg, and held the rank of a major in the Russian service, was a native of France, and born at Nancy, December 21, 1759. Scarcely had he completed his professional education at Paris, when the Revolution rendered it unsafe for him, he and his family being royalists, to remain in the country, and he accordingly emigrated to Russia, where he at first supported himself by the productions of his pencil, which not only found purchasers, but made him favourably known to the St. Petersburg public. The taste he displayed in architectural subjects led at length to his being employed by the government in that branch of art which he had originally intended to follow, and one of the first works of any importance intrusted to him was the Great Theatre (erected by the German architect Tischbein, 1782-83), which he was commissioned to improve and partly remodel, in 1804. Although not altogether free from the peculiarities of the French school, the façade and octastyle Ionic portico which he added to that structure is one of the noblest pieces of architecture in the northern capital of Russia, and, of its kind and date, in Europe. Had he executed nothing else, that alone would have entitled him to rank higher in his profession as an artist than many who owe their celebrity as much to the number as to the merit of their works. But he had also the opportunity of displaying his taste and ability in another very striking public edifice at St. Petersburg, namely, the Imperial Birzha, or Exchange, erected by him between the years 1804 and 1810, which is an insulated structure (about 256 by 300 feet) of the Roman Doric order, peripteral and decastyle at each end (although without pediments), and having altogether 44 columns. Situated at the southern point of the Vassilievskii Island, immediately facing the Neva, it stands in the centre of a spacious *plotchad*, or 'place,' upon a rich architectural terrace, which sweeps out so as to form a semicircular esplanade in front, at each extremity of which is a flight of steps leading down to the river, and a massive rostral column 120 feet high. Taken altogether, the architectural combination thus produced is exceedingly picturesque, and may be said to be unique.

Thomond also erected some private mansions and other buildings at St. Petersburg, the mausoleum of the emperor Paul at Pavlovska, the theatre at Odessa, and the Pultava monument. In 1808 he published some of his buildings and architectural designs in a quarto volume, very unsatisfactorily executed however; and he also wrote a treatise on painting, an art to which he was greatly attached. He died August 23, 1813.

(Kukolnik, in *Khudozhestvennya Gazeta*, 1837.)

THOMPSON, SIR B. [Rumford, Count.]

THOMSON, JAMES, was born at Ednam in Roxburghshire on the 11th September, 1700. His father was clergyman of the place, and distinguished for his piety and pastoral character. James was first sent to the grammar-school at Jedburgh, and completed his education at the University of Edinburgh, where in 1719 he was admitted as a student of divinity. In 1720 his father died, 'and this,' says Dr. Murdoch, 'affected him to an uncommon degree, and his relations still remember some extraordinary instances of his grief and filial duty on that occasion.'

Thomson turned from divinity to poetry owing to the following incident:—The Rev. Mr. Hamilton, who then filled the chair of divinity, gave as a subject for an exercise a psalm in which the majesty and power of God are described. Of this psalm Thomson gave a paraphrase and illustration as the exercise required, but in so poetical and figurative a style as to astonish the audience. Mr. Hamilton complimented the performance and pointed out to the students its most striking points; but, turning to Thomson, he suggested that if he intended to become a minister he must keep a stricter rein over his imagination and learn to be intelligible to an ordinary congregation.

Some encouragement held out to him by Lady Grisel Bailie following this intimation of the Professor, he determined to give up divinity and try his fortune in London. Slender as this pretext of 'encouragement' was, there have been many poets who have thus sought their fortune from no stronger reason. The truth is, Thomson wanted to try his capacity in London, and seized on this as a pretext. Arrived there, says Dr. Johnson, he was one day loitering about 'with the gaping curiosity of a new-comer, his attention upon everything rather than upon his pocket,' when his handkerchief, containing his letters of recommendation to several persons of consequence, was stolen from him. And now the lonely poet in the vast city first felt his inexperience and his poverty. A pair of shoes was his first want; his manuscript of 'Winter' his only property. A purchaser for this poem was found with great difficulty; but Mr. Millar consented to give a trifle for it, and it was published in 1726. It was little read till Mr. Whately and Mr. Spence spoke so favourably of it that attention was attracted, and it rose rapidly into popularity, and one edition very speedily followed another.

This success procured him many friends, among whom was Dr. Rundle, who introduced him to the lord chancellor Talbot; and some years after, when the eldest son of that nobleman made a tour on the continent, Thomson was appointed his travelling companion. Meanwhile his poetical powers were fully employed, and in 1727 appeared his 'Summer;' in 1728, his 'Spring;' and in 1730, his 'Autumn.' Besides these he published, in 1727, 'A Poem sacred to the Memory of Sir Isaac Newton,' and 'Britannia,' a poetical invective against the ministry for the indifference they showed to the depredations of the Spaniards in America. By this piece he declared himself a favourer of the opposition, and therefore could expect nothing from the court.

The tragedy of 'Sophonisba' was acted in 1727, Wilks taking the part of Masinissa, and Mrs. Oldfield that of Sophonisba. So high were the expectations raised, that every rehearsal was dignified with a splendid audience collected to anticipate the pleasure that was preparing for the public. Its success however was very equivocal. 'There is,' says Johnson, 'a feeble line in the play:—

"O, Sophonisba, Sophonisba, O!"

This gave occasion to a waggish parody,

"O, Jemmy Thomson, Jemmy Thomson, O!"

which for awhile was echoed through the town.'

At this time long opposition to Sir Robert Walpole had filled the nation with clamours for liberty, and Thomson, instinctively seizing the poet's office to utter in verse the wants of the nation, determined on writing a poem on 'Liberty.' He spent two years on this undertaking, and viewed it as his noblest work, probably because it had cost him the most trouble. It was divided into five parts, which were published separately, thus: 'Antient and Modern Italy compared; being the first part of "Liberty," a poem,' 1735. 'Greece; being the second part, &c.,' 1735. 'Rome; being the third part, &c.,' 1735. 'Britain; being the fourth part, &c.,' 1736. 'The Prospect; being the fifth part, &c.,' 1736. The poem of 'Liberty' does not now appear in its original state, having been shortened by Sir George (afterwards Lord) Lyttelton. Of all Thomson's works this is the least read, and deservedly so; for, independent of the feebleness of its execution, it is obvious, as Johnson remarked, that 'the recurrence of the same images must tire in time; an enumeration of examples to prove a position which nobody denied must quickly grow disgusting.'

His friend Talbot appointed him secretary of briefs, a place requiring little attendance, suiting his retired indolent way of life, and equal to all his wants. When his patron died, Lord Hardwicke succeeded him, and kept the office vacant for some time, probably till Thomson should apply for it; but either his modesty, pride, or depression of spirits prevented his asking, and the new chancellor would not give him what he would not request. This reverse of fortune increased his literary activity. In 1738, besides editing his own works in two volumes and writing a preface to Milton's 'Areopagitica,' he produced the tragedy of 'Agamemnon,' with Quin for his hero. For this he got 'no inconsiderable sum,' though it had but poor success. Johnson says that on the first night Thomson seated himself in the upper gallery, and was so interested in its performance, that 'he accompanied the players by audible recitation, till a friendly hint frighted him to silence.'

Thomson's next tragedy was 'Edward and Eleonora,' which was not allowed to be represented on account of certain pretended allusions. He then wrote, conjointly with Mallet, the masque of 'Alfred,' which was represented before the prince and princess of Wales at Clifden in 1740. This masque contains the national song of 'Rule Britannia,' which Mr. Bolton Corney ascribes, 'on no slight evidence,' to Mallet.

Thomson's next work was another tragedy, 'Tancred and Sigismunda,' which, being taken from the interesting story in 'Gil Blas,' instead of the Grecian mythology, as were his other pieces, had more success. Garrick and Mrs. Cibber played the principal parts. His friend Sir George Lyttelton now appointed him surveyor-general of the Leeward Islands, from which, after paying a deputy, he received about 300*l*. a year.

The 'Castle of Indolence,' which was many years under his hands, was now finished and published (1748). It was at first little more than a few detached stanzas, in the way of raillery on himself, and on some of his friends who reproached him with indolence, while he thought them at least as indolent as himself. But the subject grew under his hands till it became his masterpiece.

A violent cold, which from inattention became worse, at last carried him off, on the 27th August, 1748. He left behind him a tragedy of 'Coriolanus,' which was brought on the stage by Sir George Lyttelton for the benefit of his family. A considerable sum was gained, which paid his debts and relieved his sisters. The remains of the poet are deposited in Richmond churchyard.

Thomson was 'more fat than bard beseems;' of a simple, unaffected, indolent, sensual character; silent in company, but cheerful among friends, of whom he had many and true. This character is discernible in his writings. His simplicity is seen in the purity and warmth of his sentiments, sometimes even childish; his indolence in the slovenliness of his versification, and the inappropriateness of so many of his epithets: he never seems to have thought anything worth the toil of polishing, and hence the perpetual use of pompous glittering diction substituted for thought or description; his sensuality appears in the gusto with which he describes all luxuries of the senses, and the horrors of deprivation. Amidst much that is truly exquisite both in feeling and expression, he mingles the absurdities of a schoolboy's trite commonplaces and mechanical contrivances to piece out his verse. A sweet line of almost perfect beauty is followed by a bombastic allusion, or some feeble personification as tiresome as the first was bewitching. A touch of nature is overloaded by superfluous epithets—a picturesque description is often marred by pedantry or carelessness. Hazlitt says that 'he is affected through carelessness—pompous from unsuspecting simplicity of character. He is frequently pedantic and ostentatious in his style, because he had no consciousness of these vices in himself.'

In spite of these drawbacks, Thomson is a charming poet, and one whose works have always been the delight of all classes. The popularity of his 'Seasons' equals that of any poem in the language, and it is said that some one, finding a shabby copy of it lying on the window-seat of a country ale-house, exclaimed, 'That's true fame!' Thomson's beauties are genuine: his descriptions of nature often come with the force of reality upon the mind; and no one ever painted more successfully the 'changing scene' and the 'rustic joys' of England.

His 'Castle of Indolence' may be regarded as his best-sustained effort, for, although separate passages of the 'Seasons' may be superior, yet on the whole it has fewer defects, while some of the stanzas, especially in the first canto, fill the mind with lazy luxury.

Of his tragedies we need say little: their neglect has been so signal, that we may accept so unanimous a verdict without further examination; indeed the genius of Thomson was eminently undramatic.

(Dr. Johnson, *Lives of the Poets;* Murdoch's *Life of Thomson;* Thomson's *Seasons*, edited by Bolton Corney; Hazlitt's *Lectures on the English Poets;* Campbell's *Specimens of the British Poets.*)

THOMSONITE. This mineral occurs generally in masses. Structure fibrous and radiated, the fibres prolonged into small columnar crystals in the occasional cavities. Primary form a right rhombic prism. Cleavage parallel to the diagonal planes of the primary form. Fracture uneven. Hardness—scratches fluor spar, or 5·0. Colourless, translucent, and in small fragments transparent. Lustre vitreous. Brittle. Specific gravity 2·35 to 2·37.

Before the blow-pipe it intumesces and becomes opaque, but does not fuse; at a red heat it loses water.

It occurs at Kilpatrick, near Dumbarton, in trap associated with analcime and prehnite.

Analysis by—

	Dr. Thomson,	Berzelius.
Silica . .	36·80 .	38·30
Alumina . .	31·36 .	30·20
Lime . . .	15·40 .	13·54
Soda . . .	— .	4·53
Magnesia . .	0·20 .	0·40
Peroxide of iron .	0·60 .	—
Water . .	13·00 .	13·10
	97·36	100·07

THONON. [Chablais.]

THORA'CIC DUCT is the principal trunk of the lymphatic or absorbent system, and the canal through which the greater part of the chyle and lymph is conveyed into the blood. It commences, below, at what is called the receptaculum chyli, which receives all the principal absorbent vessels from the intestines and from the lower extremities, and lies at the posterior and middle part of the abdomen, on the upper lumbar vertebra and on the right side of the aorta. In man the diameter of the receptaculum is but little greater than that of the thoracic duct, which is continued from it; in most other animals it is considerably greater, and the duct seems in them to commence in a large pouch. From the receptaculum chyli the thoracic duct passes upwards, on the right side of the aorta, and behind it, from the abdomen into the chest, being joined in its course by the lymphatic vessels of the adjacent organs. Opposite the sixth dorsal vertebra it begins to bend to the left, and, after passing behind the arch of the aorta, it ascends to the level of the seventh cervical vertebra, curves forwards and downwards, and opens into the left subclavian vein, usually near its junction with the left jugular vein. At this orifice of the thoracic duct there are two valves, like those of the veins, which open to permit fluid to pass from the duct, but close when any is forced against them from the vein. Other valves in uncertain number are found in different parts of the duct, and have all the same direction as those of veins. [Absorbents; Chyle; Digestion.]

THORAX. [Respiration.]

THORDO is the Latinized name of a celebrated Danish lawyer, whose real name was Thord, or, more completely, Thord Deghn. He lived in the reign of Waldemar III., king of Denmark, and was descended from an antient family of that country. Concerning his life little is known beyond the fact that he was chief judge of the province of Jütland. His name has come down to us through a collection of Danish laws which he formed into a kind of code. It contains the earliest Danish laws, to which no historical origin can be assigned, as well as the subsequent laws which were passed between the years A.D. 1200 and 1377, by the Danish parliament, and sanctioned by the kings. They are not arranged in chronological order, but systematically, and comprise civil as well as constitutional laws. They are of very great value to the student of the social and political history of Denmark. Danish editions of this small code appeared at Ripen, 1504, 4to.; and at Copenhagen, 1508, 4to. Ludewig, in his 'Reliquiae Manuscriptorum omnis aevi diplomatum ac monumentorum ineditorum,' vol. xii., pp. 166-216, has published a Latin translation of this code of laws. In the title to them Thordo calls himself, 'Thordo legifer Daciae,' where Daciae must mean Daniae, that is, Denmark.

THORDSON, STURLA, belonged to the celebrated Icelandic family of the Sturla; his name Thordson indicates that he was a son of Thordo. He was a nephew of Snorri Sturluson, and born about A.D. 1218. Being a man of high rank and great knowledge, he was appointed to the most important offices by the Danish kings Hacon and Magnus, and it was at their command that he wrote the history of Iceland, Denmark, and Norway, from the time where the work of Snorri Sturluson broke off. This history bears the title of 'Historia Sturlungorum,' but the work which is now extant under that name is only an abridgment of the original history, and the latter part is altogether lost. The substance of the work is given in Torfaeus, 'Historia Rerum Norvegicarum,' who, in his Prolegomena, also gives an account of the 'Historia Sturlungorum.' Thordson died in A.D. 1288, at the age of seventy.

THORER. [Torinus.]

THORESBY, RALPH (born 1658, died 1725), a virtuoso and antiquary, and an early Fellow of the Royal Society was the son of a merchant at Leeds, and born in that town. He had his early education in the Leeds grammar-school, but, being intended by his father for commercial life, he did not pass to any of the higher seats of learning. He had however what may be called a liberal commercial education, being sent by his father to Holland for the purpose of becoming acquainted with the mode of conducting business in that country, and of acquiring the modern languages; and afterwards to London for a similar purpose. He settled in his native town, where his family was connected with some of the principal persons who then formed the society of Leeds, and where he had a business prepared for him, which had been successfully conducted by his father, who died when the son was just twenty-one.

Thoresby possessed from a very early period of life an eager curiosity respecting the things and persons around him which presented any features of historical interest, and a desire of collecting objects of curiosity, natural or artificial. His father had something of the same taste, having purchased the collection of coins and medals which had been formed by the family of Lord Fairfax, the parliamentary general, and this collection was the basis of the museum formed in a few years by the son. This museum was a means of bringing him acquainted with all the celebrated antiquaries and naturalists of the time, and was a perpetual attraction to persons of curiosity, who often visited Leeds for no other purpose than to see it. It is not too much to say of it that it was perhaps the best museum ever formed in England by a gentlemen of private and rather small fortune; containing, it is true, some things which would now be esteemed of not the smallest value, but also many objects of very high value, especially in the two grand departments of manuscripts and coins.

As he advanced in life, the curiosity which had at first been directed upon the objects more immediately around him became expanded so as to comprehend objects of more general interest, and in fact the whole range of what is usually understood to be comprehended in the term antiquarian literature. In the department of natural history he was also not merely a collector, but an observer, and he made many communications, esteemed of value, to his private friends or to the Royal Society.

With this turn of mind, it will hardly be supposed that he was very successful in his mercantile affairs. He had however the good sense to withdraw from business before his fortune was entirely lost to him, and about the forty-sixth year of his age he seems to have wholly retired from it, and to have formed the determination of living on the little income which the portion of his property that remained would afford him.

Besides amassing such manuscript matter as he could by any means become possessed of, he was himself a laborious transcriber, and was also accustomed to commit to writing notes of things which he observed, or information collected from his friends or the old people of his time. When released from the cares of business, he had leisure to make use of these notes, and he entered upon the preparation for the press of two works, which it was intended by him should contain all that he had gathered in what had been from the first his favourite subject, the illustration of the history, and whatever belonged to it, of his native town. One of them was to be in the form of a topographical survey of the whole of the large parish of Leeds, and of a few of the smaller parishes which are supposed to have been comprehended under the very antient local term 'Elmete:' the other, a history of the various transactions of which that district had been the scene, of its more eminent inhabitants, of the public benefactors, and of the changes which had taken place in the state or fortunes of its inhabitants. The first of these designs only was accomplished. The work appeared in a folio volume in 1715, under the title of 'Ducatus Leodiensis, or the Topography of the Town and Parish of Leeds.' This work leaves little for the inhabitants of the town to desire in this kind, except that he had prepared the 'historical part' also to which the author is perpetually referring the reader. The work is more than its title promises, since it contains a large body of genealogical information, comprehending the descents of nearly all the families of consequence who inhabited the central parts of the West Riding. There is also a very large descriptive catalogue of the treasures deposited in his museum.

The 'Ducatus' is the principal literary work for which we are indebted to him. As a kind of supplement to it, he published, in 1724, a history of the Church of Leeds, under the title 'Vicaria Leodiensis,' which, like his former work, has many things not strictly belonging to his subject, but in themselves valuable. A new edition of the 'Ducatus,' containing also all the matter of the 'Vicaria' which properly belonged to Leeds, was published by Thomas Dunham Whitaker, LL.D., in 1816.

The writings of bishop Nicolson, bishop Gibson, Obadiah Walker, Calamy, Strype, Hearne, and many other persons, show how willing Thoresby was to give assistance to any of his literary friends in their various publications.

Thoresby kept during the greater part of his life an exact diary of each day's occurrences. Large extracts from the portions which remain of it were published in two octavo volumes in 1830, and two more volumes were published at the same time of selections from the letters of his various friends; these were published under the care of Mr. Hunter. They exhibit the peculiar features of a somewhat remarkable character, and the particular incidents of his life. A large account of him may be found in the 'Biographia Britannica,' and another prefixed to Dr. Whitaker's edition of his topographical work.

THORITE, a mineral in which thorina was discovered to exist by Berzelius. It occurs massive and compact. Fracture uneven, very brittle, and full of cracks. Hardness about 5·0. Lustre resinous; vitreous; opaque. Colour black. Specific gravity 4·63 to 4·80.

Before the blow-pipe, gives off water, and becomes yellow, but does not fuse.

It is found in syenite, in Norway. It contains nearly 58 per cent. of thorina, mixed with thirteen metallic and other bodies.

THO'RIUM, or THORI'NUM, a metallic body discovered by Berzelius in an earth to which he had given the name of *thorina*. When this was converted into chloride of thorium, and treated with potassium, after washing the mass a heavy metallic powder was left of a deep leaden-grey colour, which, when pressed in an agate mortar, acquired an iron-grey tint and a metallic lustre. It is not oxidized by water, either hot or cold, but when heated in the air it burns brilliantly, and is converted into oxide of thorium, or thorina, which is perfectly white, and devoid of any trace of fusion. Thorium is scarcely at all acted upon by nitric acid, and slowly by the sulphuric; but hydrocloric acid dissolves it readily with the evolution of hydrogen gas.

Oxygen and Thorium combine to form oxide of thorium, or thorina, by heating the metal in the air, or by decomposing the chloride by means of an alkali. When it has been strongly heated, its density is 9·402, and it is then insoluble in any acid but the sulphuric, and in that with difficulty. It is precipitated in the state of hydrate from its solutions by the alkalis, and in this state it is readily soluble in acids, and is converted into carbonate by exposure to the air. The alkaline carbonates dissolve the hydrate, carbonate, and subsalts of thorina; thorina is precipitated from solution by the ferrocyanide of potassium. Thorina probably consists of—

One equivalent of oxygen	8
One equivalent of thorium	60
Equivalent . .	68

Besides combining readily with oxygen, as already mentioned, thorium unites energetically with chlorine, sulphur, and phosphorus; but the compounds which they form have not been minutely examined.

THORN. [Cratægus.]

THORN-APPLE. [Datura.]

THORN (in Polish, *Torunia*) is a celebrated fortress in the government of Marienwerder, in the province of Prussia. It is situated in 53° N. lat. and 36° 25′ E. long., on the right bank of the Vistula, over which there is a bridge, which is the only standing bridge over the Vistula in its whole course. (The others are floating bridges.) It consists of two parts, the German and the Polish bridge, which are separated by an island called the Mazarkämpe. The German part, from the town to the island, is 1246 feet long, the Polish part is 927 feet long. The whole distance from Thorn to the opposite bank of the Vistula (including 296 feet for the island) is 2469 feet: the breadth of the carriage-way is 18 feet; it is 17 feet above the river at its ordinary level.

Thorn is divided into the old and the new town. There are two Lutheran and three Roman Catholic churches, two monks' convents and one of Benedictine nuns, a celebrated Lutheran gymnasium, a Roman Catholic school (formerly a Jesuits' college), four elementary schools, one girls' school, four hospitals, an infirmary, and a house of correction. The most considerable buildings are the cathedral, built in the Gothic style; St. John's church, containing the monument of Copernicus, who was born here in 1473; the town-house, built in 1602, on the model of that at Amsterdam (the doors, inlaid with ebony and ivory, the marble tables, and the paintings on the walls are memorials of former splendour); the well-known leaning tower, like that at Pisa; and the house in which Copernicus was born.

Thorn is indebted for its foundation to Herman Balk, master of the Teutonic order, who immediately on his arrival, in 1231, fortified the antient castle of Turno, at Old Thorn, about five miles from the present town. In the following year he founded the town, but, finding the situation inconvenient, pulled it down in 1235, and chose another site eight miles farther up the Vistula. At the commencement of the fourteenth century Thorn joined the Hanseatic League, and during the dominion of the Order became rich and flourishing through its extensive commerce. It afterwards joined 'The Union of the Prussian Cities,' and with it threw off the authority of the Knights: it took an active part in the sanguinary war arising from this step, which ended with the peace concluded in its walls in 1466, by which West Prussia was annexed to Poland. Commerce continued to flourish under the Polish government, but the city suffered severely, partly from the internal troubles of the kingdom, partly by the wars with Sweden, during which it was twice plundered by the Swedes (1655, 1703). Charles XII. entirely destroyed the fortifications. The Reformation was favourably received at an early period, but led to very harsh measures on the part of the Roman Catholics, and to internal troubles. These dissensions continued from the time of Sigismund I. (1506-1548), through the sixteenth and seventeenth centuries; and at the beginning of the eighteenth century occasioned what is called the 'Thorn Tragedy,' a persecution excited by the Jesuits, which ended, on the 7th December, 1724, with the execution of the burgomaster John Rosener and eleven of the principal citizens.

When West Prussia was separated from Poland in 1772, Thorn and Danzig remained under the Polish government, but their prosperity declined in consequence of the many obstructions to their commerce caused by the regulations of Prussia for the navigation of the Vistula. After its union with Prussia, on the second partition of Poland, in 1793, its commerce and prosperity revived. Since 1809 it has been again converted into a fortress. It is also important as a commercial port for the exportation of the produce of the country, corn, timber, linen, raw hides; especially however corn. The population, including the garrison, is nearly 12,000 inhabitants.

(A. E. Preuss, *Beschreibung von Preussen*; Brockhaus, *Conversations Lexicon*, 7th edit.; Hassel; Cannabich; Hörschelmann.)

THORNBURY. [Gloucestershire.]

THORNE. [Yorkshire.]

THORNEY. [Cambridgeshire.]

THORNHILL, SIR JAMES, an eminent painter during the reigns of Queen Anne and George I., and, says Walpole, 'a man of much note in his time, who succeeded Verrio, and was the rival of Laguerre in the decorations of our palaces and public buildings,' was descended of a very antient family in Dorsetshire, and was born at Weymouth in 1676. Through the extravagance of his father, who disposed of the family estate, Thornhill was compelled to support himself by his own exertions. He adopted the profession of a painter, and, by the liberality of an uncle, Dr. Sydenham, the eminent physician, he was enabled to pursue his studies in London, where he placed himself with a painter, whose name is not known, with whom however he did not remain long. Thornhill appears to have made rapid progress in the public favour, for in his fortieth year, when he made a tour through Flanders, Holland, and France, he was sufficiently wealthy to purchase many valuable pictures of the old masters and others. Upon his return he received the commission from Queen Anne to paint the interior of the cupola of St. Paul's cathedral, in which he executed eight pictures illustrating the history of St. Paul, painted in chiar'oscuro, with the lights hatched in gold: for this work he was appointed historical painter to the queen, yet was paid only forty shillings the square yard for his production. Thornhill's reputation was now established, and, through the favour of the earl of Halifax, he received the commission to paint the princess's apartment at Hampton Court, which the lord chamberlain, the Duke of Shrewsbury, had intended should be painted by Sebastiano Ricci, then in great favour with the court in England; but the Earl of Halifax, who was then first commissioner of the treasury, declared that if Ricci painted it he would not pay him. Sir James executed many other great works, as the staircase, the gallery, and several ceilings in the palace at Kensington, a hall at Blenheim, the chapel at Lord Oxford's at Wimpole in Cambridgeshire, a saloon for Mr. Styles at Moor Park in Hertfordshire, and the ceilings of the great hall at Greenwich Hospital. Sir James commenced the last work in 1703, and was occupied upon it for several subsequent years, but it was not entirely painted by his own hands. The paintings are allegorical: on the ceiling of the lower hall, which is 112 feet by 56, are represented the founders of the institution, William III. and Queen Mary, in the centre, surrounded by the attributes of national prosperity; in the other compartments are figures which represent the zodiac, the four seasons, and the four elements, with naval trophies and emblems of science, among which are introduced the portraits of famous mathematicians who have advanced the science of navigation, as Tycho Brahé, Copernicus, Newton, and others. On the ceiling of the upper hall are represented Queen Anne and her husband Prince George of Denmark; other figures represent the four quarters of the world; on the side walls of the same apartment are the landing of William III. at Torbay, and the arrival of George I. at Greenwich; on the end wall facing the entrance are portrait groups of George I. and two generations of his family, with accessories, and Sir James Thornhill's own portrait. These works, which are executed in oil, have little to recommend them besides their vastness; yet in invention and arrangement they are equal to the majority of such works in the great buildings on the continent: in design and colouring however they are inferior.

Walpole has preserved some interesting details respecting the remuneration Thornhill received for some of his works: he says, 'High as his reputation was, and laborious as his works, he was far from being generously rewarded for some of them, and for others he found it difficult to obtain the stipulated prices. His demands were contested at Greenwich; and though La Fosse received 2000*l*. for his work at Montague House, and was allowed 500*l*. for his diet besides, Sir James could obtain but forty shillings a square yard for the cupola of St. Paul's, and I think no more for Greenwich. When the affairs of the South Sea Company were made up, Thornhill, who had painted their staircase and a little hall, by order of Mr. Knight, their cashier, demanded 1500*l*., but, the directors learning that he had been paid but twenty-five shillings a yard for the hall at Blenheim, they would allow no more. He had a longer contest with Mr. Styles, who had agreed to give him 3500*l*., but, not being satisfied with the execution, a lawsuit was commenced, and Dahl, Richardson, and others were appointed to inspect the work. They appeared in court bearing testimony to the merit of the performance; Mr. Styles was condemned to pay the money, and, by their arbitration, 500*l*. more for decorations about the house, and for Thornhill's acting as surveyor of the building.' Thornhill obtained permission, through the earl of Halifax, to copy the Cartoons of Raphael at Hampton Court, upon which he bestowed three years' labour; he made also a smaller set, one-fourth the size of the originals, and distinct studies of the heads, hands, and feet, intending to publish an exact account of the whole for the use of students, but the work never appeared. These two sets of the Cartoons were sold the year after his death, with his collection of pictures, among which were a few capital specimens of the great masters: the smaller set sold for seventy-five guineas, the larger for 200*l*. only, a price, says Walpole, which can have been owing solely to the circumstance of few persons having spaces in their houses large enough to receive them. They were purchased by the duke of Bedford, and were placed in his gallery at Bedford House in Bloomsbury Square, where they remained until that house was pulled down, when they were presented by the owner to the Royal Academy.

Thornhill painted also several portraits and some altarpieces: he painted the altar-piece of the chapel of All Souls at Oxford; and one which he presented to the church of his native town, Weymouth. There is also at Oxford, according to Dallaway, a good portrait of Sir Christopher Wren by Thornhill; and in the hall of Greenwich Hospital there is by him the portrait of John Worley, in his ninety-eighth year, one of the first pensioners admitted into the hospital: it is painted in a bold careless style, and was presented to the hospital by Thornhill himself. In 1724 he opened an academy for drawing at his house in Covent Garden. He had previously proposed to the earl of Halifax the foundation of a Royal Academy of the Arts, with apartments for professors, but without result: Sir James estimated the cost at 3139*l*.; for, amongst his other occupations, he occasionally 'dabbled' in architecture. At the end of his life he was afflicted with the gout, and in the spring of 1734 he retired to his paternal seat at Thornhill, near Weymouth, which he had the satisfaction of repurchasing; but his period of repose was extremely short, for, says Walpole, 'four days after his arrival, he expired in his chair, May 4, 1734, aged fifty-seven, leaving one son named James, whom he had procured to be appointed serjeant-painter and painter to the navy; and one daughter, married to that original and unequalled genius, Hogarth.'

Sir James Thornhill amassed considerable property, was a man of agreeable manners, was a Fellow of the Royal Society, and represented his native town, Weymouth, in parliament for several years until his death. He was knighted by George I.: his widow, Lady Thornhill, died at Chiswick in 1757.

(D'Argenville, *Abrégé de la Vie des plus fameux Peintres;* Walpole, *Anecdotes of Painting in England;* Pilkington, *Dictionary of Painters.*)

THORNTON, BONNELL, was born in London, in the year 1724. He was educated at Westminster School, and at Christchurch, Oxford. In compliance with the wish of his father, who was a physician, he studied medicine, but he seems not to have liked the profession, and left it for literature. George Colman the Elder was his fellow-student both at Westminster School and at Christchurch, though about nine years younger than Thornton. Similarity of taste led to friendship, and they commenced in conjunction the series of periodical essays called 'The Connoisseur,' which was continued from January 31, 1754, till September 30, 1756. The papers are chiefly of a humorous character, and the wit and shrewd observation of life which they display well entitle them to the place which they still retain among the works of British essayists. Thornton contributed largely to 'The St. James's Magazine,' 'The Public Advertiser,' 'The Covent-Garden Journal,' and other periodical works. He published separately 'An Ode on St. Cecilia's Day, adapted to the antient British music, viz. the salt-box, the Jews'-harp, the marrow-bones and cleavers, the hum-strum or hurdy-gurdy, &c., with an Introduction giving an account of those truly British instruments.' London, 1762, 4to.

In 1767, in conjunction with Colman and Richard Warner, he published two volumes of an English translation of Plautus, 'The Comedies of Plautus, translated into familiar Blank Verse.' Of the plays contained in these two volumes, Thornton translated 'Amphitryon,' 'The Braggart Captain,' 'The Treasure,' 'The Miser,' and 'The Shipwreck;' 'The Merchant' was translated by Colman, and 'The Captives' by Warner. The rest of the plays were translated by Warner, and were published, after Thornton's death, in two additional volumes. In 1768 Thornton published 'The Battle of the Wigs, an additional Canto to Dr. Garth's Poem of The Dispensary,' London, 4to.

Thornton, who appears to have injured his constitution by habitual indulgence in drinking, died May 9, 1768, at the age of 44. There is an inscription to his memory, by Thomas Warton, in the cloisters of Westminster Abbey.

(Baker's *Biographia Dramatica*, by Reed and Jones.)

THOROUGH-BASE, the art of playing (on keyed instruments, and according to the rules of harmony) an accompaniment from figures representing chords, such figures being placed either over or under the notes of the instrumental base staff. This is one of the many absurd terms employed in music, and its meaning is altogether arbitrary.

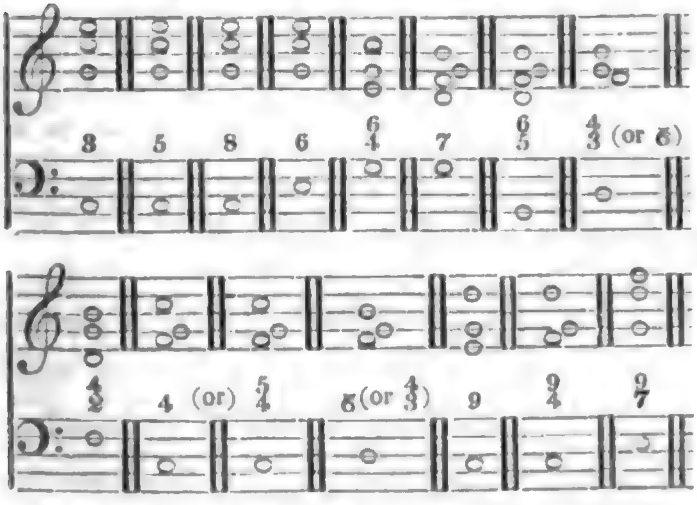
The figures used in *Thorough-Base* are the nine units. These represent certain intervals or sounds. Thus a 6 placed over a C in the base, points out A as an accompaniment: and that figure also implies two other notes attendant on it, namely, the 3rd and 8th, which are called the *accompaniments* of the 6th. A 6 and a 5 placed under it $\left(\begin{smallmatrix}6\\5\end{smallmatrix}\right)$, indicate the intervals of the 6th and 5th played together; and also, as accompanying notes, the 3rd and 8th. The figures 3, 5, and 8, singly, or together, represent the perfect or common chord. But in *Thorough-Base* a base note without any figure is supposed to carry a perfect chord. The chords are, as a general rule, assigned to the right hand of the performer, and the intervals are, in most cases, counted from an octave above the figured note. This will be more clearly understood by referring to the articles ACCOMPANIMENT, CHORD, and HARMONY.

The following is a tabular view of the figures used in *Thorough-Base* to represent chords, together with those, not written, but understood, representing the accompaniments which, with the base, form the chords:—

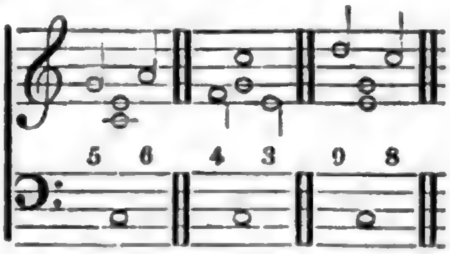
Chords designated by figures.		Accompanying intervals.
3rd,	accompanied by a . .	5th and 8th.
5th,	,, . .	3rd and 8th.
8th,	,, . .	5th and 3rd.
6th,	,, . .	3rd and 8th.
$\begin{smallmatrix}6\\4\end{smallmatrix}$th,	,, . .	8th.
7th,	,, . .	3rd, 5th, and 8th.
$\begin{smallmatrix}6\\5\end{smallmatrix}$th,	,, . .	3rd and 8th.
$\begin{smallmatrix}4\\3\end{smallmatrix}$rd,	,, . .	major 6th.
$\begin{smallmatrix}4\\2\end{smallmatrix}$nd,	,, . .	6th.
4th (sometimes called the 11th),	accompanied by a . .	5th and 8th.
$\begin{smallmatrix}5\\4\end{smallmatrix}$th,	accompanied by an . .	8th.
6̸th (sharp 6th)	,, . .	$\begin{smallmatrix}4\\3\end{smallmatrix}$rd.
9th,	,, . .	3rd and 5th.
$\begin{smallmatrix}9\\4\end{smallmatrix}$th,	,, . .	5th.
$\begin{smallmatrix}9\\7\end{smallmatrix}$th,	,, . .	3rd.
7̸ (sharp 7th)	,, . .	5th, 4th, and 2nd

Some other chords of an extraordinary kind are occasionally formed; but they are always clearly denoted, in *Thorough-Base*, by an ample number of figures.

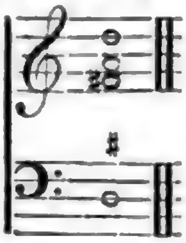
The above chords exemplified.



When two figures are placed in succession over one base note, the time of the latter is divided between them. Example:—



A sharp, or flat, or natural, placed alone over a base note, relates solely to the 3rd. Example:—



When other intervals are to be raised or lowered, the proper characters for the purpose are prefixed to them. A dash through a figure is equivalent to a sharp.

The practice of figuring a base staff, whether in a score or in the part assigned to a keyed instrument, has fallen into disuse, the harmony being now fully and clearly presented to the eye of the accompanyist in notes placed in a treble staff over the base. But a knowledge of what is yet too commonly misnamed *Thorough-base*, that is to say, harmony, is absolutely indispensable to the good musician, and very much abbreviates the labour of those who, as amateurs, only aspire to a practical skill either as vocal or instrumental performers. The rules of harmony stand in the same relation to music as those of grammar do to language.

The invention of a *Figured Base* (*Basso Cifrato*, as the Italians so well denominate it) has been stated to have taken place in 1605, and is commonly attributed to Ludovico Viadana, *Maestro di Cappella* at the cathedral of Mantua. But this kind of musical abbreviation was earlier practised, and by an English composer, Richard Deering, who, in 1597, published his *Cantiones Sacræ*, at Antwerp, in which a figured base appears. And we have now before us Jacopo Peri's serious opera *Euridice*, printed at Florence in 1600, in which the base is figured throughout. Lying by us also is Caccini's *Nuove Musiche*, likewise printed at Florence, but one year later, and here we find the base regularly figured. The edition of the latter work referred to by Dr. Burney, is dated Venezia, 1615; it is to be presumed therefore that the active historian of music was not so fortunate as to have met with the first edition of Caccini's remarkably curious and now very rare work.

THOU, JACQUES-AUGUSTE DE (or, as he called himself in Latin, Jacobus Augustus Thuanus), was born at Paris, on the 8th of October, 1553: he was the third son of Christophe de Thou, first president of the parlement of Paris, and of his wife Jacqueline Tuellen de Celi. Besides their three sons and four daughters, who grew to be men and women, De Thou's parents lost six children in infancy; and he himself was so weak and sickly a child till he reached his fifth year, that he was not expected to live. In the exemption which this state of health procured him in his childhood and early boyhood from severer taskwork, he amused himself in cultivating a turn for drawing, which was hereditary in his family; and in this way, he tells us himself, he learned to write before he had learned to read. Although originally intended for the church, he went in his early studies the whole round of literature and science as then taught; and while yet only in his eighteenth year he had conceived from the perusal of some of his writings so great an admiration of the celebrated jurist Cujacius, that he proceeded to Valence in Dauphiné, and attended his lectures on Papinian. Here he met with Joseph Scaliger, with whom he contracted an intimate friendship, which was kept up for the thirty-eight remaining years that Scaliger lived. In 1572, after he had been a year at Valence, he was recalled home by his father; and he arrived in Paris in time to be present at the marriage of Henry, the young king of Navarre, and to witness the horrors of the massacre of St. Bartholomew which followed. He relates that he saw the dead body of Coligny hanging from the gibbet on Montmartre. The next year he embraced an opportunity of visiting Italy, in the suite of Paul de Foix, who was sent by Charles IX. on a mission to certain of the Italian courts; and he remained in that country till the death of Charles, in May, 1574, and the accession of Henry III., the news of which reached them at Rome, recalled De Foix home. In 1576 he made a journey to Flanders and Holland. In 1578 he succeeded Jean de la Garde, Sieur de Saigne, as one of the ecclesiastical counsellors of the parlement de Paris—an entrance into public life which, he says, he made with reluctance, as withdrawing him in part from the society of his books and the cultivation of literature, in which he would have been much better pleased to spend his days. The next year he lost his eldest brother; and from this time it began to be proposed that, for the better chance of continuing the family, his original destination should be changed, and that he should quit his ecclesiastical for a civil career. Some years elapsed however before this scheme was finally determined upon. Meanwhile he continued to pursue his usual studies; and he states that he had already conceived the project of his great historical work, and begun industriously to collect materials for it wherever he went.

It was in the year 1582, while on a visit to Bordeaux, that he made the acquaintance of Montaigne, whose character as well as genius he has warmly eulogized. The same year his father died; and having also by this time lost his second brother, he, in 1584, resigned his rank as an ecclesiastical counsellor, and on the 10th of April was appointed by the king to the office of master of requests, which then was wont to be held indifferently by ecclesiastics or laymen. Two years after he obtained the reversion of the place held by his uncle, of one of the présidents au mortier in the parlement de Paris; and in 1587 he married Marie, daughter of François Barbanson, Sieur de Cani. When, in the next year, in the increasing distractions of the state, Henry III. found himself obliged to leave Paris, De Thou, who, as well as his father and his brothers, adhered steadily throughout the troubles of the time to the royal party, accompanied his majesty to Normandy, and afterwards to Picardy. At Chartres, in August, 1588, he was admitted a counsellor of state; and from this date he took a leading part in all the principal public transactions which followed. When the estates of the kingdom were assembled at Blois, in October of this year, De Thou, as he tells, was there courted with much blandishment by the duke of Guise, but steadily resisted the attempt to seduce him from his loyalty. He had left Blois and was in Paris when the news of the murders of the duke of Guise and his brother the cardinal (on the 23rd and 24th of December) reached the capital; and he had great difficulty in effecting his escape from the popular fury. He succeeded however in rejoining the king at Blois; and having soon after been dispatched on a mission into Germany and Italy to raise succours of men and money for the royal cause, he was at Venice when he heard of the death of Henry, in August, 1589. He immediately set out by the way of Switzerland for France, and met the king of Navarre, now calling himself Henry IV., at Châteaudun. He was received very graciously; and for some years from this time he was constantly with Henry, or employed on missions to different quarters in his service.

In 1591, while Henry was at Nantes, he received accounts of the death of Amyot, bishop of Auxerre (renowned for his translations of Plutarch and other Greek authors); upon which his majesty immediately bestowed his office of keeper of the royal library on De Thou. It was in the year 1593, as he has noted, that he at last actually commenced the composition of his History, which he now states he had conceived in his mind so long as fifteen years before. In 1594 the death of his uncle opened to him his reversionary office of one of the presidents of the parlement de Paris.

Among other important transactions in which he had a part after this, was that of the Edict of Nantes, published in 1598, which he was greatly instrumental in arranging. He has left an account of his own life, in ample detail, down to the year 1601, in which the last event he notices is the death of his wife, in August of that year. In 1604 he published the first eighteen books of his 'History.' The work was received with general applause by the literary public throughout Europe, and, although some things in it gave umbrage to the more zealous friends of the Roman Catholic faith, it was not till several years afterwards, when a second portion of it had been published, that it was formally stigmatized by being inserted in the 'Index Expurgatorius.' De Thou however severely felt this authoritative condemnation of his performance, when it did take place, in November, 1609. The death of Henry IV., in 1610, did not deprive De Thou of his place in the ministry; but he had no longer the same influence as before; and a new appointment, which he received the following year, of one of the three directors charged with the management of the finances, on the retirement of the great Sully, was felt by himself to be not so much an accession of power or honour, as a burdensome and obnoxious office forced upon him, for which he was fitted neither by tastes, habits, nor qualifications. In this same year his brother-in-law, Achille de Harlay, resigned his office of first president of the parlement de Paris, in the hope that De Thou would be nominated his successor; but the place was given to another. These disappointments and disgusts, together with the loss of a second wife, are supposed to have shortened the life of De Thou, who died at Paris on the 7th of May, 1617, in his sixty-fourth year. By his second wife, whose family name was de Bourdeilles, he left three sons and three daughters, one of the former of whom, François Auguste de Thou, the inheritor of his father's virtues and of a considerable share of his talents, fell a sacrifice to the inexorable revenge of Cardinal Richelieu, one of whose last acts was his putting this unfortunate young man to death for his alleged participation in what was called the conspiracy of Cinqmars:—he was executed at Lyon, in his thirty-fifth year, on the 12th of September, 1642, not three months before Richelieu's own death.

The president De Thou is the author of a number of Latin poems, one of the principal of which, entitled 'De Re Accipitraria' (on Hawking), was published in 1584; but his fame rests upon his 'Historia sui Temporis,' or 'History of his own Time,' written also in Latin, in 138 books, of which the first 80 appeared in his lifetime, the remainder not till 1620. The space over which it extends is from the year 1544 to 1607, comprehending the closing years of the reign of Francis I., the entire reigns of Henry II., Francis II., Charles IX., and Henry III., and nearly the whole of that of Henry IV. For about one-half of this period of sixty-three years it has the value belonging to the narrative of one who was himself a principal actor in many of the affairs which he relates, and who with regard to many others was so placed as to have an opportunity of seeing much that was concealed from the common eye; but in truth, from the author's family connections, and his extended acquaintance among the eminent and remarkable persons of his time, this is an advantage which belongs in some degree to the earlier as well as to the later part of the work. It is also admitted to have throughout the merit of a rare impartiality: with no deficiency of patriotic feeling, and perfect steadiness to his own political principles, De Thou is always ready frankly to recognise the high qualities, of whatever kind, that may have belonged either to the citizen of a rival state or a party opponent. As for religious prejudice, he shows so little of that, as to have exposed himself to the imputation of having no religion, or at least of not being really a believer in the form of Christianity, the Roman Catholic, which he professed. But for either of these charges there seems to be no ground. The reputation of his 'History' however stands not so much upon the facts contained in it that are not elsewhere to be found, as upon the skill displayed in its composition—not so much upon the material as upon the workmanship; and it is very evident that with all the pains he took in the collecting of information, this was the praise of which he was the most ambitious, as indeed may perhaps be said to have been the case with the most famous historians of every age and country, from Herodotus and Thucydides among the Greeks, and Livy and Tacitus among the Latins, to Hume and Gibbon among ourselves. But De Thou's manner of writing, though flowing and eloquent, is not very picturesque; and of course he also loses something in raciness and natural grace, ease, and expressiveness, by writing in a dead language. De Thou's Latin style, with all its merit, is not admitted to be faultless, though he has taken great pains to give it as uniformly classical an air as possible, not only by metamorphosing all his modern names, both of places and persons, so as to give them antique forms, often to the no small perplexity and hindrance of the reader, but, what sometimes produces still more obscurity or ambiguity, by generally endeavouring to describe modern proceedings and transactions in the established legal, political, and military phraseology of the old Romans. The best edition of De Thou's 'History' is that published at London in 1733, in seven volumes, folio, under the superintendence of Samuel Buckley, Esq., and at the expense of Dr. Mead. The last volume of this edition contains De Thou's autobiographical memoir (first published in 1620, and also written in Latin), in six books, together with a mass of additional materials illustrative of the history of his life and works.

THOUARS. [Sevres, Deux.]

THOUARS, LOUIS MARIE AUBERT DU PETIT, an eminent French botanist, was born at the château de Boumois, in Anjou, 1756. His family was wealthy and noble, and being destined for the army, he was early sent to the school of La Flèche. He was made a lieutenant of infantry at the age of 16. This was in a time of peace, and he occupied his leisure in studying the science of botany and its literature. At the time of the loss of La Perouse and his companions, Aristide du Petit Thouars proposed to his brother Aubert that they should go in search of him. To this he willingly consented, hoping to add to his stock of plants and his fame by the voyage. The two brothers sold their patrimony, raised a subscription, and having secured the patronage of Louis XVI., were ready to start on their voyage, when a curious accident separated them. The ship that was to have taken them lay at Brest, and Aubert, with his vasculum (the tin box which botanists carry to put their plants in) at his back, intended to botanise on his way from the capital to the port. He was however found by some *gens d'armes* in the woods, and being suspected as an enemy of his country in those days of disorder, he was arrested and thrown into prison at Quimper. He was however soon released, but too late, as his brother had sailed. He followed him to the Isle of France, but his brother had again departed; and being here without money and without friends, his only resource was his botanical knowledge, and he accordingly applied for employment to some of the rich planters of that island. He quickly obtained an engagement, and remained in the island nearly ten years. On this spot he was very favourably placed for making those observations for which his previous studies had so well prepared him; and during his stay here he collected most of the materials for the numerous works which he published on his return. Whilst a resident in the Isle of France he made a voyage to Madagascar, and collected plants from that island. He returned to Paris in 1802. Many of the results of his researches in the Isle of France and Madagascar were communicated to the Institute and other scientific bodies in Paris. His first work on the botany of the islands which he had visited, was published at Paris in 1804, with the title 'Plantes des Iles de l'Afrique Australe formant des Genres nouveaux,' &c., 4to. He also published on the same subject the 'Histoire des Végétaux des Iles de France, de Bourbon, et de Madagascar,' 1804, 4to. In the same year Bory St. Vincent gave an account of the vegetation of the African islands, in his 'Voyage dans les quatre principales Iles des Mers d'Afrique,' Paris, 4to., although he did not go out till Du Petit Thouars had returned. In 1806 Du Petit Thouars was appointed director of the royal nursery-ground at Paris, which office he held till the closing of this institution a short time before his death, which took place in May, 1831. In 1806 he published another work on the plants of Africa, with the title 'Histoire des Végétaux recueillies dans les Iles Australes d'Afrique,' Paris, 4to. In 1810 his 'Genera nova Madagascariensia' appeared, in which the Madagascar plants were arranged according to the system of Jussieu. His latest work on systematic botany was one on the Orchidaceæ of the African islands, 'Histoire des Plantes Orchidées recueillies dans les trois Iles Australes d'Afrique,' 1822, Paris, 8vo. His publications on vegetable physiology are equally numerous. Most of these had their foundation in observations and experiments which he made whilst in the Isle of France. In 1805 he published his 'Essai sur l'Organisation des Plantes,' Paris, 8vo.; in 1809, another essay on the vegetation of plants; in 1811, 'Mélanges de Botanique et de Voyages,' Paris, 8vo.; in 1819, a kind of botanical miscellany, passing in review his own labours, under the title 'Revue générale des Matériaux de Botanique et autres, fruit de trente-cinq années d'observations,' Paris 8vo.

As a systematic botanist the views of Du Petit Thouars were uncertain and speculative, and the delay in the publication of his works on African botany deprived him of the merit of introducing to the world many new species. In his physiological works his views are ingenious, but in most cases wanting in sufficient data to establish them. His views on the formation of buds, the motion of the sap, and the origin of wood, are those which have excited most attention. But each of these is perhaps more indebted to the speciousness of its reasoning than to the correctness of the facts, for the importance that botanists have attached to it. But at the same time his great activity of mind, his extensive erudition and original observation, have had a great influence on the progress of botany in the present century. He was a contributor to the 'Biographie Universelle,' and wrote the lives of many of the botanists in that work. The genus of plants *Thouarsa* was named after him, and Bory St. Vincent named *Aubertia* in honour of him.

(*Biog. Univ.*, *Supp.*; Bischoff, *Lehrbuch der Botanik*.)

THOURET, MICHEL-AUGUSTIN, an eminent French physician, was born in 1748, at Pont-l'Evêque, in the antient province of Normandy and the modern department of Calvados, where his father was royal notary (*notaire royal*). His education was commenced at his native town, and finished at the university of Caen. He afterwards went to Paris, and in 1774 was admitted gratuitously by the Faculty of Medicine in that city to the degree of M.D., an honour which was gained by public competition (*concours*). A few years later, upon the foundation of the Royal Society of Medicine, Thouret became one of its earliest members, and enriched the Memoirs of the Society by several valuable essays. The most important public work in which he took a part was the exhumation of the bodies in the cemetery of the Holy Innocents, of which he drew up a most interesting report. This cemetery, together with a church of the same name, stood on the spot now occupied by the Marché des Innocens, and had become in process of time so unhealthy from being the principal burial-ground in Paris, that it was absolutely necessary to destroy it. This great work had been several times attempted, but as often abandoned on account of the dangers and difficulties of the undertaking; at last however, in 1785, a committee was named for directing the works, which were carried on without any intermission by night and by day for more than six months, and which were at length completely successful. Thouret afterwards filled several public situations with equal zeal and integrity; and in the midst of the labours of his numerous employments was carried off, after a few days' illness, by a cerebral affection, at Meudon, near Paris, June 19, 1810. Great honours were paid him after his death by the Faculty of Medicine at Paris, of which body he was dean. His works consist almost entirely of essays published in the 'Histoire et Mémoires de la Société Royale,' of which perhaps the most interesting are the 'Rapports sur les Exhumations du Cimetière des SS. Innocens,' mentioned above. These were afterwards published in a separate form at Paris, 1789, 12mo. (*Biographie Médicale*.)

THOUROUT is a town in the province of West Flanders, in the kingdom of Belgium, in the district of Bruges, on the high road from that city to Menin and Courtray. It is a well-built town, with a population of 8000 inhabitants, who have a considerable trade in linen, flax, and linseed. They also manufacture hats, starch, and wooden shoes. [Flanders, West.] (Stein, *Lexicon*; Schulz, *Allgemeine Erdkunde*, vol. xvii.)

THRACE (Θρᾴκη, *Thracia*) was in earlier times the name of the country bounded on the north by the Danube, on the south by the Propontis and the Ægean Sea, on the east by the Black Sea, and on the west by the river Strymon and the chain of mountains which form the continuation of Mount Rhodope. This country is divided into two parts by Mount Hæmus (now the Balkan), which runs from west to east, separating the plain of the lower Danube from the rivers which flow into the Ægean Sea. This mountain probably derived its name from its cold and snowy top, since Hæmus seems to contain the same root as the Sanscrit *hima*, 'snow,' whence also comes the name of the Himâlaya Mountains. Two extensive ranges branch off from the southern side of Mount Hæmus: one at about a hundred miles from the Euxine, which runs in a south-eastern direction towards Constantinople; the other, which is far larger, branches off near the sources of the Hebrus, and likewise runs to the south-east. The latter bore the name of Rhodope, and is now called the Despoto Mountains. Between these two ranges there are many plains, which are drained by the Hebrus (the Maritza), the principal river of Thrace, and its tributaries. For a further account of the physical geography the reader is referred to the articles BALKAN MOUNTAINS and MARITZA.

In ancient times there was a great quantity of corn and wine grown in the valley of the Hebrus. In the 'Iliad' the ships of the Achæans are described as bringing wine every day to Agamemnon from Thrace (ix. 72); and the Maronean wine, which retained its reputation in the time of Pliny (*Hist. Nat.*, xiv. 6), is spoken of in the 'Odyssey' (ix. 197). In the mountainous parts of the country there were also mines of precious metals. (Justin, viii. 3.)

The Thracians were divided into many separate and independent tribes; but the name of Thracians seems to have been applied to them collectively in very early times. Thrace, according to Stephanus Byzantinus (*s. v.* Θρᾴκη), was previously called Perce (Πέρκη). It signifies any country in the north, according to Ukert (*Geographie von Griechen und Römer*, I., i., p. 282), who quotes the remark of Andron of Halicarnassus (Schol. *ad Lycophr.*, 894, 1283), that Oceanus had four daughters, Asia, Libya, Europa, and Thrace, from whom the four parts of the world were named; and thence he concludes that Asia signified the east, Libya the south, Europa the west, and Thrace the north. This conclusion however hardly amounts to a small probability. Josephus and many Biblical scholars suppose that the name is derived from Tiras (תִּירָס), the son of Japhet (*Genesis*, x. 2), but this opinion rests on little more than an apparent similarity of sound.

The Thracian nation, according to Herodotus (v. 3), was, next to the Indians, the most numerous of all, and if united under one head would have been invincible. He observes that the usages of the different tribes were similar, with the exception of the Getæ [GETÆ], the Trausi, and those who dwelt above the Crestonæi. The account which he gives of the most striking national peculiarities of the Thracians, represents them as a barbarous and savage people, which is supported by other antient writers, though the districts on the southern coast seem to have attained to some degree of civilization, owing to the numerous Greek cities which were founded there at various times. The Thracians, says Herodotus (v. 6), sell their children to be carried out of the country as slaves; they do not guard their young women, but permit them to have intercourse with whatever men they please; they purchase their wives with great sums; they puncture or tattoo their bodies, which they regard as a sign of noble birth; agriculture they despise, and consider it most honourable to live by war and robbery. Deep drinking prevailed among them extensively, and the quarrels over their cups became almost proverbial. (Hor., *Carm.*, i. 18 and 27.) In earlier times, however, there must have been a greater degree of civilization among some of their tribes at least, than prevailed at a later period. The earliest Greek poets, Orpheus, Linus, Musæus, and others, are all represented as coming from Thrace; and Eumolpus too, who founded, according to tradition, the Eleusinian mysteries at Attica, is also said to have been a Thracian. At an early period likewise the Thracians spread extensively over southern Greece. Thucydides (ii. 29) says that they once dwelt in Phocis: Strabo (ix. 401, 410) speaks of their settlement in Bœotia; and their invasion of Attica under Eumolpus, who fought against Erechtheus, is mentioned by many writers. (Strabo, vii. 321; Thucyd., ii. 15; Pausan., i. 38.)

The Thracians are said to have been subdued by Sesostris (Herod., ii. 103), and subsequently by the Mysians and Teucrians, who crossed over into Europe before the Trojan war, and penetrated as far as the Ionian Sea and the Peneus. (Herod., vii. 20.) But the first real historical event respecting them is their conquest by Megabazus, the general of Darius, who conquered all the separate tribes, with the exception of the Satræ, who were the only Thracian people that had retained their independence down to the time of Herodotus. (Herod., v. 2; vii. 111.) After the failure of the expedition of Xerxes, the Thracians appear to have recovered their independence; and in the time of the Peloponnesian war we find a powerful native empire in Thrace, which was under the dominion of Sitalces, who is called by Thucydides (ii. 29) king of the Thracians. This empire was founded by the father of Sitalces, Teres, the king of the Odrysæ, one of the most powerful of the Thracian tribes. It extended along the coast from Abdera to the mouth of the Danube, a distance of four days' and four nights' sail with a favourable wind, and was by land a journey of eleven days by the shortest road for an active man: it extended inland from Byzantium to the Lææi and the Strymon, a journey of thirteen days. The tribute paid to Seuthes, the successor of Sitalces, was 400 talents, besides a great number of presents to himself and the Odrysian nobles. Thucydides says that of all the kingdoms between the Ionian Gulf and the Euxine, this was the greatest in revenue and opulence, but that it was inferior to the Scythians in military strength and numbers. In the third year of the Peloponnesian war, B.C. 429, Sitalces, who had formed an alliance with Athens, invaded the territories of Perdiccas, king of Macedonia, with an army of 150,000 men; but being disappointed of the co-operation of an Athenian fleet, he was persuaded by his nephew Seuthes to accept the overtures of Perdiccas, and return home with his army, after remaining in Macedonia thirty days. In the year B.C. 424, Sitalces fell in battle against the Triballi, the most powerful Thracian people between Mount Hæmus and the Danube, and was succeeded by his nephew Seuthes. The power of the Odrysian empire however did not last long. In little more than twenty years from the death of Sitalces it had lost its former greatness; and when Xenophon crossed over into Thrace, in B.C. 400, he found Medorus, the reigning king of the Odrysians, unable to command the obedience of his Thracian subjects. (Compare *Anab.*, vii. 2, s. 32, &c.) In the reign of Philip, the father of Alexander, Cotys was the most powerful of the Thracian chiefs, and is usually called king of Thrace; but he was deprived by Philip of almost all his dominions between the Strymon and the Nestus, and became little else than a vassal of the Macedonian kingdom. He was a savage and vindictive barbarian, and was assassinated in B.C. 358. His son Cersobleptes succeeded to the throne; but he was eventually stripped of all his territories by Philip, who reduced, in B.C. 343, the whole of Southern Thrace at least, and compelled it to pay tribute. (Diodorus, xvi. 71.) On the death of Philip there was a general movement among the Thracians to throw off the Macedonian supremacy, at the head of which the Triballi placed themselves. But Alexander, by his activity, suppressed this rising: he crossed the Hæmus, marched into the country of the Triballi, and, after defeating them, advanced as far as the Danube, which he crossed, and offered up a sacrifice on its right bank. (Arrian, *Anab.*, i. 2, 3; Strabo, vii. 301.) On the death of Alexander, Thrace fell to the share of Lysimachus, who erected it into an independent monarchy; but it subsequently came under the dominion of the Macedonian kings. They seem however to have left the country under the government of its native rulers, and were probably contented with what the Greeks called a hegemony. In the Roman war against Perseus, Cotys, king of the Thracians, is mentioned as an ally of Perseus; though the Thracians, just before the war broke out, had sought the alliance of the Romans. (Livy, xlii. 29, 51; compare xlii. 19.) On the conclusion of the war, however, Cotys was allowed to continue in possession of his kingdom, notwithstanding the assistance he had rendered to Perseus. (Livy, xlv. 42.

At what time Thrace was reduced to the form of a Roman province is uncertain, but it seems not to have constituted a distinct province till a late period. Under Augustus, the part of Thrace north of the Hæmus was conquered by the Romans, and was afterwards erected into a separate province under the name of Mœsia. [MŒSIA.] The name of Thrace was then confined to the country south of the Hæmus, and between the Euxine, the Propontis, and the Ægean Sea. Its boundary on the west differed at various times: in the time of Ptolemy (iii. 11) it seems to have been the Nestus; but as the Strymon was antiently the boundary between Macedonia and Thrace, it will be convenient, in the following description of the principal places in Thrace, to consider the district between the Strymon and the Nestus as belonging to the latter country.

Beginning then on the left bank of the Strymon, the first town we come to is Amphipolis, which was founded by the Athenians, and was one of the most important towns in Thrace. [AMPHIPOLIS.] It was situated in the country of the Edones, who dwelt between the Strymon and the Nestus, but originally inhabited the Macedonian district of Mygdonia. (Thucyd., ii. 99.) The next town of importance east of Amphipolis was Philippi, which was founded by Philip of Macedonia: it was previously called Crenides, but was then only a small place inhabited by the Thasians, who settled there for the purpose of working the gold and silver mines in its neighbourhood. West of Philippi the country was an extensive plain stretching towards Amphipolis, which has become memorable on account of the battle fought there by Antony and Octavius (Augustus) against Brutus and Cassius. Under the Romans Philippi became a colony, and was the chief city in that part of the country, when it was visited by the Apostle Paul. (*Acts*, xvii. 12.) It still retains the name of Filibi, but is only a village.

West of the Nestus the first town of importance on the coast is Abdera. [ABDERA.] Next comes Dicæa or Dicæopolis, which was a Greek city on the shores of the lake Bistonis (Herod., vii. 109); and then Maroneia and Ismarus, which were both in the country of the Cicones, where Ulysses landed and was defeated by the inhabitants, after he had taken their city. (*Odys.*, xi. 39, &c.) The Maronean wine has been already mentioned, and the city was in consequence sacred to Dionysus, as may be seen from its coins. It was originally called Orthagoria. Its ruins are still named Maroni. Ismarus is not mentioned by later writers as a city, but only as a mountain celebrated for its wine. Following the coast we next come to Stryme, a colony of the Thasians; then to Mesembria, built by the Samothracians (Herod., vii. 108); and next to Doriscus, situated in a large plain, in which Xerxes numbered his army. (Herod., v. 59.) Crossing the Hebrus we come to Ænos, which, according to Virgil (*Æn.*, iii. 17, &c.), was founded by Æneas, but it is mentioned under this name by Homer, as the place from which Pirous came to the Trojan war (*Il.*, iv. 520). It was a place of considerable importance in later times, and under the Romans was a free town. (Pliny, *Nat. Hist.*, iv. 18.) It is still called Enus.

After passing round the head of the Gulf of Melas, now the Gulf of Saros, we come to the Thracian Chersonese (*Χεῤῥόνησος*, or *Χερσόνησος ἡ ἐν Θράκῃ*), now Gallipoli, which was very early colonized by Greek settlers, and though but of small extent is of considerable importance in antient history. In early times it was inhabited by the Dolonci, a Thracian tribe, who being hard pressed in war by the Apsinthii, were led to invite Miltiades, the son of Cypselus, an Athenian, to be their king, in consequence of an answer given them by the oracle at Delphi. This was about the year B.C. 560. Miltiades complied with their request, and took with him to the Chersonese a colony of Athenians. On his death he was succeeded by his nephew Stesagoras, and he by his brother Miltiades, the son of Cimon, who fled to Athens to escape the vengeance of Darius, on account of the advice he had given to the Ionian chiefs in the Scythian expedition of Darius. (Herod., vi. 34, &c.) [MILTIADES.] When the Persians were driven out of Greece, the Chersonese came into the hands of the Athenians, who retained it till the end of the Peloponnesian war. Shortly afterwards the Lacedæmonians, at the request of the inhabitants, built a strong wall across the isthmus to protect the country from the incursions of the Thracians. (Xenoph., *Hell.*, iii. 2, s. 8-10.) It subsequently came under the power of Athens, who wrested it from Cersobleptes, the son of Cotys, when he was deprived of his other dominions by Philip. Afterwards it formed part of the kingdom of Lysimachus, who founded the city of Lysimachia on the isthmus, which he made his capital. It was on the western side of the isthmus, not far from the antient Cardia, the inhabitants of which he removed to his new city. (Diodorus, xx. 29; Pausan., i. 9, s. 10.) South of Lysimachia were Agora, Ide, Pæon, and Alopeconnesus, the last of which only was of any importance. It was an Æolian colony, and was one of the chief towns of the Chersonese in the time of Demosthenes. On the eastern side of the Chersonese, upon the Hellespont, the most southerly town was Cynossema, near which the Lacedæmonian fleet was defeated by the Athenians under the command of Thrasybulus and Thrasyllus, in B.C. 411. (Thucyd., viii. 104, &c.) Above Cynossema was Madytus, which was also one of the chief towns of the Chersonese in the time of Demosthenes (Demosth. *pro Cor.*, p. 256); and north of Madytus was Sestos. [SESTOS.] North of Sestos was the small river of Ægospotamoi, with apparently a town of the same name at its mouth, near which the Athenian fleet was totally defeated by Lysander, in B.C. 405, who was enabled in consequence to obtain possession of Athens and put an end to the Peloponnesian war. Above Ægospotamoi were Callipolis, now Gallipoli, which has given its name to the peninsula, and Pactya, opposite Lysimachia.

As the other towns are not of so much importance as the preceding, a brief notice of them will be sufficient. On the Propontis the chief seaport was Perinthus, afterwards called Heraclea, and sometimes also Heraclea Perinthus. (Zosimus, i. 62; Diodorus, xvi. 76.) On the Bosporus (not Bosphorus, as it is frequently, but incorrectly, written in modern maps and works), which connected the Propontis and the Euxine, the antient Greek city of Byzantium was situated, which occupied part of the site of the modern Constantinople. [BYZANTIUM.]

On the European coast of the Euxine the chief towns were Salmydessus, Apollonia, and Mesembria. The two former were colonies of the Milesians, and the last of the Megarians. (Strabo, vii., 319.)

In the interior of the country the towns most worthy of mention are Trajanopolis, on the Egnatian road to the west of the Hebrus; Plotinopolis, so called in honour of Plotina, the wife of Trajan, to the north of Trajanopolis; Hadrianopolis, on the Hebrus, originally called Orestias, and now Adrianople [ADRIANOPLE]; and, lastly, Philippolis, also on the Hebrus, now called Filibi. The names of these towns sufficiently show by whom they were built or enlarged.

The Via Egnatia, which was the great road of communication between the Ionian Sea and Byzantium, and which is spoken of under MACEDONIA (p. 243), entered Thrace at Amphipolis, and passed by the towns of Philippi, Neapolis, Abdera, Maximianopolis, Trajanopolis, Cypsela, Apri, Heraclea, till it reached Byzantium.

Xenophon, in his 'Anabasis' (vi. 4), speaks of Thrace in Asia, which he describes as extending from the junction of the Bosporus and the Euxine along the Asiatic coast as far as Heracleia: the country within these limits was inhabited by Thracei Bithyni. The harbour of Calpe was about the middle of this coast-line. [BITHYNIA.]

THRA'CIA, Dr. Leach's name for a genus of testaceous mollusks described as intermediate between *Anatina* and *Mya*, and as having some resemblance to *Corbula*.

THRAPSTON. [NORTHAMPTONSHIRE.]

THRASÄ'ETOS, Mr. G. R. Gray's name for a genus of Eagles, *Harpyia*, Cuv., FALCO *destructor*, Daud. [FALCONIDÆ, vol. x., p. 174.]

THRA'SEA PAETUS. His prænomen is uncertain; some writers call him Lucius, and others Publius, but he is generally called simply Thrasea Paetus or Thrasea. He was a native of Patavium, Padua (Tacitus, *Annal.*, xvi. 21; Dion Cass., lxii. 26), and, like most men of talent at the time, he went to Rome, where he afterwards became a senator and a member of the priestly college of the quindecimviri. The first time that Thrasea came prominently forward in the senate was in A.D. 59, when a senatusconsultum was passed by which the city of Syracuse obtained permission to employ a greater number of gladiators in the public games than had been fixed by a law passed in the time of J. Cæsar. (Tacitus, *Annal.*, xiii. 49; Dion Cass., liv. 2; Sueton., *Caes.*, 10.) Although the matter was of no importance, Thrasea took an active part in the deliberation, merely to impress upon his colleagues the necessity of paying attention even to the smallest matters belonging to the administration of the senate. In the same year Nero determined to carry into effect his design of getting rid of his mother Agrippina. [NERO; AGRIPPINA.] When the crime was committed, and when the emperor sent a letter to the senate in which he endeavoured to exculpate himself, the degraded senators congratulated him upon having got rid of so dangerous a woman. The only man who on that occasion had the courage to show his detestation of the crime was Thrasea. (Dion Cass., lxi. 15; Tacit., *Annal.*, xiv. 12.)

In the year A.D. 62, when the praetor Antistius was charged by Cossutianus Capito with high treason for having composed and read at a numerous party of friends some libellous verses upon the emperor, and when the emperor showed an inclination to interfere in the trial, Thrasea boldly claimed for the senate the right to try the case according to the existing laws. The firmness of Thrasea induced most of the senators to follow his example and to vote with him. Cossutianus was thwarted in his hope of getting Antistius sentenced to death, and the emperor, though highly annoyed, endeavoured to disguise his anger. (Tacitus, *Annal.*, xiv. 48, 49.) A short time afterwards Thrasea again attracted general attention in the senate by a speech against the assumption and insolence of wealthy provincials. It had at that time become customary with the provincials to request the Roman senate, by embassies, to offer public thanks to the proconsuls who returned from their province, and who had conducted the administration to their satisfaction. The ambition to gain this distinction often deprived the proconsuls of their independence, and degraded them into flatterers of influential provincials, who thus obtained an improper power. Thrasea proposed to the senate a measure to remedy the evil, but although it met with general approbation, he did not succeed in making the senate pass a decree, which was however done shortly after on the proposal of Nero himself. (Tacitus, *Annal.*, xv. 20-22.) Nero already hated Thrasea, and envy now began to increase the hatred. When therefore, in A.D. 63, Poppaea, the wife of Nero, was expecting her confinement at Antium, and all the senators flocked thither to wait for the event, Thrasea was forbidden to go there. The Stoic philosopher bore this insult with his usual calmness. Nero afterwards indeed declared to Seneca that he was reconciled to Thrasea, but this was probably no more than an expression of his fear. The inflexible character of Thrasea, his refusal to take any part in the degrading proceedings of the senate, and the esteem which he enjoyed among his contemporaries, increased the hatred of Nero, who only waited for a favourable opportunity to get rid of him. It appears that from the year A.D. 63 Thrasea never attended the meetings of the senate. Three years thus passed away, when at length, in A.D. 66, his old enemy Cossutianus brought forward a number of charges against Thrasea, the substance of which was, that he took little or no part in public affairs, and that when he did so, it was only to oppose the measures of the government; that he was a secret enemy of the emperor, and fulfilled neither his political duties as a senator nor his religious duties as a priest. Thrasea first requested a personal interview with the emperor, which was refused. He then wrote to him, asking for a statement of the charges against him, and declaring that he would refute them. When Nero had read this letter, instead of which he had expected a confession of guilt and an humble petition for pardon, he convoked the senate, to decide upon the charges against Thrasea and others. Some of Thrasea's friends advised him to attend the meeting, but most dissuaded him from it. One young and spirited friend, Rusticus Arulenus, who was tribune of the people, offered to put his veto upon the senatus-consultum, which however Thrasea prevented. The philosopher now withdrew to his country-house. In the senate, which was surrounded by armed bands, the quaestor of the emperor read his oration, whereupon Cossutianus and others began their attacks upon Thrasea. The wishes of Nero, and the presence of armed soldiers ready to enforce them, left the senators no choice, and it was decreed that Thrasea, Soranus, and Servilia should choose their mode of death, and that Helvidius, the son-in-law of Thrasea, and Paconius, should be banished from Italy. The accusers were munificently rewarded. Towards the evening of this day the quaestor of the consul was sent to Thrasea, who had assembled around him a numerous party of friends and philosophers; but before he arrived, a friend, Domitius Cæcilianus, came to inform him of the decree of the senate, which spread consternation among all who were present. Thrasea's wife Arria, who was a relative of Persius the poet (*Vita A. Persii Flacci*), was on the point of making away with herself, but her husband entreated her not to deprive her daughter of the last support which now remained to her. When at length the quaestor arrived and officially announced the decree, Thrasea took Helvidius and his friend Demetrius to his bed-room, and had the veins of both his arms opened; and when the blood gushed forth, he called out, 'Jove, my deliverer, accept this libation.' (Tacitus, *Annal.*, xvi. 21-35; Dion Cass., lxii. 26.)

Thus died Thrasea, according to the unanimous consent of the antients a man who professed the genuine and stern virtues of the olden time in the midst of a degenerate age. Tacitus calls him virtue itself, and even Nero is reported to have said, 'I would that Thrasea liked me as much as he is a just judge.' (Plutarch, *Rei Publicae gerendae Praecepta*, p. 810, A. ed. Frankf.; comp. Martial, i. 9; Juvenal, v. 36; Pliny, *Epist.* viii. 22.) The principles which guided him through life he had imbibed from the Stoic philosophy. Cato the younger was his favourite character in the history of the Roman republic; he wrote a Life of Cato, which Plutarch made use of in his biography, and thus we probably still possess the substance of it. (Plutarch, *Cato Min.*, 25 and 37; compare Heeren, *De Fontibus Plutarchi*, p. 168.) Rusticus Arulenus wrote a work on Thrasea and Helvidius, in which he characterised them as men of the purest integrity—an expression which became fatal to the author. (Sueton., *Domit.*, 10; Tacitus, *Agric.*, 2, and 45.)

THRASHING. The separation of the grain from the ear in corn has always been one of the most laborious operations on a farm. Where the quantity grown is merely sufficient to supply food for the cultivators of the soil, the simplest methods answer the purpose sufficiently. The corn taken by handfuls may be beaten on a piece of wood or a table, and by repeatedly turning the straw the whole of the grain may be readily beaten out. This mode of thrashing is still adopted in order to obtain the finest and ripest grains for seed; but then the straw is afterwards thrashed over again with the *flail*, which is the instrument most generally adopted for thrashing corn. It is needless to describe this instrument, which is so generally known. It requires some practice to use it effectually and to avoid accidents to the thrasher himself or the bystanders. The flail being swung round the head, the beating part of it is made to fall horizontally on the straw which is spread on the thrashing-floor; and, by inserting this part occasionally under the straw, it is turned over and a fresh portion is brought up to be beaten. This is done without losing the stroke or time when several men are thrashing together. If it were not that thrashing is mostly done in winter, when no out-door work could well be done, few labourers would submit to its toil; and it is very difficult to ensure the entire separation of the grain without great vigilance and attention on the part of the master or overseer. If the labour is paid by the day, much time is usually lost; and if it be by the quantity of grain thrashed or by the number of sheaves, there is a great temptation for the men to hurry over the work, as more grain is thrashed out at first when the ears are full than afterwards.

Where the corn is thrashed out immediately after harvest, to be put into a granary, as is the case in those countries where extensive tracts of rich land are sown with corn two or three times without much tillage or manuring, and then left to be recruited by several years' rest and pasture, the most common practice is to level a portion of a field, and laying the corn in the straw in a large circle, to drive oxen and horses over it till it is all trodden out. This is the method alluded to in Scripture, and can only take place where the climate is serene and dry. Till ingenuity had produced machines to supersede the flail, this was the only instrument in use. The first idea of a machine for thrashing was that of imitating the motion of the flail, but so much depends on the eye of the thrasher, that no mechanism could well imitate the motion of his arms. This was consequently given up, and an imitation of the rubbing of the grains from the ears between the hands, combined with the beaters of a flax dressing-machine, gradually produced the present improved thrashing-machine.

Without a figure it would be difficult to describe the different parts and motions of a thrashing-machine. They are however now so common, that it will suffice to give the general principle of action, and to mention some of the latest improvements in it. A rapid motion is given to a hollow cylinder round a horizontal axis; on the outer surface there are projecting ribs parallel to the axis at equal distances from each other; the width of these is from two to six inches. Around half the cylinder is a case the inner surface of which is lined with plates of cast-iron grooved in the direction of the axis. The ribs or beaters come quite close to these grooves, so that an ear of wheat or other corn cannot well pass between them without being flattened. The sheaves of corn, having been untied, are spread on a slanting table, and in some machines are drawn in between two iron rollers, of which one is plain and the other fluted. The motion of these rollers is slow, while that of the cylinder or drum is very rapid. The beaters act on the straw as it comes through the rollers, and beat out most of the corn; but what remains is carried in between the beaters and the fluted case, and when it has made half a revolution all the grain has been beaten and rubbed out. It falls on a sieve which lets the grain through, but retains the straw, which is raked off by hand or by circular rakes moved by the machinery. Some of the best implement-makers in England have found the two rollers superfluous, and have accordingly dispensed with them. The straw is at once subjected to the beaters, and the machine may be fed more or less rapidly according to circumstances. It requires a little more attention in the person who feeds the machine, but more work is done and some power saved. The great perfection of a thrashing-machine is to rub out every grain and to break the straw as little as possible; the larger the scale of the machine the better it does this. Hand-machines have been made on the same principle, but they do not effect any saving in the expense, requiring many men to produce the effect of one horse. The great advantage of hand-machines is that men and women can be employed to thrash who could not use the flail skilfully. Moveable thrashing-machines are very generally in use in England where farms are small. They are often the property of an industrious labourer or mechanic, who undertakes to superintend the work, the farmer finding horses and men. Thus he goes from farm to farm and earns his livelihood from a small capital laid out in the purchase of a machine. The price of thrashing in this way is about half of what is usually paid for thrashing with the flail; it is more rapidly done, there is less chance of pilfering, and fewer grains remain in the straw.

On very large farms it has been found economical to erect a steam-engine to work the thrashing-machine, chaff-cutter, and other domestic implements. Where coals are cheap there is a great saving. A steam-engine costs little to keep it in order. When not working, the interest on the original price is the only loss, whereas horses must be fed whether they work or not. The price of steam-engines is so much reduced and their construction so simplified, that they will probably soon form an essential part of the implements on every farm.

There are some thrashing-machines on a new principle which are said to work well. The drum is furnished with rows of spikes, and similar spikes are fixed into the cover, which work in the intervals between the first. The corn in the straw is drawn in by the spikes on the drum, which revolves rapidly, and the ears being beaten in all directions by the fixed and the revolving spikes, the grain falls out of the ear and is collected below. Such a machine was exhibited at the Agricultural Meeting at Cambridge in 1840, but it seemed to break the straw more, and to be more apt to clog, than the machines in general use. These will no doubt be made gradually simpler and cheaper, till they entirely supersede the flail, even in very small farms.

THRASYBU'LUS (Θρασύβουλος), the son of Lycus, was born at Steiria in Attica. In the year B.C. 411 the oligarchal party at Athens gained the ascendency, and formed a new senate of 400 members. The oligarchs in the fleet stationed at Samos endeavoured to bring about a similar revolution there, but their efforts failed; and among the men who exerted themselves to maintain the democratical constitution, Thrasybulus, who then had the command of a trireme, was foremost. He and his friend Thrasyllus compelled the oligarchs to swear to keep quiet, and not to attempt any alteration in the constitution. The generals who were known to belong to the oligarchs were removed, and Thrasybulus and Thrasyllus were appointed in their stead. The army under their command assumed the rights and power of the people of Athens, and in an assembly of the camp Thrasybulus got a decree passed, by which Alcibiades, who had lately been the chief support of the democratical party, and who was living in exile with Tissaphernes, should be recalled. Thrasybulus set out to fetch him to the camp. (Thucydides, viii. 81.) In 410 B.C. he greatly contributed to the victory which the Athenians gained in the battle of Cyzicus. In B.C. 408, when Alcibiades returned to Athens from Byzantium, Thrasybulus was sent with a fleet of eighty galleys to the coast of Thrace, where he restored the Athenian sovereignty in most of the revolted towns; and while he was engaged here he was elected at Athens one of the generals, together with Alcibiades and Conon. In B.C. 406 Thrasybulus was engaged as one of the inferior officers in the Athenian fleet during the battle of Arginusae; and after the battle he and Theramenes were commissioned by the generals to save the men on the wrecks: but a storm prevented their executing this order. Respecting the fate of the generals and the conduct of Theramenes on this occasion, see THERAMENES. Thrasybulus is not charged with any improper act during the proceedings against the generals, and for two years after his name does not occur in the history of Attica.

During the government of the Thirty Tyrants at Athens, he was sent into exile, and took refuge at Thebes. The calamities under which his country was suffering roused him to exertions. The spirit which prevailed at Thebes against Sparta, and against its partisans at Athens, emboldened him to undertake the deliverance of his country. With a band of about seventy, or, according to others, of only thirty fellow-exiles, he took possession of the fortress of Phyle, in the north of Attica. The Thirty, sure of victory over so insignificant a garrison, sent out the 3000 Athenians whom they had left in the enjoyment of a kind of franchise, and the knights, the only part of the population of Athens who were allowed to bear arms. On their approach to Phyle some of the younger men, eager to distinguish themselves, made an assault upon the place, but were repelled with considerable loss. The oligarchs then determined to reduce the fortress by blockade; but a heavy fall of snow compelled them to return to Athens. During their retreat the exiles sallied forth, attacked the rear, and cut down a great number of them. The Thirty now sent the greater part of the Lacedaemonian garrison of Athens and two detachments of cavalry to encamp at the distance of about fifteen stadia (nearly two miles) from Phyle, for the purpose of keeping the exiles in check. The small band of Thrasybulus had in the meantime increased to 700, as the Athenian exiles flocked to him from all parts. With this increased force he one morning descended from Phyle, surprised the enemy, and slew upwards of 120 hoplites and a few horsemen, and put the rest to flight. Thrasybulus erected a trophy, took all the arms and military implements which he found in the enemy's camp, and returned to Phyle.

The Thirty now began to be alarmed at the success of the exiles, and thought it necessary to secure a place of refuge in case the exiles should succeed in getting possession of Athens. For this purpose they, or rather Critias, devised a most atrocious plan. By fraud and force he contrived to secure 300 citizens of Eleusis and Salamis capable of bearing arms; and after they were conveyed to Athens, he compelled the 3000 and the knights to condemn them to death. All were accordingly executed, and Eleusis was deprived of that part of its population to which it might have looked for protection. In the meantime the number of exiles at Phyle had continued to increase, and now amounted to one thousand. With these Thrasybulus marched by night to Piræeus, where he was joyfully received, and great numbers of other exiles immediately increased his army. The Thirty no sooner heard of this movement than they marched against Piræeus with all their forces. Thrasybulus by a skilful manœuvre obliged the enemy, who was superior in numbers, to occupy an unfavourable position at the foot of the hill of Munychia. In the ensuing battle the army of the tyrants was put to flight and driven back to the city. Critias fell in the contest.

The consequences of this success showed that there had been little unity among the oligarchs, and that an open breach had only been prevented by fear of Critias. Some of the Thirty and a great many of the 3000 were in their hearts opposed to the atrocities which had been committed, and had avoided, as much as they could, taking part in the rapine and bloodshed. They also were aware that the hatred and contempt under which they were labouring were owing mainly to the violence of their colleagues; and for the purpose of maintaining their own power they now resolved to sacrifice their colleagues. An assembly was held in which the Thirty were deposed, and a college of ten men, one from each tribe, was appointed to conduct the government. Two of these ten had formerly belonged to the Thirty, and the rest of the Thirty withdrew to Eleusis. As regards the army of exiles under Thrasybulus, the new government of Athens was no less determined to put them down than the Thirty had been. Thrasybulus therefore continued to strengthen himself, and to prepare for further operations. His army had gradually become more numerous than that of Athens, for he engaged aliens in his service, and promised them, in case of their success, the same immunities at Athens as those enjoyed by the citizens (*ἰσοτέλεια*). Arms, of which he was still in want, were generally supplied by the wealthy citizens of Piraeeus and other places, and by the ingenuity of his own men. As the danger from the exiles became at last very imminent, the Ten of Athens applied to Sparta for assistance. At the same time the faction at Eleusis also sent envoys to Sparta; but the government of Sparta refused to send an army for an undertaking from which it could reap no advantages. However Lysander, as harmostes, obtained leave to levy an army, and his brother Libys was appointed admiral to blockade Piraeeus. Lysander went to Eleusis, and got together a numerous army. Being thus enclosed by land and by sea, Thrasybulus and his army had no prospect except to surrender.

But their deliverance came from a quarter whence it could have least been expected. The power and influence which Lysander had gradually acquired, had excited the envy of the leading men at Sparta, even of the ephors and kings, and they were now bent upon thwarting his plans. King Pausanias was accordingly sent out with an army to Attica, avowedly to assist Lysander in his operations, but in reality for the purpose of preventing the accomplishment of his designs. He encamped near Piraeeus, as if he designed to besiege the place in conjunction with Lysander. After several sham manœuvres against the exiles, Pausanias gained a victory over them without following it up. He now sent secretly an embassy to them, requesting them to send a deputation to him and the ephors; and he also suggested the language which the deputies should use. At the same time he invited the pacific party at Athens to meet and make a public declaration of their sentiments. Hereupon a truce was concluded with the exiles, and a deputation of them, as well as of the pacific party at Athens, was sent to Sparta to negotiate a general settlement of affairs. As soon as the Ten of Athens heard of this, they also sent envoys to Sparta to oppose the other embassy. But this attempt failed, and the ephors appointed fifteen commissioners with full powers, in conjunction with king Pausanias, to settle all the differences between the parties in Attica. In accordance with the wishes of the exiles and the peaceful party of the city, the commissioners proclaimed a general amnesty, from which none were to be excluded except the Thirty, the Eleven, and the Ten who had formed the government of Piraeeus. Any one who might not think it safe to return to Athens was permitted to take up his residence at Eleusis. This clause is unintelligible, unless we suppose that the Spartans still wished to see Eleusis in the hands of a party which might check the reviving spirit of independence among the Athenians. Sparta guaranteed the execution of the proclamation. Pausanias withdrew his forces, and Thrasybulus at the head of the exiles entered Athens in triumph, and marched up the Acropolis to offer thanks to Athena. An assembly was then held, in which Thrasybulus impressed upon all parties the necessity of strictly observing the conditions of the peace.

Eleusis was now the seat of the most violent of the oligarchical party, and they still indulged some hope of recovering what was lost. They assembled a body of mercenaries to renew the civil war; but Athens sent out a strong force against them. Xenophon says that the leaders of the Eleusinian party were drawn to a conference and then put to death. This isolated statement is rather surprising, as in all other respects the popular party showed the greatest moderation, and immediately after the quelling of the Eleusinian rebellion Thrasybulus induced the Athenians to proclaim a second amnesty, from which no one was to be excluded. This amnesty was faithfully observed. The first step after the abolition of the oligarchy was the passing of a decree which restored the democratic form of government.

Thrasybulus acquired the esteem of his fellow-citizens by the courage and perseverance which he had shown in the deliverance of his country, and although for many years he does not come forth very prominently in the history of Attica, he was no less active in restoring Athens to her former greatness, than he had been in wresting her from the hands of her enemies. His last military undertaking belongs to the year B.C. 389, when the government of Athens placed a fleet of 40 galleys at his command, with which he was to support the democratical party in the island of Rhodes. On his arrival there he found that no protection was needed, and he sailed to the north part of the Ægean. In Thrace he settled a dispute between two princes, and gained them as allies for Athens. At Byzantium and Chalcedon also the influence of Athens was restored, and with it new sources of revenue to the republic were opened. After this he sailed to Mitylene, the only town in the island of Lesbos in which the Spartan party had not gained the ascendency. Thrasybulus here fought a battle with Therimachus, the Spartan harmostes, who was defeated and slain. Several towns were now reduced, and after he had plundered the lands of those who refused to submit to Athens, he prepared to sail to Rhodes; but before he landed there, he sailed along the southern coast of Asia Minor to levy some contributions there. His fleet cast anchor in the mouth of the river Eurymedon in Pamphylia, near Aspendus. In consequence of some outrage committed by his soldiers on land, the Aspendians were exasperated, and during the night they surprised and killed Thrasybulus in his tent, in B.C. 389.

(Thucydides, viii.; Xenophon, *Hellen.*, i. 1, 12; i. 6, 36; ii. 3, 42; ii. 4, 2, &c.; iv. 8, 25, &c.; Diodorus Sic., xiv. 32, &c.; 94 and 99; C. Nepos, *Thrasybulus;* compare E. Ph. Hinrichs, *De Theramenis, Critiae, et Thrasybuli Rebus et Ingenio*, Hamburg, 1820, 4to.; Thirlwall, *History of Greece*, vol. iv.)

THRASYBU'LUS (Θρασύβουλος), of Collytus in Attica, was a contemporary of Thrasybulus, the deliverer of Athens, from whom he is usually distinguished by the epithet of the Collytian. He was one of the Athenian exiles who joined his namesake at Phyle and afterwards at Piræeus. (Demosthenes, in *Timocrat.*, p. 742.) In the war against Antalcidas he commanded eight Athenian galleys, with which he was taken prisoner by the Spartan admiral.

(Xenophon, *Hellen.*, v. 1, 26, &c.; compare Æschines in *Ctesiphont.*, p. 73, ed. Steph.)

THRASYBU'LUS (Θρασύβουλος), a tyrant of Syracuse. He was a son of Gelo, and brother of Hiero the Elder, who ruled over Syracuse till the year B.C. 466. Hiero was succeeded by his brother Thrasybulus, who was a bloodthirsty tyrant, and oppressed the people still more than Hiero: great numbers of citizens were put to death and others sent into exile, and their property filled the private coffers of the tyrant. In order to protect himself against the exasperated citizens, he got together a large force of mercenaries, and relying on this new support, he carried his reckless cruelties so far, that at last the Syracusans determined to rid themselves of their tyrant. They chose leaders to give them a military organization, that they might be enabled to resist the mercenaries of Thrasybulus. The tyrant at first endeavoured to stop the insurrection by persuasion, but this attempt failing, he drew reinforcements from Catana and other places, and also engaged new mercenaries. With this army, consisting of about 15,000 men, he occupied that part of the city which was called Achradina, and the fortified island, and harassed by frequent sallies the citizens, who fortified themselves in a quarter of their city called Ityce. The Syracusans sent envoys to several Greek towns in the interior of Sicily, soliciting their aid. The request was readily complied with, and they soon had an army and a fleet at their disposal. Thrasybulus attacked them both by sea and land, but his fleet was compelled to sail back to the island after the loss of several triremes, and his army was obliged to retreat to Achradina. Seeing no possibility of maintaining himself, he sent ambassadors to the Syracusans with offers of terms of peace, which was granted on condition of his quitting Syracuse. Thrasybulus submitted to these terms, after having scarcely reigned one year, and went to Locri in Southern Italy, in B.C. 466, in exile. After the Syracusans had thus delivered themselves of the tyrant, they granted to his mercenaries free departure, and also assisted other Greek towns in Sicily in recovering their freedom. (Diodorus Sic., xi. 67 and 68.)

THRASYMENE LAKE (Trasiménus Lacus, in the best Latin MSS.; in Greek writers, *ἡ λίμνη Τρασυμένη*, or *Θρασυμένη*), the antient name of the Lago di Perugia in Italy. It was in Etruria, and was the scene of the third defeat of the Romans by Hannibal after he had crossed the Alps. [Hannibal.] The lake itself is fully described under Perugia.

THRAULITE. *Hisingerite. Hydrated Silicate of Iron.* Occurs in roundish nodules. Fracture uneven or imperfect conchoidal. Structure curved, foliated. Brittle. Splendent. Nearly opaque. Lustre vitreo-resinous. Colour brownish-black.

Gives out water when heated in a glass tube; imperfectly fused by the blowpipe, and is, after heating, attracted by the magnet.

It occurs at Riddarhyttan in Westmanland (1) and at Bodenmais in Bavaria (2), accompanying iron pyrites.

Analysis by

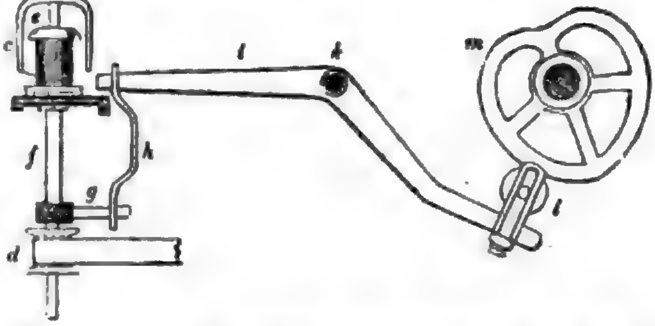
	(1) Hisinger.	(2) Kobell.
Silica . .	36·30	31·28
Peroxide of Iron .	44·39	50·86
Water . .	20·70	19·12
	101·39	101·26

THREAD (French, *Fil*; German, *Zwirn*; Dutch, *Garen*; Italian, *Refe*; Spanish, *Hilo, Torzal*; Russian, *Nitki*), a small line formed by twisting together fibres of vegetable or animal substances, as flax, cotton, or silk. Sewing-thread, and the various kinds of thread used in the manufacture of bobbin-net, lace, and some other kinds of textile fabric, consist of two or more *yarns*, or simple spun threads, firmly united together by twisting, just as a rope-strand consists of several yarns or distinct cylinders of hemp. [Rope, vol. xx., p. 154; Spinning, vol. xxii., p. 349.]

In a paper on the manufactures of Paisley, printed in the Appendix to Anderson's 'History of Commerce' (edition of 1787-9), it is stated that 'the manufacture of thread was first attempted in this country by Mrs. Millar, of Balgarran, in 1722, on having received some information and machinery from Holland.' Her example was speedily followed by several families in Paisley, where the manufacture soon became of considerable importance. The first manufacturers imitated the kind called Nuns' or ounce thread, which was made up in hanks of forty threads each, reeled upon reels a yard in circumference; but when the profits of the manufacture were diminished by competition, it was injured by the surreptitious practices of some of the manufacturers, who reduced the number of threads in each hank from forty to thirty, and when this became notorious in the market, put but twenty-eight threads in the hank, or reduced the diameter of their reels, and consequently the length of the threads. These frauds were carried to such an extent that it became necessary, in 1788, to pass an act of parliament requiring all manufacturers of this description of thread to use uniform standard reels of thirty-six inches in circumference, and to put thirty threads or rounds of the reel in each hank. From the statement above referred to, it appears that the number of machines employed at Paisley in twining thread, in 1784, was not less than 120; and that the number employed in the thread manufacture in the whole of Scotland at that time was at least 500, of which about 200 were engaged in the production of the different species of ounce threads. These consumed upon an average 2400 spindles of yarn each, or 480,000 in the whole; and these spindles, valued at 4*s*. 6*d*. each, when manufactured into thread, amounted to 108,000*l*. The 300 machines employed in making other kinds of thread consumed upon an average 2000 spindles each, or 600,000 spindles in the whole, which, estimated at 3*s*. 9*d*. each when manufactured, amounted to 112,000*l*. Thus the total annual value of the thread manufactured in Scotland about 1784 was 220,000*l*.; and it is stated that the manufacture gave employment in its various operations, from the spinning of the flax to the finishing of the thread, to upwards of 20,000 women, besides 4000 or 5000 men.

The manufacture of thread from fibres of cotton-wool, for sewing and other purposes, is one of the many important departments of British industry called into exercise by the improvements effected by Arkwright and his successors in spinning-machinery, and forms a considerable branch of business both in Manchester and in Scotland, for exportation as well as for home consumption.

The operation of combining yarns of cotton or linen into thread is performed by a machine called a doubling and twisting frame, somewhat resembling the throstle of the cotton-spinner. Engravings of this machine, with a minute description, are given in Dr. Ure's 'Cotton Manufacture of Great Britain,' vol. ii., pp. 226-234, and 'Dictionary of Arts,' pp. 1239-1241, from which authorities the following account is derived. Along the centre of the machine is an elevated creel or frame-work, which supports two parallel rows of cops or bobbins of yarn, one row towards each side of the machine. The cops or bobbins are placed vertically, or nearly so, and the lower ends of their axes rest in oiled steps or hollows, while the upper ends are supported by wire eyes, so that they may revolve with facility. The number of cops or bobbins of yarn is twice as great as that of the twisting spindles when the thread is to consist of two yarns, three times as great for thread formed of three yarns, &c.; and the yarn with which they are charged is frequently *gassed*, or passed quickly through a series of coal-gas flames, to singe off any loose downy fibres, before it is taken to the doubling and twisting frame. From the cops the yarns are conducted over horizontal glass rods, which are fixed parallel with the creel, and thence downwards into troughs filled with water or very thin starch-paste, which by moistening the yarns facilitates the subsequent process of twisting. To ensure the equal moistening of the yarns they are, while being drawn through the troughs, made to pass either under a glass rod, or through eyes which may, if necessary, be lifted out of the trough without wetting the fingers, by means of upright stems provided for that purpose. The wetting-troughs and other apparatus are alike on each side of the machine; but in further tracing the progress of the thread we shall confine our attention to one side, and to the apparatus necessary for producing one thread, although a great number of such trains of apparatus are combined in one frame, and set in motion by one train of impelling machinery. After being wetted the yarns pass over the rounded edge of the trough, which is covered with flannel for the purpose of absorbing the superfluous moisture; and thence under and partly around an iron roller, which is made to revolve with any required velocity by a train of wheel-work. Upon this roller rests another, of box-wood, which revolves solely by contact with the iron roller, its axis playing in vertical slots. In passing under the iron roller, then between it and the wooden roller, and finally over the latter, the yarns required to form the thread are brought together and slightly compressed; but although thus prepared for a more intimate union, they are not yet twisted together. The action of the winding and twisting apparatus may be illustrated by a diagram, in which none but the essential parts are shown. In this figure *a a* represents the untwisted thread, or rather the united yarns which are to form the thread, and *b* is a fixed eyelet through which they are conducted to the flyer *c*, which is mounted upon and revolves with a long vertical spindle set in motion by a whorl or pulley and strap at *d*. *e* is the bobbin upon which the finished thread is wound by the revolution of the flyer, which also gives to it any predetermined degree of twist. The spindle passes freely through a hole in the



centre of this bobbin, which rests upon a bar called the copping-rail, the transverse section of which is indicated by a tint in the cut; and the copping-rail, which extends the whole width of the machine, is supported at intervals by vertical rods, one of which is shown at *f*. To these rods, and consequently to the copping-rail and bobbins supported by them, a reciprocating vertical motion is imparted through the connecting pieces *g* and *h*, from the bent lever *i i*, which is pivoted at *k*, and receives its motion through the adjustable friction-roller *l*, from an eccentric or heart wheel *m*. Thus by the combined rotatory motion of the spindle and flyer, and rising and falling motion of the bobbin, the thread is at once twisted and wound regularly upon the bobbins, which may be easily removed when full. It is unnecessary to detail the contrivances by which motion is communicated to various parts of the machine, and it is sufficient to add that, by changes in the relative sizes of some of the toothed wheels by which the moving-power is distributed from the main shaft, the spindles, which always revolve much faster than the rollers, may be made to do so to any required degree, so as to impart a greater or less degree of twist to the thread.

Silk thread is, according to Dr. Ure, commonly twisted in lengths of from fifty to a hundred feet, with hand-reels somewhat similar to those employed in rope-making.

(Anderson, *History of Commerce*, vol. iv., pp. 703-4; Dr. Ure's *Cotton Manufacture of Great Britain*, vol. ii., pp. 226-234; *Dict. of Arts*; &c.)

THREATS AND THREATENING LETTERS. By the criminal law of England, threats of personal violence, or any other threats by which a man of ordinary firmness and prudence may be put in fear, and by means of which money or other property is extorted from him, amount to the crime of robbery. [ROBBERY.] And by the statute 7 Will. IV. & 1 Vict., c. 87, sect. 7, a person demanding by menaces any property of another with intent to steal the same, is declared to be guilty of felony, and is liable to imprisonment for any term not exceeding three years. Besides these offences, it is a misdemeanor at common law to threaten another in order to deter him from doing some lawful act, or to compel him to do an unlawful one, or to extort money or goods from him, or to obtain any other benefit to the person who makes the threat.

The offence of sending or delivering letters or writings, threatening to kill or injure the person to whom they are sent or delivered, or to burn his house, or to accuse him of some heinous crime for the purpose of extorting money, was formerly considered to be high treason (stat. 8 Hen. V., c. 6); and under the stat. 9 Geo. I., c. 22, continued for more than a century to be punishable as a capital felony. By the stat. 4 Geo. IV., c. 54, s. 3, it was declared to be desirable that a less punishment should be substituted for that of death; and it was enacted that, 'if any person shall knowingly and wilfully send or deliver any writing, with or without any name or signature subscribed thereto, or with a fictitious name or signature, threatening to kill or murder any person, or to burn or destroy his house, outhouse, barns, or stacks of corn or grain, hay or straw, the offender shall be guilty of felony, punishable with transportation for life, or not less than seven years, or imprisonment for any term not exceeding seven years.' By a more recent statute, 7 & 8 Geo. IV., c, 29, sect. 8, it is enacted that, 'if any person shall knowingly send or deliver any letter or writing, demanding of any person with menaces, and without any reasonable or probable cause, any chattel, money, or valuable security; or if any person shall accuse, or threaten to accuse, or shall knowingly send or deliver any letter or writing accusing or threatening to accuse, any person of any crime punishable by law with death, transportation, or pillory, or of any assault with intent to commit any rape, or of any attempt or endeavour to commit any rape, or of any infamous crime (the meaning of which term is specially defined in the 9th section of the same statute), with a view or intent to extort or gain from such person any chattel, money, or valuable security,' every such offender shall be guilty of felony, and shall be punishable with transportation for life or not less than seven years, or with imprisonment not exceeding four years, with or without whipping.

THREE, RULE OF, the technical name of the rule in arithmetic by which, three quantities being given, the first and second of one kind, a fourth is found such that the four are in proportion, or that the first is the same multiple, part, or parts, of the second, which the third is of the fourth.

In the earliest modern treatises are found the explanatory headings of this process, from which the denomination *rule of three* has been formed by abbreviation. Almost all such abbreviations date from the time when systems of commercial arithmetic began to be written, that is, about the beginning of the sixteenth century. Before that time, such books as were written always contained demonstrations from full definitions; and it was not judged necessary to provide the simple case of finding a fourth proportional to three given numbers with a separate name, or to divide the rule for doing it from others. This however was done by traders in their daily practice, who separated the rule of three from the other parts of arithmetic, and called it the *golden rule*, an older term, probably, than *rule of three.* Bishop Tonstal ('Ars supputandi,' 1522) begins his chapter on the 'Regula de tribus notis quartum ignotum commonstrantibus' in this manner: 'Præcipua omnium regula est quæ de tribus notis quartum ignotum in noticiam educentibus ab Arithmeticis traditur. Vulgus *regulam auream* vocat; quia hæc cæteris Arithmeticæ regulis velut cæteris metallis aurum præstet.' Robert Recorde (1540) calls it the 'feate of the rule of proportions, whiche for his excellencie is called the golden rule.' Humphrey Baker (1562) uses the phrase 'rule of three,' and says that 'the philosophers did name it the golden rule....but nowe in these latter daies, by us it is called the rule of three.'

The immense variety of questions which are to be solved by finding a fourth proportional defies all classification: but they may all be reduced to one form, though it may in particular cases not be easy to see the mode of reduction. That form is:—A produces B; what will C produce? It may be that it is money which produces goods, or goods which produce money, or money which produces interest, or money of one country which produces money of another, or time which produces distance travelled, &c. &c. &c. The difficulty to beginners is the reduction of the question given to the above simple form, which must be done before what is (or used to be) called the *statement* of the question can be made, namely, the writing down the numbers A, B, C, in the proper order, with the marks of proportion between them:

$$A : B :: C : \text{the answer required.}$$

It is proper enough to say that this is a question of proportion when numbers only are considered: but absurd when the things represented by the numbers are used instead of the numbers. Thus, if 5 pence buy 10 apples, 7 pence will buy 14 apples, and the number 5 is to 7 as 10 is to 14, or 5 is the same fraction of 7 as 10 is of 14. But it is absurd to say that 5 pence bear the same proportion to 10 apples that 7 pence bear to 14 apples: simply because 5 pence are not any assignable fraction of 10 apples. That there is a *relation* is true: but that relation is not proportion. Thus, it is not absurd to say, in the common language of the rule, As 5 pence are to 10 apples, so are 7 pence to 14 apples; for the first does stand to the second in the same relation as the third to the fourth: 5 pence must, at all rates, do as much towards the purchase of 10 apples as 7 pence towards that of 14 apples. With this understanding there is no objection to the common mode of statement, and the proof of the rule is as follows:—If A of the first produce B of the second, then, at the same rate of production, 1 of the first must produce $\frac{B}{A}$ of the second; whence C of the first must produce

$$C \times \frac{B}{A}, \text{ or } \frac{CB}{A} \text{ of the second.}$$

The importance of the rule of three induced arithmeticians to attach two other rules to it: the inverse rule of three (called by Recorde, Baker, &c., the *backer* rule); and the double rule of three. Some of the writers of Cocker's school, apparently by an abbreviation of his words, tell us that the rule of three inverse is used 'when less requires more and more requires less;' meaning that the greater the third of the given numbers, the less will be the answer, and *vice versâ*. Thus, suppose that 10*l*. has been lent me for 3 months, and I want to know how long I ought to lend a given sum (other than 10*l*.) in return: evidently the more I lend, the less the time for which I ought to lend it. If the sum be 15*l*., then 3 months is to the time required, not as 10 to 15, but in its inverse ratio, as 15 to 10, or $15 : 10 :: 3 : 3\times 10 \div 15$, or 2; and 2 months is the answer required.

The double rule of three (at least in the class of questions which are usually considered as falling under it) is applied where time is an element in the production which the question supposes. For example: supposing it known that A men can pave B square feet in C days, it may be asked how many men can pave b square feet in c days, or how many square feet can a men pave in c days, or how many days will it take a men to pave b square feet. If we write down the data and answer in two lines, and in the following order—force employed—effect produced—time of production—thus,

$$\begin{array}{ccc} \mathrm{A} & \mathrm{B} & \mathrm{C} \\ a & b & c \end{array}$$

the rule is—Take such an answer as will make the extremes of each line multiplied by the mean of the other, the same in both. That is, let $\mathrm{A}b\mathrm{C} = a\mathrm{B}c$, and according as a, b, or c is to be found, the mode of working is as follows:—

$$a = \frac{\mathrm{A}b\mathrm{C}}{\mathrm{B}c},\ b = \frac{a\mathrm{B}c}{\mathrm{AC}},\ c = \frac{\mathrm{A}b\mathrm{C}}{a\mathrm{B}}$$

The proof is as follows:—*One* man in C days could pave $\frac{\mathrm{B}}{\mathrm{A}}$ square feet, and in *one* day $\frac{\mathrm{B}}{\mathrm{AC}}$ square feet. By similar reasoning one man in one day could pave $\frac{b}{ac}$ square feet. Hence

$$\frac{\mathrm{B}}{\mathrm{AC}} = \frac{b}{ac};\ \text{or } a\mathrm{B}c = \mathrm{A}b\mathrm{C}.$$

The principal caution which a beginner requires is;—not to suppose that the rule of three (or the rule of finding a fourth quantity which, with three others, shall constitute a proportion) is to be applied in all cases in which three quantities are given to find a fourth. That such a caution is necessary arises from the defect of works on arithmetic; which frequently exhibit this rule without any mention of proportion, and leave it to be inferred that there is but one way of obtaining a fourth quantity from three others.

THREE RIVERS. [CANADA.]

THRIO'THORUS, M. Vieillot's name for a genus of birds, *Sylvia*, Lath., and placed by Mr. G. R. Gray in his subfamily TROGLODYTINÆ, of his family *Certhidæ*.

THRIOTHU'RUS, M. Vieillot's name for a genus of Birds (*Sylvia*, Lath.), placed by Mr. G. R. Gray in his subfamily TROGLODYTINÆ.

THROCMORTON, SIR NICHOLAS, was descended from an antient family in Warwickshire, and his ancestors had been employed in the higher offices of state for some centuries. His father, Sir George Throcmorton, had been in favour with Henry VIII., but, being a zealous papist, he incurred the king's displeasure by refusing to take the oath of supremacy, and about 1538 was imprisoned in the Tower of London, where he remained several years.

Nicholas, who was Sir George's fourth son, was born about the year 1513. Having been appointed page to the Duke of Richmond, the king's natural son, he accompanied his master to France, and remained in his service till the duke's death in 1536.

Sir George Throcmorton was released from the Tower in 1543. His son Nicholas was then appointed sewer to the king, in which it was his duty to attend the

> 'marshall'd feast,
> Serv'd up in hall with sewer and seneschal.'

In 1544 he headed a troop in the armament against France which Henry VIII. commanded in person; he assisted at the siege of Boulogne, and after his return received a pension from the king as a reward for his services. After the king's death he attached himself to the queen-dowager Catherine Parr, and to the Princess Elizabeth. In 1547 he distinguished himself in the campaign in Scotland under the Protector Somerset; he was present at the battle of Pinkey (or Musselburgh), and Somerset sent him to London with the news of the victory. He was soon afterwards created a knight, appointed to a place in the privy-chamber, and admitted to great intimacy with Edward VI. The king bestowed upon him some valuable manors, and made him under-treasurer of the Mint. He sat in parliament during Edward's reign as member for Northampton.

A short time before the king's death, Sir Nicholas married the daughter of Sir Nicholas Carew, and on taking his wife to visit his father at Coughton in Warwickshire, he was received with coldness by the old knight; partly perhaps on account of his Protestant principles, but chiefly because he had been knighted before his eldest brother. To remove this cause of offence, he took his brother back with him to court, and, at the request of Sir Nicholas, the king raised him to the dignity of a knight.

Sir Nicholas Throcmorton was present when Edward VI. died at Greenwich in 1553. He was aware of the designs of the partisans of Lady Jane Grey, but, though a Protestant, he was too much attached to law and legitimacy to give the least sanction to them. He therefore came immediately to London, and despatched Mary's goldsmith to announce to her the king's demise.

On the 2nd of February, 1554, Sir Nicholas Throcmorton was arrested and committed to the Tower on a charge of being concerned in the rebellion of Sir Thomas Wyatt. On the 17th of April he was brought to trial at Guildhall, London. This trial is the most important and interesting event in his life. A report of it, taken from Holinshed, is given in the 'Library of Entertaining Knowledge—Criminal Trials.' It is certain that he was acquainted with Wyatt's intentions, and there is little doubt that he was to some extent implicated in the rebellion. He was tried before commissioners, some of whom were bitterly inimical to him, and who seemed to regard his trial as merely a form necessary to be gone through previous to his execution. Sir Nicholas however conducted his own defence; and this he did with such admirable adroitness, such promptness of reply and coolness of argument, intermixed with retorts, spirited, fearless, and reiterated, in answer to the partial remarks of the lord chief justice and other commissioners, and followed up by an impassioned earnestness of appeal to the jury, that, in defiance of the threats of the chief justice and the attorney-general, he obtained a verdict of acquittal. Sir Nicholas was directed to be discharged, but was remanded, and kept in prison till the 18th Jan., 1555. The jury were made to suffer severely for their independent verdict. Two were fined 2000*l*. each, six were fined 1000 marks each, and four, who expressed contrition, were not fined. All were remanded to prison, where they remained till the 12th of December, when five were discharged on payment of the reduced fine of 220*l*. each, three on payment of 60*l*. each, and four without fine.

Sir Nicholas Throcmorton, after his release, avoided the approaching storm of persecution by going to France, where he remained till 1556. Though he afterwards served in Queen Mary's army under the Earl of Pembroke, he devoted himself chiefly to the princess Elizabeth, whom he visited privately at Hatfield. When Queen Mary died, he was admitted to see her corpse, and, as Elizabeth had requested, took from her finger the wedding-ring which had been given to her by Philip, and delivered it to Elizabeth. Elizabeth gave him the office of chief butler of England, a situation of some dignity, but inconsiderable emolument, and afterwards made him chamberlain of the exchequer. In 1559 he was sent on an embassy to France, and remained at the French court as resident ambassador till the beginning of 1563. Dr. Forbes has published the greater part of Throcmorton's correspondence with his own government while he was in this confidential situation. It displays great diplomatic skill and management, but perhaps rather too much tendency to intrigue; and he supported the cautious and somewhat doubtful policy of Cecil with zeal and discretion. Indeed he was on the most confidential terms with Cecil during the whole of this period, but after his return a coolness arose between the two statesmen, which increased till it became a strong personal animosity.

In 1565 Throcmorton was sent on a special embassy to Scotland, to remonstrate with Mary Queen of Scots against her intended marriage with Darnley; and when Mary was imprisoned at Lochleven in 1567, Throcmorton was commissioned by Elizabeth to negotiate with the rebel lords for her release.

In 1569 Throcmorton was sent to the Tower on a charge, which indeed appears to have been well founded, of having been engaged in the intrigue for a marriage between Mary Queen of Scots and the Duke of Norfolk. Though he was not kept long in confinement, he never afterwards regained the confidence of Elizabeth, and the distress of mind occasioned by the loss of her favour has been thought to have hastened his death, which took place at the house of the Earl of Leicester, Feb. 12, 1571, in his 58th year.

Sir Francis Walsingham, in a letter to the Earl of Leicester, on the occasion of Throcmorton's death, says of him that 'for counsel in peace and for conduct in war he hath not left of like sufficiency that I know.' Camden says he was 'a man of large experience, piercing judgment, and singular prudence; but he died very luckily for himself and his family, his life and estate being in great danger by reason of his turbulent spirit.'

(*Criminal Trials*, in *Library of Entertaining Knowledge; Pictorial History of England.*)

THROMBUS is a tumour formed by blood effused from a vein after bleeding, and coagulated in the adjacent cellular tissue. It is a kind of intense ecchymosis or bruise, and usually arises from the puncture in the vein not having been made exactly opposite that in the skin, so that some of the blood, instead of flowing out, is infiltrated between the vein and the surface. It is rarely of sufficient importance to require treatment, and is usually removed like the effused blood of an ordinary bruise. Sometimes however inflammation ensues around the tumour, which should be treated by leeches and cold; or, if it proceed to suppuration, should be managed like a common abscess.

THROSTLE. [THRUSHES.]

THRUSH, or Aphthæ, is a disease which commonly appears in the form of minute opaque-white vesicles scattered over the interior of the mouth and fauces. Vesicles or blisters of this kind often appear in a succession of eruptions, those which were first formed bursting and leaving tender and raw surfaces, while others are breaking out; and thus continuing through the whole course of some general disorder of the system.

The only variety of thrush in which the eruption is the most obvious sign of disease is that which is called milk-thrush, or aphtha infantum, or sometimes, in the supposition that it is the primary disease, idiopathic thrush. This however is almost always connected with disturbance of the digestion and other functions, and is usually traceable to some error of diet. It is most frequently observed in children that are brought up 'by hand;' and, in ordinary cases, requires only the means adapted to correct the disturbed digestion, such as small doses of magnesia and gentle purgatives. In very weakly children however, and in those that are ill fed and clothed, the surface of the mouth and fauces, exposed by the bursting of the vesicles, may slough or ulcerate; and this condition is always a sign of the necessity of administering tonics, nutritious food, and even powerful stimulants, such as wine or brandy. It is this form of thrush which is usually described as aphtha maligna.

In adults, thrush is a very common occurrence in the advanced stages of many diseases, such as typhoid and other acute fevers, the hectic fever accompanying phthisis, diabetes, &c.: in short, in nearly all cases in which there is great prostration of strength, thrush may occur. In these cases, the only treatment that can be applied peculiarly to it is local. Great relief is often afforded by lightly sponging the affected surfaces with a solution of nitrate of silver, in the proportion of eight or ten grains to an ounce of water. Gargles, consisting of a drachm of alum to a pint of water or acidulated infusion of roses, or of one or two drachms of sub-borate of soda to half a pint of water, are often beneficial; and so is the mel boracis of the Pharmacopœia, when a small quantity of it is held for a few minutes in contact with the affected part.

THRUSHES. Under this name many ornithologists treat of the whole of the MERULIDÆ, in which article the views of Mr. Vigors, Mr. Swainson, and the Prince of Musignano, now Prince of Canino, with regard to this family, are given.

Since the article *Merulidæ* was written, Mr. G. R. Gray has published his 'List of the Genera of Birds,' and we proceed to lay before our readers his arrangement.

Mr. G. R. Gray makes the *Turdidæ* (*Turdus*, Linn.) the second family of his third tribe (*Dentirostres*) of his second order (*Passeres*). The *Dentirostres* are placed by him between the *Tenuirostres* and the *Conirostres*, and the *Turdidæ* between the *Luscinidæ* and the *Muscicapidæ*.

The following are the subfamilies and genera into which Mr. G. R. Gray divides the Turdidæ:—

Subfam. 1. Formicarinæ.

Genera:—*Notodela*, Less.; *Eupetes*, Temm.; *Ajax*, Less.; *Dasycephala*, Sw.; *Pithys*, Vieill.; *Formicivora*, Sw.; *Myrmeciza*, G. R. Gray; *Urotomus*, Sw.; *Malurio*, Less.; *Corythopis*, Sundev.; *Brachypteryx*, Horsf.; *Macronus*, Jard. and Selby; *Tinactor*, Pr. Max.; *Formicarius*, Bodd.; *Chamæza*, Vig.; *Grallaria*, Vieill.: *Cissa*, Boie; *Brachyurus*, Thunb.; *Myiophoneus*, Temm.; *Hydrobata*, Vieill.

Subfam. 2. Turdinæ.

Genera:—*Petrocossyphus*, Boie; *Orocetes*, G. R. Gray; *Larvivora*, Hodgs.; *Bessonornis*, Smith; *Saxicolides*, Less.; *Chaëtops*, Sw.; *Geocichla*, Kuhl; *Zoothera*, Vig.; *Myiophaga*, Less.; *Oreocincla*, Gould; *Turdus*, Linn.; *Merula* (Ray), Boie; *Mimus*, Briss.; *Toxostoma*, Wagl.

Subfam. 3. Timalinæ.

Genera:—*Donacobius*, Sw.; *Pellorneum*, Sw.; *Aipsnemia*, Sw.; *Crateropus*, Sw.; *Garrulax*, Less.; *Actinodura*, Gould; *Cinclosoma*, Vig. and Horsf.; *Suya*, Hodgs.; *Sibia*, Hodgs.; *Tesia*, Hodgs.; *Malacocercus*, Sw.; *Timalia*, Horsf.; *Pomatorhinus*, Horsf.; ——? *Paludicola*, Hodgs.; *Icteria*, Vieill.; *Turnagra*, Less.

Subfam. 4. Oriolinæ.

Genera:—*Dulus*, Vieill.; *Sphecotheres*, Vieill.; *Oriolus*, Linn.; *Mimeta*, Vig. and Horsf.; *Analcipus*, Sw.; *Sericulus*, Sw.; *Oriolia*, J. Geoff.

Subfam. 5. Pycnonotinæ.

Genera:—*Microscelis*, G. R. Gray; *Microtarsus*, Eyton; *Malacopteron*, Eyton; *Trichophorus*, Temm.; *Hypsipetes*, Vig.; *Yuhina*, Hodgs.; *Phyllastrephus*, Sw.; *Hæmatornis*, Sw.; *Pycnonotus*, Kuhl; *Andropadus*, Sw.; ? *Trichixos*, Less.; ? *Setornis*, Less.

Mr. G. R. Gray, with his usual diligence and accuracy, gives the synonyms of all these genera; and observes, with regard to some of them, that *Drymophila*, Sw., has been used in botany; that *Leptorhynchus*, Menestr., was previously employed; *Petrophila*, Sw., used in botany; *Cossypha*, Vig., used in entomology, only the termination is there in *us; Cichla*, Wagl., previously used in ichthyology; *Paludicola*, Hodgs., previously employed in herpetology; and *Micropus*, and *Brachypus*, Sw., previously used in other branches of natural history.

Some of these forms have already been noticed in detail in this work, and we shall here confine ourselves to the true thrushes, or those so nearly allied to them, that, in common parlance, they are so termed.

EUROPEAN THRUSHES.

The following thrushes are European:—

Black Ouzel, or BLACKBIRD, *Merula vulgaris*, Ray; the *Ring Ouzel*, *Merula torquata*, Briss.; the *Migratory Ouzel*, *Merula migratoria*, Sw.; the *Black-throated Thrush*, *Turdus atrogularis*, Temm.; the *Fieldfare*, *Turdus pilaris*, Linn.; the *Redwing*, *Turdus Iliacus*, Linn.; the *Missel Thrush*, *Turdus viscivorus*, Linn.; the *Song-Thrush*, or *Throstle*, *Turdus musicus*, Linn.; *Naumann's Thrush*, *Turdus Naumanni*, Temm.; the *Pallid Thrush*, *Turdus pallidus*, Pall.; *White's Thrush*, *Turdus Whitei*, Eyton; the *Siberian Thrush*, *Turdus Sibericus*, Pall.; the *Water Ouzel*, or *Common Dipper*, *Cinclus aquaticus*, Bechst.; the *Black-bellied Water-Ouzel*, *Cinclus melanogaster*, Brehm; Pallas's *Water Ouzel*, *Cinclus Pallasii*, Temm.; the *Rock-Thrush*, *Petrocincla saxatilis*, Vig.; and the *Blue-Thrush*, *Petrocincla cyaneus*, Vig.

Of these, the WATER OUZEL, or *Common Dipper*; the *Missel Thrush*; *White's Thrush* (occasional only); the *Song Thrush*; the *Fieldfare*; the *Redwing*; the *Blackbird*; and the *Ring Ouzel*, or RING BLACKBIRD, are British.

We select as an example the sweetest songster among this tribe, in our opinion at least, and we write it without disrespect to the rich mellow whistle of the blackbird, or the loud stirring notes of the missel thrush.

The *Throstle* or *Song Thrush*.

This well-known bird needs no description. It is the *Grive* and *Petite Grive* of the French; *Tordo*, *Tordo commune*, and *Tordo Bottaccio* of the Italians; *Sing-drossel*, or *Weiss-drossel*, of the Germans; *Mavis*, with the other names above given, of the modern British;* and *Aderyn bronfraith* of the antient British.

Geographical Distribution.—Inhabits every country in Europe, haunting gardens and woods near streams or mea-

* N.B. The *Mauvis* of the French is the *Redwing*.

dows. Bechstein says that in Germany, as soon as the autumnal fogs appear, the throstles collect in large flights to seek a warmer climate, the principal time of passage being from the 15th of Sept. to the 15th of October, and the return about the middle or end of March, when each pair seeks its own district. In Britain it is permanent, and spread over England, Wales, Ireland, Scotland, and its islands. Russia, Denmark, Sweden, and Norway possess it. In the south, besides Germany, France, Italy, and Greece have it. It has been seen in winter at Smyrna and Trebizond. Professor Nilsson states that it leaves Sweden for the winter, and comes farther south. Mr. Selby observes that such visitors arrive in Britain with a north or north-east wind, and, after staying a few days to recruit, move southward.

Habits, Food, &c.—Worms, insects, snails, and fruits form the food of the throstle. The common garden-snail, *Helix hortensis*, and the wood-snail, *Helix nemoralis*, are killed and eaten in great numbers by this species. The bird beats and breaks the shells against a stone to get at the animals. The nest is made of green moss generally, and fine root-fibres on the outside, and is lined within with cow-dung and decayed wood, the lining forming a cement, so perfectly spread that it will hold water. Eggs four or five, of a light blue, the larger end having a few small black specks or spots. Time of incubation thirteen days. The first hatch generally comes forth in April, but the young have been known to be out at the end of March. There are generally two broods in the year. Both the cock and the hen sit, but the former less than the latter. He often feeds her on the nest. A holly, a thick bush—a tall one is mostly preferred—a dense and somewhat high shrub or a fir, is usually selected; but the bird has been known to breed in an open shed or tool-house, and does not seem to shun the neighbourhood of man. In 1833 a pair built their nest in a low tree at the bottom of Gray's Inn Gardens, near the gates where passengers are going by all day long. The hen laid her complement of eggs, and was sitting on them, when a cat climbed up and killed her on the nest. The cock immediately deserted the place.

Bechstein states that in captivity the Throstle is easily taught to perform airs. For taking it he recommends a perch with a limed twig as the best mode of capturing a fine-toned male: but in September or October he says that they may be caught in the water-traps, where they repair at sunrise and sunset, so late that they sometimes cannot be seen, and the bird-catcher is only guided by his ear. He observes that, when the birds enter the water, there must be no haste on the part of the fowler, because they like to bathe in company, and assemble sometimes to the number of ten or twelve at once, by means of a peculiar call. Bechstein tells us that the first which finds a convenient stream, and wishes to go to it, cries in a tone of surprise or joy, '*sik, sik, sik, siki, tsac, tsac, tsac:*' then all the thrushes in the neighbourhood immediately reply in concert and repair to the place. The bath is entered however with a good deal of circumspection on their parts, and they seldom venture till they have seen a Red-breast bathe without danger. But the first that bathes is soon followed by others, and they begin to quarrel among themselves if the bath is not large enough to accommodate all satisfactorily. Bechstein further remarks that it is a good plan to have a tame bird running and fluttering on the banks of the stream, as a decoy to attract them.

Asiatic Thrushes.

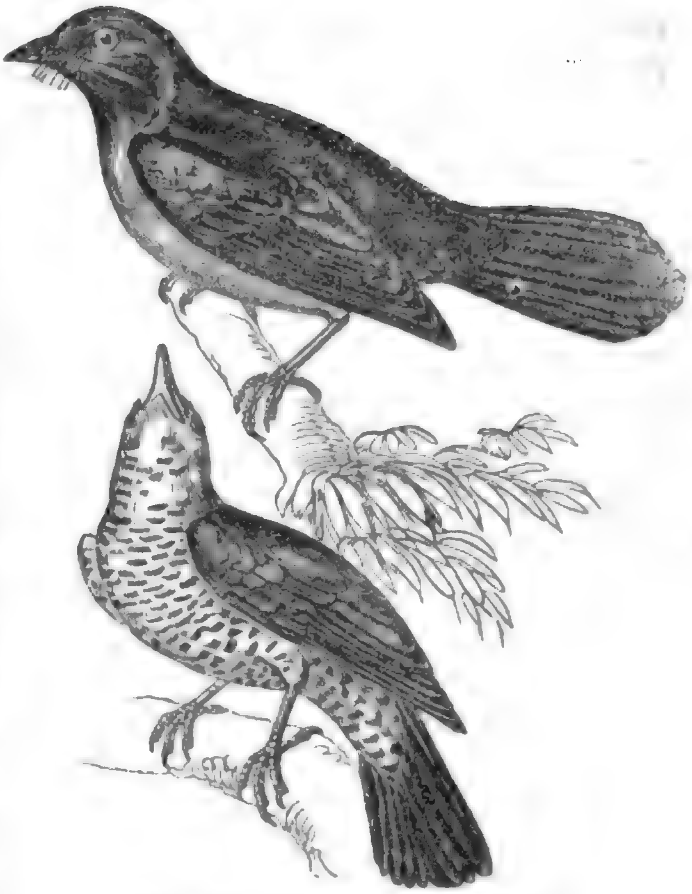
Example, *Turdus erythrogaster*.

Description.—*Male.*—Grey-cærulescent above; the cheeks, the sides of the neck, and the quills black; breast, abdomen, and rump red; beak and tarsi black.

Female differs in being cærulescent-brown, the lower part of the back obscurely banded with brown; neck in front whitish marked with dark brown; breast, abdomen, and rump reddish-white marked with undulations. Length 8¼ inches.

Mr. Gould (*Century of Birds from the Himalaya Mountains*) states that this beautiful species exhibits a marked departure in the style of colouring from its more typical congeners; and were it not that its form dictated the situation in which it is retained, it would otherwise seem to be allied in many respects to the genus *Petrocincla*.

Locality.—The rocky districts of Himalaya; never found in the low lands.



Turdus erythrogaster, male and female. (Gould.)

African Thrushes.

Example, *Turdus strepitans*, Smith (*Merula Letsitsirupa* of the same).

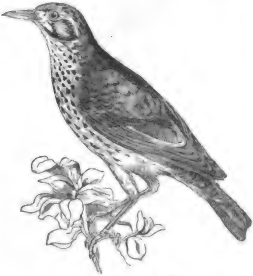
Description.—*Male.*—Front and top of head brownish-grey; occiput, upper aspect of neck, interscapulars, scapulars, and shoulders deep yellowish-grey, faintly shaded with brown; back, rump, and upper tail-coverts dirty ash-grey. Under parts white, tinted in places with ochre-yellow; sides of the neck, whole of the breast, flanks, and belly variegated with blackish-brown pyriform spots, one on each feather, the large end reaching nearly to its point. Sides of the head white, slightly tinted with ochre-yellow, variegated below the eyes with three blackish-brown bands; the foremost proceeds from the base of the lower mandible, the second from the middle of the under eyelid, and the third from the outer angle of the eye; the first extends nearly horizontally, and the two others obliquely downwards and backwards till they unite with the horizontal one. Primary wing-coverts and primary quill-feathers deep brownish-red, the latter tipped and edged externally with yellowish-white; the first two-thirds at least of the inner vanes of these feathers are of a clear buff-colour, darkest towards the shafts; secondary wing-coverts and secondary and tertiary quill-feathers dark greyish-brown, the outer vanes lightest, all margined externally and tipped with dirty white. Eyes reddish brown; upper mandible and tip of lower inferiorly as well as the claws liver-brown; lower mandible elsewhere, and the cutting edge of upper, pale saffron-yellow. Feet and insides of the bill deep straw-yellow.

Figure robust and rather short. Bill long, and moderately strong; upper mandible broad and slightly depressed towards the base, narrow and distinctly notched near the tip; culmen between nostrils elevated and rounded, towards the point of the bill strongly curved; nasal fossæ large and membranous, the nostrils narrow longitudinal slits near to the edges of the mandible; wings short and rounded, and when folded they reach over the first half of the tail; the first quill-feather rudimentary, the third rather the longest; the second and fourth of equal length, and scarcely shorter than the third; the fifth a little shorter than the fourth, and the remaining primaries diminish in length successively. Tail short and slightly forked. Legs long, tarsi robust, anteriorly indistinctly scutellated, posteriorly entire; toes strong, the inner and outer toes of the same length; claws strong, much curved and pointed. Length from point of bill to tip of tail eight inches six lines

Female differing but little in colour, if at all, from the male. (Smith.)

Locality, Habits, Food, &c.—Dr. Smith states that immediately upon reaching Kurichane, this thrush began to appear in the thickets, and he continued to acquire occasionally a specimen even in the vicinity of the tropic. It seeks, he says, its food upon the ground, and, when so occupied, its resort is readily discovered by the natives from the noise it makes in scratching the ground, or in displacing rubbish and decayed leaves which conceal the insects it is seeking. The name by which it is known in the country it inhabits is, he informs us, characteristic of the vigour with which it employs its feet, and the nearest translation he can give is 'Ground-Scraper.'

Dr. Smith further remarks that the form of its bill, particularly towards the base, the length of its legs, and the shortness of its tail, are all characters which remove it from the more typical species of the genus *Turdus;* but yet there is in its structure and habits what necessarily constitutes it a true thrush. (*Illustrations of the Zoology of South Africa.*)



Turdus strepitans, male. (Smith.)

AMERICAN THRUSHES.

Example, *Turdus mustelinus*, Gm.

Description.—Above, bright cinnamon brown, brightening into rufous on the head, and inclining to olive on the rump and tail. Beneath, whitish, thickly marked with pencil-shaped dusky spots. Vent pure white. Orbits of the eye white. Bill dusky brown, slightly notched, lower mandible flesh-coloured towards the base. Legs and claws very pale flesh-colour. Iris dark chocolate. Length 8 inches; alar extent 13 inches. (Nuttall.)

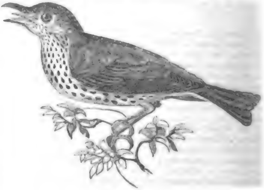
This appears to be the *Turdus melodus* of Wilson and *Tawny Thrush* of Pennant, and is generally known as the *Wood Thrush.*

Locality, Habits, Food, &c.—Nuttall states that this solitary and retiring songster inhabits, during summer, the whole continent from Hudson's Bay to Florida, and, according to his friend Mr. Ware, breeds as far south as the vicinity of Natchez, in the State of Mississippi. He remarks that it is not satisfactorily ascertained whether the species quits the boundaries of the United States in winter, because the bird is then silent, and always difficult of access. He thinks it probable that this Thrush may winter in the Southern States, as a young bird, gleaning insects and berries, had been caught in a garden in Boston on the 26th October.

But, wherever the Wood Thrush may winter, it arrives in the Middle States from the 1st to the 15th of April. Nuttall thus describes its song and habits:—

'At the dawn of morning he announces his presence in the woods, and from the top of some tall tree, rising through the dark and shady forest, he pours out his few clear and harmonious notes in a pleasing reverie, as if inspired by the enthusiasm of renovated nature. The prelude to this song resembles almost the double tonguing of the flute, blended with a tinkling, shrill, and solemn warble, which re-echoes from his solitary retreat, like the dirge of some sad recluse who shuns the busy haunts of life. The whole air consists usually of four parts or bars, which succeed, in deliberate time, and finally blend together in impressive and soothing harmony, becoming more mellow and sweet at every repetition. Rival performers seem to challenge each other from various parts of the wood, vying for the favour of their mates, with sympathetic responses and softer tones; and, some wageing a jealous strife, terminate the warm dispute by an appeal to combat and violence. Like the Robin and the Thrasher, in dark and gloomy weather, when other birds are sheltered and silent, the clear notes of the Wood Thrush are heard through the dropping woods, from dawn to dusk, so that, the sadder the day, the sweeter and more constant is his song. His clear and interrupted whistle is likewise often nearly the only voice of melody heard by the traveller, to mid-day, in the heat of summer, as he traverses the silent, dark, and wooded wilderness, remote from the haunts of men. It is nearly impossible by words to convey any idea of the peculiar warble of this vocal hermit, but amongst his phrases the sound of *'airŏee*, peculiarly liquid, and followed by a trill, repeated in two interrupted bars, is readily recognisable. At times their notes bear a considerable resemblance to those of Wilson's Thrush, such as *eh rhehu 'vrehu*, then varied to *'eh villia villia*, *'eh villia vrehu*, then, *'eh villa villu*, high and shrill.

'The Wood Thrush is always of a shy and retiring disposition, appearing alone, or only in single pairs, and, while he willingly charms us with his song, he is content and even solicitous to remain concealed. His favourite haunts are low shady glens by watercourses, often rendered dark with alder-bushes, mantled with the trailing grape-vine. In quest of his insect prey he delights to follow the meanders of the rivulet, through whose leafy shades the sunbeams steal only in a few uninterrupted rays over the sparkling surface of the running brook. So partial is this bird to solitude, that I have known one to sing almost uniformly in the same place, though nearly half a mile from his mate and nest. At times, indeed, he would venture a few faltering low notes in an oak near his consort, but his mellowest morning and evening warble was always delivered from a tall hickory, overtopping a grove of hemlock firs, in which the dimness of twilight prevailed at noon. The Wood Thrush, like the Nightingale, therefore, feels inspired in darkness, but, instead of waiting for the setting sun, he chooses a retreat where the beams of day can seldom enter. These shady retreats have also an additional attraction to our Thrush; it is here that the most interesting scene of his instinctive labour begins and ends, here he first saw the light, and breathed into existence, and here he now bestows his nest in a sapling oak, or in the next thick laurel or blooming alder, whose berries afford him an ample repast in the coming autumn. Outwardly it presents a warm bed of withered beach or oak leaves, above these a layer of coarse old grass and leaf-stalks is laid, tempered with a mixture of mud and decayed wood smoothly plastered, so as to form a crust like the nest of the Robin. The whole is then surmounted by a thin lining of the black fibrous radicles of the fern.'



Wood Thrush.

The same author states that the eggs, which are four or five in number, are scarcely distinguishable from those of the Robin, and of an uniform bright greenish blue destitute of spots. Beetles, caterpillars, and other insects, and in autumn berries, constitute the principal food of the species. Nuttall further states that the young remain for weeks around gardens in quest of berries, and that they are particularly fond of those of the various species of cornel and *viburnum*. At this season, he says, they occasionally leave their favourite glens, and in their devious wanderings, previous to their departure, sometimes venture to visit the rural suburbs of the city. The young, it appears, are easily reared, and, like our Throstle, sing nearly as well in the cage as in their native wilds. (*Manual of the Ornithology of the United States and of Canada.*)

THUA'NUS. [Thou, De.]

THUCY'DIDES (Θουκυδίδης), the son of Olorus, or Orolus, and Hegesipyle, was a native of the demus of Alimus in Attica. He was connected by his mother's side with the family of the great Miltiades, and the name of his father was a common one among the Thracian princes. If he was forty years old at the commencement of the Peloponnesian war, according to the statement of Pamphila (Gellius, xv. 23), he was born in B.C. 471. In his own work he nowhere mentions his age or the time of his birth, but he says that he lived through the whole of the Peloponnesian war, and that he was of the proper age for observing its progress (v. 26).

Our principal information respecting the life of Thucydides is a biography of him written by Marcellinus, which is however full of contradictions and doubtful stories. There is also an anonymous biography of him prefixed to many editions of his works, which is still worse than that of Marcellinus. Thucydides mentions incidentally a few facts concerning himself, which is almost all that we know with certainty about his life.

There is a well-known story that when a boy he heard Herodotus read his History at Olympia, and was so much moved that he burst into tears. But there is good reason for believing that this recitation of the History of Herodotus never took place at the Olympic games [Herodotus]; and if there is any foundation for the story of Thucydides having heard him read it, we would rather refer it to a later recitation at Athens, which is mentioned by Plutarch and Eusebius. Suidas is the only writer who says that Thucydides heard Herodotus at Olympia; Marcellinus and Photius relate the same tale without mentioning where the recitation took place.

There seems nothing improbable in the accounts of the antient biographers that Thucydides was taught philosophy by Anaxagoras and rhetoric by Antiphon; but their statement that he accompanied the Athenian colony to Thurii is probably a mistake arising from their confounding him with Herodotus, who, we know, was of the colonists. But whether he went to Thurii or not, it is certain that he was in Athens in the second year of the Peloponnesian war, B.C. 430, when he was one of those who had the plague. (Thucyd., ii. 48.) In the eighth year of the war, B.C. 424, he was in command of an Athenian fleet of seven ships, which lay off Thasos. Brasidas, the Lacedæmonian commander, made an attempt to obtain possession of Amphipolis on the Strymon, which then belonged to Athens; and Thucydides, as soon as he heard of it, sailed to protect Amphipolis, but was only in sufficient time to save Eion, a seaport at the mouth of the Strymon. Amphipolis had fallen before he could arrive there. (Thucyd., iv. 102, &c.) For this he was either condemned to death or banished by the Athenians in the year following, B.C. 423; and in consequence of the sentence passed upon him he spent twenty years in exile, namely, till B.C. 403. (Thucyd., v. 26.) This year coincides exactly with the restoration of the democracy by Thrasybulus, when a general amnesty was granted, of which Thucydides seems to have availed himself. Where he passed the time of his exile is not mentioned by himself. Marcellinus says that he first went to Ægina, and afterwards to Scapte-Hyle in Thrace, opposite the island of Thasos, where he had some valuable gold-mines. (Compare Plutarch, *De Exilio*, p. 605.) It appears however not improbable that he visited several places during his exile: the intimate knowledge which he shows respecting the history of the Italiotes and Sicceliotes almost inclines one to suppose that he may have visited Italy and Sicily after the failure of the Athenian expedition in the latter island. His property in Thrace would however naturally lead him to pass the greater part of his time in that country. This property, which was very considerable (Thucyd., iv. 105), was probably derived from his family, which came from Thrace, though Marcellinus says that he obtained it by marrying a Thracian heiress.

How long he lived after his return from exile, and whether he continued at Athens till the time of his death, is quite uncertain. According to some accounts he was assassinated at Athens, according to others he died at Thasos, and his bones were carried to Athens. He is said to have been buried in the sepulchre of the family of Miltiades.

The Peloponnesian war forms the subject of the History of Thucydides. He tells us that he foresaw it would be the most important war that Greece had ever known, and that he therefore began collecting materials for its history from its very commencement; that, where he had to rely upon the testimony of others, he carefully weighed and examined the statements that were made him; and that he spared neither time nor trouble to arrive at the truth, and that in consequence of his exile he was enabled to obtain information from the Peloponnesians as well as his own countrymen (i. 22; v. 26). Though he was engaged in collecting materials during the whole of the war, he does not appear to have reduced them into the form of a regular history till after his return from exile, since he alludes in many parts of it to the conclusion of the war (i. 13; v. 26, &c.). He did not however live to complete it: the eighth book ends abruptly in the middle of the year B.C. 411, seven years before the termination of the war. Even the eighth book itself does not seem to have received the last revision of the author, although there is no reason at all for doubting its genuineness, as it bears on every page indubitable traces of his style and mode of thought. Some antient writers however attributed it to his daughter, others to Theopompus or Xenophon. As the work of Thucydides is evidently incomplete, it would appear that it was not published in his lifetime; and there is therefore great probability that the statement is correct which attributes the publication of it to Xenophon. Niebuhr has brought forward reasons which seem to render it almost certain that Xenophon's 'Hellenics' consist of two distinct works, and that the last five books were not published till long after the first two. The first two, which seem to have borne the title of the 'Paralipomena' of Thucydides, complete the history of the Peloponnesian war, and were not improbably published by Xenophon, together with the eight books of Thucydides. (Niebuhr, in *Philological Museum*, i. 485, &c.)

The first book of Thucydides is a kind of introduction to the history. He commences by observing that the Peloponnesian war was more important than any that had been known before; and to prove this, he reviews the state of Greece from the earliest times down to the commencement of the war (c. 1-21). He then proceeds to investigate the causes which led to it, of which the real one was the jealousy which the Peloponnesians entertained of the power of Athens; and interrupts his narrative to give an account of the rise and progress of the Athenian empire down to the commencement of the war (c. 89-118). He had an additional reason for making this digression, since this history had either been passed over by previous writers altogether, or had been treated briefly, without attention to chronology (c. 97). He resumes the thread of his narrative at c. 119, with the negotiations of the Peloponnesian confederacy previous to the declaration of the war; but the demand of the Lacedæmonians, that the Athenians should drive out the accused, which was answered by the Athenians requiring the Lacedæmonians to do the same, leads to another digression respecting the treason and death of Pausanias (c. 128-134); and as proofs were found implicating Themistocles in the designs of the Spartan king, he continues the digression in order to give an account of the exile and death of Themistocles (c. 135-138). He then resumes the narrative, and concludes the book with the speech of Pericles which induced the Athenians to refuse compliance with the demands of the Peloponnesians. The history of the war does not therefore begin till the second book; but it would be out of place to give here an abstract of the remainder of the work.

Thucydides had formed a high opinion of the value and importance of the work he had undertaken. It was not his object to afford amusement, like former writers, but to give such a faithful representation of the past as would serve as a guide for the future (i. 22). His observation of human character was profound; he penetrates with extraordinary clearsightedness into the motives and policy of the leading actors of the war; and he draws from the events he relates those lessons of political wisdom which have always made his work a favourite study with thoughtful men of all countries.

He claims for himself the merit of the strictest accuracy, and it is impossible to read his History without being convinced of the trustworthiness of his statements. His impartiality also is conspicuous: although he had been banished from his native city, he does not, like Xenophon, turn renegade, and try to misrepresent the conduct and motives of his own countrymen. Although a contemporary, and one who had taken an active part in public affairs, he writes as free from prejudice and party-feeling as if he had lived at a time long subsequent to the events he narrates.

His History is constructed on entirely different principles from those of his predecessors. He confines himself strictly to his subject, and seldom makes any digressions. He feels deeply the importance of his work, and constantly strives to impress the same feeling upon his readers. He had proposed to himself a noble subject, and writes with the consciousness of the value of his labours, and the presentiment that his work will be read in all future ages. There is consequently a moral elevation in his style and mode of treating a subject, which is scarcely to be found in any other writer except Tacitus.

In narrating the events of the war, Thucydides pays particular attention to chronology. He divides each year into two portions, the summer and the winter, and is careful to relate under each the events that took place respectively during that time. The speeches which he introduces are not mere inventions of his own, but contain the general sense of what the speakers actually delivered, although the style and the arrangement are his (i. 22).

The style of Thucydides is marked by great strength and energy. Not only his expressions, but even single words seem to have been well weighed before they were used; each has its proper force and significance, and none are used merely for the sake of ornament and effect. The style is not easy, and it is probable that Thucydides never intended it should be so, even to his own countrymen: his work was not to be read without thought. Still his style is open to serious objections. He does not sufficiently consult perspicuity, which is the first virtue in all writing. His sentences too are frequently unnecessarily long, and the constructions harsh and involved. These remarks are more especially applicable to the speeches inserted in the History, which Cicero found as difficult as we do. (*Orator.*, 9.)

The Greek text was first published by Aldus, Venice, 1502, and the scholia in the following year. The first Latin translation, which was made by Laurentius Valla, appeared at Paris in 1513, fol. The first Greek and Latin edition was that of Henry Stephens, the Latin being the translation of Valla, with corrections by Stephens, 1564, fol. Among the modern editions, those most worthy of notice are Poppo's, which contains two volumes of prolegomena, with the scholia and numerous notes, Leipzig, 10 vols. 8vo., 1821-1838; Haack's, with selections from the Greek scholia and short notes, which the student will find very useful, 2 vols. 8vo., Leipzig, 1820, reprinted in London, in 3 vols. 8vo. 1823; Göller's, 2 vols. 8vo., Leipzig, 1836, 2nd edition, reprinted in London; and Arnold's, 3 vols. 8vo., Oxford, 1830-1835, of which a second edition is in course of publication.

There are translations of Thucydides into most of the modern European languages. In English the first translation was made by Thomas Nicolls, from the French version of Seysel, and was published in London, 1550, fol. This was succeeded by the translations of Hobbes and William Smith, which have been frequently reprinted. The most recent is by S. T. Bloomfield, 3 vols. 8vo., London, 1829. The most recent translation in German is by Klein, München, 1826, 8vo.; and in French one of the best is said to be by Gail.

Respecting the life of Thucydides, the reader may consult Dodwell, 'Annales Thucydidei et Xenophonteii,' &c., Oxf., 1702, 4to.; and Krüger, 'Untersuchungen über das Leben des Thucydides,' Berlin, 1832.

THUG (from Hindustanee *t'hagna*, to deceive) means a deceiver, and is the special appellation of secret murderers in India, whom since the year 1810 it has been the endeavour of the British government to root out. Of their origin nothing can be said with any degree of certainty. The Thugs themselves refer it to the remotest antiquity, and there is no doubt that the ceremonies with which they carry on their murderous trade can be traced as far back as the Kâlika Purâna, where we find them described with the utmost accuracy. But before we proceed to investigate their secret history, of which we have only a slight and unsatisfactory knowledge, we shall describe them as they were at the time of their discovery. Their gangs, consisting of from ten to two or three hundred men of all races, castes, sects, and religions, yet all joining in the worship of Kali, moved about all parts of India, sacrificing to their tutelary goddess every victim that they could seize, and sharing the plunder among themselves. Still they shed no blood, except when forced by circumstances; murder being their religion, the performance of its duties required secrecy, and the instrument of death was a rope or a handkerchief, which could excite no suspicion. They were stranglers. Every gang had its leader, the *Jemadar* or *Sirdar*; its teacher, the *Guru*, whose duty it was to initiate the novice into the secret of using the *roomal*, or handkerchief. Then come the *Bhuttotes*, that is stranglers, and the *Sothas*, or entrappers, and at last the *Lughaees*, or gravediggers. In a country like India, the striking character of whose inhabitants is an almost incredible apathy, it was easy for them to commit the most outrageous murders without exciting the interest of the victim's relations. The immense jungles which border the roads afforded the Lughaees every facility for effectually concealing the bodies; and the prevailing custom of travelling in parties prevented the designs of the Sotha from being suspected, whenever he succeeded in offering the protection of his Jemadar to travellers whom their wealth induced him to entrap. The Thugs generally assume the appearance of merchants, which increases the confidence of their victims, whom they despatch with the greatest celerity whenever they find a convenient place. Whilst the Bhuttotes arrange themselves in a manner to effect their purpose with facility, the Lughaees dig the hole; and at a given signal the noose is passed round the neck of the traveller, and, being taken unawares, he is strangled without being able to make any resistance. He is then thrown into the hole, and large incisions are made in the abdomen to prevent the corpse from swelling, and the whole is covered over with a layer of dry sand, another of thorns and bushes, and over all is thrown the earth which had been dug out, which they smooth down so as not to attract the notice of travellers. After every murder they offer a sacrifice to Kâli, which they call *Tupounee*. It is performed in the following manner:—A large sheet is spread over the cleanest spot they can select, and on this is cast a pile consisting of one rupee and four annas' worth of coarse sugar; near this they place the consecrated pick-axe (an instrument sacred to Siva and Bhâvanî), and a piece of silver as a *rûpa darsana*, or silver offering. The leader then sits down on the sheet, and the best stranglers place themselves on each side of him with their faces to the west. They then distribute the sugar and eat it in solemn silence. But for this as well as other ceremonies we must refer to the works of Colonel Sleeman and Captain Meadows, as well as to an article in the 130th number of the *Edinburgh Review*. Here it will suffice to state that many ceremonies to which the Thugs attach the greatest importance are scrupulously performed by them both before and after the murder is committed; such as consulting the omens, propitiating Devî, thanksgiving, &c.

We have already observed that Thugs were found exercising their fearful trade in all parts of India. In the Deccan they are called Phânsîgars (from Sanscrit *pâsa*, a noose) or noosers, and on them we have a very interesting paper in the 13th volume of the 'Asiatic Researches.' Their customs are the same as those of the northern Thugs; but, having fewer Mohammedans among them, they are more strict observers of the duties which their religion imposes: they kill neither women, nor old men, nor any of the subjects which the Kâlika Purâna (in the *Rudhira Adyâya*) declares to be unfit for a sacrifice to Devî. In the same volume of the 'Asiatic Researches' there is another article on them, by Mr. Shakespear: both were written in 1816.

The origin of this atrocious worship is undoubtedly Hindu. The Thugs maintain that their occupation is represented in the caves of Ellora, as well as all other trades. Moreover the terms they use are chiefly of Sanscrit origin; and the worship of Kâli corresponds so well to the religious ceremonies of the Thugs, that there can be no doubt as to their identity. To satisfy the reader on this head we refer to the 5th volume of the 'Asiatic Researches,' where a chapter from the Kâlika Purâna has been translated and communicated by Mr. Blaquière.

All the ceremonies of the Thugs are fixed by this Purâna, the date of which it is difficult to ascertain, but, frequent allusions being made to it in the Vîra Charita, a drama of Bhâvabhûti, who lived at the court of king Bhoja in the beginning of the eighth century of our æra, we have sufficient reason to refer it at least to his time, if not to a previous period.

The Thugs then are a degenerate sect of Kâlî worshippers. They are very numerous in Bengal; but they offer only buffaloes and kids (Colebrook, 'Essays,' i. 111), and shed their blood, which they present to the idol in cups that are kept for that purpose. In like manner as the Saktas left the pure worship of Siva in order to indulge their gross sensuality, the Thugs abandoned the original worship of Kâlî to get a livelihood by plunder. Both nevertheless adhere strictly to the injunctions of their religion, which is taught in the Tantras of the Saktas and in the tradition of the Thugs, and thereby convert crime into a sacred duty. As well may be expected, secrecy was dictated by prudence, and hence it is that we find the Thugs seldom mentioned by travellers.

Thévenot, in his Travels (part iii., ch. 22), is the first to notice them; he describes them as infesting the road from Agra to Delhi, and using a long rope furnished with a noose, which they throw with great dexterity round the traveller's neck, and he relates that their Sothas were frequently women. About ten years after Thévenot, Dr. Fryer found them at Surat, where a gang of them were executed. He describes them as Thévenot does, and it appears from the description that they belonged to the *Mooltaneas*, a peculiar class of Mohammedan Thugs.

Although the whole of the ceremonial is Hindu, the Thugs themselves, whether Hindu or Mohammedan, maintain that they descend from seven Mohammedan clans, Thugs, Bhys, Bursote, Kachunee, Huttar, Ganoo, and Thundee ('Ramaseeana,' p. 11); the seven clans are admitted to be the most antient and the original stock on which all the others have been engrafted. This circumstance may lead us to suspect that Mohammedans were indeed the first to give a sort of political system to the Thugs; and the seven clans of Ismailis, whose occupation was murder as dreadful as that of the Thugs, may, when persecuted in the last days of their political existence, have joined themselves to the Hindu Phânsîgars, and, adopting their ritual, have given rise to their present institution. This point is investigated with much ingenuity in an article on the 'Secret Societies of Asia,' in the 49th vol. of 'Blackwood's Magazine' (part civ.). Shah Jehan and Aurengzebe instituted criminal proceedings against them. After this we again lose sight of them until the time of Hyder Ali, who proceeded against them in a summary way. Mysore however seems to have been their favourite residence; for in order to suppress them, in the reign of Tippoo Sultan, many of them were apprehended and sentenced to hard labour, and others suffered mutilation. It was in Mysore also that the English government first discovered them soon after 1799; but it was not before 1810 that any measures were taken for their extermination; and a plan for their suppression, which promises success, was adopted in 1830 by the then governor-general, Lord William Bentinck. Since that time their numbers have rapidly diminished, and it is to be hoped that they will soon be totally extinct.

(*Ramaseeana, or Vocabulary of the Peculiar Language used by the Thugs*, Calcutta, 1836; this work is written by Col. Sleeman; *The Confessions of a Thug*, by Captain Meadows, 1840, London; *Illustrations of the History and Practices of the Thugs*, London, 1837.)

THUJA, or THUYA, the name of a genus of plants belonging to the natural order Coniferæ. This name is derived from θύω, as, on account of the pleasant odour given out by the wood in burning, it was used in antient sacrifices. The species of the genus are more commonly known by the name of *Arbor Vitæ*, but why this name has been given to it is a matter of uncertainty. Clusius, who wrote in the sixteenth century, gives it this name, and Dr. Royle says that the Cypress, an allied genus, is called the tree of life in the East. It belongs to the section of Coniferæ called Cupressinæ by Richard, in which Cupressus, Callitris, Taxodium, and Juniperus are also included. The pistils and stamens are in separate flowers on the same tree. The male catkins are terminal and solitary; the pollen of each flower is included in four cases that are attached to the inner face of the scale towards its base. The female catkin is terminal; the ovary is united to the bractea, forming together a kind of receptacle; each receptacle has two ovules; the receptacles are semipeltate, imbricated, and smooth, or, in some cases, have a recurved beak near the tip; the seeds in some are slightly winged. The leaves are scale-like, closely imbricated or compressed. The species are evergreen, either trees or shrubs, and are inhabitants of Asia, Africa, and North America.

T. occidentalis, the Western or American Arbor Vitæ, has the branchlets 2-edged; the leaves imbricated in four rows, ovato-rhomboid, adpressed, and tuberculated; the cones are obovate with the interior scales truncate and gibbous beneath the apex. This plant is a large shrub or small tree, and is a native of North America, from Canada to the mountains of Virginia and the Carolinas. It is not so frequent in the Southern states, and is found there on the steep banks of mountain-torrents. In the Northern states of America it is sometimes called the white cedar, but more commonly arbor vitæ. It grows best in cool moist places, on the borders of rivers and lakes, and in swamps, some of which it covers to the extent of 50 to 100 acres. The stem of this tree seldom rises straight from the ground, but makes a short bend before it becomes straight. On this account it is difficult to obtain trunks of any length, and, although the timber is very durable, it is not much used in building. It makes good posts and rails, which last three or four times as long as any other species. Its branches are used for making brooms, a recommendation of which is, that they exhale an agreeable odour. In Great Britain the American arbor vitæ is planted as an ornamental shrub, for which purpose it flourishes best in low moist and sheltered situations. It will bear cutting well, and hence is employed for making hedges. It grows slowly, making 6 or 8 inches of stem in a year; the largest specimens in this country have attained a height of from 30 to 45 feet.

T. orientalis, the Oriental or Chinese Arbor Vitæ, has 2-edged branchlets; imbricated, ovato-rhomboid, adpressed leaves, furrowed in the middle and in 4 rows; the cones are elliptic with the interior scales blunt, and mucronate beneath the apex. It is a native of rocky situations in Siberia and China, and on the mountains of Japan. It is a low tree and easily distinguishable from the American species by its denser foliage and lighter green colour. It has a straight trunk, and seldom exceeds 18 or 20 feet in height. It is a hardy plant, and flourishes in the gardens about London, where it was first introduced by Miller in 1752.

T. pendula, the Pendulous or Weeping Arbor Vitæ, has opposite, decussating, spreading, lanceolate, mucronate, keeled, somewhat distant leaves; globose cones; convex smooth scales; filiform pendulous branches. It is a native of Tartary, and is an elegant shrub, but only a few specimens exist at present in this country.

T. articulata of Desfontaines is now called *Callitris quadrivalvis*, four-valved Callitris. The genus Callitris differs from Thuja in having the scales of the female catkins, from 4 to 6 in number, opening like the valves of a regular pericarp, and the seeds at the base of these scales winged on the margin. The four-valved Callitris has flattened articulated leaves; the female catkin with four oval pointed valves, two of which have seeds. It is a native of Barbary, and attains a height of from 15 to 20 feet. It was first discovered by Desfontaines on Mount Atlas in 1796. The gum-sandarac of commerce [SANDARAC], according to Broussonet, Brongniart, and others, is the produce of this tree, although it is often ascribed to the Juniperus communis. This substance is brought into the market in tears, which are clear, shining, and diaphanous, and of whitish-yellow colour. When reduced to a fine powder, it makes an excellent pounce. Dissolved in spirits of wine, it forms a delicate varnish. Under the name of *alerce*, the wood of this tree is in great repute in the East for building religious edifices. Captain S. E. Cook ascertained that the roof of the celebrated mosque, now the cathedral of Cordova, which was built in the ninth century, is constructed of the wood of the *alerce*. It appears to be a hardy tree, and would probably grow well in this climate in the open air.

(Loudon, *Arboretum et Fruticetum Britannicum;* Lindley, *Natural System;* Burnett's *Outlines of Botany*.)

THULDEN, THEODOR VAN, born at Bois-le-Duc in 1607, was one of the most distinguished scholars and assistants of Rubens, with whom he was also a favourite. He was with Rubens in Paris, and is said to have executed the greater part of the celebrated series of the so-called Gallery of the Luxembourg, painted in honour of Mary de' Medici. Van Thulden is distinguished both as a painter and as an etcher. As a painter he excelled in various styles. There are several large pictures, both historical and allegorical, by him, dispersed over Germany and the Netherlands; he painted also small pictures from common life in the manner of Teniers, such as markets, fairs, and the like; and he was frequently employed by architectural and landscape painters to embellish their pictures with small appropriate figures, in which he was excellent; he painted many such in the pictures of Neefs and Steenwyck.

Van Thulden's style in his greater works is altogether that of Rubens, and, although inferior in boldness of design and colouring, his works may easily be mistaken for those of Rubens; the Martyrdom of St. Andrew, in St. Michael's church at Ghent, was long thought to be a work of Rubens. In chiar'oscuro, Van Thulden was quite equal to his master. A St. Sebastian, in the church of the Bernardines at Mechlin, and an Assumption of the Virgin, in the church of the Jesuits at Bruges, were considered two of his best altar-pieces. While at Paris he painted twenty-four pictures of the Life of St. John of Matha in the church of the Mathurins, which he himself etched on copper in 1633; the pictures have since been painted over. Van Thulden's etchings are numerous, and in a masterly style: he published a set of 58 plates from the paintings of Niccolò Abati at Fontainebleau, after the designs of Primaticcio, which are greatly valued, for as the paintings were destroyed in 1738, they are all that remains of the original designs. They have been copied several times; the original set appeared under the following title: 'Les Travaux d'Ulysse, desseignez par le Sieur de Sainct-Martin, de la façon qu'ils se voyent dans la Maison Royale de Fontainebleau, peint par le Sieur Nicolas, et gravés au cuivre par Theodore van Thulden, avec le suject et l'explication morale de chaque figure.' He etched also 42 plates after Rubens, of the entrance of Ferdinand the Cardinal-Infant into Antwerp: 'Pompa introitus Ferdinandi,' &c. The eight plates of the History of the Prodigal Son, to which he put Rubens' name, are now said to be from his own designs; they are entitled, 'De verlooren Soon, door P. P. Rubens. Th. Van Thulden fec.' Van Thulden died in his native place, Bois-le-Duc, in 1676.

(Descamps, *La Vie des Peintres Flamands*, &c.; Füssli, *Allgemeines Künstler Lexicon*.)

THULITE, a mineral, the texture of which is usually granular. Lustre vitreous. Translucent on the edges. Hardness between 5 and 6; but the grains separate so easily that it is rather difficult to determine it. Colour rose-red; streak greyish-white. Specific gravity 3·1055.

Before the blowpipe fuses with carbonate of soda into a greenish-white bead; with borax forms a colourless transparent bead; but on the addition of nitre becomes violet.

It has been found in Norway; and, according to Gmelin, consists of—silica, 42·808; alumina, 31·144; lime, 18·726; soda and a trace of potash, 1·891; oxide of iron, 2·888; oxide of manganese, 1·635; water, 0·640: total, 99·732.

THÜMMEL, MORITZ AUGUST VON, a German writer who was greatly admired by his contemporaries, and who still continues to hold a high literary rank with his own countrymen. He was born at Schönfeld, near Leipzig, May 27th, 1738, where his father possessed considerable property, but lost much of it by the plundering of the Prussian troops in Saxony, 1745. Moritz, who was the second son of a family of nineteen, was sent to the university of Leipzig in 1756. There he found in Gellert not only an instructor, but a friend; and he also formed an acquaintance with Weisse, Rabener, von Kleist, &c., and, among others, with an old advocate named Balz, who at his death, in 1776, left him the whole of his fortune, twenty-four thousand dollars. This accession of wealth enabled Moritz to give up the places he held under Duke Ernest of Saxe-Coburg, first as Kammer-junker, and, from 1768, as privy councillor and minister, and to retire in 1783 to Sonneborn, an estate of his wife, at which place and at Gotha he continued chiefly to reside until his death, which happened while he was on a visit at Coburg, October 26th, 1817. Thümmel's literary reputation was established by his 'Wilhelmine,' a 'comic poem in prose,' first published in 1764. This short production, for it is in only five cantos or chapters, was received as something altogether new in German literature, and as a masterpiece of polished humour and playful satire. It was translated not only into French, but Dutch, Italian, and Russian; and it has been reprinted entire in Wolff's 'Encyclopädie' (1842). His poetical tale, 'Die Inoculation der Liebe,' 1771, and other pieces in verse, did not add much to his fame; but his last and longest work, 'Reise in den Mittaglichen Provinzen von Frankreich' (Travels in the Southern Provinces of France), in 9 vols., 1799-1805, is also his literary chef-d'œuvre. Instead of being, as its title would import, the mere record of his tours in that country, it is, like Sterne's 'Sentimental Journey,' to a great extent, a work of fiction, interspersed with fragments in verse, which breathe more of poetry than his other productions of that kind. It abounds with satiric humour and pleasantry, with witty and shrewd observations, and shows the author to have been an accomplished man of the world, intimately acquainted with human nature. That it is a work of no ordinary merit and pretension may be supposed from the notice it has obtained from Schiller, in his essay 'Ueber Naive und Sentimentalische Dichtung;' who, if he praises it with greater reserve than other critics, admits that, as a work of amusement, it is one of a superior kind, and will as such continue to enjoy the character it has obtained. A portrait of Thümmel, after Oeser, is prefixed to the 6th volume of the 'Neue Bibliothek der Schönen Wissenschaften,' a complete edition of his works in six volumes.

(Jörden's *Lexicon;* Schiller's *Kleinere Prosaische Schriften;* Wachler's *Vorlesungen*.)

THUN, a town in the canton of Bern in Switzerland, situated on the river Aar, about a mile below its egress from the lake of the same name. Part of the town stands on an island formed by the river, and part is on the right bank, at the foot of a hill, on which is built the castle, the keep of which was, in the middle ages, the residence of the counts of Thun. On the opposite or southern side are seen the Alps of the Oberland, covered with perpetual snow. The parish church, with its lofty tower, is a remarkable building. There are also a handsome town-house, an hospital, an orphan asylum, a public library of 7000 volumes, and a military school for the artillery and engineer corps of the federal service. [SWITZERLAND.] The population of Thun amounted, by the last census, to 4833 inhabitants. (Lerésche, *Dictionnaire Géographique Statistique de la Suisse*, 1836.)

The lake of Thun, Thunersee in German, is 14 miles long from south-east to north-west, about three miles in its greatest width, and about 700 feet deep. Its surface is 1780 feet above the sea. The Aar, coming from the lake of Brienz, enters it at its south-east end, and issues from it at the opposite extremity. The Kander, swelled by the Simmen, also enters the lake from the south. The lake abounds with fish; and its banks, planted with vineyards in some places, and rising abruptly to steep mountains in others, afford a variety of scenery. A steam-boat plies on the lake.

THUNBERG, CARL PETTER, an eminent Swedish traveller and botanist, and professor of natural history in the university of Upsal, was born on the 11th of November, 1743, at Jönkoping in Sweden, where his father was a clergyman. He was early sent to the university of Upsal for the purpose of studying medicine, and became a pupil of the great Linnæus. Under his instruction he acquired that taste for natural history which so remarkably distinguished the school of Linnæus, and which has given to the world so many famous naturalists. Having completed his course of study, he graduated in 1770, and was honoured by having bestowed upon him the Kohrean pension for the space of three years. Although the sum was small, about fifteen pounds per annum, he determined to use it for the purposes of improvement, and accordingly left Upsal for the purpose of visiting Paris and the universities of Holland. Whilst in Amsterdam, he became acquainted with the botanists and florists of that city, and, they suggested to him the desirableness of some person visiting Japan for the purpose of exploring its vegetable treasures. Thunberg immediately offered his services, and a situation as surgeon to one of the Dutch East India Company's vessels having been obtained for him, he left Amsterdam for Japan in the year 1771. He landed at the Cape of Good Hope for the purpose of learning amongst the Dutch settlers there the Dutch language, which is the only European language spoken extensively in Japan, and also in the hope of adding to his knowledge of natural objects by researches in Africa. Here he made several excursions into the interior, visiting various of the native tribes, and after having remained at the Cape three winters, where he collected much valuable information, he set sail in 1773 for Java and the Japan Isles. He remained in these islands five years, making large collections of the plants of these countries, as well as observations on the habits, manners, and language of their inhabitants. His ability to labour, however, during his residence both in Africa and Asia, was very much diminished by a frightful accident which he met with on first leaving Holland. The keeper of the stores in the ship, having inadvertently given out white lead instead of flour, it was mixed with flour and used for making pancakes, of which the whole crew partook. All were ill, and many suffered very severely at the time, but none was so bad as Thunberg; he only gradually recovered his health, and through his long life always laboured under the debility and derangement his system had thus received. He returned to his native country in 1779, making first a short stay in England. Here he formed the acquaintance of Sir Joseph Banks, Dryander, and Solander, and availed himself of the extensive collection of plants from all parts of the world, and valuable library of Sir Joseph, for the purpose of adding to his botanical knowledge. During his absence he had been made demonstrator of botany at Upsal in 1777, and in 1784 was installed in the chair of the great Linnæus as professor of botany. In 1785 he was made a knight of the order of Wasa, and in 1815 commander of the same order.

On gaining his home, Thunberg immediately commenced arranging the vast mass of materials he had collected in his travels for the purpose of publication. His first important work was a description of the Japanese plants, which was published at Leipzig in 1784, with the title, 'Flora Japonica, sistens Plantas Insularum Japonicarum, secundum Systema Sexuale emendatum,' 8vo., and illustrated with thirty-nine engravings. In this work a great number of new plants were described and arranged according to the Linnæan system, in which he ventured to dispense with the three classes called Monœcia, Diœcia, and Polygamia. He subsequently published some botanical observations on this 'Flora,' in the second volume of the 'Transactions' of the Linnæan Society.

In 1788 he commenced the publication of an account of his travels, under the title, 'Resa uti Europa, Africa, Asia, forattad åren 1770-1779,' Upsal., 8vo. This work was completed in four volumes, and contains a full account of his eventful life, from the time he started from Upsal with his Kohrean pension, till he returned to the same place laden with treasures from a hitherto unexplored region. In these volumes he has taken great pains to collect all possible information on the medicinal and dietetic properties of plants in the countries he visited, as well as their uses in rural and domestic economy. He recommends several new plants for cultivation in Europe as substitutes for those in present use. This work also gives a simple and pleasing account of the original natives of the places in which he sojourned, as well as of the European settlers.

It has been translated into German by Groskund, and published at Berlin in 1792. It appeared in English at London in 1793, and in French at Paris in 1796. His next work was a 'Prodromus Plantarum Capensium, Annis 1772-1775 collectarum,' Upsaliæ, 1794-1800; being an account of the plants he had collected at the Cape. From 1794 to 1805 he published in folio, under the title 'Icones Plantarum Japonicarum,' Upsaliæ, a series of plates illustrative of the botany of the Japan Isles. These were followed by the 'Flora Capensis,' Upsaliæ, 1807-13, 8vo. In this work the most complete view of the botany of the Cape of Good Hope is given that has hitherto been published. In 1807, in conjunction with Billberg, he published the 'Plantarum Brasiliensium Decas Prima,' Upsaliæ, 4to. In this work the plants collected by Freireiss and Sauerländer, in the province of Minas Geraës in Brazil, are described; but the subsequent parts were published by other hands.

Besides the above works, on which the reputation of Thunberg as a traveller and a botanist mainly rests, he was the author of almost countless memoirs and academical dissertations. The subjects of these were chiefly those which his long residence in Africa and Asia afforded. The majority of them are upon botanical topics, not a few however are devoted to a consideration of zoological subjects. Although botany was his primary object in his travels, he yet lost no opportunity of obtaining a knowledge of the new animals he met with, and several of his papers are descriptions of these. He published several memoirs in the London 'Philosophical Transactions,' and the 'Transactions' of the Linnæan Society, also in the Transactions of Russian, German, French, and Dutch scientific Societies and Journals, and a much greater number in those of Sweden. The academical dissertations bearing his name, and presented at the university of Upsal, are nearly one hundred in number, and were published between the years 1789 and 1813.

Thunberg was elected an honorary member of sixty-six learned societies. He died at the advanced age of eighty-five, on the 8th of August, 1828.

Retzius named a genus of plants in the natural order Acanthaceæ, in honour of him, *Thunbergia*. The following genera of plants have species named after him:—Ixia, Isolepis, Cyperus, Imperata, Spatalla, Convolvulus, Campanula, Gardenia, Atriplex, Hydrocotyle, Rhus, Crassula, Berberis, Erica, Passerina, Thalictrum, Cocculus, Equisetum, Hypnum, Fissidens, Cystoseira, Gyalecta, and Endocarpon. Of insects, the genera Harpalus, Lygæus, Pyralis, and Tinea have specific names after Thunberg.

Thunberg was an amiable kind man, and highly esteemed by his friends and pupils. The great additions that he has made to our knowledge of the plants of the world, as well as their uses to man, place him amongst the most distinguished botanists of the last and present century. He was not great as a vegetable physiologist, nor did he attempt anything more in systematic botany than a slight emendation of the system of Linnæus. In this he was followed by very few; and those who at the present day have recourse to that system for arranging plants, generally adopt the primitive plan of Linnæus. As a traveller, Thunberg is remarkable for the accuracy of his observations on the manners, habits, and domestic economy of the people that he visited.

(Bischoff, *Lehrbuch der Botanik*; *Resa uti Europa*, &c.; *Kongl. Vetensk. Acad. Handlingar*, 1829.)

THUNDER is an explosion accompanied by a loud noise, which is heard after a discharge of lightning from the clouds. The character of the noise is variable: it sometimes resembles that which is produced when a single piece of ordnance is fired; at other times it is a rolling sound like the successive discharges of several great guns; and occasionally it may be compared to a series of sharp reports from a fire of musketry.

The identity of lightning with the electric fluid is now well known [LIGHTNING], but the physical cause of the detonation which accompanies the flash is still the subject of conjecture; in general it is considered that lightning, by its heat, creates a partial vacuum in the atmosphere, and that the sudden rushing of air into the void space produces the sound; but various reasons have been assigned for its prolongation. It was formerly supposed that the rolling noise is merely the result of several echos caused by the sound being reflected from mountains, woods, buildings, or clouds, or from the latter alone when a thunder-storm takes place over the ocean: this opinion seems to have been founded upon the fact that the report of a fire-arm discharged in a mountainous tract is prolonged by the echos during at least half a minute, which is about the time that the rolling of thunder continues. But though the reflections of sound are, very probably, in part, or at times, the causes of the prolongation of the report arising from the explosion, yet it must be admitted that these will not always afford a satisfactory explanation of the phenomena. It may happen, for example, that, when the sky is uniformly covered with clouds, a flash of lightning will dart from the zenith, and, after a few seconds, the crash of thunder will take place accompanied by a rolling sound: soon, a second flash may pierce the clouds in the zenith and thunder may follow, but now the crash, though loud, may not be prolonged. It is justly observed by M. Arago that this is very different from the phenomena of echoes; and the explanation which was first proposed by Dr. Hooke ('Posthumous Works,' 1705) is perhaps that which possesses the highest degree of probability. The flashes of lightning, Dr. Hooke observes, are either simple or multiple: the first occupies but one small portion of space, and gives rise to an instantaneous report; the multiple flash takes place at different parts of one long line: if these parts should be situated in a circular arc, and the observer should be in its centre, all the reports would arrive at his ear at the same time, and still one loud crash only would be heard; but if the parts were nearly in a straight line, and the observer were at one of its extremities, the reports, whether they take place at the same instant or in succession, would arrive at his ear at different times, depending wholly or partly on the distances. It may be considered therefore that the rolling arises from the circumstance that the points of explosion are at different distances from the observer; and it will follow that the duration of the noise is equal to the time in which sound travels through an interval equal to the difference between the lengths of two lines drawn from the observer to the two extremities of the flash. The flash of lightning and the report of the thunder take place in reality at the same moment; but since sound travels at the rate of 1100 feet per second, while the passage of light from the cloud to the observer may be considered as instantaneous, it follows that, on counting the number of seconds which elapse between the time of seeing the flash and hearing the report, the distance of the thunder-cloud from the observer may be ascertained if 1100 feet be multiplied by that number of seconds.

The experiments of Lavoisier and La Place have shown that the molecules of water, in evaporating, convey away from the earth a portion of the electricity which it contains, and which the water has acquired in being converted into vapour. This electricity becomes diffused in the upper regions of the atmosphere, and, when the vapours again become condensed so as to form globules of water, the electricity disposes itself on the surface of the globules in different quantities according to their magnitudes. When these globules have equal volumes, those quantities are equal; and, an equilibrium then subsisting with respect to electricity, no sensible effect is produced: but when a considerable difference takes place between the quantities of electricity on the different globules, the tendency of that element to return to a state of equilibrium causes it to pass rapidly in flashes from those globules which have more, to those which have less, than their mean quantity; and thus, if the condensation be great and take place suddenly, vivid flashes of lightning and loud peals of thunder may take place. The effect is probably the greatest when two masses of clouds in opposite states of electricity are carried rapidly against one another by winds blowing in contrary directions.

An opinion prevails that thunder has been heard when the sky was without a cloud, but the fact can scarcely be said to be satisfactorily established; for the sounds which, in countries subject to earthquakes, have been supposed to be thunder, proceed from under the ground, and may result from a different cause. Volney however relates that, being one day at Pontchartrain near Versailles, when no cloud was visible, he heard distinctly four or five claps of thunder: he adds that about an hour afterwards the sky became overcast, and a violent hail-storm followed. On this relation M. Arago observes that the sounds could not have been heard if they had come from clouds at a greater distance than six leagues; and if the clouds had been at, or a little within, that distance, they must have been visible, unless it be supposed that they were not more than a few yards above the ground: but the hail which followed the thunder must have proceeded from clouds having great elevation, though at the time the claps were heard they were too remote to allow any sound from them to reach the ear; and therefore he concludes that the sounds must have been produced in the air itself. For an account of death caused by electricity in the air when the thunder-cloud was very distant, and for the theory of the returning stroke, see the *Philosophical Transactions*, vol. lxxvii.; and STANHOPE, CHARLES, EARL.

From the meteorological observations made by Dr. Scoresby, and Captains Phipps, Parry, and Ross, it appears that neither thunder nor lightning is known to take place beyond the 75th degree of north latitude: even so low as the 70th degree those phenomena are very rare; and in the tables of Captain Parry the occurrence of thunder and lightning is mentioned but once between June, 1821, and September, 1823. Captain Franklin also, in 67½° N. lat., heard thunder on one day only between September, 1825, and August, 1826.

THUNDER-ROD, a bar of metal attached generally to a side of a building, and extending from below the level of the ground to a point several feet above the highest part of the roof, or of the steeple, if the building have one, in order to secure the edifice from the effects of thunder or lightning: the upper extremity of the rod or bar terminates in a point.

When a thunder-cloud passes above an elevated object, it produces in the nearest part of the object the kind of electricity which is opposite to that of the cloud itself, so that a rapid and abundant communication takes place: either the electric matter in the cloud rushes towards the earth, or that of the earth rushes towards the cloud: and if the materials of the building are not good conductors of the fluid, the latter in its passage exerts an explosive action by which the building is destroyed or greatly injured. The thunder-rod, from the conducting property of its metallic substance, serves to convey the fluid harmlessly to the earth or air. When it has happened that there is an interruption of the communication, by the rod being broken, or even by being much diminished in magnitude in some part of its length, the electric fluid has been observed to pass between the parts of the rod above and below the place of fracture.

Buffon, and Dalibard, at his suggestion (1752), appear to have been the first persons who drew lightning from the atmosphere by means of pointed rods of metal; and in the following year M. de Romas elevated a paper kite to the height of 550 feet for the like purpose: this was about twelve months before Dr. Franklin, without any knowledge of what had been done in Europe, performed the like experiment in America. The object of the French philosophers was merely to obtain by those means, electrical sparks or flashes of fire; but it is to Dr. Franklin that the world is indebted for the idea of raising pointed rods in order to secure buildings from the effects of atmospherical electricity; and the recommendation was immediately adopted both for edifices on land and ships on the water.

Soon after the first employment of thunder-rods in Europe, an opinion prevailed that when their extremities were pointed they created a danger which did not exist before, and that they attracted lightnings which would, without the rods, have discharged themselves at a distance: and in order to diminish the risk, it was proposed to crown the summits of the rods with knobs or balls of metal. This notion was entertained by the Abbé Nollet, in France: but in the Royal Society of London the question concerning the relative efficacies of pointed and knobbed conductors was agitated with great vehemence, chiefly through the obstinacy of Mr. Wilson, one of the Fellows, who, in 1778, made himself the head of a party in support of the latter kind of conductors, in opposition to the president. [PRINGLE, JOHN.] It is remarkable that both George III. of England and Frederick of Prussia placed themselves on the side of the opponents of Franklin; the first king giving the preference to balls over points, and the other, while he consented to have conductors raised on his barracks and powder-magazines, prohibited the erection of them on his palace of Sans Souci. It is now admitted that the prejudice against pointed thunder-rods was entirely without foundation: those conductors have been found not only to protect buildings when struck, but also to diminish the number of shocks which in a given time they have experienced. An experiment which was made by Beccaria in 1753, might have shown the superiority of pointed conductors over those with balls; for that distinguished electrician set up on the roof of the church of San Giovanni at Turin, a metallic rod bent near the top and terminating in a point: the upper part was capable of being turned round by means of a silk line, so that the point could be directed upwards or downwards at pleasure, and the lower part of the rod terminated upon substances which were imperfect conductors of electricity. On directing the point towards the sky when a thunder-cloud passed over the church, electrical sparks issued in abundance from the foot of the rod; but when the point of the rod was reversed so that the bend was upwards, few or none were obtained. The conducting-rod set up by Professor Richman, at St. Petersburg, may be said to have been the cause of his death (in 1753); but the house would most probably have been struck if there had been no conductor. The immediate cause of the melancholy accident was that the rod led into the apartment, and the unfortunate Professor was standing too near its lower extremity. (*Phil. Trans.*, vol. xlviii.)

Some doubt however still exists concerning the distance to which the protecting influence of the rod extends, but it is generally supposed that this influence is limited by the circumference of a circle described about the rod with a radius equal to double its height above the top of the building.

When the magazine at Purfleet was struck by lightning in 1777, the shock took place on an iron cramp which united two stones of the cornice, at the distance of 24 feet from the thunder-rod, measured horizontally; and the upper extremity of the rod was 11 feet above the top of the roof on which it was erected. Again, in 1781, the workhouse at Heckingham in Norfolk, though provided with eight rods, was struck by lightning at a spot which was distant 55 feet measured horizontally from the nearest rod, while the pointed summit of the latter was 22 feet above the level of the part struck; and many other instances might be cited in confirmation of the supposition. It may be inferred therefore that large buildings ought to be secured by several rods, and that the less these are elevated the greater ought to be their number; also that no point of the building ought to be at a greater horizontal distance from the nearest rod than twice the height of the rod above the top of the building. Mr. Cavendish, Dr. Priestley, and other English philosophers, recommend them to stand 10 feet above the roof; but in France their height is sometimes more than 30 feet.

The most elevated objects are not always those which are struck by lightning; for in 1829, the sails of a mill at Toothill in Essex being at rest, the electric fluid left untouched the arm, which was in a vertical position, and fell on a knob of iron at the middle of one of those which was inclined to the horizon in an angle of 45°; and it has frequently happened that buildings containing in their walls conducting substances have been struck much below their summits by a lateral action of the fluid; bars or plates of metal in the side walls having served to attract it more powerfully than the materials on the roof. This happened to the cathedral at Lausanne in 1783.

In order that the points of rods may not become blunt by rust, they are generally made of copper and covered with gilding; but it appears to be the practice of late to make the upper part of the rod of platinum, this metal being not only unaffected by the corrosive power of the air or rain-water, but also incapable of fusion by heat. As the erection of a thunder-rod requires in general an expensive scaffolding, the latter metal, even though more costly than iron or copper, will from its durability be in reality more economical than either of the others.

Thunder-rods are frequently made to terminate at the upper extremity with one point in a vertical position, and about this a number of points diverge from the rod at different inclinations to the horizon: by this construction there is not only a probability that some of the points will be acute when others may have been blunted by the action of the atmosphere, but also among them there will always be one which presents itself in the most favourable position for attracting the electric fluid. Observations have not yet however been sufficiently multiplied to enable philosophers to decide whether conductors so terminated have any advantage over the more simple rods of Franklin.

The thunder-rod should be thick enough to carry the electric fluid to the ground without being melted by it; in general a cylindrical rod about half an inch in diameter will be sufficient to prevent this effect from taking place; whether of iron or copper, it should be covered above ground with a coating of paint; and the part under ground is usually formed with two or more branches in order to facilitate the passage of the electric fluid into the earth. It must be observed however that, if the lower part of an iron thunder-rod descends into water, it is liable to become corroded by rust; and a dry soil is not a good conductor of electricity. On the Continent it has been the practice to let the lower part of the rod enter into a pit filled with ashes of burnt wood or powdered coke. If the rod is made of a kind of metal which does not become corroded in water, its lower extremity may be allowed to enter about three feet below the surface: the water should be that of a natural pond, for, if it be in an artificial reservoir, the walls of the latter, being sometimes formed of, or covered with, conducting substances, may prevent the electric fluid from diffusing itself in the earth.

When a building is provided with several rods, each of these should be continued quite to the ground: at the level of the parapet the several rods should be connected together laterally by slender iron bars; and the plates of iron which enter into the construction of roofs should in like manner have a metallic communication with each other. As the thunder-rod is necessarily made to follow the outline of a cornice and roof, the part below that which projects above the roof may be made of metallic cords, in order to avoid the formation of angles in its length; for experience has shown that lightning in descending a rod has quitted the latter at its angles, and, after passing through the air, has struck objects which were situated in the line of its first direction. In the expectation of being able to attract the lightning entirely away from powder-magazines, or any building containing explosive materials, thunder-rods have been attached to masts at the distance of a few yards from the building: this practice has many advocates, and the only objection to it is, that it is attended with considerable expense.

Many lofty buildings contain in their construction the means of securing them from the effects of lightning, and such is the case with the Monument on Fish-Street Hill; this building, whose height is more than 200 feet, is crowned with a metallic ball surrounded by bands which terminate in points tending upwards. From the ball descend four bars of iron which serve to support a flight of steps, of the same metal, and one of them is in connection with the iron railing which extends from the balcony to the ground. In 1764 lightning struck the steeple of St. Bride's Church in Fleet Street, and descended from thence along an iron bar about 20 feet in length and two inches in breadth, which was almost buried in the stones: the electric fluid left no traces of its passage along this bar, but at the place where the metal terminated the damage commenced, the stones being destroyed or thrown to a considerable distance. A similar accident has this summer (1842) occurred to the church of St. Martin in Westminster.

A ship at sea, like an edifice on land, may, when there is an accumulation of electric matter in the upper part of the atmosphere, be struck aloft; or, when the atmosphere is in a contrary state, the lower part of the ship may be struck, the lightning in the latter case ascending along the mast: and ships unfurnished with metallic conductors have frequently suffered serious injury during thunderstorms, while those which have been so provided have generally escaped. When Captain Cook was at Batavia, lightning fell on the ship with such force that the shock resembled an earthquake; the conductor, which was very slender, appeared to be on fire from the mast-head to the sea, yet no damage was done to the ship. In 1814, while a great storm raged at Plymouth, of all the ships then in port only one was struck by lightning, and this alone was not provided with conductors. And in the roads at Corfu, three violent flashes struck the ship Etna, which had conductors, without doing any injury, while two ships not far distant, being destitute of such protection, were much damaged.

The rigid bars of Franklin are considered inapplicable, as conductors, to ships, and instead of them chains of copper have been generally employed; these are attached to the masts at their upper extremities; and, following the standing rigging, they pass down the ship's sides into the water. Objections have been made to them on account of their want of continuity, and their liability to be injured or broken during storms; and copper links attached to the masts by flexible spiral wires were suggested by Mr. Singer. M. le Roy also recommended a chain of copper rings which were to encircle the main-topmast backstay; but neither of these methods has been put in practice. In

1822 Mr. Snow Harris proposed ('Observations on the effects of Lightning on Floating Bodies'), and subsequently caused to be executed for ships, conductors consisting of slips of copper, of sufficient thickness to prevent them from being fused; these slips are inserted, in two layers, in a groove cut longitudinally along the mast, the joints of one layer being opposite the middle parts of the other, and they are fastened to the mast by copper screws. The whole line of metal passes down from the copper spindle at the top of the mast-head, and at the junctions of the upper and lower masts the slip is made to join a cylinder of copper which lines each sheave-hole: the lower part of the line is connected with a plate of copper which is fixed on the keelson, at the step, and from thence there is a communication with the water by three copper bolts which pass quite through the keel.

THURGAU, a canton of Switzerland, bounded on the north partly by the lake of Constance, and partly by the Rhine, which divides it from the canton of Schaffhausen; on the east and south by the canton of St. Gallen, and on the west by that of Zürich. The river Thur, which comes from the canton of St. Gallen and is joined by the Sitter from Appenzell, has given its name to the canton 'Thurgau,' or 'district of the Thur,' the river crossing the middle part of it from east to west. The valley of the Thur is separated from the basin of the lake of Constance by a succession of hills which rise in terraces on both sides, and are intersected by several valleys. On the south and west sides other hills divide the Thurgau from the valley of the Toss in the canton of Zürich. The whole country belongs to the plateau or table-land of Switzerland, and is a considerable distance from the Alpine region. The climate of the Thurgau is comparatively mild; a great part of the country is planted with fruit-trees, especially apple, pear, and cherry: the vine also thrives in several localities. The produce of corn is not sufficient for the consumption. According to a late return, there were in Thurgau about 28,000 head of horned cattle, 3500 sheep and goats, and 2550 horses. The rivers and the lake abound with fish. The area of the canton is estimated at about 365 English square miles; and the population in 1835 was 84,124 inhabitants, of whom about 66,000 follow the tenets of the Reformed or Protestant communion, and the rest are Roman Catholics. German is the language of the country. About one-third of the population is employed in trade and manufactures. The principal manufactures consist of cotton goods, in which above 3000 looms are employed. The average wages of a workman are about 7½ batzen, or eleven pence sterling per day. About 3000 pieces of fine linen from native flax are made annually; but this manufacture is on the decline. There are also spinning-factories which produce yarns of the quality from No. 40 to 60. The tariff of the German commercial league has much diminished the exportation of manufactured goods. Some silks are manufactured for the French market. The other exports consist of wine, cattle, oats, dried fruit, and cider. The principal imports are—iron and metal ware, chiefly from England; coarse woollen goods from Germany; fine woollen from France and Belgium; fine cotton yarns from England; salt from Bavaria and Würtemberg; colonial articles, and wheat.

The revenue of the canton amounts to about 102,000 florins, or 8500*l.* sterling, and is derived from duties on salt and other articles imported, stamps, transfers of property, and an income-tax.

Elementary education has been improved of late years. There are about 264 schools, 200 of which are for Protestants, 58 for Roman Catholics, and six mixed of both communions. About 17,000 children attend the schools. A school for teachers has been established at Kreutzlingen.

There is a fund, the capital of which amounts to about half a million of florins, for the support of the poor, besides which there is a small poor's rate on property. The annual expenditure for the poor varies from 15,000 to 30,000 florins. There is a special fund for hospitals and also a benevolent fund. Switzerland in general is a country remarkable for its charitable spirit.

Thurgau is divided into eight districts—Frauenfeld, Arbon, Bischofzell, Tobel, Weinfelden, Gottlieben, Steckborn, and Diessenhofen. The principle towns are—1. Frauenfeld, which is the head town of the canton, situated in a fertile valley near the confluence of the river Murg with the Thur. It consists of 162 houses, besides other buildings, forming three wide streets; the inhabitants amount to about 1300. The old castle, formerly the residence of the Swiss vogten or governors of Thurgau; the town-house, where the Helvetic diet used to assemble in the time of the old confederation; the arsenal; and the Protestant and Roman Catholic churches, are the chief buildings. 2. Steckborn, a small busy town pleasantly situated on the banks of the Zellersee, or smaller basin of the lake of Constance, has several manufactories, and about 1900 inhabitants. In the neighbourhood of Steckborn is the fine country-residence called Arenaberg, which was purchased by the countess of St. Leu, daughter of Josephine Beauharnais and wife of Louis Bonaparte, ex-king of Holland, and in which she died in 1840. 3. Diessenhofen, on the left or southern bank of the Rhine, is a place of considerable trade in agricultural produce, and has about 1000 inhabitants. 4. Bischofzell, at the confluence of the Sitter and the Thur, is a walled town, with a collegiate church of the ninth century, an old castle, a long bridge on the Thur, several schools, and about 1000 inhabitants. 5. Arbon, a small town on the southern bank of the Bodensee, or lake of Constance, of which it enjoys a splendid view, is said to be built on the site of a Roman station named Arbor Felix.

The canton of Thurgau is a representative democracy with a legislative assembly, 'Grosser Rath,' and an executive council, 'Kleiner Rath.' The right of voting for elections of members of the legislature is subject to some qualifications; but by the last accounts we have seen the constitution was undergoing a revisal.

(Leresche, *Dictionnaire Géographique Statistique de la Suisse*; J. Bowring's *Report on the Commerce and Manufactories of Switzerland*.)

THÜRINGER WALD. [GERMANY; PRUSSIA.]

THURINGIA (*Thüringen*) is the antient name of an extensive tract of country in the central part of Germany, situated between the Harz Mountains, the rivers Saale and Werra, and the Thüringerwald. These however are not the boundaries of the great kingdom of Thüringia, which extended to the Elbe, and northwards nearly to Magdeburg, southwards to the vicinity of the Danube, and comprehended on the west the greater part of the country afterwards called Franconia. It cannot be positively ascertained what people originally possessed Thuringia. According to Galetti, it was formerly inhabited by the Catti; according to F. Wachter and Wilhelm, by the Cherusci. Vegetius mentions the Thuringi about the year 404. Various conjectures have been made respecting the derivation of the name; and authors, misled by a similarity of names, have confounded them with others. The history of the country is very intricate, and has been the subject of numerous works, such as Galetti's 'History of Thuringia,' 6 vols.; and Wachter's History, in 3 vols. Thuringia long gave the title of margrave to the elector of Saxony. Properly speaking, there is no country now called Thuringia: it is divided among Prussia, Saxe-Weimar, Saxe-Coburg, Schwazburg-Sonderhausen, and Schwarzburg-Rudolstadt. The name is still preserved in Thüringerwald, a continuation of the Fichtelgebirge, from which it branches out near Münchberg and Gefrees, in the kingdom of Bavaria: near Eisenach, Marksuhl, and Salzungen it rises above the Werrathal; runs south-east along the frontier of the former circles of Upper Saxony and Franconia, till it turns, near Lobenstein, into the Saalthal (where however it receives the name of Frankenwald), and declines, near Kronach, into the Mainthal. The length is 70 English miles, and its breadth varies from 9 to 18 miles. It covers about 3400 square miles, and has a population of 220,000 inhabitants, living in 28 towns and 570 villages. It is a long mountain-chain with a narrow ridge, and it is only near the Schneekopf, on the road between Suhl and Ohrdruf, that there is a plateau two or three miles across. The two highest points are the Schneekopf, 2700 feet, and the Inselsberg, 2604 feet, above the level of the sea. The highest points consist of granite, clay-slate, and principally porphyry: the whole chain is clothed to the very summit with pine-forests, mixed in a few places with oak and other timber. Numerous rivers rise in this chain, which flow on one side into the Elbe, and on the other into the Weser.

(Hassel, *Geograph. Lexicon*; Stein's *Lexicon*; Brockhaus, *Conversations Lexicon*.)

THURLOE, JOHN, who held the office of secretary of state during the Commonwealth, was born in 1616, at Abbots Roding, in Essex, of which place his father, the Rev. Thomas Thurloe, was rector. He was designed for the profession of the law. Through the interest of Oliver St. John, who was his patron through life, he was appointed, in 1645, one of the secretaries to the parliament commissioners for conducting the treaty of Uxbridge. He was called to the bar after this, in 1647, by the society of Lincoln's Inn; and in March, 1648, he received the appointment of receiver or clerk of the cursitors' fines, 'worth at least 350*l.* per annum,' says Whitelocke; 'and in this place was Mr. Thurloe servant to Mr. Solicitor St. John.' (*Memorials*, p. 296.)

Thurloe has left behind him a distinct denial of knowledge of or participation in King Charles's death, which took place, as is well known, in January, 1649. Writing to Sir Harbottle Grimston for the purpose of contradicting reports that St. John had been Cromwell's counsellor on that and on other occasions, and 'that I was the medium or hand between them by which their counsels were communicated to each other,' he says, 'I was altogether a stranger to that fact and to all the counsels about it, having not had the least communication with any person whatsoever therein.' (Thurloe's *State Papers*, vol. vii., p. 914.) It was very unlikely that a person in Thurloe's subordinate position at that time should have been consulted; and if it were a question of any importance whether he approved of the king's death or not, his subsequent continual identification with the authors of that event is more than sufficient to fix him with responsibility.

On the 11th of February, 1650, Thurloe was appointed one of the officers of the treasury of the Company of undertakers for draining Bedford Level, a new effort to drain this tract of country having been set on foot the year before. [BEDFORD LEVEL.] In a letter from St. John to Thurloe, dated April 13, 1652 (*State Papers*, vol. i., p. 205), which is interesting as showing the terms on which Thurloe and St. John were, we find that Thurloe was then on an official tour of inspection: 'Now you are upon the place, it would be well to see all the works on the north of Bedford river to be begun. Pray by the next let me know whether Bedford river be finished as to the bottoming.' In the same letter are directions from St. John, now lord-chief-justice, for the purchase of a place for him in the neighbourhood of London, from which it would appear that Thurloe was in the habit of managing St. John's private affairs for him. The same letter contains St. John's congratulations to Thurloe on his appointment as secretary to the council of state, which appointment had just taken place: 'I hear from Sir Hen. Vayne, and otherwise, of your election into Mr. Frost's place, with the circumstances. God forbid I should in the least repine at any his works of Providence, much more at those relating to your own good, and the good of many. No, I bless him. As soon as I heard the news, in what concerned you, I rejoiced in it upon those grounds. No, go on and prosper: let not your hands faint: wait upon Him in his ways, and he that hath called you will cause his presence and blessing to go along with you.' In the course of the previous year, 1651, Thurloe had been to the Hague, as secretary to St. John and Strickland, ambassadors to the states of the United Provinces.

When Cromwell assumed the Protectorship, in December, 1653, Thurloe was appointed his secretary of state. In consequence of his attaining to this distinction, he was, in the February succeeding, elected a bencher of the society of Lincoln's Inn. Thurloe was elected member for the Isle of Ely in Cromwell's second parliament, called in June, 1654, and framed on the model prescribed by the Instrument of Government. He was re-elected for the Isle of Ely in the next parliament, called in September, 1656. Cromwell obtained from this parliament an act settling the office of post of letters, both inland and foreign, in the state for ever, and granting power to the Protector to let it for eleven years at such rent as he should judge reasonable; and it was let by him to Thurloe, at a rent of 4000*l.* a year, as we learn from a memorandum drawn up by him when the Rump Parliament had cancelled the grant. (*State Papers*, vol. vii., p. 788.) It is to be inferred that he made much profit by this farming of the postage. The salary of his secretaryship of state was 800*l.* a year. He is described in a 'Narrative of the Late Parliament,' reprinted in the 'Harleian Miscellany' (vol. iii., p. 453), as 'secretary of state and chief postmaster of England, places of a vast income.'

There is the following entry in Whitelocke's 'Memorials,' under the date of April 9, 1657:—'A plot discovered by the vigilancy of Thurloe, of an intended insurrection by Major-General Harrison and many of the Fifth-Monarchy men' (p. 655). Thurloe afterwards, by Cromwell's desire, reported on the subject of this plot to the parliament, and received in his place the thanks of the house, through the Speaker, for his detection of the plot, and 'for the great services done by him to the commonwealth and to the parliament, both in this and many other particulars.' On the 13th July, 1657, he was sworn one of the privy council to the Protector, appointed in accordance with the 'Humble Petition and Advice.' Honours now came thick upon him. In the year 1658 he was elected one of the governors of the Charter-House and chancellor of the university of Glasgow.

In September, 1658, Cromwell died, and his son Richard was proclaimed in his stead. In the parliament that was called in December, Thurloe was solicited to sit for Tewksbury, in a letter which is worth extracting, as showing his estimation and position at this time, and the spirit of constituencies:—'Noble Sir, We understand that you are pleased so much to honour this poor corporation as to accept of our free and unanimous electing you one of our burgesses in the next parliament, and to sit a member for this place. Sir, we are so sensible of the greatness of the obligation, that we know not by what expressions sufficiently to demonstrate our acknowledgments; only at present we beseech you to accept of this for an earnest, that whomsoever you shall think worthy to be your partner shall have the second election; and our zeal and hearty affections to serve and honour you whilst we are, as we shall ever strive to be, Sir, your most humble and obliged servants,' &c.: signed by the bailiffs and justices of Tewksbury. (*State Papers*, vol. vii., p. 572.) He was not after all chosen for Tewksbury. He was elected for Wisbech, Huntingdon, and the university of Cambridge. His election for the last was communicated to him in a letter from the celebrated Dr. Cudworth, who wrote to him in this strain:—'We being all very glad that there was a person of so much worth and so good a friend to the university and learning as yourself, whom we might betrust with the care of our privileges and concernments.' (*State Papers*, vol. vii., p. 587.) Thurloe made his election to sit for the university of Cambridge.

The meeting of this parliament was the beginning of discontents and of Richard Cromwell's fall. We find Thurloe, in a letter to Henry Cromwell, viewing the complaints of the army and of the opposition in parliament as pointed principally against himself, and stating that he had asked the Protector's permission to retire from his office. 'I trust,' he adds, 'other honest men will have their opportunity, and may do the same thing with myself with better acceptance, having not been engaged in many particulars, as I have, in your father's lifetime, which must be the true reason of these stirrings; for they were all set on foot before his now highness had done or refused one single thing, or had received any advice from any one person whatsoever.' Thurloe remained however secretary of state. It was one of the objects set before themselves by the royalists in this parliament, who, by uniting with the republican party, formed a most troublesome opposition to Richard Cromwell's government, to impeach Thurloe; but this object was yet undeveloped when the parliament was dissolved. Thurloe appears to have given strong counsel against the dissolution.[*] The immediate consequence of the dissolution was the summoning, by Fleetwood and the council of officers, of the Rump of the Long Parliament, and Richard Cromwell's deposition.

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[*] It is generally stated otherwise, on the authority of the following passage in Whitelocke:—'Richard advised with the Lord Broghill, Fiennes, Thurloe, Wolsey, myself, and some others, whether it were not fit to dissolve the present parliament: most of them were for it; I doubted the success of it" (p. 677). Those mentioned are very few of the council, and, even if there had been no others, it would be quite consistent with the words of this passage that Thurloe should have sided with Whitelocke. That Thurloe strenuously opposed the dissolution is distinctly stated, and with circumstantial mention of the authority, in Calamy's Life of Howe, prefixed to Howe's Works, p. 9, ed. 1724, fol. We know further that the dissolution was urged on Richard Cromwell by the Republican and Royalist parties, which were united against Thurloe. Whitelocke says, a little afterwards, of the dissolution, that it 'caused much trouble in the minds of many honest men; the Cavaliers and Republicans rejoiced at it.' One of the 'many honest men' was doubtless Thurloe. See also Clarendon's 'State Papers,' vol. iii., pp. 420-60.

The letters written during Richard Cromwell's short Protectorate, in the third volume of Clarendon's 'State Papers,' are full of acknowledgments of Thurloe's influence with Richard Cromwell, and of the importance attached to him by the intriguing Royalists. Thus, Cooper, one of Hyde's spies, writes to him, February 13, 1659, 'Cromwell is governed by Thurloe, whether for fear or love I know not; but sure it is, he hath power to dispose him against the sense of right, or indeed his own interests. Thurloe's malice, I doubt, will never suffer him to do us good' (p. 425). Again Hyde writes to another of his agents, Brodrick, 'There is nothing we have thought of more importance, or have given more in charge to our friends since the beginning of the parliament, than that they should advance all charges and accusations against Thurloe and St. John, who will never think of serving the king; and if they two were thoroughly prosecuted, and some of the members of the High Court of Justice, Cromwell's spirits would fall apace' (p. 428). 'It is strange,' Hyde writes a month after, March 10, 1659, 'they have not in all this time fell upon Thurloe and those other persons who advanced Cromwell's tyranny' (p. 436). Then overtures to Thurloe to aid the king are thought of. 'I do confess to you,' Hyde writes, 'I cannot comprehend why Thurloe, and even his master St. John, should not be very ready to dispose Cromwell to join with the king, and why they should not reasonably promise themselves more particular advantages from thence than from anything else that is like to fall out' (p. 449). After the dissolution of the parliament, serious thoughts seem to have been entertained of soliciting Thurloe's and St. John's aid (p. 477). But Thurloe afterwards becomes again an object of fear to Hyde. During the government by the army, he writes, 'I do less understand how Thurloe shapes, and is in danger to be exempted out of the Act of Oblivion, and at the same time employed in the greatest secrets of the government, for I have some reason to believe that he meddles as much as ever in the foreign intelligence' (p. 532).

On the 14th of January, 1660, Thurloe was succeeded in his office of secretary of state by Scot, one of the republican party; but he was reappointed on the 27th of February. His patent as chief postmaster had been cancelled in the interval, on the 2nd of February. (*Commons' Journals*, vol. vii., p. 533.) In the movements that followed for the restoration of Charles II., Thurloe made an offer of his services to those who were bringing about that event. Sir E. Hyde writes to Sir John Grenville, April 23rd, 1660, 'We have, since I saw you, received very frank overtures from Secretary Thurloe, with many great professions of resolving to serve the king, and not only in his own endeavours, but by the services of his friends, who are easily enough guessed at. This comes through the hands of a person who will not deceive us, nor is easily to be deceived himself, except by such bold dissimulation of the other, which cannot at first be discerned. . . . The king returned such answers as are fit, and desires to see some effects of his good affection, and then he will find his service more acceptable.' (Thurloe's *State Papers*, vol. vii., p. 897.) And Hyde goes on to instruct his correspondent to consult Monk as to Thurloe's character, and as to his power to be of use, supposing he were sincerely willing. On the 15th of May Thurloe was accused by the parliament of high treason, and ordered to be secured; but on the 29th of June a vote was passed allowing him 'liberty to attend the secretary of state, at such times as they [the House] shall appoint, and for so long a time as they shall own his attendance for the service of the state, without any trouble or molestation during such his attendance, and in his going and returning to and from the secretary of state, any former order of this House notwithstanding.'

After his release from imprisonment, he retired to Great Milton in Oxfordshire, where he generally resided, except in term-time, when he occupied his chambers in Lincoln's-Inn. It is said that he was often solicited by Charles II. to resume public business, and always refused, telling the king that he despaired of serving him as he had served Cromwell, whose rule was to seek out men for places, and not places for men. (Birch's *Life of Thurloe*, prefixed to *State Papers*, p. xix.) Thurloe died at Lincoln's-Inn on the 21st of February, 1668.

He had been twice married, and left four sons and two daughters, all by his second wife, a sister of Sir Thomas Overbury. He was possessed, during the days of power, of the manors of Whittlesey St. Mary's and Whittlesey St. Andrews, and the rectory of Whittlesey St. Mary's, in the Isle of Ely, and of Wisbech Castle, which he rebuilt. But after the Restoration they reverted to the Bishop of Ely. There is an entry in the Commons' Journals of the 18th of May, 1660: 'Mr. Secretary Thurloe put out of the ordinance for assessment of the isle of Ely:' (vol. viii., p. 36.) Dr. Birch says he had an estate of about 400*l*. a-year at Astwood in Buckinghamshire. In a monumental inscription to the memory of his son-in-law in St. Paul's Church, Bedford (*Cole's MSS.*, vol. iii., p. 43), Thurloe is described as of Astwood, Bucks.

Thurloe does not appear to have possessed any striking qualities, either moral or intellectual, to impress the minds of his contemporaries; and we know little else of him than that he had great powers of business. Burnet describes him as 'a very dexterous man at getting intelligence.' (*Hist. of his own Times*, i. 66.) From a story in Burnet relative to Syndercomb's conspiracy against Cromwell, and from what is said by Pepys of Morland, when assistant to Thurloe, who played his master false, and gained a baronetcy from Charles II. for his treachery, it might appear that he was not of a very generous disposition, or much liked by those who were under him. Morland attributed his misconduct to 'Thurloe's bad usage of him.' (Pepys, vol. i., p. 133.) [MORLAND, SIR SAMUEL.] Burnet's story is, that Thurloe treated lightly information which had been given him of the design on Cromwell's life, and that when, on the subsequent discovery of this design, Cromwell became aware that information had been given to Thurloe, on which he had not acted, and blamed Thurloe for his conduct, Thurloe availed himself of his influence with the Protector to malign his informant: 'So he (the informant) found,' says Burnet, 'how dangerous it was even to preserve a prince (so he called him), when a minister was wounded in the doing of it, and that the minister would be too hard for the prince, even though his own safety was concerned in it' (vol. i., p. 79).

Thurloe's 'State Papers,' 7 vols. fol., 1742, contain a large mass of records of his official transactions, together with a number of private letters and papers. They were edited by Dr. Birch, who gives the following history of Thurloe's papers: 'The principal part of this collection consists of a series of papers discovered in the reign of King William, in a false ceiling in the garrets belonging to Secretary Thurloe's chambers, No. xiii., near the chapel in Lincoln's-Inn, by a clergyman who had borrowed those chambers, during the long vacation, of his friend Mr. Thomlinson, the owner of them. This clergyman soon after disposed of the papers to the Right Honourable John Lord Somers, then lord high chancellor of England, who caused them to be bound up in 67 volumes in folio. These afterwards descended to Sir Joseph Jekyll, master of the rolls; upon whose decease they were purchased by the late Mr. Fletcher Gyles, bookseller.' They were published by Mr. Gyles's executors. Dr. Birch, the editor, received many other papers from different individuals, especially from Lord Shelburne and the then archbishop of Canterbury, which he has incorporated in the collection. For historical purposes this is an invaluable collection.

THURLOW, EDWARD, LORD, was born in the year 1732, at Little Ashfield near Stowmarket in Suffolk. His father, Thomas Thurlow, was a clergyman, and held successively the livings of Little Ashfield, and of Stratton St. Mary's in Norfolk. After receiving the rudiments of his education from his father, young Thurlow was sent to the grammar-school at Canterbury at the suggestion of Dr. Donne, who sought (as Mr. Southey states in his 'Life of Cowper' upon the authority of Sir Egerton Brydges) to gratify a malignant feeling towards the head-master, by placing under his care 'a daring, refractory, clever boy, who would be sure to torment him.' The motive ascribed to Donne is far-fetched, and seems improbable; but there is no doubt that Thurlow was educated at the Canterbury school, and that he continued there several years, and until he was removed to Caius College, Cambridge. His character and conduct at the university did not promise any meritorious eminence in future life. He gained no academical honours, and was compelled to leave Cambridge abruptly in consequence of turbulent and indecorous behaviour towards the dean of his college. Soon after he quitted Cambridge he was entered as a member of the Society of the Inner Temple. In Michaelmas term, 1754, he was called to the bar, and joined the Western circuit in the ensuing spring.

Thurlow immediately applied himself to the practice of his profession with great assiduity; and although he brought with him an indifferent character from the university, he attained unusually early to reputation and employment both in Westminster Hall and on the circuit. His name appears frequently in the Law Reports soon after he was called to the bar; and his success in the profession he had chosen was clearly ascertained in less than seven years from the commencement of his practice. In 1761 he obtained the rank of king's counsel; and it may perhaps be inferred from an anecdote which is related by his early friend and associate Cowper, in one of his letters (Cowper's *Works*, vol. v., p. 254, Southey's edit.), and which refers to this period, that Thurlow had then acquired a degree of reputation which suggested the prediction that he would eventually rise to the highest office in his profession. A more convincing proof of his position in the law is however recorded in the Reports, from which it appears that immediately after his appointment as king's counsel his practice in the courts rapidly increased, and, during ten years preceding his appointment as solicitor-general, was exceeded only by that of Sir Fletcher Norton, and one or two others of the most eminent advocates of his time. To have succeeded so early and to so great an extent, without adventitious aid from influence or connection, and in competition with advocates of unquestioned ability and learning, is a substantial argument of professional merit. His employment in preparing and arranging the documentary evidence for the trial of the appeal in the House of Lords against the decision of the Court of Session in the Great Douglas Cause (which, according to professional tradition, resulted from mere accident) may have had the effect of bringing his talents, industry, and legal acquirements under the immediate notice of persons of power and influence, and of thus opening the way to his subsequent elevation.

In the new parliament called in 1768 he was returned as member for the borough of Tamworth, and became a constant and useful supporter of Lord North's administration. Upon Dunning's resignation of the office of solicitor-general in March, 1770, and Blackstone's refusal to accept it ('Life of Sir William Blackstone,' prefixed to Blackstone's *Reports*), Thurlow received the appointment, and in January, 1771, he succeeded Sir William De Grey as attorney-general. Soon after his introduction to office, he attracted the particular notice of George III. by the zeal and energy displayed by him in supporting the policy of Lord North's government respecting America, and in which the king is known to have taken the warmest interest. Thurlow's strenuous and steady support of the minister in the great parliamentary contest which ensued respecting that policy, procured for him a degree of confidence and even of personal regard on the part of the king, which continued unabated for upwards of twenty years, and had unquestionably great influence in the remarkable vicissitudes of party which occurred in that period.

In the summer of 1778 lord chancellor Bathurst resigned his office; and on the 2nd of June in that year Thurlow was appointed his successor, and raised to the peerage with the title of Baron Thurlow of Ashfield in the county of Suffolk. Four years afterwards, in March, 1782, when Lord North was removed from power, and the ephemeral Rockingham administration was formed, Thurlow remained in possession of the great seal by the express command of the king, and in spite of Mr. Fox's opposition to his continuance in office; thus furnishing an instance without a parallel in the history of English party, of a lord chancellor retaining office under an administration to all the leading features of whose policy he was resolutely opposed. Nor was he content in this inconsistent association to differ from his colleagues in opinion only; on the contrary, he took no pains to conceal his hostility to their principles, and even opposed in the House of Lords with all his characteristic energy the measures which they unanimously supported. Thus, after the bill for preventing government contractors from sitting in the House of Commons had been introduced into the House of Lords, where it was supported by Lord Shelburne and all the ministers in that house, the lord chancellor left the woolsack, and himself moved that 'the bill be not committed,' denouncing the measure as 'an attempt to deceive and betray the people,' and designating it 'a jumble of contradictions.' (Hansard's *Parl. Hist.*, vol. xxii., pp. 1356-1379.) The inconvenience produced by this embarrassing disunion of councils was deeply felt, and was one of the principal reasons for Mr. Fox's retirement from administration on the death of the marquis of Rockingham; and when the administration was dissolved in February, 1783, upon the coalition formed between Lord North and Mr. Fox, Lord Thurlow was compelled to retire from office, notwithstanding the exertions of the king to retain him. But though no longer chancellor, he still continued to be one of those who were described by Junius as 'the king's friends,' and was supposed to have been his secret and confidential adviser during the short reign of the Coalition ministry. Upon the dissolution of that ministry at the end of the same year in which it was formed, the great seal was restored to Lord Thurlow by Mr. Pitt, who then became prime minister. He continued to hold the office of lord chancellor for nine years after his reappointment; and until the occurrence of the king's madness in 1788, appeared to act cordially with the rest of the cabinet; but when that event rendered a change of councils by means of a regency probable, he was suspected, with good reason, of some intriguing communications with the Prince of Wales and the Whigs (Moore's *Life of Sheridan*, vol. ii., chap. xiii.), and was always subsequently regarded with distrust by Mr. Pitt and his colleagues. On the other hand, Lord Thurlow took no pains to conceal his dislike of Mr. Pitt; and that minister felt himself so embarrassed by the chancellor's personal hostility to him, that in 1789 he complained to the king, who immediately wrote to Thurlow upon the subject, and obtained from him a satisfactory answer. His angry feeling however still continued, until at length, in 1792, probably relying upon his personal influence with the king, he ventured to adopt a similar course to that which he had followed in very different circumstances under the Rockingham administration, and actually opposed several measures brought into parliament by the government. In particular he violently opposed Mr. Pitt's favourite scheme for continuing the Sinking Fund, and voted against it in the House of Lords, though he had never expressed his dissent from the measure in the cabinet. This kind of opposition, though submitted to from necessity by a weak government like that of the marquis of Rockingham, could not be endured by so powerful a minister as Mr. Pitt; and on the next day he informed the king that either the lord chancellor or himself must retire from the administration. The king, without any struggle or even apparent reluctance, at once consented to the removal of Lord Thurlow, who was acquainted by command of his majesty that he must resign the great seal upon the prorogation of parliament. Lord Thurlow is said to have been deeply mortified by this conduct on the part of the king; and he is related to have declared in conversation that 'no man had a right to treat another as the king had treated him.' Subsequently to his notice of dismissal, and before he quitted office, his ill humour was displayed by his opposition to another measure prepared and supported by Mr. Pitt, the object of which was the encouragement of the growth of timber in the New Forest. On this occasion he reflected severely upon those who had advised the king upon this measure, and went so far as to say that his majesty had been imposed upon. (Tomline's *Life of Pitt*, vol. iii., p. 398-9.) One of his latest acts as lord chancellor was to sign a protest in the House of Lords against Mr. Fox's Libel Act. The opportunity of his retirement from office was taken to grant him a new patent, by which he was created Baron Thurlow, of Thurlow, in the county of Suffolk, with remainder, failing his male issue, to his three nephews, one of whom afterwards succeeded to the title under this limitation.

After his retirement from office in 1792, Lord Thurlow ceased to take any leading part in politics, and having little personal influence with any party, became insignificant as a public character. He occasionally spoke in the House of Lords on the subjects of interest which were discussed at the period of the French revolution; and it is worthy of remark that he frequently opposed the measures adopted by the Tory government at that time for the suppression of popular disturbances. Instances of this occur with respect to the Treasonable Practices Bill and the Seditious Meetings Bill, in 1795; and a comparison of the sentiments expressed by him on these occasions, with his speeches respecting America during Lord North's administration, affords a striking example of political inconsistency. A circumstance is recorded in the 'Memoirs of Sir Samuel Romilly' (vol. ii., p. 124), which proves that till within a few months of his death Lord Thurlow was still confidentially consulted by members of the royal family. On occasion of the first communication of the charges made by Lady Douglas against the princess of Wales in 1805, the prince (afterwards George IV.) directed that Thurlow should be consulted, and the particulars of the interview between him and Sir Samuel Romilly are characteristic and interesting.

Lord Thurlow died at Brighton, on the 12th of September, 1826, after an illness of two years.

THURMER, JOSEPH, a German architect of some note, was born at Münich, November 3, 1789, but did not begin to apply himself to architecture professionally until 1817, when he became a pupil of Professor Fischer's, and had for his fellow-students Gärtner, Ziebland, Öhlmuller [ÖHLMULLER], and many others who have since rendered themselves more or less distinguished. At the end of the following year (after a previous visit to Rome at the commencement of it) he joined Hübsch, Heger (died 1837), and Koch, in a professional excursion to Greece, where he spent five months in studying and drawing the remains of buildings at Athens, some few of which he published on his return, with the title of 'Ansichten von Athen und seine Denkmaler,' 1823-6. He did not however confine himself to the study of the Grecian style, nor was he such a prejudiced admirer of it as to have no relish for any other; on the contrary, he considered the Italian style of the time of Leo X. to be equally worthy of the architect's attention, and to deserve to be far better, more faithfully and tastefully, represented by means of engravings than it previously had been. He accordingly joined with Gutensohn in bringing out a 'Sammlung von Denkmaler,' &c., 'Collection of Architectural Studies, and Decorations from Buildings at Rome, of the fifteenth and sixteenth centuries,' the first number of which appeared in 1826; but, unfortunately, it did not meet with the encouragement it deserved, and was therefore given up, when very little progress had been made with it. The publication however was so far advantageous to Thurmer, since it recommended him to notice, and led to his receiving (1827) at the same time two different invitations, one from Frankfort, the other from Dresden, to which last he gave the preference. He was there made professor-extraordinary at the school of architecture, and in 1832 was promoted to be first professor of architecture, in which capacity he did very much for the advancement of the art and the improvement of taste. Though he has left very little executed by himself in that city, the only public building in it entirely by him being the post-office (for though the 'Hauptwache,' or guard-house, was erected by him, it was after Schinkel's designs), his opinions had a very beneficial influence. That he should have had so few opportunities for displaying his ability, is not very surprising, nor does it detract from his reputation, since he did not long survive the completion of his first edifice: he died November 13th, 1833, while staying at Münich. What he might have done, had a longer life been granted him, is shown by the number of designs he left, all more or less stamped by originality and artistical feeling. That the grateful regard expressed for his memory and his talents by his friends and pupils was not a mere temporary effusion, is proved by their having erected a bronze bust and monument to him, in 1838, at the Academy of Arts.

(*Convers. Lex. der Neuesten Zeit*; *Morgenblatt*, 1838.)

THURNEYSSER ZUM THURN, LEONARD, a celebrated alchemist and astrologer, was born in 1530 at Basle, where his father carried on the trade of a goldsmith. He was himself brought up to this employment, but he was obliged to leave his native place when eighteen years of age, on account of having sold to a Jew a piece of gilt lead for pure gold. He first went to England, thence to France, and afterwards to Germany, where he enlisted among the troops of the margrave of Brandenburg. The following year he was taken prisoner; from that time he gave up a military life, and having visited the mines and foundries of Germany and the north of Europe, he came back in 1551 to Nürnberg, Strassburg, and Kostnitz. Here he again carried on the trade of a goldsmith, and made much money by it, till, on account of his reputation for skill in the art of mining, he was sent for to the Tyrol to superintend different mineral works. Accordingly in 1558 he went to Tarenz in Upper Innthal, and established on his own account in that place, as well as at St. Leonard, foundries for the purifying of sulphur, the success of which contributed still more to his celebrity. The Archduke Ferdinand had so much confidence in him that he sent him to travel in Scotland, the Orkney Islands, Spain, and Portugal. Thurneysser also visited the coasts of Barbary, Ethiopia, Egypt, Arabia, Syria, and Palestine, and returned to the Tyrol in 1567. Two years afterwards, at the request of the same prince, he again visited the mines of Hungary and Bohemia. The publication of his works made him determine to go to Münster and Frankfort on the Oder, at which latter place he became acquainted with the elector of Brandenburg, whose wife he cured of a dangerous illness, and who resolved to attach him to his service in the hope that he might discover in his estates some unknown mineral treasures. Thurneysser accepted the office of physician to the prince, and accompanied him to Berlin, where, from his skill in profiting by the prejudices and weaknesses of his contemporaries, and from being acquainted with all the resources of charlatanism, he soon succeeded not only in acquiring considerable wealth, but also in passing himself off for one of the most learned and scientific men of his age. At length however, by the envy of others, and still more by his own imprudence, his deceptions were discovered, and he was, in 1584, obliged to leave Berlin. He went to Prague, Cologne, and Rome; and after having thus led a wandering life for some years, he died at last in a convent at Cologne, at the age of sixty-six, in 1596. He was an advocate for the pretended sciences of alchemy and uromancy, and his whole history (like that of most similar characters) is a proof of the influence that may be acquired in an ignorant age by a bold and enterprising man, when he possesses some little information above the generality of his contemporaries. His writings were numerous, but of little worth, and they are now very seldom looked into. The titles of twelve of them are given in the *Biographie Médicale*, from which work the preceding account is taken.

THUROTZ, or THUROCZ, is a small county in Hungary, in the circle on this side the Danube. It is bounded on the north by Arva, on the east by Leptan and Sohl, on the south by Bars, and on the west by Neitra and Trentsin. Its area is 445 square miles, and the population 42,000 inhabitants, chiefly Slowacs, of whom about two-thirds are Lutherans and one-third Roman Catholics, except about 500 Jews. 'This country is justly called a beautiful garden' (says the anonymous author of the description of Hungary, Croatia, and Slavonia), for it is surrounded on all sides with lofty mountains, as with walls, within which nature has been lavish of the most beautiful scenery. This garden has only two entrances in the northern part, through which the river Waag enters and leaves the country. The first entrance is between the two mountain-chains called the Great and the Little Fatra, and the other near Sztrecsno. The Great Fatra has two summits, the Stock, 4876 feet high, and the Thurocz Krivan, 5300 feet high.' The climate is cold, but healthy. Though the soil is fertile, there is no superfluity of natural productions: it produces no wine, but nearly sufficient corn (chiefly buckwheat) for the consumption of the inhabitants; and so much barley and oats, that some portion can be exported. Pulse of different kinds abounds, especially large and excellent peas. Potatoes are extensively cultivated, and also a species of turnip peculiar to this country. The inhabitants collect a considerable quantity of a balsam from the mountain-pines, which is sold to the common people, and extolled as possessing great medicinal virtues: it is exported to Germany, and even to America. There are numerous flocks of sheep on the mountains and in the numerous valleys. Of 158,820 acres of productive land, only 62,442 acres are arable, and 83,758 acres are covered with forests. The chief town is St. Martin, on the river Thurocz, which has about 2000 inhabitants. It has a handsome county-hall, and five large Roman Catholic churches. (Hassel, *Geography*; Blumenbach, *Oesterreschische Monarchie*.)

THURROCK. [ESSEX.]

THURSDAY. [WEEK.]

THURSO. [CAITHNESS.]

THUS. [BOSWELLIA.]

THYATEIRA. [LYDIA.]

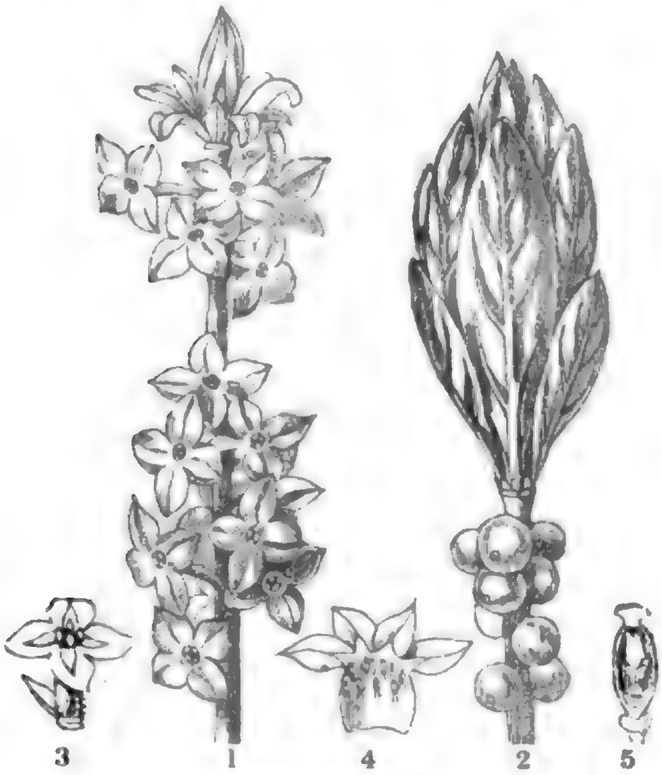
THYLA'CINUS. [MARSUPIALIA, vol. xiv., p. 455.]

THYLACOTHE'RIUM. [MARSUPIALIA, vol. xiv., p. 464.]

THYME. [THYMUS.]

THYMELA'CEÆ, a natural order of plants belonging to the tubiferous group of Incomplete Exogens. The name of this order is derived from Thymelæa, a plant spoken of by the antients, and which some have supposed to be the Daphne Gnidium, a plant belonging to the present order. This order consists of shrubs or small trees, very rarely herbaceous, with non-articulated, sometimes spiny branches having a very tenacious bark. The leaves are entire, simple, without stipules, and alternate or opposite. The flowers are capitate or spiked, terminal or axillary, occasionally solitary. The calyx is tubular, coloured, 4-cleft with an imbricate æstivation; the stamens 2-4 or 8 in number, inserted into the tube with 2-celled anthers, dehiscing lengthwise in the middle; the ovary is solitary, with a solitary pendulous ovule; the fruit is hard and dry, or drupaceous; the seed has little or no albumen, a straight embryo, with a short radicle and entire cotyledons. This order is related to Santalaceæ, from which it differs in its inferior calyx. It is also allied to Elæagnaceæ and Proteaceæ, from both of which it is distinguished by its pendulous ovules. Lindley refers to this order Bartling's Antholobeæ, on account of their superior fruit. [EXOCARPUS.] The species are found in Europe, but are not common; they occur in greatest abundance in the cooler parts of India and South America, at the Cape of Good Hope, and in New Holland.

The most prominent property of this order is their causticity, which resides in their bark. When applied to the skin, it produces vesication, and pain in the mouth when chewed. The bark of several of the species is very tough, and may be manufactured into cordage. Passerina tinctoria yields a dye which is used in the south of Europe to colour wool yellow. The various species of Daphne possess active properties; some are used for dyeing, some are poisonous, and the Daphne Lagetta is the Lace-bark-tree of Jamaica. [DAPHNE.]



Daphne Mezereum.

1, Cutting with flowers; 2, ditto with fruit; 3, single flower; 4, calyx opened, showing the insertion of the stamens; 5, section of ovary, showing the single pendulous seed.

THYMUS (*θύμος*), the name of a genus of plants belonging to the natural order Lamiaceæ or Labiatæ. It has an ovate bilabiate calyx with thirteen ribs; the upper lip is trifid, the lower lip is bifid with ciliated subulate segments, and throat villous inside; the corolla with the upper lip erect, nearly plane, notched, lower patent and trifid; stamens straight, exserted; anthers 2-celled; styles bifid at apex. All the species are small under-shrubs with usually purplish flowers. Between twenty and thirty species have been described by botanists, most of them inhabitants of Europe, especially the region of the Mediterranean: one only is a native of the British Isles.

T. vulgaris, Common or Garden Thyme, is an erect plant, or sometimes procumbent at the base, or clothed with a hoary pubescence; the leaves are sessile, linear, or ovato-lanceolate, acute, with revolute edges, fascicled in the axils; the teeth of the upper lip of the calyx are lanceolate, but the segments of the lower lip are subulate and ciliated. This plant is a native of the south-west parts of Europe, in dry plains and on hills, and uncultivated places free from woods. The plant is very much branched, and has purplish flowers. This species is cultivated for culinary purposes, and many varieties of it are met with in gardens. It has a pungent aromatic odour and taste. These properties are communicated to water by infusion only to a slight extent. They depend upon an essential oil, an ounce of which may be obtained from thirty pounds of the plant.

T. serpyllum, Wild Thyme, or Mother-of-Thyme, is a suffruticose plant, with capitate flowers, branched decumbent stems, with plain, ovate, obtuse, entire, petiolate leaves, more or less ciliated at the base. It is a native of Great Britain, on hills and in dry pastures, and throughout Europe and the north of Asia. This plant has the same sensible properties as the last, but is more inclined to produce varieties, several of which have been described as species. These vary principally in the colour of the flowers and the size of the leaves and plant. One of the varieties, *T. s. citratus*, is known by the name of Lemon-Thyme on account of its scent resembling the lemon. The seeds will not however maintain this property: if required to be preserved, the plants must be propagated by means of slips or cuttings.

Both this and the former species, when cultivated, are best raised by means of seeds, although they may be easily propagated by parting the roots or planting slips and cuttings. The seed may be sown in March or April, in a light fine soil, and when the plants are two or three inches high, they should be transplanted. Roots or slips should be planted in the autumn. The plants produce abundance of seeds in the summer and autumn, which, when gathered, should be rubbed out, and preserved for planting in the following spring.

These plants are not so much used in medicine as for culinary purposes. The volatile oil is frequently used as an application to carious teeth. Linnæus recommends them as a remedy for dissipating the effects of intoxicating liquors, and a decoction is used in France as an application for the itch.

T. mastichina, Mastich-Thyme, or Herb-Mastich, has ovate or oblong, obtuse, petiolate leaves, narrowed at the base and not ciliated; the calyx is villous, with feathery subulate teeth, which are longer than the tube. It is a native of dry, sandy, uncultivated places in Spain, Portugal, and Barbary. It exhales a scent resembling mastich. It is the *Marum vulgare* of older botanists, and at one time had some reputation as an errhine. Several other species of thyme are cultivated; they do not require much care; the more delicate and rarer kinds are found amongst collections of alpine plants.

THYMUS GLAND, which in the calf and lamb is called the sweetbread, is an organ situated behind the sternum, in the anterior mediastinum, in front of the pericardium and the large vessels arising from the base of the heart. In the embryo and the infant it has, in proportion to the rest of the body, a very considerable size; in after-life it becomes comparatively smaller, and at last nearly disappears. It is of an elongated form, its greatest dimension being from above downwards, and is composed of two chief portions, which, by careful dissection, may be separated in the middle line. At each end it bears two processes or *horns*, of which the upper are longer and more slender than the lower, and the right are usually longer than the left. It is supplied by several branches from the internal mammary, inferior thyroid, and mediastinal arteries, to which veins of considerable size correspond. Its absorbent vessels are numerous and large, but not more so than in other glands of equal vascularity.

The thymus gland is composed of a great number of similar small masses or lobules, which may be separated by dissection, and are held together by fine cellular tissue continued from that which invests the whole gland. The lobules vary in size from half a line to three lines in diameter, and have simple or complex cavities filled with a milky fluid. Sir Astley Cooper (*The Anatomy of the Thymus Gland*) says that the lobules are arranged in spiral lines, so that the gland may be unravelled into a sort of knotted rope of lobules, which are wound around a central cavity or reservoir, with which the cavities of the lobules communicate. But the existence of such a central cavity is not generally admitted.

The fluid contained in the cells of the thymus gland is, in young and healthy animals, opaque and creamy. It has been particularly examined by Mr. Gulliver (Appendix to Gerber's *General Anatomy*), who has found that both in its chemical composition, and in the abundance and structure of the globules which it contains, it closely resembles the fluid of the lymphatic glands.

Of the function of the thymus gland scarcely anything probable is known. Whatever it be, it is performed most actively during fœtal life and the first year of extra-uterine life: for during this time the thymus gland grows at the same rate as the rest of the body, its cells are full of fluid, and the fluid is thick and abundant in globules. From the end of the first to the end of the third year its size does not materially vary; but after this time it gradually diminishes, and after the twelfth or fourteenth year it is rare to meet with more than a slight trace of it. It is also of considerable size and is full of fluid in hybernating animals: and this, together with its activity during fœtal life, has suggested that its office is in some way connected with the preparation of the blood, when respiration is either inactive or has not commenced. But, in these same circumstances, digestion is not going on, and it is therefore just as probable that the thymus gland may have the office of preparing a fluid and globules, like those of the chyle, from the materials which have served for the nutrition of the body and have been re-absorbed; in other words, that its function is analogous to that of the lymphatic glands. This was the opinion of Hewson (*Experimental Enquiries*); it is supported by the observations of Mr. Gulliver and many others, and is on the whole more probable than any other yet advanced.

The thymus gland is rarely diseased. The only affections of it yet described are an unnatural enlargement of it, and its persistence in the dimensions which it has in fœtal life. When it is enlarged there is generally a more than usual development of all the lymphatic glands; and not unfrequently there are at the same time signs of serious general disorder of the health, such as rickets, hydrocephalus, &c. It has been supposed, especially by the German pathologists, that a peculiar affection of the respiration, which has been called Thymic Asthma, is the general result of enlargement of this gland; but the connection of the two affections is not yet clearly established.

THYO'NE [Holothuria vol. xii., p. 269.]

THYROID GLAND is an organ situated in the middle and fore part of the neck in front and by the sides of the thyroid cartilage of the larynx (from which it has its name), and of the cricoid cartilage and the upper part of the trachea [Larynx], to which it is closely fixed by cellular tissue. It is composed of two chief lateral portions or lobes, and a smaller portion or isthmus connecting them. A fourth portion, which is long and slender, and is named the middle column or horn, usually passes upwards from the isthmus in front of the larynx. The lateral lobes are of a somewhat pyramidal form, about two inches long, and an inch wide at their bases. The whole gland is proportionally larger in the embryo than in the adult, and in women than in men.

The substance of the thyroid gland is firm, fleshy, and very vascular. It receives a copious supply of blood from two superior and two inferior thyroid arteries; the former are branches of the external carotid, the latter of the subclavian arteries; their branches communicate freely in the gland, and they are accompanied by veins and lymphatics of corresponding size. The interior of the gland contains numerous very minute cells, lined by polished membranes, and in young persons filled by a clear albuminous fluid, in which, or in the walls of the cells, there are numerous granular corpuscles.

Of the function of the thyroid gland no more is known than of those of the spleen and thymus gland, between which it seems, in structure, to hold an intermediate place; resembling the spleen in its vascularity, which is far greater than is required for its nutrition, and the thymus in the existence of cells containing a fluid, and in its development during early life. What has been said of their probable functions might be repeated here.

The thyroid gland is subject to several changes of structure, most of which, being attended with enlargement, are comprehended in the name of bronchocele or goître [Bronchocele], to which the reader is referred. In many cases the cells of the gland are enlarged, and its structure, which in health is with difficulty discernible, may in these be easily demonstrated.

THYSANO'PODA. [Stomapods, vol. xxiii., p. 81.]

TIA'RA (τιάρα or τιάρας), a high kind of hat, which was in antient times worn by the inhabitants of Middle and Western Asia, especially by the Persians, Parthians, Armenians, and Phrygians. There were two kinds of tiaras: the upright tiara was only used by kings, priests, and other persons of the highest rank, and the upper part had frequently the shape of a crown; the tiara worn by other people was of a soft and flexible material, so that it hung down on one side, as in the case of the so-called Phrygian bonnet. (Hesychius and Suidas, *s. v.* τιάρα.) The tiaras of persons of high rank were of the most costly colours, such as purple, and adorned with gold and precious stones. (Ovid, *Metamorph.*, xi. 181; Valerius Flaccus, vi. 699; compare *Dictionary of Greek and Rom. Antiq.*, under 'Tiara.')

In modern times the term tiara is applied to the headdress of the popes, which is worn on solemn occasions, and consists of a triple crown. Hence it is also used in a figurative sense to designate the papal dignity.

TIA'RA, Mr. Swainson's name for a genus of 'Mitrinæ.' his term for the subfamily of testaceous mollusks, the shells of which are termed 'Mitres' by collectors. [Volutidæ.] N.B. This generic name comes too near to Tiaris.

TIARI'NI, ALESSANDRO, one of the most celebrated painters of the Bolognese school, was born at Bologna in 1577. He first studied under Prospero Fontana, and, after Fontana's death in 1597, under Bartolomeo Cesi; but having in a quarrel discharged a pistol or similar weapon at a fellow-scholar, without however doing him any injury, he was obliged to fly from Bologna. He went to Florence, and there engaged himself with a portrait-painter, for whom he painted hands and draperies, and some of his performances having attracted the notice of Domenico da Passignano, he was admitted by that painter into his studio as a scholar. Tiarini remained with Passignano seven years, and by that time acquired so great a reputation, that he received invitations from Bologna to return to that city. In Bologna his works excited universal admiration for their invention and earnestness of character, and for their boldness of foreshortening, correctness of design, and propriety of colouring: the tone of Tiarini's pictures is sombre; he used little red, and avoided gay colours generally. His works, which are very numerous, consist chiefly in oil-paintings; he executed comparatively little in fresco: those in public places alone, in Bologna and its vicinity, and in Mantua, Modena, Reggio, Parma, Cremona, and Pavia, amount to upwards of two hundred: their subjects are generally of a melancholy or serious nature. The following are the most celebrated:—A Miracle of St. Dominic, in the Capella del Rosario, in the church of San Domenico at Bologna, painted in competition with Lionello Spada, in which the saint restores a dead child to life; the exhumation of a dead monk, in the convent of San Michele in Bosco; and St. Peter repenting his Denial of Christ, standing outside the door of the house of the high priest, with the Mocking of Christ in the background, illuminated by torchlight.

Ludovico Carracci, whose style Tiarini ultimately adopted, was a great admirer of his works: when he first saw Tiarini's picture of the Miracle of San Domenico, he is reported to have exclaimed that he knew no living master that could be compared with Tiarini. Many of Tiarini's pictures, out of Bologna, have been attributed to one or other of the Carracci: such was the case with the celebrated Deposition from the Cross, now in the Gallery of the Academy of Bologna, formerly in the church of the college of Montalto: it is engraved in the work of Rosapina, 'La Pinacoteca della Ponteficia Accademia dell- Belle Arti in Bologna.

Several of Tiarini's pictures have lost their colour, owing to his practice of glazing; in some the colouring consists entirely of glazed tints, the design being executed in grey. He opened a life academy in Bologna, and had many scholars. Malvasia has preserved the name of a famous model that he used frequently to engage, Valstrago. Tiarini died in 1668, aged ninety-one.

(Malvasia, *Felsina Pittrice;* Lanzi, *Storia Pittorica*, &c.)

TIA'RIS, *Crestlet*, Mr. Swainson's name for a genus of Fringillidæ, placed by him in the subfamily *Coccothraustinæ*, between *Amadina* and its subgenera and *Carduelis*.

Generic Character.—Bill perfectly conic, entire; commissure sinuated, and consequently angulated. Nostrils almost naked, round. Wings moderate; first quill rather shorter than the second, third, and fourth, which are equal and longest. Tail even or slightly rounded. Feet moderate. Middle toe and tarsus of equal length; lateral toes equal; hinder toe much shorter than the tarsus. Claws small, fully curved. Head crested. *Locality*, South America only.

Example, *Tiaris ornatus*. Pl. Col., 208 (*Classification of Birds*).

Mr. G. R. Gray arranges this genus in the subfamily *Fringillinæ*, between *Pytelia*, Sw., and *Carduelis* (Antiq.), Briss. (*List of the Genera of Birds.*)

TIBALDEO. [Tebaldeo.]

TIBALDI, PELLEGRI'NO, otherwise called Pellegrino Pellegrini, or sometimes Pellegrino da Bologna, distinguished himself both in painting and in architecture. He was born in 1527, at Bologna, where his father, who originally came from Valsolda in the Milanese territory, was only a common mason. How, so circumstanced, the father was able to bring up his son to a profession requiring means beyond those of his own condition in life, does not appear; neither is it known from whom Tibaldi received his first instruction in painting. In 1547 he visited Rome, with the intention, it is said, of studying under Pierino del Vaga, but as the latter died in that same year, he could hardly have received any lessons from him. Whether he became a pupil of Michael Agnolo is unknown: he certainly studied his works very successfully, for while he caught from them grandeur of style and energy of forms, he so attempered their severity by the freedom and grace of his pencil, that he afterwards acquired from the Carracci the name of 'Michelagnolo Riformato,' and may be considered as the originator of that style which they perfected. We must, however, conclude that although he was employed there in the church of S. Lodovico di Francesi, he did not display any great ability with his pencil during his residence at Rome, it being related of him that he felt so discouraged as to have determined to starve himself to death, from which desperate resolution he was withheld only by Ottaviano Mascherino, who advised him to give up painting and devote himself entirely to architecture, for which he had shown considerable taste. In all probability this anecdote has been strangely exaggerated, nor are we informed how he set about putting Mascherino's advice into practice. That he partly adopted it, is certain, and equally certain that if he renounced painting for a while, he returned to it: in fact, not very long after the circumstance just spoken of, he was sent to Bologna by Cardinal Poggi to adorn his palace (afterwards occupied by the Academia Clementina), where he painted the history of Ulysses. For the same prelate he also painted the Poggi Chapel, which had been erected after Tibaldi's own designs, and it was those productions which excited the admiration of the Carracci. He was next employed at Loretto and Ancona, where he executed several works in fresco, and among them those with which he adorned the Sala de' Mercanti, or Exchange, in the last-mentioned city.

His reputation as an architect in the meanwhile increased, and after being employed to design, if not to execute, several buildings at Bologna, and the Palazzo della Sapienza, or Collegio Borromeo, at Pavia (which last was begun by Cardinal Carlo Borromeo in 1564), he restored the Archiepiscopal Palace at Milan, and was appointed chief architect of the Duomo, or cathedral, in that city (1570). He suggested the idea or first design of the modern façade attached to that celebrated Gothic structure,—a design which has obtained him both praise and censure in almost equal degree. Among other buildings by him at Milan are the church of San Lorenzo, that of S. Fedele, and that of the Jesuits. But the work which, if less celebrated than some of his others, is considered by one of his critics his chef-d'œuvre, and a masterpiece for the contrivance and ability shown in it, is the 'Casa Professa,' or that of the Jesuits at Genoa, with its church, &c., where he completely mastered all the difficulties arising from the inconvenience of the site. Neither his fame nor his works were confined to Italy, for the former caused him to be invited to Spain in 1586, by Philip II., where he was employed both in his capacity of architect and in that of painter, in which last he executed many admirable frescoes in the Escurial. Liberally rewarded by Philip, who also conferred on him the title of Marquis of Valsolda (his birth-place), Tibaldi returned to Italy after passing about nine years in Spain, and died at Milan in 1598; such at least is the date assigned by Tiraboschi, though some make it much earlier, 1590 or 1591, and others about as much later, viz. 1606.

(Tiraboschi; Lanzi; Milizia; Nagler.)

TIBALDI, DOMENICO, younger brother, not son of the preceding, as he is sometimes called, was born in 1541, and was, if not equally celebrated, like him both a painter and architect, but ranks far higher in the latter than in the other character. He executed many buildings at Bologna, the principal among which are the Palazzo Magnani, the Dogana, or custom-house, the chapel in the cathedral, so greatly admired by Clement VIII. as being superior to anything of the kind at Rome, and the small church of the Madonna del Borgo. Domenico also practised engraving with success, and in that branch of art was the instructor of Agostino Carracci. He died at Bologna in 1583.

(Milizia; Nagler.)

TIBBOOS. [Sahara.]

TIBER. [Papal State.]

TIBE'RIAS. [Palestine; Syria.]

TIBE'RIUS CLAU'DIUS NERO was born in Rome, on the 16th November, 42 B.C., according to Suetonius. He belonged to the gens Claudia, an old patrician family of great distinction, which was known for its aristocratical pride. Tiberius belonged to this house by the side of his father, Tiberius Claudius Nero, as well as his mother, Livia Drusilla, who was the niece of her husband, being the daughter of Appius Pulcher. This Appius Pulcher was a brother of Tiberius Claudius Nero the elder, and they were both sons of Appius Cæcus. His father was quaestor to C. Julius Cæsar, and distinguished himself as commander of the fleet in the Alexandrian war. He became successively praetor and pontifex, and in the civil troubles during the triumvirate he followed the party of M. Antonius. Being compelled by Octavianus to fly from Rome, he escaped by sea, and hastened to M. Antonius, who was then in Greece. His wife and his infant son accompanied him in his flight, and they happily escaped. Tiberius the elder soon made his peace with Octavianus; he gave up to him his wife, Livia Drusilla, who was then pregnant with Nero Claudius Drusus, and he died shortly afterwards (38 B.C.). Thus Tiberius the younger and his brother Nero Claudius Drusus became step-sons of Octavianus, who from the year 27 B.C. was Augustus.

The great talents of Tiberius were developed at a very early age. In his ninth year he delivered a public speech in honour of his father; in 29 B.C. he accompanied Octavianus in his triumph after the battle of Actium, and rode on his left side, Marcellus being on the right. After having assumed the toga virilis, he distinguished himself by splendid entertainments which he gave to the people. He married Vipsania Agrippina, the daughter of Agrippa, and the granddaughter of Cicero's friend T. Pomponius Atticus. She brought him a son, Drusus, and she was again with child when Tiberius was obliged to sacrifice her to the policy of Augustus, who compelled him to marry his daughter Julia, the widow of Marcellus and of Agrippa, and the mother of Caius and Lucius Cæsar. (12 B.C.) Tiberius obeyed reluctantly, but he never ceased to love Vipsania. Such was his affection for her, that whenever he saw his repudiated wife he would follow her with tears; and accordingly an order was given that Agrippina should never appear in sight of Tiberius. For some time Tiberius lived in harmony with Julia, and had a son by her, who died young. But the scandalous conduct of Julia soon disgusted him, and he withdrew from all intimate intercourse with her.

During this time Tiberius took an active part in public affairs. He defended the interests of king Archelaus (of Judæa, or of Cappadocia), of the Tralliani, and of the Thessalians: he was active in obtaining relief for the inhabitants of Laodicea, of Thyatira, and of Chios, who, having suffered from an earthquake, had implored the assistance of the senate; he pleaded against Fannius Cæpio, who had conspired against Augustus, and who was condemned for high treason; and he was twice intrusted with the 'cura annonae.' Tiberius made his first campaign as Tribunus militum in the Cantabrian war. From Spain he went to Asia Minor, and succeeded in restoring Tigranes to the throne of Armenia, and in forcing the Parthians to surrender the eagles which they had taken from M. Crassus. He returned to Rome in 18 B.C. During a year he had the command in Gallia Comata, the peace of which province was troubled by disputes between the princes and by incursions of the barbarians.

In 15 B.C. he and his brother Drusus brought the Alpine nations of Rhaetia to obedience. He also put an end to the war in Pannonia, which had lasted since 18 B.C., and which he terminated by subduing the Breuci, the Scordisci, and the Dalmatae, who were allied with the Pannonians. (14 B.C.) The Germani having defeated M. Lollius and taken the eagle of the fifth legion in 16 B.C. (Velleius Paterculus, ii. 97), Drusus was sent to the Rhine, and Tiberius returned to Rome, where he celebrated his first triumph. In the Rhaetian war Tiberius had shown great military skill, but the Romans carried on the war with unheard of cruelties against the inhabitants, of whom the majority were killed or carried off as slaves. In memory of his victories, a monument was erected at Torba (now Monaco, in the neighbourhood of Nizza), on which the names of forty-five Rhaetian tribes were inscribed. (Plinius, *Hist. Nat.*, iii. 24.) In 13 B.C. Tiberius was appointed consul, together with P. Quintilius Varus. Meanwhile Drusus carried on the war in Germany with great success; but in 9 B.C., on his retreat from the banks of the Elbe to the Rhine, he had a fall from his horse, which proved fatal. Tiberius was then at Pavia, but as soon as he was informed of this accident, he hastened to Germany, and arrived in the camp of his brother, near the Yssel and the Rhine, just before he died.

Tiberius led the army to Mainz (Moguntiacum). He ordered the body of his brother to be carried to Rome, and he accompanied it on foot. After discharging this pious duty, he returned to Germany. In the new war with the Germani, Tiberius at first defeated them, and transplanted 40,000 Sigambri from the right bank of the lower Rhine to the left bank; but he afterwards employed peaceable measures, and by negotiation he obtained more influence over them than his brother Drusus by all his victories. (Velleius Paterculus, ii. 97; Tacitus, *Annal.*, ii. 26.) He left the command in Germany in 7 B.C., and returned to Rome, where he celebrated his second triumph, and he was consul for the second time in the same year.

Tiberius was now at the height of his fame; he was respected by the army, and admired by the people; and he enjoyed the confidence of the emperor. He nevertheless suddenly abandoned his important functions, left Rome, and, without communicating his motives to anybody, retired to the island of Rhodes. So firm was his resolution to retire from public affairs, that he refused to take any nourishment for four days, in order to show his mother that her prayers and tears could not keep him any longer in Rome. (Suetonius, *Tiberius*, c. 10.) During eight years he led a private life at Rhodes, renouncing all honours, and living in the Greek style, and on terms of equality with those around him, with whom he kept up a friendly intercourse, especially Greek philosophers and poets. The Romans were surprised to see the step-son of their emperor retire to a distant island; and various hypotheses were raised to explain the motive of his voluntary exile. The disgusting conduct of his wife Julia was supposed to be a sufficient cause for this extraordinary resolution; but Tiberius himself afterwards avowed that he had renounced public business in order to escape all charges of having formed ambitious schemes against his stepsons, Caius and Lucius Cæsar, who were created 'principes juventutis,' and appointed successors of Augustus in the very year in which Tiberius went to Rhodes. It seems that he was dissatisfied with the elevation of these two young men, and that there was discord between him and them; for when he afterwards wished to go back to Rome, Augustus would not allow it until Caius Cæsar had consented, and it was also on condition that he should take no part in the government of the state. From all this we may conclude that Tiberius and his mother Livia had perhaps been intriguing to exclude Caius and Lucius Cæsar from the succession, and that he preferred a voluntary exile to a compulsory banishment, such as was inflicted by Augustus upon his own daughter Julia. But this is mere supposition, and there are no facts on which a direct accusation against Tiberius can be sustained. With regard to his banished wife Julia, Tiberius acted with great delicacy, notwithstanding her conduct, and he besought Augustus to leave her all those presents which he had formerly given to her. (Suetonius, *Tiberius*, c. 12, 13.) At last Tiberius returned to Rome (A.D. 2), and was received by the people with demonstrations of great joy. In the same year Lucius Cæsar died at Massilia (Marseille), and his death was followed by that of his brother, who died in 4 A.D., in consequence of a wound which he had received in the Parthian war. Augustus then adopted Tiberius as his future successor, in 4 A.D., and Tiberius in his turn was compelled by Augustus to adopt Drusus Germanicus, the son of his late brother Drusus Nero. Augustus also adopted M. Agrippa, the posthumous son of Agrippa and Julia, but he did not designate him as a successor in the empire. The imperial throne was thus secured to the house of the Claudii. In the same year (4 A.D.) Tiberius was appointed commander-in-chief in Germany, and he was accompanied by the historian Velleius Paterculus, who was præfectus equitum. After having subdued the Bructeri, and renewed the alliance with the Chatti, Tiberius in 5 A.D. made a campaign against the Longobards; who were defeated, and he obliged the whole north-west of Germany to acknowledge the Roman authority. In the following year (6 A.D.) he led 70,000 foot and 4000 horse against Maroboduus, the king of the Marcomanni, who was saved from ruin by a rising of the inhabitants of Pannonia and northern Illyricum, who intercepted the communications of the Roman army with Italy. Tiberius employed fifteen legions and an equal number of auxiliaries against these nations, and, in spite of difficulties of every description, he quelled the outbreak within three years. This war was especially dangerous because the Germani threatened to join the Pannonians, but Tiberius prevented their junction by negotiations and by the success of his arms. After having celebrated his third triumph, he was again sent against the Germani, who had slain Varus and his army (9 A.D.). Tiberius, who was accompanied by Germanicus, succeeded in preventing the Germani from invading the countries on the left bank of the Rhine, and he then celebrated his fourth triumph. Velleius Paterculus, an able judge of military talents, gives us a most favourable idea of him as a general. Suetonius says also that, sharing in all the hardships of the common soldiers, he maintained a severe discipline, but that at the same time he carefully watched over the security and the comfort of the soldiers.

Augustus died at Nola on his return from Naples, where he had accompanied Tiberius, who was going to conduct the war in Illyria (29th of August, A.D. 14). Anxious to see her son at that critical moment in Rome, Livia concealed the emperor's death until Tiberius, who was informed of it by messengers, had arrived at Nola. (Dio. Cassius, vi. 30, 31.)

Tiberius became emperor in his fifty-fifth year, at an age when both the virtues and the vices have acquired strength from habit, and when a man's character seldom changes. Until that time he was generally supposed to be a virtuous man; his virtues were imbued with the severe gravity of his character. Among his biographers none has blamed his early life; yet no sooner was he emperor, than he was charged with crimes the most dreadful and disgusting. His former life is represented as dissimulation and hypocrisy. An example of such dissimulation is known in history. Sixtus V. concealed his real intentions for thirty years; however, it was not his real character which he thus concealed, but by retiring from affairs, and by simulating disease and infirmity, he made the cardinals believe that by choosing him pope they would make him their instrument, because his infirmities would not allow him to act with energy. Tiberius however, except the eight years that he spent n Rhodes, was constantly employed in matters which, although they would have allowed him to conceal his real disposition, he could never have managed with such success, unless his conduct had been directed by the force of his real character.

Augustus succeeded in making himself master of the republic by accumulating in his person the different high functions of the state. Tiberius, proud and energetic, abolished even the shadow of the sovereignty of a nation which he despised. The Romans being sufficiently disposed to obedience, the only obstacles in his way were the worn-out institutions of the antient republic. Immediately upon the accession of Tiberius, Agrippa Postumus was put to death, probably by order of Tiberius (Suetonius, *Tiberius*, c. 22; Tacitus, *Annal.*, i. 6.) About this time the supreme power was offered by the troops on the Lower Rhine to Germanicus, who however refused it; and the mutiny was quelled by him and by Drusus, the son of Tiberius, who commanded in Pannonia. Tiberius began by some enactments which tended to ameliorate the state of morals; he abolished the comitia for the election of the various officers of the state, and transferred the election to the senate, the members of which were subservient to him. It has been already said that Tiberius intended to destroy the last remnants of the antient sovereignty of the people, and to supplant the majesty of the Roman nation by the majesty of the emperor. Augustus had already employed the Lex Julia Majestatis to punish the authors of libels against his person (Tacitus, *Annal.*, i. 72); and his example was followed by Tiberius, who established the Judicia Majestatis, by which all those who were suspected of having impugned the majesty of the emperor, either by deeds or by words, were prosecuted with the utmost severity. The number of the delatores, or denouncers of such crimes, daily increased, and a secret police was gradually established in Rome, as well organised, and as well supported by spies, as the secret police of Napoleon. The property, honour, and life of the citizens were exposed to the most unfounded calumnies, and a general feeling of anxiety and moral disease prevailed through the empire. The natural severity of Tiberius gradually degenerated into cruelty, and he showed symptoms of that misanthropy and that gloomy state of mind which increased with years. In the mean time Germanicus, the favourite of the army, had avenged the defeat of Varus, but Tiberius recalled him from Germany, and sent him into the East (17 A.D.). Germanicus conquered Cilicia and Commagene, and he renewed the alliance with the Parthians, but he died suddenly at Antioch (19 A.D.): public opinion accused Cneius Piso, the commander in Syria, of having poisoned Germanicus by order of the emperor; but before Piso could be sent to trial, he was found dead.

Seianus, the son of a Praefectus Praetorio, succeeded in obtaining the confidence of the emperor (19-22 A.D.), who henceforth gradually abandoned to him the direction of public affairs, of which Seianus became the absolute master from the year 22 A.D. Drusus, the son of Tiberius, who had governed the Roman part of Germany with great ability, was poisoned by Seianus (23 A.D.), and this crime was followed by a great many others, with which it is possible that the emperor was very imperfectly acquainted. His practice was to shut himself up within his palace, and to spend his time in the most revolting debauchery. After the death of Drusus, Tiberius recommended to the senate as his successors, Nero and Drusus, the sons of the unfortunate Germanicus and of Agrippina, who was still alive. In 26 A.D., Seianus at last persuaded him to retire from public affairs. Tiberius followed his advice and went to Capua and Nola, until at last he fixed his residence on the island of Capreae in the Gulf of Naples. The life which he led at Capreae was a series of infamous pleasures.

From this time all public affairs were directed by Seianus; the emperor was inaccessible. T. Sabinus, a friend of Nero, was put to death; statues were erected to Seianus, and received divine honours. After the death of Livia, in 29 A.D., the authority of Seianus was at its height; but at last Antonia, the aged mother of Germanicus, penetrated through the barriers of Capreae, and informed the aged Tiberius that Seianus had left him only the name of emperor. She was supported by Macro, the commander of the Praetorian guard. In consequence of this information, Tiberius ordered the senate to condemn Seianus; and the senate obeyed: Seianus, his family, and his friends were put to death in 31 A.D. Some time after this event, Tiberius retired from Capreae, and took up his residence at a villa near Misenum, which had formerly belonged to Lucullus. (Suetonius, *Tiberius*, c. 73.) On the 16th March, 37 A.D., he fell into a lethargy, and everybody believing him to be dead, Caligula, the third son of Germanicus, the favourite of old Tiberius, was proclaimed emperor. However Tiberius recovered, and Macro, in order to save himself and the new emperor, ordered him to be suffocated in his bed. Thus died Tiberius, at the age of seventy-eight, after a reign of twenty-three years. (Tacitus, *Annal.*, vi. 50; Suetonius, *Tiberius*, c. 73.)

There is little doubt that the crimes said to have been committed during the reign of Tiberius, either by himself or by others in his name, are real facts. But the question is whether they are all to be imputed as crimes to Tiberius. His insanity is a fact which can hardly be doubted; a dark melancholy, disgust of life, and misanthropy, had taken possession of him, and his struggle with the idea of self-destruction often threw him into wild despair. He found consolation in the sufferings of others, and thus gave those bloody orders which he afterwards regretted. The unnatural pleasures to which he was addicted were only another mode of soothing the despair of his soul. It is probable that his insanity was complete when he retired to Capreae. Sometimes he had lucid intervals, in which he wrote those letters of which Suetonius gives some extracts (*Tiberius*, c. 67), and in which he confesses the wretched state of his soul. His physical health was excellent, until some days before his death. Tiberius loved the arts and literature. According to Suetonius he wrote a lyric poem, 'Conquestio de L. Cæsaris Morte;' he also wrote poems in Greek, choosing for his models Euphorion, Rhianus, and Parthenius, the author of an erotic poem which has come down to us.

(Suetonius, *Tiberius;* Velleius Paterculus, ii., c. 94, &c.; Tacitus, *Annal.*, lib. i.-vi.; Dion Cassius, lib. xlvi.-xlviii.; Horn, *Tiberius, ein Historisches Gemälde.* The character of Tiberius has been defended by Buchholz, *Philosophische Untersuchungen*, vol. ii., p. 49, &c.)

TIBE'RIUS II., ANI'CIUS THRAX, FLA'VIUS CONSTANTI'NUS, one of the greatest and most virtuous emperors of the East. He was born in Thrace towards the middle of the sixth century A.D., and belonged to a rich and very distinguished family, the history of which is unknown to us. He was educated at the court of Justinian, whose successor, Justin II. (565-578), loved him as his son, and employed him in various civil and military offices. In 573 Tiberius, who was then general of the Imperial guards, commanded the army against the Avars, who were powerful north of the Save and the Danube. His lieutenant having neglected to watch the passages of the Danube, Tiberius was surprised by the Avars and lost a battle. However, he recovered this loss, and concluded a peace, by which the possession of the important fortress of Sirmium, now Mitrowicz, on the Save, near its junction with the Danube, was secured to the Romans. This was one of the few advantages obtained by the Greek armies during the unfortunate reign of Justin II. Italy, which had been conquered by Justinian, was overrun by the Longobards; the Berbers ravaged the kingdom of Carthage, which had been taken from the Vandals; and on the Persian frontier Chosroes (Khosrew) made various conquests. Justin, feeling his incompetency, and having lost his son, looked for a co-regent, and his choice fell upon Tiberius. The great talents of Tiberius, his amiable character, his generosity and love of justice, and his sincere piety, had won him the hearts of the nation, and the esteem of the emperor and his ministers. Justin was confirmed in his choice by the empress Sophia, whose private views on this occasion harmonised with the interest of the state. Tiberius was the handsomest man at the court, and it seems that Sophia intended to marry him on the death of Justin. However this may be, before she declared in his favour, she asked him whether he was married. Tiberius immediately guessed the motive of the question, and answered that he was not, although he was secretly married to a lady named Anastasia. He thus gained the protection of the empress, and was proclaimed Cæsar by Justin on the 7th of December, 574, in a most solemn assembly of the civil and military officers, and of the clergy under the presidency of the patriarch Eutychius, by whom Tiberius was crowned with the imperial diadem. In this assembly the emperor Justin addressed to his future successor the following remarkable speech (Theophylactus, iii. 11), which Gibbon translates thus:—'You behold the ensigns of supreme power. You are about to receive them, not from my hand, but from the hand of God. Honour them, and from them you will derive honour. Respect the empress your mother—you are now her son—before, you were her servant. Delight not in blood, abstain from revenge, avoid those actions by which I have incurred the public hatred, and consult the experience rather than the example of your predecessor. As a man, I have sinned; as a sinner, even in this life I have been severely punished: but these servants (his ministers), who have abused my confidence and inflamed my passion, will appear with me before the tribunal of Christ. I have been dazzled by the splendour of the diadem: be thou wise and modest; remember what you have been, remember what you are.' To this speech of a dying sinner, Tiberius answered:—'If you consent, I live; if you command, I die: may the God of heaven and earth infuse into your heart whatever I have neglected or forgotten.'

The burden of government devolved upon Tiberius, whose authority was never checked by Justin. The war with Persia prevented Tiberius from expelling the Longobards from Italy; but he sent there all the troops he could dispose of, and succeeded in maintaining the imperial authority in the Exarchate of Ravenna, on the Ligurian coast, in the fortified places in the Cottian Alps, in Rome, in Naples, and in the greater part of Campania and of Lucania. He saved Rome and pope Pelagius II. from the Longobards by sending a fleet laden with provisions (775). Some years later he concluded an alliance with the Frankish king Chilperic, who checked the Longobards in the north of Italy, and Tiberius succeeded in bribing several of the thirty Longobardian dukes, who, after the murder of king Clepho (573-574) and during the minority of Antharis, imitated in Italy the Thirty Tyrants of Athens. The daughter of king Alboin and Rosamond, who had fled from Italy, was then living at the court of Constantinople.

The most important event in the reigns of Justin and Tiberius was the war with Persia. Khosrew, the king of Persia, had made extensive conquests in Asia Minor during the reign of Justin. In 575 Tiberius concluded a partial truce for three years with him, on condition that hostilities should cease except on the frontiers of Armenia, where the war was still carried on. These frontiers being easily defended on account of the great number of defiles in the Armenian mountains, Tiberius levied a strong army while Khosrew lost time in forcing passages or in besieging small fortified places. For several centuries the Eastern empire had not seen such an army as was then raised by Tiberius. A hundred and fifty thousand men, among whom were many Teutonic and Slavonic barbarians, crossed the Bosporus in 576, under the command of Justinian, and advanced to the relief of Theodosiopolis, the key of Armenia. Theodore, the Byzantine general, defended the fortress against the whole army of Khosrew. At the approach of Justinian the Persian king left the siege and advanced to meet the Greeks. The encounter took place near Melitene (in the district of Melitene in Armenia Minor). The Persians were routed, and many of them were drowned in their retreat across the Euphrates; twenty-four elephants, loaded with the treasures of Khosrew and the spoil of his camp, were sent to Constantinople. Justinian then advanced as far as the Persian Gulf, and a peace was about to be concluded in 577; but Khosrew broke off the negotiations on account of a victory which his general Tamchosroes (Tam-khosrew) unexpectedly obtained over Justinian by surprising him in Armenia. Tiberius now recalled Justinian, and appointed in his place Mauritius, who was afterwards emperor. Mauritius restored the old Roman precaution of never passing the night except in a fortified camp; he advanced to meet the Persians, who had broken the truce of 575, and attacked the empire on the side of Mesopotamia (577). The Persians retired at the approach of Mauritius, who took up his winter-quarters in Mesopotamia (577-8).

On the 26th of September, 578, Tiberius became sole emperor by the solemn abdication of Justin, who died on the 5th of October next. After the funeral of Justin, when the new emperor appeared in the Hippodrome, the people became impatient to see the empress. The widow of Justin, who was in the Hippodrome, expected to be presented to the people as empress; but she was soon undeceived by the sight of Anastasia, who suddenly appeared at the side of Tiberius. In revenge, Sophia formed a plot against Tiberius, and persuaded Justinian, the former commander in the Persian war, to put himself at the head of the conspiracy. Tiberius however was informed of this design. Justinian was arrested, and the emperor by pardoning him made him for ever his faithful friend. Sophia was deprived of her imperial pension and palaces, and she died in neglect and obscurity.

A quarrel broke out between Eutychius, the patriarch, and Gregorius, the apocrisiarius of Constantinople, who could not agree on the state of the soul after death. The Greeks were then the most disputatious people in the world about religious matters, and their disputes often led to serious trouble. The emperor accordingly undertook to settle this dispute. Adhering to the opinion of Gregorius, he convinced the patriarch that he was wrong, and he persuaded him to burn a book which he had written on the corporeal nature of the soul after death.

Khosrew died in 579, after a reign of forty-eight years. He had entered into negotiations with the Greeks, but his successor, Hormisdas (Ormuz), broke them off and recommenced the war. Hormisdas was defeated by Mauritius and his lieutenant, Narses, a great captain, who must not be confounded with Narses, the victor of the Ostro-Goths. They overran Persia in one campaign (579), and in 580 they routed the army of Hormisdas in a bloody battle on the banks of the Euphrates, and took up their winter-quarters in Mesopotamia. At the same time the Greeks obtained great advantages in Africa. Gasmul, king of the Mauritani, or Berbers, had defeated and killed three Greek generals, Theodore, Theoctistes, and Amabilis. But in 580 he was defeated by the exarch Gennadius, and put to death. Tiberius was less fortunate in Europe, the Avars having surprised and taken the town of Sirmium. But in the following year (581) Mauritius destroyed the Persian army in the plain of Constantine, and their general, Tam-Khosrew, lost his life. Mauritius had a triumph in Constantinople, and on the 5th of August he was created Cæsar by Tiberius, who was then worn out by illness, and who had no male issue. After having given his daughter, Constantina, in marriage to Mauritius, Tiberius died on the 14th of August, 582, and, since the time of the great Theodosius, no emperor's death caused regret so universal. It is a remarkable circumstance in the reign of this emperor, that he was always provided with money without oppressing the people by taxation; and yet his liberality was so great that the people used to say that he had an inexhaustible treasure. But all these resources did not enable him to save Italy, which may be accounted for thus:—During the invasions of Italy and other parts of the Roman empire by the barbarians, many rich men saved great quantities of gold and silver, which they carried to Constantinople, then the only safe place in Europe. This city being the centre of the arts, and the commerce and industry of the East being very extensive, even the money which fell into the hands of the barbarians gradually found its way into the Greek empire, where the barbarians purchased all those articles which they had not skill enough to fabricate themselves. This view is corroborated by the fact, that notwithstanding the immense tribute which the Greek emperors often paid to the barbarians, there was always a want of coin in the barbarian kingdoms. On the other hand, the Greeks having lost their martial habits, the emperors were obliged to recruit their armies among the barbarians. These people however were as ready to fight against the emperors as for them; and it would have endangered the existence of the empire if too large a number had been engaged in its service. Thus Tiberius preferred bribing the Longobardian dukes to raising a large army of barbarians, who would probably have joined the Longobards as soon as they had got their pay.

(Cedrenus; Theophanes; Theophylactus; Zonaras, Gregorius Turonensis; Paulus Diaconus; Gibbon, *Decline and Fall*; Le Beau, *Histoire du Bas Empire*.)

TIBE'RIUS ALEXANDER, prefect of Egypt, was the son of Tiberius Alexander who was alabarcha of Alexandria, and the brother of Philo Judæus, the well-known writer. Tacitus calls him an Egyptian, but this only means that he was a native of Alexandria; for he was a Jew, though he afterwards adopted paganism. Nero appointed him governor of Judaea, where he succeeded Cuspius Fadus, and he made him a Roman eques. In the last campaign of Corbulo against the Parthians, Tiberius Alexander and Vinianus Annius, the son-in-law of Corbulo, were given as hostages to king Tiridates, who came to the Roman camp for the purpose of settling his differences with the Romans (A.D. 63). Tiberius Alexander was afterwards appointed prefect of Egypt, in which capacity he quelled a dangerous insurrection of the Jews of Alexandria, who were jealous of the favour which Nero showed the Greek inhabitants of that town. The resistance of the Jews was so obstinate, that Tiberius was obliged to employ two legions and five thousand Libyan soldiers against them; and it is said that more than fifty thousand Jews perished on this occasion. On the 1st of July, 69, Tiberius Alexander proclaimed Vespasian emperor, pursuant to a scheme which had been concerted by Vespasian, Titus, and Mucianus, the proconsul of Syria. In consequence of this event, the 1st of July, 69, is regarded as the beginning of the reign of Vespasian, who showed great regard for his governor of Egypt. When Titus, the successor of Vespasian, was about to undertake the siege of Jerusalem, which resulted in its capture, he was accompanied by Tiberius Alexander.

(Josephus, *Antiq. Jud.* and *De Bello Jud.*; Suetonius, *Vespasianus*; Tacitus, *Annal.*, xv. 28; *Hist.*, i. 11; ii. 74, 79; the notes of Ernesti to Suetonius and Tacitus.)

TIBERIUS (Τιβέριος), an Alexandrine grammarian, who probably lived in the fourth century of our æra. Suidas (*s. v.* Τιβέριος), who calls him a philosopher and a sophist, ascribes to him a long list of rhetorical works, all of which are lost, with the exception of one, which formerly used to be called *περὶ τῶν παρὰ Δημοσθένει σχημάτων*, and which is one of the best works of the kind that were produced at the time. The editio princeps of it, which is ascribed to Leo Allatius, appeared at Rome in 1643. The next edition is that of Gale, who incorporated the work of Tiberius in his 'Rhetores Selecti,' Oxford, 1676, 8vo. A reprint of this collection of rhetoricians was edited by J. F. Fischer, Leipzig, 1773, 8vo. In all these editions the work of Tiberius contains only 22 short chapters, which treat on Schemata, that is, those forms of expression which are not the natural forms, but are adopted for ornament or use. In the year 1815, J. F. Boissonade published at London a new edition, in 8vo., from a Vatican manuscript, in which the work is called *περὶ σχημάτων ῥητορικῶν*, and in which there are 26 chapters more than had ever before been published; and this second part of the work treats on the so-called 'figurae elocutionis,' or the ornamental forms of elocution. This edition of Boissonade also contains a work of Rufus, entitled *τέχνη ῥητορική*, the author of which has only become known through the Vatican MS. containing the complete work of Tiberius: in the editions of Gale and Fischer it was called the work of an anonymous writer. A few fragments of other works of Tiberius are preserved in the scholiast on Hermogenes, ii., pp. 385 and 401, edit. Aldus.

(Groddeck, *Initia Historiae Graecorum Literariae*, ii., p. 173; Westermann, *Geschichte der Griech. Beredtsamkeit*, p. 251, &c.)

TIBE'RIUS ABSI'MARUS became emperor of the East, in A.D. 698, under the following circumstances:—Leontius dethroned and banished the tyrant Justinian II., and having assumed the imperial title in 695, continued the war with the Arabs in Africa. Notwithstanding the Greeks were assisted by the Berbers, they lost Carthage in 697; they reconquered it shortly afterwards, but in 698 the Arabs retook the town from the Greeks and entirely destroyed it. A powerful fleet, commanded by the patrician John, was then off Carthage; but although John entered the harbour with a division of his fleet, and landed a body of troops, his measures had only a partial effect, and he was obliged to leave Carthage to her fate. The destruction of this famous town was attributed by the Greek officers to the incompetency of John, and they were afraid to return to Constantinople without having prevented the ruin of Carthage. Absimarus, the commander of the Cibyratae, or the troops of the province of Cibyra, then the collective name of Caria and Lycia, turned the discontent of the soldiers to his own profit. He persuaded his men that the emperor would punish them severely for not having obtained some advantage over the Arabs, and that they ran the risk of suffering for the faults of their commander-in-chief. When the fleet was off Crete, a mutiny broke out. The Cibyratae proclaimed Absimarus emperor, the rest of the fleet followed their example, and John was massacred.

Absimarus having arrived at Constantinople, cast anchor in the bay of Ceras (now the Golden Horn), between this city and the suburb of Sycae. Leontius prepared a vigorous resistance; but the courage of his soldiers and of the inhabitants was weakened by an epidemic disease, and at last Absimarus found his way into the town by bribing some sentinels.

Absimarus assumed the name of Tiberius and was acknowledged emperor: his rival, Leontius, had his nose and his ears cut off, and was confined in a monastery. Tiberius Absimarus continued the war with the Arabs, and appointed his brother Heraclius commander-in-chief. This experienced general conquered Syria in 699 and 700, and treated the Mohammedan inhabitants most barbarously: it is said that two hundred thousand of them lost their lives by the sword of the Greeks. This war continued during 701, 702, and 703; and, although the Greeks did not recover Carthage, they obtained many signal advantages. Tiberius Absimarus had great influence in Italy, where popes Sergius and John VI. were continually harassed by John Platys, and afterwards by Theophylact, the Greek exarch of Ravenna.

Tiberius Absimarus lost his crown by a sudden revolution. When Leontius dethroned Justinian II., this prince had his nose cut off, and was banished to the town of Cherson, in the present Crimea. Some years after, he fled to the khaghan, or khan, of the Khazars [TARTARS, *Khazars*], who received him respectfully, and assigned for his residence Phanagoria, once an opulent city, on the island of Tamatarcha. [TAMAN.] The khaghan, whose name was Busirus, gave him in marriage his sister Theodora; but Tiberius Absimarus bribed the khan with a large sum of gold, and Justinian was only saved by the affection of Theodora, who discovered to him the treacherous design of her brother. After strangling with his own hand the two emissaries of the khaghan, Justinian rewarded the love of his wife by repudiating her and sending her back to her brother Busirus; and he fled to Terbelis, or Terbellus, the king of the Bulgarians. He now formed the plan of recovering his throne, and he purchased the aid of Terbelis by promising him his daughter and a part of the imperial treasury. At the head of fifteen thousand horse, they set out for Constantinople. Tiberius Absimarus was dismayed by the sudden appearance of his rival, whose head had been promised by the khaghan, and of whose escape he was yet ignorant. Justinian had still some adherents in Constantinople, who introduced his troops into the city by means of an aqueduct. Tiberius escaped from Constantinople, but he was seized at Apollonia on the Pontus Euxinus (705), and Justinian ordered him, his brother Heraclius, and the deposed Leontius, who was still alive, to be dragged into the Hippodrome. Before their execution, the two usurpers were led in chains to the throne, and forced to prostrate themselves before Justinian, who had sworn not to spare one of his enemies. Planting his feet on their necks, the tyrant watched the chariot-race for more than an hour, while the people shouted out the words of the Psalmist, 'Thou shalt trample on the asp and basilisk, and on the lion and dragon shalt thou set thy foot.' He then gave orders to behead Tiberius, Leontius, and Heraclius. Justinian II. reigned till 711. The Greeks gave him the surname of Rhinotmetus, that is, 'he whose nose is cut off.' Tiberius Absimarus had two sons, Theodore and Constantine, who probably perished with their father. It is said however that Theodore, who is also called Theodosius, survived his father, and became bishop of Ephesus and one of the leaders of the Iconoclasts; but this is doubtful.

(Theophanes; Cedrenus; Zonaras; Gibbon, *Decline and Fall*; Le Beau, *Histoire du Bas Empire*.)

TI'BET is the most southern of the three great table-lands of Middle Asia. The name Tibet is derived from 'Thu-pho,' that is, the country of the 'Thu,' who founded an empire in Northern Tibet in the sixth century A.D. The name 'Thu-pho' has been mutilated by foreigners, and especially by the Mongols, into Thupo, Tobut, Tibet, Tebet, and Thibet. The orthography Tibet was introduced by the Jesuit missionaries. Sanang Setsen, the historian of the Mongols, and the modern Chinese, write it Tübet, and this latter orthography has been adopted by Ritter. Another name of this country is 'Pue-Koa-chim,' which, according to Turner, signifies the 'snowy country in the north.' Sanang Setsen often calls it 'Gang-d'yan-yul,' which signifies the 'country of the snow' in the Mongol language, a name which is analogous to 'Iceland.'

Our knowledge of Tibet is very imperfect. We are only acquainted with some lines of road and certain points which have been visited by travellers. The Chinese geographers have furnished very valuable notices concerning this country, but the Tibetan sources are almost unknown to Europeans. Marco Polo visited Tibet; in the beginning of the eighteenth century (from the 17th of August, 1715, to the 18th of March, 1716) Father Desideri travelled through nearly the whole extent of Southern Tibet, from Leh in the west, to H'Lassa or Lassa in the east; Father de la Penna was also in Tibet; and in our own days Turner, Moorcroft, and Gerard have visited parts of it.

Boundaries.—Tibet, in the largest sense of the word, has the following frontiers. The Bolor Mountains, a branch of the Hindu Kush, which stretches towards the north-west, in 72° 30′ E. long., form the western boundary. The length of this frontier is about 87 miles. It is bounded on the south-west by the Hindu Kush, from Mount Tutukan Mutlami and the north-western part of the Himalaya as far as the western frontier of Nepal, a distance of about 480 miles. The southern boundaries are formed by the range of the Himalaya from the western frontier of Nepal to the eastern frontier of Bootan, a distance of about 740 miles, and by the northern boundaries of Assam, Burma, and part of the Chinese province of Yunnan. This latter part, which is nearly unknown, runs in a south-eastern direction, and most probably as far as the junction of the Yu-leang-Ho, or Li-tchou, with the Kincha-Kiang, or Yang-tse-Kiang, in Yunnan, between 102° and 103° E. long. The length of this part of the frontier in a straight line between the two extremities is about 320 miles. The whole length of the southern frontier, according to a rough estimate, is 1540 miles, but as this frontier forms a curve, its real length is much more. The eastern frontier of Tibet is formed by the western boundaries of the Chinese provinces of Sütchuang (Setchuen), Shensi, and Kansu. This frontier has been fixed by the Chinese, but Europeans only know some points of it which are marked in the Itineraries of the Chinese geographers. From the junction of the Yu-leang-Ho with the Kincha-Kiang it stretches northwards, and probably along the river Ya-long-Kiang as far as the 30th degree of N. lat. It then takes a north-eastern direction, and stretches as far as Kiai, along a range of wild and snowy mountains, which, on some maps, are called the Yun-ling Mountains. At Kiai it takes a north-west direction, crosses the Hoang-Ho, or Yellow River, runs to the east as far as Hongchin, and then takes a north-west direction as far as a point situated in the mountains of Amegangar, in 38° 25′ N. lat. and 100° E. long. That part of Tibet however which lies south of the 29th degree of N. lat., and east of the Kincha Kiang, or the mountains of Batang, was ceded to China in 1727, and is now under the immediate sovereignty of the emperor of China. The whole extent of the eastern frontiers of Tibet is at least 900 miles. We have no positive knowledge of the northern frontiers. They begin in the Bolor Mountains, east of which they were traversed by F. Desideri (*Nouv. Journal Asiatique*, tom. viii., p. 117) on his way from Yarkand to Leh. From thence they are said to stretch east-south-east along the mountains of Kárákorum as far as a point situated in the mountains of Kuenlun (Oneuta, or Kulkoun), in 35° N. lat. and 85° E. long., across the deserts of Khor and of Katchi, or Katche. Thence they run north-east and east, until they reach the eastern frontier at that point which we have mentioned above, as situated in 38° 25′ N. lat. and 100° E. long. The whole length of the northern frontier, including the larger bends, amounts to about 1300 miles. It is however doubted whether the extensive country of Khu-khu-Nor, in north-eastern Tibet, belongs to Tibet in the political sense of the word; and if so, the northern frontier of Eastern Tibet will not extend beyond 36° N. lat. (Ritter, iv., p. 173.) But geographically speaking, Khu-khu-Nor belongs to Tibet. It is a very remarkable fact that the northern frontiers, as they have been here described, form a curve almost parallel to the curve of the Himalaya, although they diverge in proportion as they stretch towards the east. From this parallelism we may conclude that these northern frontiers are perhaps identical with the natural frontier of the Tibetan table-land. Thus Tibet is bounded on the west by Independent Turkistan; on the south-west and south by Punjab, British Hindustan, Nepaul, Bootan, and Assam; on the south-east by Assam and China; on the east by China; and on the north by the desert of Gobi and Chinese Turkistan.

Tibet, comprised between these limits, resembles an immense cornucopia, the handle of which is in the west, between the Hindu Kush and the mountains of Kárákorum, and through its wide opening, 1500 miles to the east, the largest rivers of eastern Asia flow, and carry fertility and abundance to Burma, Siam, and China.

Mountains.—Tibet is a table-land, the highest plains of which are more than 10,000 feet above the level of the sea. This table-land is divided into three great and distinct parts. The first, which is long, and not very wide, begins in the east, near Mount Kailasa, in the Himalaya, and stretches to the north-west, between parts of the Himalaya and of the Hindu Kush in the south-west, and the range of the mountains of Kárákorum in the north-east. It is traversed in its whole length by the upper part of the Indus. Its lower or north-western part, Balti or Baltistan, is also called the First Tibet, or Little Tibet, and is an independent state. Its upper or south-eastern part has the name of Ladakh, and is also called the Second Tibet, or Great Tibet, because it is larger than Baltistan. Sometimes the name of Little Tibet is given to the whole valley of the Indus. Ladakh is also an independent state, but the most eastern part of it, as far as Teshigang on the Indus, belongs to China. Baltistan and Ladakh have been described under the heads of Himalaya and Hindustan (vol. xii., p. 219, &c.). Baltistan and Ladakh belong only to Tibet in the most extensive sense of the word. The second great division of Tibet begins in the south, near Mount Kailasa, and is an immense elevated desert, the western part of which is called Khor, and the eastern part Katchi. Its boundaries are the range of Kárákorum on the west; the Kuenlun mountains on the north; the snowy mountains around the sources of the Kincha Kiang, the Om-Tsiu, and the lake of Tengri-Nor in the east; and the mountains of Dzang and Ngari in the south. Khor and Katchi have never been visited by Europeans, though the eastern part is traversed by the great road which leads from H'Lassa to Yarkand, in Chinese Turkistan. The third great division of Tibet contains the remainder of this country, which lies east and south of Khor and Katchi.

The second and third natural divisions have the common name of Eastern or Third Tibet, or Tibet in the proper sense of the word. Eastern Tibet is subject to China.

All that we can say about Khor and Katchi is that they are an immense table-land, some parts of which are 10,000 feet above the level of the sea. This table-land, however is not a level plain. It is a country traversed by chains of mountains, which have a height varying from 3000 to 4000 feet above their base, or from 13,000 to 14,000 feet above the sea. The middle part seems to be less elevated than the boundaries, as the country contains several rivers which terminate in the table-land; and the southern and western parts are higher than the eastern and northern parts, the direction of the greater number of those rivers being from the west to the east, and from the south to the north.

The aspect of the southern and eastern parts of Third Tibet is very different from that of Khor and Katchi. Third Tibet is traversed by numerous ranges of lofty mountains, the direction of which is from west to east and from north-west to south-east. From these ranges lateral branches run out in different directions, and contain deep valleys between them. In proportion as the principal chains advance towards the south-east, they converge towards one another, and thus the valleys between them gradually become narrower, until at last, on the frontiers of Yunnan and Burma, they are mere mountain-passes. On this spot there are four parallel valleys, traversed by four of the greatest rivers of the world, and the breadth of these four valleys together seems not to be more than one hundred miles. But the range of the mountains of Ngari and Dzang diverges from the Himalaya; and the valley between them, which is traversed by the Dzangbo, he comes broader as it advances towards the east. The chain which, in the south-eastern corner of Tibet, separates the Kincha-Kiang in the east from the Lang-tsang-Kiang in the west, has the name of Ning-tsing-Shan, or Mang-li (Moung-lan); and, since 1727, the frontiers between Tibet and China run along the foot of this chain, the summits of which are covered with eternal snow. The height of the mountains in south and eastern Tibet is much greater than in the northern and central parts of the country, and the whole tract towards China, Nepaul, and Bootan, is an immense alpine country. Several passes in the Mang-li mountains are from 10,000 to 11,000 feet above the sea; the region of perpetual snow seems to begin at 12,500 feet, and as the snow always covers an immense number of summits and whole ranges, it is evident that the number of summits which have an absolute elevation of above 12,500 feet must be very considerable. Some of them probably attain the height of 26,000 feet above the sea. The extent of the Mang-li mountains between Bathang on the Kincha-Kiang, and Tsiamdo on the Lang-tsan-Kiang, according to the Chinese itineraries, is 1405 li, of 250 to a degree. (Ritter, iv. 202.) All this country is intersected by deep valleys and chasms. The summits of the mountains are covered with eternal snow, and the traveller crosses the chasms by means of bridges which are enveloped in the clouds. The mountains north of the Mang-li, around the sources of the Lan-tsan-Kiang, in the province of Tsiamdo, are no less elevated, but they have never been visited by Europeans. A very extensive range begins at Mount Kailasa in the Himalaya, and stretches to the east as far as the ninetieth degree of east longitude, in a direction diverging from the Himalaya in Nepaul and Bootan. These are the mountains of Ngari and Dzang, the most western part of which is called Gangdisri, or the country of the snow mountains. At the beginning of this westernmost part, and in the north-eastern part of the province of Ngari, is situated the celebrated Mount Kailasa, which is said to be higher than the Dhawalagiri. The Kailasa is steep on all sides, and is 140 li in circumference; its summit is always covered with snow, and the water tumbles down from it in cataracts into the surrounding valleys. This mountain has also the name of Oneuta. East of the Kailasa are situated four mountains, or perhaps groups of mountains, the K'habhabhs, each of which resembles a different animal. The first is the Horse-mountain, or Tam-tsiogh-K'habhabh; the second is the Elephant-mountain, or Lang-tsien-K'h; the third is the Lion-mountain, or Sengghe-K'h; and the fourth is the Peacock-mountain, or Mabghia-K'h. The length of these four mountains is said to be 800 li, and with respect to the valleys which begin at their foot and stretch in different directions, they resemble Mount St. Gothard in Switzerland. The mountains on the southernmost part of Tibet have been described in the article HIMALAYA.

Rivers.—The sources of the Dzangbo are on the east side of the K'habhabhs, in the province of Ngari. Its complete name is Yaru-Dzangbo-tsu, that is, the pure frontier river of the west. According to the Chinese geographers, the source of the Dzangbo is on Mount Tam-tsiogh, in 30° 10′ north latitude, and 79° 35′ longitude east of Paris. It flows in an east-south-eastern direction, through the whole of Southern Tibet, a distance of about 700 miles, and waters the provinces of Ngari, Dzang, and Wei. The valley of this river is formed by the Himalaya on the south, and the mountains of Ngari and Dzang on the north. The country through which it flows being very extensive, and all the mountains being covered in winter with snow, of which an immense quantity melts in the summer, the volume of water in this river must be very considerable. The tributary rivers of the Dzangbo, on its left or northern side, are: the Nauk-Dzangbo; the Dzang-tsu, or Galdjao-muren, that is, the 'furious river,' which has its sources in the north-east, about 200 miles from its junction with the Dzangbo near H'Lassa, and which is sometimes confounded with the Dzangbo itself. There are five considerable rivers between the Nauk-Dzangbo and the Dziang-tsu. The tributary rivers on the right or southern side are: the Guyang, which has its source near Mastang, in the Himalaya (there are five other considerable rivers, which come down from the Himalaya of Nepal); and the Pai-nom-tsu, or Fuang-dze, along which Turner travelled, from its source at Phari to its junction with the Dzangbo, and which has a fine iron bridge of thirteen arches. An iron suspension-bridge is thrown over the Dzangbo, south of H'Lassa, on the great road from the west to this town. The course of the Dzangbo is known as far as a point which is situated about 100 miles east of H'Lassa, in 26° 30′ N. lat. according to D'Anville; in 28° 30′ N. lat. according to Klaproth; and in 29° 15′ N. lat. according to Berghaus. It has been conjectured that the Brahmaputra is the continuation of the Dzangbo [BRAHMAPUTRA], but it is now known that they are different rivers. The continuation of the Dzangbo is the Irawaddy. We owe this discovery to Julius von Klaproth, who published several memoirs on the course of the Irawaddy, of the Brahmaputra, and the Dzangbo.

All that we know about the Southern Nu-kiang is conjectural. Ritter says that the Nu-kiang is a southern tributary river of the Dzangbo, but this is impossible, and instead of 'southern' we must read 'northern.' (Ritter, iv., pp. 212-223.) The sources of the Gakbo-dzangbo-tsu, or the clear river of Gakbo, are situated in 31° 30′ N. lat., between the mountains of Sangtsen-sum-do-ri and Barkala, on the frontiers of the provinces of K'ham and of Wei. Its upper course has the name of Sang-chu or Dziangbo-tsiu. Its direction is at first south-east. The great road from China to H'Lassa crosses this river some distance east of the celebrated temple of H'Lari. The Gakbo-dzangbo-tsu then enters the country of Gakbo, where it receives a considerable river called Bo-Dzangbo, which enters it on the left or eastern side. After having entered the country of H'Lokba, it probably takes a southern direction, but we have no positive knowledge of it. According to the Chinese map of the emperor Khien-Long, of which the 'Carte de l'Asie Centrale' of Klaproth is a reduction, the Gakbo-dzangbo-tsu enters the Chinese province of Yunnan, and there receives the name of Lung-chuan-Kiang. As to the Om-tsu, or Oui-tsu, another great river, there is great difference of opinion. According to the Chinese maps, the Om-tsu is formed by the junction of three rivers, the Ser-Sumbu, or Ser-tsu, in the east, the Uir-chu in the west, and the Kárá-us-su, the largest river, in the middle. The source of the Kárá-us-su is said to be in the table-land of Middle Tibet, about 32° 30′ N. lat. and 90° to 91° E. long. The Om-tsu has a south-east course, and flows in a very deep and narrow valley, enclosed by steep rocks of an immense height; it enters the province of Yunnan in China, where it receives the Chinese name Nu-Kiang, that is, 'the river of the barbarians.' The latter part of its course within Tibet is unknown to European geographers. The Lang-tsang-Kiang traverses almost the whole extent of eastern Tibet, from north-west to south-east. Two rivers, the Om-chu in the west, and the Dzo'chu in the east, the sources of which are situated north of the upper part of the Om-tsu, in the province of K'ham, join at Tsiamdo, and thus form the Lang-tsang-Kiang, the direction of which is from north-west to south-east. From the 30th to the 27th degree of N. lat. the Lang-tsang-Kiang traverses a country quite unknown to Europeans. This river is also called La-chou, La-tsu, Lo-tsau, and Lo-tsu. After having traversed Yunnan, it enters Lao, forms the frontier between Siam and Cochin-China, and flows into the Chinese Sea in 10° N. lat., after a course of more than 1700 miles. The sources of the Kincha-Kiang, or Yang-tse-Kiang, which traverses China from west to east, are situated between 37° and 38° N. lat., and between 89° and 92° E. long., on the table-land towards the north-western frontiers of Eastern Tibet. Its upper part is called Muru-us-su by the nomadic Mongols of that country; its middle part has the Tibetan name of Boureï-tsu; and it is only in China that it is called Kincha-Kiang. Its direction is east as far as 95° E. long.; from this point to Batang the direction is south-east and south; from Batang to its junction with the Litchou (the old frontier of Tibet), it is again south-east. This latter part of the Kincha-Kiang forms a part of the present frontier between Tibet and China. The Ya-long-Kiang is an important tributary of the Kincha-Kiang. Its sources are about 29° N. lat. and 97° 30′ E. long., in the Bayan-Khara, a range of high and wild mountains stretching in a south-east direction, between the Kincha-Kiang and the Ya-long-Kiang in the south, and the sources of the Hoang-Ho in the north. The direction of the Ya-long-Kiang is at first south-east for about 200 miles: east of 100° E. long. it runs southward for about 300 miles: during the latter part of its course the direction is at first east, as it seems, and then again south for about 100 miles. But all this is conjectural. The Hoang-Ho, or Yellow River, has its sources north of the Bayan-Khara, in the province of Sifan. Only its sources and a part of its upper course are in Tibet and in Khu-Khu-Nor (Köke-Nor), the most northern part of Tibet, of which we have already spoken. The description of this river has been given under CHINA. The whole country between the upper part of the Hoang-Ho in the north and in the west, the Ya-long-Kiang in the south-west, and the frontier of China in the east, or the eastern parts of Sifan and Khu-Khu-Nor, is traversed by ranges of high mountains covered with perpetual snow; it is an unknown country to us.

Lakes.—The Tengri-Nor, the largest lake of Tibet, is nine days' journey north of H'Lassa. The Chinese call it Thian-chhi, or the Celestial Lake. This lake appears to be surrounded by high mountains and rocks covered with snow and ice. It receives the Tarku-Dzangbo, a river which comes from the west. The lake of Palte, which is situated south-west of H'Lassa, in the valley of the Dzangbo, resembles a large ditch surrounding an extensive island which fills up the middle of the lake. On the Tibetan maps it has the name of Bhaldi-Yumtso, and the Chinese call it Yar-brok-Yumtso. According to the Chinese geographers there is a nunnery on that island which has the name of Dhordze-phagh-mo, or the 'Palace of the Holy Sow,' which is said to be one of the finest in Tibet. It is said that north of this lake there is a high mountain called Kambala, from the summit of which extensive ranges of high snowy Alps may be seen to the north. These are most probably the mountains which surround Lake Tengri-Nor. In the extreme north of Tibet is situated the Lake Khu-Khu-Nor, or Köke-Nor, that is, 'the Blue or the Celestial Lake,' which name has been given to all the surrounding country. The lakes of Kailasa, in the southern part of Tibet, have been described under HIMALAYA.

Climate.—Tibet is known in India and China as a country of hunger and misery, and as such it is represented by the Mongol historian Sanang Setsen. However cold and barren the table-lands and the mountains may be, on account of their extreme elevation and of the snow which perpetually covers whole tracts, the climate of the valleys, and especially of the valley of the Dzangbo, is hot. From March to September the weather is fair, interrupted only by some showers; the winds are not regular, as in India. In H'Lassa the trees bud at the end of April and in the beginning of May. Corn and peas are sown towards the end of the spring and in the beginning of the summer; and the harvest is reaped in the months of August and September. Dew falls in the summer nights; it hails often; the snow is not deep in the winter. On the high table-lands the climate is very different. Turner, who visited a part of them on his way from Bootan to Teshu Lumbu, gives an interesting description of it. From May to October the sky is always clear, and the sun shines with uncommon brightness. From October to May there are violent gales. The surface of the weather-beaten rocks breaks in pieces, which the air dissolves into fragments as small as dust; and clouds of this dust, raised by whirlwinds, are driven from the plain to the summits of the mountains, and from the mountains down to the houses of the inhabitants. The air is excessively dry, and its effects resemble those of the dry heat of the Sahara. The trees wither; their leaves may be ground to powder between the fingers; planks and beams break, and the inhabitants cover the timbers of their houses with wet towels in order to preserve them against the destructive effects of excessive dryness. The timber never rots. The flesh of sheep exposed to the open air becomes dry, and may be ground like bread, and thus preserved during years. This flesh-bread is a very common food in Tibet.

Productions.—Among the minerals there are gold, silver, copper, tin; salt, which is taken from the salt-lakes of Jayek and Deng-tsavga; corundum stone, lapis lazuli, turquois, and agate. Besides a great number of grasses which are common in Europe, Tibet produces a kind of grey barley, grapes in Bathang, and, near H'Lassa, Ingwer, assafœtida rhubarb, madder safflower, apples, nuts, apricots, peaches, pomegranates, and figs in the valleys. The cedar grows in Tibet. Among the animals there are wild-oxen with long hair, buffaloes, the buffalo which is called the yak, goats with a very fine fleece, goats with long fine hair, silk-worms, wild-cats, tigers, leopards, lynxes, argali with horns of one hundred pounds weight, pigs, white eagles, and swans. All our domestic animals are known in Tibet, and the horses are excellent. Fish are abundant in the rivers, but they are not eaten, being prohibited by the religion of Buddha.

Political Division.—1. The territory of the Dalai-Lama contains the eastern and north-eastern parts of Tibet. The capital, H'Lassa or Lassa, is situated in a beautiful plain on the banks of the Dzang-tsu, about twelve leagues from its junction with the Dzangbo. It is a populous and very commercial town, and distinguished by many fine public buildings, especially convents, among which there is the first temple of the Buddhists. There are a small-pox hospital, a printing-office, and several schools, especially for divinity. The town has walls and five fortified gates. In the neighbourhood of the town, in the north, the east, the south, and the west of it, are four magnificent convents, the largest among the 3000 convents of Tibet, a great number of which contain several thousand monks. The residence of the Dalai-Lama is in the convent of Pobrang-Marbu (the red town) on Mount Botala, north-west of H'Lassa. It is said that the principal building of this residence, or the Lapranga, is 367 feet high, and that it contains 10,000 rooms. (Ritter, iv. 243.) On the walls of one of its large rooms are most probably suspended those chorographical tables which Father de la Penna admired when he was in H'Lassa. The environs of H'Lassa are full of convents and palaces, of which the most magnificent is that of Dzundzio-lu-Khang. Besides the capital we only know some points on the great roads which lead to H'Lassa from the east and from the west, but no considerable towns are mentioned on these roads, except Yiga-gung-ghar, a town which is inhabited by 20,000 families, and which is situated east of H'Lassa on the Dzang-bo.

2. The territory of the Teshu-Lama contains the provinces of Dzang and Ngari, and perhaps also the countries of Khor and of Katchi. His residence is at the palace, or rather the convent of Teshu-H'Lumbu, in 29° 4′ N. lat. and 89° 7′ E. long., according to Turner, who visited this place in 1783. It was founded in 1447, on a small plain surrounded by lofty mountains; but as this plain is a part of the high table-land, the environs are cold and desert. Teshu-H'Lumbu lies almost opposite to a pass across the Himalaya of Bootan, which is defended by the fortress of Dzigadze-Jeung. Teshu H'Lumbu, or, more correctly, Iachi H'Lumbo, contains from 300 to 400 houses, convents, temples, and palaces, which are surrounded by a wall, and all communicate with each other. The chief building, where the Lama resides, has the name of Lapranga, the most remarkable part of which is the mausoleum of the Teshu-Lama, who died in Peking in 1781. This mausoleum, of which Turner gives a careful description, has a most beautiful appearance, and is a fine specimen of Tibetan sculpture. It is said that 3700 Gylongs or monks are daily occupied in the performance of their various religious duties in the palace of Teshu H'Lumbu. The greater part of the country between Teshu H'Lumbu and H'Lassa is a fertile and beautiful tract, which extends along the river Dzangbo from west to east. At one day's journey east of Teshu H'Lumbu is Pina (Bainam), a small town with a fortified castle. Baldi or Bedi, another small town, lies on the northern bank of Lake Palte.

Inhabitants and History.—According to the legend Tibet was originally inhabited by animals and demons. At a certain period God sent to Tibet the king of the monkeys, who led there the life of a hermit: his exclusive occupation was the performance of religious duties, and he was absorbed in the pursuit of the knowledge of nonentity. When he was just on the point of attaining the object of his pursuit, he was disturbed in his contemplations by the visit of a female Manggus. The Manggus, whose Sanscrit name is Rakshas, are ugly demons, who however can adopt any figure they please. The Manggus who came to the king of the monkeys had assumed a beautiful figure, and proposed to the king to marry her. The king at first alleged his monastical duties, but at last he married the Manggus, and their descendants are the people of Tibet. (Schmidt, *Forschungen*, p. 211.) This account however, ridiculous as it may appear to a European, is all-important to a nation which believes in the metempsychosis, and is proud of its descent from a monkey, because he is one of the most cunning of animals. The first accounts of the history of Tibet are in the annals of the Mongols and of the Chinese. The Tibetans belong to the Mongol race: they were at first divided into many independent tribes which led a nomadic life, like all the other Mongol tribes before the time of Genghis Khan. The first king of Tibet, according to Sanang Setsen, was Seger-Sandilitu-Khaghan-Tül-Esen, whose youth resembles that of Moses, for he was exposed by his father, and afterwards found in a copper box swimming on the river Ganga. He became king in 313 B.C., and united the four great tribes of Ngari, of Dzang, of K'ham, and of H'Lassa or Wei. One of his descendants was H'latotori, who was born in 348 A.D., and who became king in 367 A.D. In the fortieth year of his reign (407) Buddhism was introduced into Tibet. [Buddha.] The history of Tibet becomes more certain from the reign of king Srongdsan-Gambo, who was born in 617, and who ascended the throne in 629. He founded the town of H'Lassa, where he held his residence, and he built a splendid palace on Mount Pudala. His reign is particularly remarkable for the invention, or rather introduction, of the Tibetan alphabet. Tongmi Sambhoda invented this alphabet, which is only a modification of the Sanscrit alphabet; and he made the first Tibetan grammar. Srongdsan-Gambo, who is also renowned as a legislator and administrator, died in 699. His successors carried on war with China, in which they were often successful; but in 821 Tibet was compelled to pay tribute to China. Under king Dharma, who ascended the throne in 901, Buddhism was almost destroyed, the king having adopted the Black religion, or the Islam. Buddhism again became the dominant religion after Dharma had been murdered by a priest in 925.

In the beginning of the eleventh century each of the seven grandsons of king Bilamgur-Dzang became an independent prince; and from this event dates the entire decline of the kingdom of Tibet, the power of which had been already broken by the civil troubles which accompanied the persecution of Buddhism. One of the new kingdoms was Tangut, in the northern part of Tibet. Genghis Khan subdued all Tibet in 1206, according to Sanang Setsen, but Schmidt affirms that the Chinese and Mohammedan historians do not mention this fact. It is nevertheless a fact that Tibet was conquered and ravaged by the Mongols; and it was not before the end of the thirteenth century that the country recovered from the calamity of the Mongol war by the careful administration of Khublai-Khan. The easternmost parts of Tibet, which during the middle ages extended much farther to the east than they do at present, were gradually conquered by the Chinese in 1125, 1255, 1362, and 1371; and in 1727 another part of Tibet was incorporated with China, which has been mentioned above. Since the year 1720 all Tibet has been a vassal state of China, and Chinese garrisons are in its towns, and they watch the passes in the frontier mountains: the number of Chinese troops in Tibet amounts to 64,000 men. The tribute which Tibet pays to the emperor of China is composed of a great many different articles, which Ritter (iv., p. 233, 234) enumerates. The national government of Tibet is supported by a perfectly organized hierarchy. The name of the chief priests is Lama; and the Dalai-Lama is the first of them. The second is the Teshu, or Bogdo-Lama. The people are kind, tolerant, polite, and much more civilized than the Mongols, although they are generally poor. They live in a state of polyandry, that is, several men cohabit with one woman; but it is only brothers who are allowed thus to have one woman in common. Arts and literature are cultivated, but the works and the language of the Tibetans are almost unknown in Europe. The extreme north of Tibet is inhabited by nomadic Mongols, and Turkish hordes sometimes appear in the deserts of Khor and of Katchi. Both the Lamas are absolute princes in religious matters, but their sovereignty is checked by the authority of the emperor of China, who has two lieutenants or generals in Tibet, who control the Lamas, and who have the command of the army and the direction of temporal affairs. The high functionaries are almost all Chinese. A great number of officers are employed in the administration of the studs for breeding horses, and of the stores for the army.

(Ritter, *Erdkunde*, vol. iv.; Turner, *Embassy to the Court of Teshoo Lama in Tibet*; Moorcroft, in *Asiat. Journ.*, 1826, vol. xxi.; Klaproth, *Tableaux Historiques de l'Asie*; Abel Remusat, *Recherches sur les Langues Tartares*, vol. i.; Kircher, *China Illustrata*, cap. iv.; Sanang Setsen, *History of the Mongols*, ed. Schmidt: Schmidt, *Forschungen im Gebiete der Völker Mittelasiens.*)

TI'BIA. [Skeleton.]

TIBIA'NA, a genus of Polypiaria. [Sertulariæa.]

TIBULLUS, A'LBIUS, lived in the time of Augustus, and was a friend and contemporary of Horace. He was of equestrian rank, and originally possessed considerable property, of which he lost the greater part (Tibull., i. 1, 19, &c.; iv. 1, 128, &c.), probably, as it is conjectured, in consequence of the assignments of lands among the veterans of Augustus; and this supposition is rendered still more probable by the circumstance that Tibullus never celebrates the praises of Augustus, like the other poets of his time. He was not however reduced to absolute poverty; the estate on which he resided at Pedum (Horace, *Ep.*, i. 4), a town between Præneste and Tibur, appears to have been his own, and to have descended to him from his ancestors. (Tibull., i. 10, 15, &c.) Here he passed the greater part of his time in the enjoyment of a quiet country-life, which had for him the greatest charms. He left it however to accompany his patron, Valerius Messalla, into Aquitania, and was present with him through the campaign, either in B.C. 28 or 27. (Tibull., i. 7, 9.) He afterwards set out with him to Asia, but was taken ill at Corcyra; but that he died at Corcyra, as is stated by some modern writers, is only a conjecture, unsupported by any antient authority, and is directly contradicted by what Ovid says. It appears from an epigram of Domitius Marsus (in Tibull., iv. 15), who lived in the age of Augustus, that Tibullus died soon after Virgil; and as Virgil died in B.C. 19, we may perhaps place the death of Tibullus in the following year, B.C. 18. It has been already mentioned that Tibullus was the friend of Horace; two poems have come down to us addressed to him by the latter (*Carm.*, i. 33; *Epist.*, i. 4). Ovid too laments his death in a beautiful elegy, from which it appears that his mother and sister were present at his death (*Amor.*, iii. 9).

It is difficult to determine at what time Tibullus was born; and we can but at best make some approximation to it. In the epigram of Domitius Marsus, already referred to, he is called *juvenis*, and Ovid deplores his untimely death. We must not however be misled by the expression *juvenis* into supposing that he was quite a young man, in our sense of the word, at the time of his death, since the antients extended the meaning of *juvenis* to a time which we consider to be that of mature manhood. Several circumstances tend to show that he could not be much less than forty at his death. Ovid speaks of Tibullus as preceding Propertius, and of Propertius as preceding himself; and as Ovid was born B.C. 43, we must place the birth of Tibullus a few years at least before that time. Again. Horace in the first book of his Odes addresses Tibullus as an intimate friend, which hardly allows us to suppose that Tibullus was a mere youth at the time. If Bentley's supposition is correct, that the first book of the Odes was published about B.C. 30 or 28, Horace was then about 35, and Tibullus may have been a few years younger. Moreover he does not appear to have been a very young man when he accompanied Messalla into Aquitania in B.C. 28 or 27. We may therefore perhaps place his birth at about B.C. 57. There are indeed two lines in Tibullus (iii. 5, 17, 18), which expressly assign his birth to B.C. 43, the same year in which Ovid was born; but these are, without doubt, an interpolation derived from one of Ovid's poems (*Trist.*, iv. 10, 6).

We have thirty-six poems of Tibullus, written, with one exception, in elegiac metre, and divided into four books. The first two books are admitted by all critics to have been written by Tibullus, but of the genuineness of the last two, considerable doubts have been raised. J. H. Voss and others attribute the third book to a poet of the name of Lygdamis, but the style and mode of treating the subjects resemble the other elegies of Tibullus, and there do not appear sufficient reasons for doubting that it is his composition. There are however stronger grounds for supposing the first poem in the fourth book, written in hexameters, not to be genuine. It differs considerably in style and expression from the other poems, and is attributed by some writers to Sulpicia, who lived under Domitian, by others to a Sulpicia of the age of Augustus; but we know nothing with certainty respecting its author. Of the other poems in this book, almost all bear traces of being the genuine works of Tibullus.

The elegies of Tibullus are chiefly of an amatory kind. In the earlier period of his life Delia seems to have been his favourite, and afterwards Nemesis, and their names occur most frequently in his poems. Several of his elegies are devoted more or less to celebrating the praises of his patron Messalla, but these are the least pleasing parts of his works, for he does not appear to have excelled in panegyric.

Tibullus is placed by Quinctilian at the head of the Roman elegiac poets (*Inst. Orat.*, x. 1). His poems are distinguished by great tenderness of feeling, which sometimes degenerates into effeminacy, but they at the same time excite our warmest sympathies. He seems to have been of a melancholy temperament, and to have looked at things from a gloomy point of view; hence we find the subject of death frequently introduced, and the enjoyment of the present interrupted by dark forebodings of the future. He constantly describes the pleasures of a country-life and the beauties of nature, for which he had the most exquisite relish; and there is in these descriptions a naturalness and truthfulness which place him above his contemporary Propertius. His style too is not of the artificial character which distinguishes the elegies of Propertius; and his subjects are not, like the latter, mere imitations or translations of the Greek poets, but essentially original works.

Tibullus was formerly edited together with Catullus and Propertius, the earlier editions of which are mentioned under PROPERTIUS. The principal separate editions are by Brockhusius (Amst., 1708, 4to.), Vulpius (Padua, 1749, 4to.), Heyne (Leipz., 1777, 8vo., often reprinted, of which the fourth edition, containing the notes of Wunderlich and Dissen, appeared in 1817-19, 2 vols. 8vo., Leipz.), J. H. Voss (Heidelberg, 1811, 8vo.), Bach (Leipz., 1819, 8vo.), Goldbéry (Paris, 1826, 8vo.), Lachmann (Berlin, 1829, 8vo.), and Dissen (Göttingen, 1835, 2 vols. 8vo.), of which the two last contain the best text.

Tibullus has been translated into English by Dart (1720), and Grainger (1759). The most modern German translations are by J. H. Voss (Tübingen, 1810), Günther (Leipz., 1825), and Richter (Magdeburg, 1831). There are also French and Italian translations.

Respecting the life of Tibullus and the Roman elegy in general, the reader may consult with advantage Gruppe's 'Die Römische Elegie,' Leipz., 1838.

TIBUR. [TIVOLI.]

TIC DOULOUREUX. [NEURALGIA.]

TICHFIELD. [TITCHFIELD.]

TICHO'DROMA. [CREEPER, vol. viii., p. 147.] Mr. Swainson places the genus in the subfamily *Troglodytinæ* (family *Certhiadæ*). (*Classification of Birds.*) Mr. G. R. Gray arranges it under the subfamily *Certhinæ*, between *Climacteris*, Temm., and *Geobates*, Sw. (*List of the Genera of Birds.*)

TICI'NO, CANTON OF (*Tessin*, in French and German), one of the cantons of the Swiss Confederation, is situated south of the Lepontine and Rhætian Alps, and the surface slopes towards and merges in the great plain of Lombardy. It is the only Italian canton in the Confederation; and the inhabitants speak a Lombard dialect resembling the Milanese, and are Italian in their habits and manners: they are all Roman Catholics. The canton takes its name from the river Ticino, which has its sources in the great central group of the St. Gothard, flows southward along the Val Leventina, passes by Bellinzona, and then enters the Lago Maggiore at its northern extremity, and issues out of it at the opposite end by the town of Sesto in Lombardy. [PO, BASIN OF.] The canton is very mountainous, being intersected by several offsets from the great chain of the Lepontine and Rhætian Alps. A number of valleys, large and small, lie between these offsets, the largest running nearly parallel to each other, and sloping towards the south. The principal valleys are—1, the Val Leventina, already mentioned, called Livinen Thal in German, which runs in a southern direction through the centre of the canton. East of the Val Leventina are—2, the Val Blegno, drained by the river of the same name, which flows from the southern slope of the Grisons Alps and joins the Ticino below Poleggio; 3, the Val Mocsa, which is a continuation of the Val Misocco, belonging to the canton of the Grisons; 4, the Val Morobbia, which slopes down from the Iöri Berg on the frontiers of Valtellina, and the water-drain of which falls into Ticino below Bellinzona. West of the Ticino are—5, the Val Maggia, one of the largest in the canton, which in its upper part is called Val Lavizzara; it is drained by the river Maggia, a rapid Alpine stream, which enters the Lago Maggiore near Locarno; 6, the Val Verzatca, which lies between the Val Leventina and the Val Maggia, and runs parallel to them, but is not so large as either; 7 and 8, the Val d'Onternone and the Centovalli, west of the Val Maggia, which they both join at its lower end near the Lago Maggiore.

A ridge called Monte Cenere runs across the southern part of the canton of Ticino from north-east to south-west. It detaches itself from the Iöri Berg, and runs to the east bank of the Lago Maggiore. South of this ridge lies the basin of the lake of Lugano, which is thus separated from the rest or northern part of the canton, the waters of which run into the Lago Maggiore. The lake of Lugano, called also Ceresio, lies within the territory of the canton, with the exception of its north-east extremity, which stretches into Austrian Lombardy. Its form is very irregular: its length is about 20 miles, but the breadth is little more than a mile, except in front of the town of Lugano, where it is about two miles wide: the surface is about 800 feet above the sea, and the greatest depth is 500 feet. A number of trading-boats ply on the lake. Its outlet is formed by the river Tresa, which runs into the Lago Maggiore. The lake of Lugano separates the southern part of the canton, consisting of the district of Mendrisio and the circle of Ceresio, which form part of the district of Lugano, from the rest of the canton, which lies north of the lake.

Only the northern extremity of the Lago Maggiore belongs to the canton Ticino. [LAGO MAGGIORE.] The canton of Ticino is bounded on the north by the cantons of Uri, Valais, and the Grisons; on the east partly by the Grisons and partly by the province of Como in Austrian Lombardy, on the south by the province of Milan, and on the west by the Sardinian states. The surface of the canton of Ticino may be divided into five regions: 1, the region of the vine, the fig, and the peach, which includes the lower valleys and hills, and extends to the height of 2400 feet above the Lago Maggiore. The olive, orange, and lemon-trees thrive in some favoured spots. 2, The region of the chestnut, the pear, the apple, and cherry-tree, which rises about 1000 feet higher. 3, The region of the fir-tree, which rises to about 4500 feet above the level of the lake. 4, The Alpine pastures, which reach as high as 6000 feet. 5, The region of perpetual snow, which includes several Alpine summits between 8000 and 9000 feet high. There is consequently a great variety of climate as well as of productions in the canton, but the people are not, generally speaking, as industrious as they might be. The horned cattle amount to about 52,000 head, the sheep to 23,000, goats to 75,000, and pigs to 27,000. The number of horses and mules is about 2000. Wolves and bears are hunted in the mountains. The rivers and lakes abound in fish. The principal articles of export are cattle, cheese, wine and fruits, hay, hides, and marble from the numerous quarries. Corn is imported from Lombardy. The manufactures are of no very great importance; they consist chiefly of coarse cloth, leather, platted straw, and tobacco. The silkworm is reared in some localities.

The population of Ticino amounted in 1833 to 109,000. The area is computed at about 1100 square miles. Several thousand people emigrate every year to work in other countries, as masons, porters, glaziers, chocolate-makers, and sellers of barometers. Many of them return home after a year or two, bringing with them some savings.

The canton is divided into eight districts, which are subdivided into circles. The districts are—1, Val Leventina, the northernmost part of the canton, lying at the foot of the high Alps; 2, Bellinzona, south of the Val Leventina; 3, Locarno, at the northern extremity of the Lago Maggiore; 4, Val Maggia; 5, Val Blegno or Blenio; 6, Riviera, on the borders of the canton of the Grisons; 7, Lugano, which stretches on both banks of the lake of the same name; 8, Mendrisio, south of Lugano, and which borders upon the lowland of Lombardy. The principal towns are—1, Lugano, a pretty-looking thriving town on the north-west bank of the lake of the same name, in a lovely situation, enjoying an Italian climate, has some fine churches with paintings by Luvini, a pupil of Leonardo da Vinci, some large mansions or palaces, as they are called in Italy, an hospital, a theatre, manufactories of silk, paper, tobacco, leather, and iron and copper works, and 4500 inhabitants. There are at Lugano many merchants, it being one of the great high roads between Switzerland and Italy. The fair, which is held in the month of October, is well attended. Lugano has a college under the direction of the Fathers Somaschi, which is attended by more than one hundred pupils, several elementary schools, a school of drawing, a reading-room, and three newspapers in the Italian language. The country around Lugano is planted with vines, olives, and other southern trees, and full of country-houses. 2, Bellinzona, a walled town situated in the valley of the Ticino, on the high road of the St. Gothard, has a very fine church, a college, an arsenal, and about 1500 inhabitants. There are several ruined castles of the middle ages in the neighbourhood. 3, Locarno, a small town with a fort on the Lago Maggiore, in a romantic situation, has several churches worthy of notice, a castle, which is now the government-house, and about 1700 inhabitants. It was once a thriving town with 5000 inhabitants, but many of the principal families, being banished about the middle of the sixteenth century, for having embraced the doctrines of the Reformation, carried away their fortunes and their industry to Zürich and other places, and Locarno has never since recovered from the blow. The families of Orelli and Muralt, long established at Zürich, were originally from Locarno. 4, Mendrisio, a town of 1700 inhabitants, in a fertile country, and on the high road to Como and Milan, has a college, several churches and convents, a printing-press, and some silk manufactories. 5, Capolago, at the southern extremity of the lake of Lugano, known for its printing-press, where many Italian works are printed to avoid the censorship of the government of Italy.

The valleys and highlands of which the canton of Ticino consists were inhabited in the ante-Roman times by the Lepontii and other aboriginal tribes of mountaineers, who were finally reduced to subjection under Augustus. After the fall of the empire, the Longobards spread their dominion over the country. After several more vicissitudes in subsequent centuries, we find the country partly under the dominion of the Visconti, dukes of Milan, and partly under the feudal barons of Sax and other Rhætian lords, till the fifteenth century, when the Swiss of the Forest cantons conquered the Val Leventina, and soon after acquired Bellinzona and the country north of Mount Cenere by a formal cession from the barons of Sax. In the Italian wars of Louis XII., at the beginning of the sixteenth century, the Swiss obtained possession of Locarno, Lugano, and the rest of the country, which they formed into several Landvogteyen, or bailliages, some of which were under the exclusive dependence of the three Forest cantons, and others, such as Lugano and Locarno, were subject to the whole Swiss confederation. This state of things continued till the French invasion of Switzerland and the dissolution of the old confederation in 1798; the Cisalpine republic attempted to annex them by force to its territory, but the people of Lugano stood firm to their Swiss connection and repulsed the Cisalpines, and took from them several standards, which are still seen in the church of San Lorenzo of Lugano. The distinction between sovereign and subject states having at the same time disappeared from Switzerland, the whole district was united into one canton of the new Swiss confederation by the name of Ticino, and as such it was acknowledged by Bonaparte in his Act of Mediation, and afterwards by the allied powers in 1814. In June, 1830, the canton of Ticino changed its constitution and adopted one by which the franchise is given to all natives of the canton not younger than twenty-five years, and who are burgesses of a commune and are possessed of real property or capital placed at interest of the value of at least 300 francs. The qualification required for members of the Great Council is four thousand francs. The Great Council, or legislature, consists of 114 members, elected for four years, and appoints the members of the Little Council, or Executive, as well as the judges of the various courts. In ecclesiastical matters the canton of Ticino depends partly on the bishop of Como and partly on the archbishop of Milan. The public revenue amounts to about 800,000 francs, derived chiefly from customs, stamps, salt monopoly, and other taxes. There is a public debt of about four millions of francs. New codes have been lately framed, but much remains to be done to ensure the proper administration of justice in the canton, where venality, corruption, and infractions of the laws are evils of antient date, and still of not unfrequent occurrence. The standard of the intellectual and moral condition of the people in general is considered to be lower than that of most other cantons of Switzerland. Yet the canton of Ticino has produced several distinguished men in various branches, such as Professor Soave, the Abbé Fontana, Franscini, who is still living, the architects Fontana, Borromini, Maderna, Albertolli, and Bianchi, several sculptors and painters, several members of the family of Quadri, one of the principal families in the canton, and others. The people of Ticino are not deficient in intelligence, but they want instruction.

(Leresche, *Dictionnaire Géographique Statistique de la Suisse;* Franscini, *Statistica della Svizzera*, and his more especial description of his native canton.)

TICINO, River. [Po, Basin of the.]

TICKELL, THOMAS, an English poet of unblemished mediocrity. He was born in 1686, at Bridekirk in Cumberland. He was sent to Queen's College, Oxford, and he took his degree of Master of Arts in 1708. Two years afterwards he was chosen fellow of his college, and as he did not comply with the statutes by taking orders, he obtained a dispensation from the crown for holding his fellowship, till he vacated it by marrying in 1726.

His praises of Addison were so acceptable that they procured him the patronage of that writer, who 'initiated him,' says Johnson, 'into public affairs.' When the queen was negotiating with France, Tickell published 'The Prospect of Peace,' in which he raised his voice to reclaim the nation from the pride of conquest to the pleasures of tranquillity. This, owing perhaps to Addison's friendly praises of it in 'The Spectator,' had a rapid sale, and six editions were speedily exhausted.

On the arrival of King George I. Tickell wrote 'The Royal Progress,' which was printed in the 'Spectator.' Johnson says of it that 'it is neither high nor low,' a very equivocal criticism, considering Johnson's habitual tastes.

The translation of the first book of the 'Iliad' was the most important thing in Tickell's poetical career, having been published in opposition to Pope's; both appeared at the same time. Addison declared that the rival versions were both excellent, but that Tickell's was the best that was ever made. This praise ceases to surprise us when we find strong suspicions of Addison himself being the translator, as Pope, Young, and Warburton asserted. Dr. Johnson says, 'To compare the two translations would be tedious; the palm is now universally given to Pope. But I think the first lines of Tickell's were rather to be preferred; and Pope seems since to have borrowed something from them in connection with his own.'

During the dispute on the Hanoverian succession Tickell assisted the royal cause with his 'Letter to Avignon,' of which five editions were sold. Addison now employed him in important public business, and when, in 1717, he himself rose to be secretary of state, he made Tickell under secretary. On Addison's death, Tickell published his works, to which he prefixed an elegy on the author, which Johnson pronounces to be equal to any funeral poem for sublimity and elegance in the English language. Considering that we have the 'Lycidas' of Milton, this sounds oddly: on turning to this elegy, we are forced to admit, with Steele, that it is only 'prose in rhyme,' and very bad prose too. Such lines as—

> 'O'er my dim eyeballs glance the sudden tears'

indicate the substitution of sound for sense, which writers like Tickell delight in. He never asked himself whether it was his eyeballs that were dim or whether tears glanced: all he knew was that dim, eyeballs, glance, tears, were common poetical phrases, and therefore suited his purpose. In 1725 Tickell was made secretary to the Lords Justices of Ireland, a place of honour in which he continued till his death, on the 23rd April, 1740.

(Johnson's *Lives of the Poets;* Campbell's *Specimens of British Poets.*)

TICKHILL. [Yorkshire.]

TICONDERO'GA. [New York.]

TICO'ZZI, STE'FANO, born in 1762, in the Val Sassina, in the province of Como, studied at Milan, and afterwards at Pavia, took priest's orders, and afterwards was appointed incumbent of a country parish near Lecco, in his native province. When the French invaded Lombardy in 1796, he and his brother Cesare Francesco, who was an advocate, favoured the revolutionary movement; but when the Austrians came back in 1799, Ticozzi was obliged to emigrate into France, and his brother was seized and sent prisoner to Cattaro. Ticozzi returned with the victorious French in the following year, and was appointed to several political offices under the Italian republic, and in 1806 was made sub-prefect of the department of the Piave under Napoleon's administration. In 1810 he published some disquisitions on monastic institutions: 'Degli Istituti Claustrali Dialoghi Tre,' 8vo., Belluno. He lost his situation on the fall of Napoleon, and retired to Milan, where he lived mainly by literary labour. He translated into Italian Sismondi's 'History of the Italian Republics,' Llorente's 'History of the Inquisition,' Agincourt's 'History of the Arts,' and other works. In 1818 he published his 'Dizionario dei Pittori dal Rinnovamento delle Arti fino al 1800,' which he afterwards merged in his larger work, 'Dizionario degli Architetti, Scultori, Pittori, Intagliatori in rame e in pietra, Coniatori di Medaglie, Musaicisti, Niellatori, Intarsiatori d'ogni Etá e d'ogni Nazione,' Milan, 4 vols. 8vo. This is a really useful compilation, although not always exact about dates. He also published—1, 'Memorie Storiche,' Florence, 12 vols. 8vo., being a series of historical tales taken from the history of Italy in the middle ages; 2, 'Viaggi di Messer Francesco Novello da Carrara, Signore di Padova, e di Taddea d'Este, sua consorte, a diverse parti d'Europa,' 2 vols. 8vo., a work also illustrative of the same period; 3, a continuation of Corniani's biographical work, 'I Secoli della Letteratura Italiana,' down to our own times, and also a continuation of Bottari's collection of letters concerning the arts: 'Raccolta di Lettere sulla Pittura, Scultura, ed Architettura, scritti dai più celebri Personaggi dei Secoli xv., xvi., e xvii., continuata fino ad nostri Giorni,' 8 vols. 8vo.; and likewise a continuation of Verri's 'History of Milan:' 'Storia di Milano del Conte Pietro Verri, dai suoi più rimoti Tempi fino al 1525, continuata fino alla presente Eta,' Milan, 6 vols. 12mo., besides several dissertations upon various paintings and other minor works. He left inedited and unfinished a Life of Correggio, and 'A Treatise on the Art of distinguishing Copies from the Originals in Paintings.'

Ticozzi died in 1836. He married a granddaughter of the historian Giannone, by whom he had several children.

(Tipaldo, *Biografia degli Italiani Illustri*.)

TIDE-MILL, a kind of water-mill in which the machinery is impelled by the alternate flow and ebb of the tide, instead of a stream continually flowing in one direction and at a nearly uniform level. Although tide-mills have never been brought into very common use in this or in other countries, they are by no means of recent origin. Beckmann, in his 'History of Inventions' (English edition of 1814, vol. i., p. 245), states that 'at Venice and other places there were mills which righted themselves by ebbing and flowing of the tide, and which every six hours changed the position of the wheels;' and he adds that 'Zanetti has shown, from some old charters, that such mills existed about the year 1044, and with still more certainty in 1078, 1079, and 1107.' Belidor, in his 'Architecture Hydraulique,' describes a tide-mill which was used at Dunkerque early in the last century, and attributes the invention to a master-carpenter of that place, named Perse. The expense attending the construction of tide-mills renders their adoption unadvisable in ordinary cases; but in many situations in which other mills are inapplicable, owing to the want of a sufficient current, or the necessity of avoiding any interference with the navigation of a stream, they may be erected with advantage. The water required for impelling their machinery may be admitted either from the side of a tidal river or immediately from the sea.

The late Dr. Gregory, in the second volume of his 'Treatise on Mechanics,' has devoted several pages to an account of various plans for obtaining a moving-power from the rising and falling of the tide; and, although he does not pretend to notice all the contrivances which have been proposed for the purpose, he divides the most important into four classes, varying from each other in the manner in which the motion of the water-wheel is effected and applied to the machinery of the mill. In the first of these the wheel turns in one direction while the tide is rising, and in the opposite direction while it falls; in the second the passage of the water is so regulated by sluices, that the wheel may always turn in one direction; in the third the wheel itself rises and falls with the tide so as to preserve a tolerably equal degree of immersion, or a uniform head of water to act upon its float-boards; and in the fourth the axle of the wheel is permanently fixed at one level, and the wheel is so constructed as to revolve whether partially or completely immersed in the water. Of these conditions it is observed that the first and third have been usually exemplified in one machine, and that the second and fourth may readily be united in another. Dr. Gregory therefore treats of tide-mills under two heads, which are as follow:—1. Tide-mills in which the water-wheel rises and falls, and turns one way with the rising tide, and the contrary when it ebbs; and, 2. Tide-mills in which the axle of the water-wheel neither rises nor falls, and in which that wheel is made always to revolve in the same direction.

Of the first of these varieties of tide-mill a good example is given from a corn-mill erected on the bank of the Thames, at East Greenwich, by Mr. Lloyd. The details of the mechanism are fully explained by Gregory, and also by Professor Barlow, in his 'Treatise on Manufactures and Machinery' in the 'Encyclopædia Metropolitana;' but the essential features of the contrivance may be briefly described. The side of the mill which is parallel to the river is forty feet wide, and is capable of being opened to the river by sluice-gates, which are carried down to low-water mark. Thus there is a water-way forty feet wide through the mill, by which the rising tide enters a reservoir, which covers about four acres of land. A smaller reservoir beyond the principal one affords the means for cleansing the whole apparatus by flushing or scouring at low-water. The water-wheel is a cylinder twenty-six feet long and eleven feet in diameter, with thirty-two float-boards, arranged in four divisions on the same principle as the divided paddle-wheel described under STEAM-VESSEL, vol. xxii., p. 509, in order to equalize the action of the water; and its axis is laid in a position parallel to the side of the river, so that it may be turned with equal facility by a stream flowing from the river into the reservoir, or from the reservoir into the river, according to the direction in which the tide is moving, and the positions of the sluices for admitting the head of water on one side, and allowing free vent for the tail-water on the other. At each end of the water-wheel is fixed, upon the same axis, a large bevil-wheel, from which the rotatory motion is communicated to an upright shaft, by means of two small horizontal bevil-wheels, called wallowers, either of which may be readily thrown into connection with the large wheel while the other revolves freely, without coming in contact with it. Thus, by throwing the upper wallower into gear while the water-wheel revolves in one direction, and the lower one when its motion is reversed, the vertical shaft is made to revolve continually in one direction. The water-wheel, and the parts immediately connected with it, forming an apparatus of the weight of nearly twenty tons, are so mounted as to rise and fall by the action of the water, with very little attention; the bottom of the wheel-frame being connected with a kind of horizontal folding-door, which prevents any communication between the river and the reservoir, excepting in the required direction, whatever may be the position of the wheel-frame. The motion of the vertical shafts is communicated to the machinery of the mill by large horizontal wheels which turn with the shafts, but do not rise and fall with them. The weight of these horizontal wheels is supported by a series of friction-rollers resting upon a stationary part of the machinery, so that the vertical shafts, which are squared to fit the naves, may slide freely up and down, although they cannot turn round without turning the wheels.

Of the means for effecting the objects required in the second of the above-mentioned varieties of tide-mills, a very slight notice will suffice. Belidor describes a water-wheel contrived by MM. Gosset and De la Deuille, in which the float-boards are hinged in such a manner that, while at the bottom of the wheel, they would press against the radii or arms of the wheel, and would present their full surface to the action of the current, while in any other position they would, by turning on their hinges, present little more than their edges to it. Such a wheel will revolve when completely immersed in water, although an ordinary water-wheel would be quite stationary. Gregory describes also a bucket-wheel invented by Mr. Dryden, which will work with nearly equal force, whether the head of water be within one or two feet of the top of its periphery, and the tail-water above the level of the axle, or the tail-water level with the bottom of the wheel, and the head at a proportionate elevation, but below the level of the axle. The float-boards, or divisions between the buckets, are all set at one angle with the radii of the wheel, and a small space is left between each float and the drum-boarding, or soling of the wheel, to allow air to enter the buckets freely as they rise out of the water, and thereby to prevent the loss of power occasioned by the formation of a partial vacuum in the rising bucket, causing it, in the language of the miller, to 'suck up the tail-water.' The uniform rotation of the wheel in one direction must be provided for by having two passages, provided with sluices, from each end of the water-way in which the wheel is placed; one passage leading to the river, and the other to the reservoir. By opening and closing the sluices alternately, the current, whether from the river to the reservoir or from the reservoir to the river, may always be made to pass under the wheel in the same direction. M. Navier, in his notes to the new edition of Belidor, published at Paris in 1819 (in which tide-mills are treated of at considerable length), states that the former kind of wheel, with hinged floats, had been tried successfully in Spain, by M. Dussaussoy, an officer of artillery. A work by Aldini on the tide as a moving-power for mills was published early in the present century.

TIDEMAN, PHILIP, was a native of Nürnberg, where he was born in the year 1657. He studied first under a painter named Nicholas Raes, with whom he remained eight years, and was distinguished by his diligent application to his art, in which he attained great proficiency. Desiring however to improve his knowledge and taste, he went to Amsterdam to study the capital works of the great masters in the collections in that city.

Lairesse being at that time in great esteem at Amsterdam, Tideman resolved to place himself under his direction; and so gained the good opinion of his teacher by his pleasing manners and his talents, that Lairesse conceived a great affection for him, and not only gave him the best instruction in the art, but employed him to assist in some important works on which he was engaged. In executing these works Tideman gave such evident proof of his abilities, that he soon obtained sufficient employment independent of Lairesse.

His compositions of fabulous history and allegory indicate a lively fancy, genius, and invention; insomuch that in this respect his designs have been recommended as models to succeeding artists. Two of his capital compositions were Venus complaining to Jupiter of Juno's persecution of Æneas, and Juno applying to Æolus to destroy the Trojan fleet. He died in 1715, at the age of fifty-eight, leaving a very great number of sketches and designs, which afford proofs both of his industry and the fertility of his invention.

(Pilkington; Fuseli; Bryan.)

TIDES. [WAVE.]

TIDESWELL. [DERBYSHIRE.]

TIDORE, one of the Moluccas, is situated in the strait which divides the island of Gilolo from that of Celebes, and is traversed by 45′ N. lat. and by 127° 25′ E. long. It is only about 21 miles in circumference. Near the southern coast rises a mountain in the form of a cone, which is of volcanic origin. According to an estimate its summit may be about 4000 feet above the sea-level. The soil is composed of volcanic matter mixed with a considerable portion of vegetable mould, and abundantly watered by numerous rivulets which descend from the mountain: it is of great fertility, well cultivated, and produces rice in abundance. The sago-tree, as well as the clove and nutmeg-tree, grow wild, though the Dutch have been at great pains to extirpate the trees, to secure the monopoly in spices. The island is very populous, and governed by a sultan, who also possesses the southern and middle portions of Gilolo, where the towns of Maba, Wida, and Patang belong to him. He claims also the islands which are situated between Gilolo and Papua, namely, Wageeow, Battanta, and Mysole, and lives in great state. The inhabitants are Malays and Mohammedans. At the time of Forrest's visit (1774) there were twenty-five mosques on the island.

This island was first visited by the vessels with which Magalhaens sailed round the globe in 1521, and the Spaniards loaded their ships with spices. They returned five years after, and found that the Portuguese had begun to establish their authority on the Moluccas. This gave rise to a war between the Spaniards and Portuguese, which ended, in 1529, by the emperor Charles V. renouncing his rights to the Moluccas, and receiving from the king of Portugal as an equivalent a loan of 350,000 ducats. Tidore was visited by Sir Francis Drake in 1579. In 1613 the Dutch took all the Portuguese settlements on these islands, and began to subject their sovereigns to a more strict obedience for the purpose of establishing their monopoly in the spice trade. They treated them for some time with great harshness. In 1778 the sultan of Tidore was dethroned and exiled to Batavia, but he was afterwards re-established. In 1796, when the British took Amboyna under Admiral Rainier, Tidore, being dependent on its government, fell also into their power: it was restored by the peace of 1801. In 1808 the sultan of Tidore, disagreeing with the Dutch at Amboyna, was expelled and obliged to fly to Papua. He applied to the English for assistance, and with their aid he recovered the greater part of his possessions. Soon afterwards (1810), the English having again taken possession of Amboyna, the sultan of Tidore became dependent on them; but in 1814 all the settlements on the islands of the Indian Archipelago which had been taken by the English, were again restored to the Dutch, and the sultan of Tidore is now dependent on the Dutch government.

(Forrest's *Voyage to New Guinea and the Moluccas;* Stavorinus, *Voyages to the East Indies.*)

TIEDEMANN, DIETRICH, a German philosopher, was born the 3rd of April, 1748, at Bremervörde, near Bremen, where his father was burgomaster. He received his earliest education at home, and as he was scarcely allowed to have any intercourse with other children, his leisure hours were spent in reading. His father sent him in 1763 to Verden, where he was chiefly engaged in acquiring a knowledge of the antient and some modern languages. After a stay of two years there he entered the Athenæum of Bremen. The system of education and the distinguished masters of this institution had great influence on young Tiedemann. It was here that he first conceived a love for philosophy and its history, and he began his philosophical studies by reading the works of Descartes, Locke, Helvetius, and Malebranche. After spending eighteen months at Bremen, he entered the university of Göttingen, with the intention of studying theology pursuant to his father's wish; but he continued the study of classical literature, mathematics, and philosophy. The study of philosophy raised in his mind strong doubts respecting certain main points of the Christian religion, which he was unable to overcome, and this led him to abandon the study of theology. He now tried jurisprudence, but notwithstanding the entreaties of his father to devote himself to some profession, he abandoned the study of the law also, and at last determined to follow his own inclinations, and to give himself up entirely to philosophy and its history. His father, dissatisfied with his son's conduct, refused to send him further means of subsistence. After having spent two years and a half at Göttingen, Professor Eyring proposed to him to take the place of tutor in a nobleman's family in Livonia, which Tiedemann accepted very reluctantly. In 1769 he entered his new situation, in which he remained four years, although he was shut out from all means of prosecuting his own studies, and had to devote almost all his time to his pupils. Nevertheless he found time to write a little work on the origin of language, a favourite topic with the philosophers of that time. It was published under the title, 'Versuch einer Erklärung des Ursprungs der Sprache,' Riga, 1772, 8vo. In the year following he returned to his native place, and after having spent a year there in studying various subjects which he had neglected in Livonia, he again went to Göttingen. His friend Meiners, who was now a professor in the university, introduced him to Heyne, who immediately made him a member of the philological seminary. The small income derived from this institution and from private instruction, together with what he got by writing, enabled him to live in independence. His work on the Stoic philosophy appeared under the title of 'System der Stoischen Philosophie,' Leipzig, 1776, 8vo., with a preface by Heyne, who had recommended the publication. In this year Heyne was applied to in order to recommend a competent person for the professorship of antient literature at the Carolinum in Cassel. Heyne recommended Tiedemann, and accepted the place for him without telling him of it. Tiedemann was delighted with the place, as it did not occupy too much of his time, and put him in connection with some of the most distinguished men in Germany. The study of philosophy and its history was now prosecuted with fresh zeal and vigour. The philosophical views which he had imbibed from the authors whom he had most studied tended towards materialism; but his friend Tetens vigorously counteracted them, and at length succeeded in turning his mind in a different direction. In the year 1786, when the Carolinum was broken up, Tiedemann was transferred with the other professors to Marburg. Here he lectured at different times on logic, metaphysics, the law of nature, on moral philosophy, psychology, universal history, history of philosophy, and sometimes also on some classical Greek writer. His lectures were very popular, and his kind disposition made his hearers look upon him more as a friend than as a master. Sometimes, especially during the last period of his life, he did not conduct himself with the calmness and dignity of a philosopher in combating the philosophy of Kant, to which he was opposed. He died in the midst of literary undertakings, after a short illness, on the 24th of May, 1803.

Tiedemann was beloved and esteemed by all who knew him. His life was spent in intellectual occupations and bodily exercise, of which he was very fond. His striking qualities were great self-control, cheerfulness, and a total absence of all pretension to literary superiority, although his works were extremely popular. Besides the works already mentioned, the following deserve notice:—'Untersuchungen über den Menschen,' Leipzig, 1777, &c., 3 vols. 8vo.; 'Griechenlands erste Philosophen, oder Leben und Systeme des Orpheus, Pherecydes, Thales, und Pythagoras,' Leipzig, 1780, 8vo.; 'Hermes Trismegists Poemander, oder von der göttlichen Macht und Weishiet,' Berlin and Stettin, 1781, 8vo. This work is a translation from the Greek of Hermes Trismegistus. 'Geist der Speculativen Philosophie,' Marburg, 1791-97, 6 vols. 8vo. This work is a history of philosophy from the time of Thales down to Leibnitz and Christian Wolff, and is still useful for the materials which it contains. In style and arrangement it is deficient, and the author did not possess that critical and profound knowledge of philosophy which would have enabled him to perceive the organic connection and the necessary succession of the various philosophical systems. 'Theaetet, oder über das menschliche Wissen,' Frankfurt, 1794, 8vo.; 'Handbuch der Psychologie.' This work was edited after the author's death (Leipzig, 1804, 8vo.) by L. Wachler, who has prefixed to it a biographical memoir of Tiedemann. Besides these greater works Tiedemann wrote numerous smaller treatises and made many translations from the French: he also contributed papers to several periodicals. He is the author of some Latin dissertations, among which we may mention three programs: 'De Antiquis quibusdam Musei Fridericiani Simulacris,' Cassel, 1778-80, 4to.; 'Dialogorum Platonis Argumenta exposita et illustrata,' Bipont, 1786, 8vo.; 'Dissertatio de Quaestione: quae fuerit artium magicarum origo, quomodo illae ab Asiae populis ad Graecos atque Romanos et ab his ad caeteras gentes sint propagatae,' &c., Marburg, 1787, 4to.

(L. Wachler's Memoir of Tiedemann, in his *Handbuch der Psychologie*; Creuzer, *Memoria Diterici Tiedemanni*, Marburg, 1803, 4to.; and Jörden's *Lexikon Deutscher Dichter und Prosaisten*, vol. v., p. 76-86.)

TIEDGE, CHRISTOPH AUGUST, 'The Nestor of German Poetry,' and one who has now taken his place among the German classics, was born at Gardelegen in Altmark, Dec. 14th, 1752. His early prospects in life were by no means flattering, for the death of his father (Conrector at the Magdeburg gymnasium), in 1772, left him and a family of younger children in a very destitute situation. He completed however his legal studies at Halle; but notwithstanding the favourable opinion his talents had acquired for him, he soon abandoned the profession for which he had prepared himself, and, in 1776, accepted the situation of private teacher in the Arnstadt family at Elrich in Hohenstein. The choice he had made proved a fortunate one, since it eventually led to connections and friendships that proved very advantageous. The immediate result of the course he had adopted was an intimacy with Gökingk, Gleim, and other literary persons of that day, including the Baroness von der Recke. The friendships thus formed, laid the foundation of the prosperous and unruffled tenour of his after-life. On quitting Elrich he was invited by Gleim to reside with him at Halberstadt, which he continued to do until 1792, when he became private secretary to Domherr von Stedern; and though he died in the following year, Tiedge remained in the family upon the same footing during the life of Madame von Stedern, who, at her death, in 1799, secured to him a handsome competency. Being thus placed perfectly at ease in his circumstances, he travelled through the north of Germany, and visited Berlin, where it was his good fortune again to meet with Madame von der Recke, and the intimacy thus resumed continued for life. Though not in accordance with the ordinary usages of society, it was entirely free from the slightest suspicion of impropriety, and no more open to it than was the similar domestication of Cowper with Mrs. Unwin. This union, of a kind so exceedingly rare that no name has been invented for it, was that of two noble and pure minds, congenial in their tastes, and equally inspired with a feeling for poetry and those pursuits which, while they refine, also elevate our nature. The author of 'Urania' was as well shielded from scandal as was the author of the 'Task;' for although very different in form, the first-mentioned poem is, like the other, deeply tinged by religious sentiment; and its merits were more immediately recognised, for it went through several editions within a very short time from its first appearance in 1801.

In 1804 Tiedge and his female friend visited Italy, where they remained about two years; and of this journey we have an account from the pen of Madame von der Recke herself, 'Tagebuch einer Reise,' &c., 4 vols. 8vo., with a preface and notes by Böttiger, which, besides being very superior to the general class of tour-books, affords evidence of her being a zealous though candid Protestant, and a woman of strict piety. On their return to Germany, Madame von der Recke made Berlin, and afterwards (1819) Dresden, her chief place of residence, passing the summer months at Teplitz or Carlsbad. The only change Tiedge henceforth experienced was that occasioned by the loss of his companion and benefactress, for she had taken care that her death (1833) should cause no change whatever in his outward circumstances, not even that of his residence; as she directed that her establishment should be kept up for him precisely as before, and that he should continue to enjoy the luxuries and comforts he had so long been accustomed to. Nor was her anxious solicitude for her friend's welfare useless; for so pre-eminently was Tiedge favoured beyond the ordinary lot, that he not only attained an unusual age, but nearly free from all infirmities of either body or mind. In his eighty-ninth year, says one who appears to have known him personally, he did not seem to be much more than sixty: the only alteration in him was, that for some years he could not take exercise on foot, or stir out except in a carriage or a wheel-chair. Even but a week before his death (March 8th, 1841) he was at the birth-day fête of one of his friends.

Soon after his death, his 'Life and Literary Remains' were given to the world by Dr. K. Falkenstein, in 4 vols.; and an entire edition of all his works, in 10 vols., is now in course of publication. After his 'Urania,' his most original production is perhaps his 'Wanderungen durch den Markt des Lebens,' 1836, which, like the other, may be said to be lyric-didactic, and similar in tendency, though of a less decidedly religious character, the seriousness of its moral precepts being relieved by the tone of playful irony which pervades many parts of the poem. His principal other productions are his 'Poetical Epistles,' his 'Elegies,' and his 'Frauenspiegel,' all which have contributed to his reputation. The esteem in which the poet of 'Urania' is held is proved by the fact that, in honour of his memory, a 'Tiedge Verein,' or Tiedge Institution, has just been established at Dresden, one object of which, it appears, is to give a literary prize every five years, and another to make some provision in their declining years for meritorious writers who may have fallen into adversity in consequence of age and infirmities.

(*Conversations Lexicon*; Wolff's *Encyclopädie*; *Morgenblatt*, 1842; *Litteraturblatt*, 1842.)

TIEL. [Thiel.]

TIE'POLO, GIOVANNI BATTISTA, a celebrated Italian painter of the eighteenth century, was born of a good family at Venice in 1693. Tiepolo, says Lanzi, was the last of the Venetians who acquired a European fame; celebrated in Italy, in Germany, and in Spain. He studied as a boy under Gregorio Lazzarini, painted at first in his manner, then imitated the style of Piazzetta, but attached himself eventually to that of Paul Veronese. Already at the age of sixteen he was known even out of Venice, and when still young he received invitations from various Italian cities to decorate their churches and their public buildings. His works in the north of Italy, both in oil and in fresco, are numerous: one of his first works of note was the Shipwreck of San Satiro, in the church of St. Ambrose, at Milan: he excelled chiefly in fresco, and his colouring and the folds of his draperies bear great resemblance to those of Paul Veronese. In Germany also Tiepolo executed several works: at Würzburg he painted the staircase and the saloon of the bishop's palace and two altar-pieces. He was afterwards invited by Charles III. to Spain, where, in Madrid, he painted the ceiling of the saloon in the new palace of the king, and the hall of the royal guard, by which he is said to have excited the jealousy of Mengs: he executed also the chief altar-piece in oil for the convent church of St. Paschal, at Aranjuez. He died in Madrid in 1769 or 1770.

Tiepolo's style was slight and brilliant, yet his colouring was not glaring: the effect of his paintings was not produced by a recourse to bright colours, but by a judicious contrast of tints: his drawing was however feeble, yet this weakness was nearly concealed by the gracefulness of his attitudes. One of his best pictures in oil is the Martyrdom of St. Agatha, in the church of St. Antonio, at Padua. He etched several plates in a very free and spirited manner. He left two sons, Giovanni Domenico and Lorenzo, who were both painters: the elder etched some of his father's designs.

(Zanetti, *Della Pittura Veneziana*, &c.; Lanzi, *Storia Pittorica*, &c.; Fiorillo, *Geschichte der Mahlerey*, vol. ii.)

TIFLIS, or **TEFLIS**, the capital of the Russian province of Georgia, is in about 41° 43′ N. lat., according to Capt. Monteith. In 1829 Mr. Federof, who accompanied Professor Parrot on his visit to Mount Ararat, found the latitude of the cathedral church to be 41° 41′. The longitude, according to Birdin, is 62° 34′ E. from Ferro, or 44° 56′ E. of London. Professor Parrot fixes the elevation of the stone bridge over the river Kur at exactly 1100 feet above the level of the Black Sea, and 31 feet above the mean level of the river. The Kur flows through a valley confined between two ranges of lofty mountains. The river enters the valley on the north, and 'at the extremity of the defile,' says Sir R. K. Porter, 'we saw the capital of Georgia, the massy towers of Tiflis rising on the precipitous and sublime banks of the Kur. But the effect produced here is of a deeper tinge. The town itself stands at the foot of a line of dark and barren hills, whose high and caverned sides gloomily overshadow it. Every house, every building within its walls, seems to share the dismal hue of the surrounding heights; for a deep blackness rests on all. The heavy battlements above, and the still majestic towers of the ancient citadel, the spires of Christian churches, and other marks of European residence, could not for some time erase the horrible dungeon impression of Asiatic dirt and barbarism received at first view of the town.' This was written in 1817.

The town is built on both sides of the river; but the larger portion, which is on the right or west bank, contains the houses of the wealthiest inhabitants, the great bazar, the principal squares, the finest churches, the public offices, the residence of the military governor, and of the commander-in-chief. This is the city properly so called, which again is divided into two parts, the old and new town. The limits of the old town are distinctly marked by the ruins of the antient fortifications. The new town extends to the north and west beyond these walls, and is distinguished from the old town by its new buildings in the European style and broader streets. The greater part of it is called by the Georgians Goretuban, that is, the street out of the city. On the left bank is the extensive suburb Awlabar, a large caravansary, the barracks, a long row of houses inhabited by colonists from Southern Germany, and the fortress or citadel, built by the Turks in 1576. Toward the south the town leans against the chain of hills running from the south-west, on the summit of which are extensive ruins of a very antient fortress; its highest point at the western end of the old wall is 392 feet above the bridge; towards the west it rises higher, and from thence a small stream of water is conducted to the city the bed of which however is generally quite dry, except immediately after rain.

There are in Tiflis 15 Greek churches, 20 Armenian, and 2 Roman Catholic, some of which are very handsome. At a point where the river in its course through the town is hemmed in by rocks, a bridge of a single arch connects the town with the suburb of Awlabar. Here also are the ruins of an antient fort, church and houses, and about two miles farther from this side of the city stand the remains of another sacred edifice, on the summit of a lofty hill.

The houses in Tiflis are ill-built, and the streets so narrow that only one carriage can pass through the widest, and in the smaller streets there is scarcely room for a horseman. We must not however derive our ideas from the description of travellers, before or for a few years after the incorporation of Georgia with the Russian empire in 1801. The letters on the Caucasus and Georgia in 1812, written by the wife of a Russian envoy, speak of Tiflis as 'a mass of ruins, melancholy monuments of the ravages of Aga Mahomet and the Persians.' Sir Robert Ker Porter, in 1817, says that the governor was making great improvements, ordering all ruinous houses to be repaired, or entirely pulled down to make way for the erection of new ones. Among these improvements are the alterations in the great bazar, a long narrow winding street with shops on both sides, which he had caused to be entirely roofed in, with circular apertures to admit air and light. Professor Eichwald, who visited Tiflis in 1825 and 1826, and gives some particulars as late as 1829, says, 'Since the year 1801 tranquillity and security have returned, and are now firmly established in Georgia; civilization and commerce increase every year; since that time Tiflis has been improving in its appearance, is continually enlarged by new buildings, and its inhabitants have easily become familiar with all the comforts and even the luxuries of European life.' Professor Parrot, who was there in 1829, speaks in similar terms of the improvements introduced by the Russian government, but does not appear to be so satisfied with the introduction of European fashions.

One of the worst effects of the habitual intercourse with Europeans is the change that has been made in the manners of the women, who have thrown off their former Asiatic restraint, without adopting the reserve and decorum of European manners. This effect is much more decided among the lower orders, because the troops are quartered in the houses of the inhabitants, so that the customary line of separation between the women and the men could no longer be preserved. This circumstance greatly disgusts the Georgians, and they accordingly hailed with delight the judicious ukase of 1829, by which the proprietors of newly-built houses are exempted from receiving soldiers into their houses for six years.

Tiflis has been chiefly indebted for its celebrity to its warm baths, and its Georgian name, Tphilisk Alaki, is equivalent to 'warm town.' Parrot says, its name is derived from the Georgian word *tbili*, warm, which may have been given it either on account of the warm springs, or from the contrast of the great warmth of the climate of Tiflis, with the preceding residence of the Georgian kings at Mzchet, which lies on the declivity of the Caucasus, and has a much cooler temperature. The building of Tiflis and the transferring of the royal residence to this place were effected about the year 455, by king Waktang I., Gork-Aslan. (Klaproth, *Reise*, i. 715; ii. 164.) The mineral springs rise in considerable numbers at the south end of the city, between the strata of limestone, whence they are conducted into the cavern excavated in the solid rock, under one immense roof, divided into different apartments for the men and the women, into which not a ray of day-light is admitted, and which are merely rescued from total darkness by the faint glimmerings of a few twinkling lamps struggling with the vapour arising from the water. The stench of the place and the disorder and filth which this meagre illumination renders visible, show, says Sir R. K. Porter, sufficient argument for the whole having been left in shade. He observes however that this want of order and cleanliness is not to be wondered at, since the entrance to the baths is free to all, and they crowd indiscriminately into every chamber. Sir Robert went to look at these baths, and was much surprised at being urged by a gentleman who accompanied him, to view the baths of the women, to which they were shown by an old woman. Their entrance did not seem to cause any alarm or astonishment. These waters are reputed to be very beneficial in rheumatic complaints and cutaneous disorders. No chemical analysis that can be depended on has yet been made. Professor Parrot, who examined 17 springs in four different baths, states the hottest at 37°, and the coolest at 19° Réaumur. There are only two springs below 30°; the temperature of the air in the shade, out of the baths, was from 15° to 16° Réaumur.

The situation of Tiflis would certainly make it one of the most delightful spots in the world, if the mountains between which it lies were not totally destitute of trees. They now only reflect the rays of the sun from the southern slope of the Caucasus (which also keeps off the cooling north and north-east winds), and thus produce in the valleys an oppressive heat, which often strikes like the glow of a furnace, and may perhaps be the cause of the bilious diseases prevalent here. The greatest heat during the residence of Professor Parrot was on the 28th of July, between 3 and 5 in the afternoon, 30° 4′ Réaumur.

Though Professor Parrot states that 'notwithstanding the great advantages held out by the Russian government, which entices many persons from Russia and other countries, yet all, from the counsellor of state and general down to the clerk and common Cossack, often long in a few weeks to return to their native country as to a lost paradise;' yet the population is constantly and rapidly increasing. In 1820 it was stated not to exceed 15,000, and is now probably nearly 45,000, it having been 40,000 three years ago. Full one-half are Armenians, the remainder chiefly Georgians, that is, old Greek Christians, some Roman Catholics, and about a hundred Mohammedans. It is the residence of a Georgian patriarch, a Georgian metropolitan, and an Armenian archbishop. There are some manufactories of woollen, cotton, and silk.

Tiflis is most favourably situated to be the medium of an extensive trade between Europe and Asia, but it is only since the arrival of the Russians and the peace of Gulistan that there has been any direct commerce with Georgia. At first, and till the emperor Alexander granted free trade to the trans-Caucasian province, the Armenians merely purchased such goods as they wanted for common use at the fair of Nishnei Novgorod, to which they brought Persian goods, raw silk, Cashmere shawls, and pearls, which they exchanged for woollens, linen, printed calicoes, &c.: they often bought with ready money. In 1821 the ukase granting freedom of trade was published, and commerce greatly increased. In 1823 a rich Armenian went to Odessa, where he purchased goods to the amount of many thousand pounds, which he disposed of to great advantage at Tiflis.

In the following year for the first time, six Armenian merchants came to Leipzig fair, where they purchased European manufactures to the amount of 600,000 rubles franco (25,000*l.*), which they conveyed through Galicia and the south of Russia to Odessa, where they were embarked for Redout Kale. In the year 1825 the value of the goods purchased at Leipzig was 1,200,000 rubles, and in the following year twice as much. Professor Eichwald says it is much to be wished that some European merchants might settle in Tiflis, and endeavour to improve the trade from that city to Persia, Afghanistan, Bokhara, and Tibet. Then the caravans from Cashmere, Cabul, and Tibet would no longer go to Tauris and Ispahan, but cross the Caspian Sea, and so up the Kur to Tiflis, whence the goods would be forwarded over the Black Sea to Europe.

The trade with Persia is very important, and is almost entirely in the hands of the Armenians of Bushire on the Persian Gulf and of Tiflis. The former trade chiefly to the East Indies: the greater part of the ships which navigate between Bushire and Bombay belong to the Imaum of Muscat: only a few English ships come to Bushire. The value of goods brought from India to Persia was two millions of ducats in 1826, and the exports from Persia to India 500,000 ducats. A considerable part of this trade takes the way of Basrah, from which place the manufactures of England and India go up the Euphrates, and are disposed of in Turkey. The transit trade of foreign goods, which chiefly come from Leipzig, is an important branch of the trade between Tiflis and Persia. On the whole the commerce of Tiflis is increasing every year in extent and value.

(Sir Robert Ker Porter, *Travels in Georgia*, &c.; *Lettres sur le Caucase et la Géorgie*, 1812; Klaproth, *Reise in den Caucasus und Georgie*; Parrot, *Reise zum Ararat* Berlin, 1834; Eichwald, *Reise in den Kaukasus*, Stuttgard, 1837.)

TIGA, Professor Kaup's name for a genus of birds (*Chrysonotus*, Sw.; *Picus*, Horsf.), placed by Mr. G. R. Gray in the subfamily *Celeinæ* (the 5th) of the *Picidæ*. [WOODPECKERS.]

TIGER-BITTERNS. [TIGRISOMA.]

TIGER-CATS. [TIGERS.]

TIGERS. Although there is but one species of *Tiger*, properly so called, the *Tiger-Cats*, or those species of the genus *Felis* in which the tigerine character predominates, may be also treated of under the title before us.

The *Royal Tiger*, *Felis Tigris*, claims our first notice: and, although poets and poetical zoologists have joined to elevate the lion with his majestic mane to the sovereignty, it may be doubted whether the *Tiger* is not the type of the ferocious and blood-thirsty genus *Felis*.

Some have thought that this species was but little known to the antients; but, we think, with no sufficient grounds. The numerous passages in which the word *Tigris* (τίγρις) occurs in Greek and Latin authors, leave little room for doubting this knowledge; and Hyrcania, with which it is so frequently associated by the latter, is a locality well suited to what we now know of its geographical distribution.

When Aristotle (*Hist. Anim.*, viii. 28), treating of hybrid animals which spring from an intermixture of different races, says that people pretend that the dogs of India are bred from the tiger (τοῦ τίγριος) and a bitch, not indeed at the first union, but at the third, we see no reason, considering the locality which he assigns to the *tigris*, and the opportunities which the conquests of Alexander gave him of knowing the animals of India, why the word should be rendered otherwise than by *Tiger* in our present acceptation of the term. 'The tiger,' writes Pliny (*Nat. Hist.*, viii. 18), 'is produced in Hyrcania and India;' following this up with an allusion to the 'tremendous swiftness' of the animal, and the strong attachment which the Tigress, notwithstanding accidental exception, is known to manifest for her cubs. Again (*Ibid.*, vi. 20), he notices the Indian nations as abounding in wild tigers. Of course he does not omit the story of the origin of the Indian dogs from the Tiger, and the rejection of the two first litters as too ferocious, while the third is taken and brought up. (*Ibid.*, viii. 40.) But, further, it is quite clear from the same authority, that the *Tigris* had been exhibited at Rome, and that Pliny and others well knew the distinction between that species and leopards and panthers. After mentioning the two last, and referring to an ancient decree of the senate that African beasts should not be imported, but stating that the tribune Cneius Aufidius caused a plebiscitum to be passed which permitted their importation for the Circensian games, he states the numbers brought, first by Scaurus, and then by Pompey the Great and Augustus; adding that Augustus was the first who showed a tame tigress (*tigrin*) in a den at Rome, upon the dedication of the Theatre of Marcellus, during the consulship of Q. Tubero and Fabius Maximus, and that the emperor Claudius showed four together. (*Ibid.*, viii. 17.) Suetonius (*Aug.*, xliii.) states that it was the habit of Augustus, besides the exhibitions at the great spectacles, to show to the public any rarity that was brought over, 'ut rhinocerotem apud septa; *tigrim in scena*; anguem quinquaginta cubitorum pro comitio:' and Dion remarks that the tigers (τίγρεις) first seen by the Romans, and, as he thinks, by the Greeks also, were those sent by the Indians as gifts when they were suing for peace from Augustus. The emperor Philip on one occasion exhibited ten tigers, together with thirty-two elephants, ten elks, sixty lions, thirty leopards, ten hyænas, one hippopotamus, one rhinoceros, forty wild horses, twenty wild asses, and numbers of deer, goats, antelopes, and other beasts; the brutal exhibition being crowned by the mortal combat of two thousand gladiators.

Gordian III. also exhibited ten tigers, and they were present in the shows of Antoninus and Elagabalus. Aurelian, in his triumph over Zenobia, showed four, together with a giraffe, an elk, and other rare animals.

Oppian cannot be mistaken when he writes (*Cyneg.*, iii. 130),

> Παρδάλιες τε ϑοαί, καὶ τίγριες ἀιολόνωτοι ;

for here we have leopards and tigers in the same line, and the epithet αιολόνωτος (having a variegated back) is quite applicable to the latter.

The Latin poets abound with allusions to the *Tigris*, that, in most instances, can hardly be allotted to any animal but the Royal Tiger; for, though Virgil, in his fourth 'Georgic' (l. 407), applies the epithet 'atra' (black) to 'tigris' in the passage where Cyrene is warning Aristæus as to the forms into which Proteus will transform himself, the word, evidently, does not there allude to colour, but to ferocity. In the fourth 'Æneid,' Dido, in her exclamation against Æneas, says,

> ——'Duris genuit te cautibus horrens
> Caucasus, *Hyrcanæque* admorunt ubera *tigres*.'

The tigers of Bacchus may be considered more doubtful. In the 'Gemmæ et Sculpturæ Antiquæ' there is a representation of a large female *Felis* with the thyrsus from a carnelian (corgnola), with the superscription, 'Tigre di Bacho;' but though the figure, generally, might pass for a Tiger, the tail of the animal is terminated by a shaggy tuft, and no tiger's tail is. Claudian comes much nearer to the mark where he describes Iacchus as marching crowned with ivy, and clad (in the skin) of the Parthian Tiger. When Virgil describes Orpheus, as 'mulcentem tigres' as 'soothing tigers' (*Georg.* iv., l. 510), and Horace, with nearly the same thought, addresses Mercury,

> 'Tu potes tigres comitesque sylvas
> Ducere'

(*Carm.* iii., *Ode* ii.); and again, in his epistle to the Pisos ('De Arte Poeticâ,' l. 393), says of Orpheus,

> 'Dictus ab hoc lenire tigres, rabidosque leones;'

they make the Tiger personify the greatest ferocity, and they certainly could not have chosen a more apt representative.

Martial speaks of the Tiger in the time of Titus and Domitian. (*Spect.*, Epig. 18, and lib. i., Epig. 105.)

To conclude this branch of the subject, we shall advert to one more literary proof, and one piece of pictorial evidence: and we think that no doubt can exist that, although the Royal Tiger was not so abundant in the Roman shows, particularly the earlier ones, as the leopard and the panther, its form and colouring, as distinguished from the other great cats, were as well and familiarly known to that people.

Pliny, in his chapter 'De Atlantis Arboribus et Cedrinis Mensis,' &c. (*Nat. Hist.*, xiii. 15), speaking of the grain or pattern of these tables, says that where it was oblong or lengthened, they were called tigrine, but where it was wreathed or curled (*intorto*), they were termed pantherine.

The pictorial evidence (so to speak) was furnished by the mosaic found at Rome near the arch of Gallienus. In this work of art, executed not improbably in commemoration of the exhibition of Claudius above noticed, four Royal Tigers, each devouring his prey, are well represented.

Our Zoological Societies and menageries have so increased in number during a long period of peace, that it becomes almost superfluous to describe a form so well known. But as a description of an animal holding so important a rank in the animal kingdom may be expected, we select that of Mr. Bennett, who, in the *Tower Menagerie*, remarks that the Tiger, closely allied to the Lion in size, in power, in external form, in internal structure, in zoological characters, in prowling habits, and in sanguinary propensities, is at once distinguished from it, and from every other of their common genus, by the peculiar markings of its coat. 'On a ground which exhibits in different individuals various shades of yellow,' says Mr. Bennett, 'he is elegantly striped by a series of transverse black bands or bars, which occupy the sides of his head, neck, and body, and are continued upon his tail in the form of rings, the last of the series uniformly occupying the extremity of that organ, and giving it a black tip of greater or less extent. The under parts of his body and the inner sides of his legs are almost entirely white; he has no mane; and his whole frame, though less elevated than that of the Lion, is of a slenderer and more graceful make. His head is also shorter and more rounded.'

There is a paler variety, almost approaching to whitish, and with the stripes visible only in particular lights: this has been exhibited in this country. According to Du Halde, the Chinese Tiger (*Lou-chu*, or *Lau-hu*) varies in colour, some being white, striped with black and grey.

The size of the Tiger varies also; but the dimensions of the form, when fully developed, are, if we are to give credit to some accounts, the veracity of which has not been impugned, most formidable. Buffon notices an individual which was (tail included) 15 feet long; and it is on record that Hyder Ali presented to the Nabob of Arcot one which measured 18 feet in length. The average height varies from about four feet to about three feet, and the length from about eight or nine feet to six.

Geographical Distribution.—Asia only, and not the south of Africa, as Buffon erroneously states; but authors generally agree that the Tiger is now rarely, if ever, met with on this side of the Indus. It is said to be found in the deserts which separate China from Siberia, and as far as the banks of the Oby; and in the south of China, and the larger East Indian Islands (Sumatra, for instance), it is common. Pennant States that it is found as far north as China and Chinese Tartary, and about Lake Aral and the Altaic Mountains. 'It inhabits Mount Ararat,' says the same author in continuation, 'and Hyrcania, of old famous for its wild beasts; but the greatest numbers, the largest, and the most cruel, are met with in India and its islands. In Sumatra the natives are so infatuated that they seldom kill them, having a notion that they are animated by the souls of their ancestors. They are the scourge of the country; they lurk among the bushes on the sides of rivers, and almost depopulate many places. They are insidious, blood-thirsty, and malevolent, and seem to prefer preying on the human race.' Hindustan may be considered the head-quarters of this destructive animal; there it is that he reigns unawed even by the lion, with which he disputes the mastery, and which is comparatively rare in that peninsula.

Habits, Chase, &c.—The bound with which the ambushed tiger throws himself upon his prey is as wonderful in its extent as it is terrible in its effects. Pennant justly observes that the distance which it clears in this deadly leap is scarcely credible. Man is a mere puppet in his gripe; and the Indian buffalo is not only borne down by the ferocious beast, but carried off by his enormous strength. If he fails, it has been said that he makes off. This may be true in certain instances, but in general he does not slink away, but pursues the affrighted prey with a speedy activity which is seldom exerted in vain. This leads us to the observation of Pliny celebrating its swiftness,* for which the Roman zoologist has been censured, most unjustly, apparently; nor is he the only author among the ancients who notices its speed. Oppian (*Cyneg.*, i. 323) speaks of the swift Tigers as being the offspring (γενέθλη) of the zephyr. 'Pliny,' says Pennant, 'has been frequently taken to task by the moderns for calling the Tiger "animal tremendæ velocitatis;" they allow it great agility in its bounds, but deny it swiftness in pursuit. Two travellers of authority, both eye-witnesses, confirm what Pliny says: the one indeed only mentions in general vast fleetness; the other saw a trial between one and a swift horse, whose rider escaped merely by getting in time amidst a circle of armed men. The chase of this animal was a favourite diversion with the great Cam-Hi, the Chinese monarch, in whose company our countryman Mr. Bell, that faithful traveller, and the Père Gerbillon, saw these proofs of the tiger's speed.' †

In the ''Ἑκατοντάς, seu Centuria Imaginum Hieroglyphicarum' (cIↃ. IↃc. xxiii.) is a wood-cut (here copied) that may refer to such a scene.

Ferocious as the Tiger is, and much as it may deserve the odium heaped upon it, the general chorus of the herd of authors who eulogize 'the courage, greatness, clemency, and generosity' of the lion, contrasting it with the unpro-

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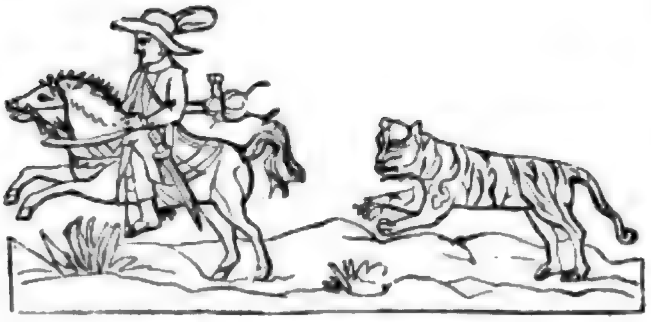
* Ante, p. 436.

† Bell's 'Travels,' ii. 91; Du Halde, ii. 263.



Tiger pursuing a man on horseback.

voked ferocity, unnecessary cruelty, and poltroonery of the Tiger, becomes ridiculous, though led by such names as Buffon and Pennant. The lion has owed a good deal to his mane and his noble and dignified aspect; but appearances are not always to be trusted. Mr. Barrow, with much more truth, characterizes the king of beasts as powerful but treacherous. 'Happy,' says that traveller, 'for the peasantry, the Hottentots, and those animals that are the objects of its destruction, were its noble and generous nature, that so oft has fired the imagination of poets, realized, and that his royal paw disdained to stain itself in the blood of any sleeping creature! The lion, in fact, is one of the most indolent of all the beasts of prey, and never gives himself the trouble of a pursuit unless hard pressed by hunger.'

Pennant gives the following as an instance, after stating that there is a sort of cruelty in the devastations of the tiger unknown to the generous lion, as well as poltroonery in its sudden retreat on any disappointment: 'I was informed by very good authority, that in the beginning of this century some gentlemen and ladies, being on a party of pleasure under the shade of trees, on the banks of a river in Bengal, observed a tiger preparing for its fatal spring; one of the ladies, with amazing presence of mind, laid hold of an umbrella and furled it full in the animal's face, which instantly retired, and gave the company an opportunity of removing from so terrible a neighbour.'

This is a very pretty story, and the heroine deserves all praise, though it is not very clear what is meant by *furling* an umbrella, so as to make the alleged act square with the context, and the tiger was undoubtedly very polite. But tigers spring from a considerable distance, 15 or 20 feet, and from ambush; and we suspect that a cross-examination of the parties concerned might have slightly damaged the anecdote. Granting, however, that this bold lady walked up to a crouched tiger, and suddenly opened an umbrella in its face (for that, we presume, is the action meant), we may easily conceive that the surprise may have utterly confounded him; but this is not poltroonery. Indeed the same author immediately afterwards gives a tolerable proof of the animal's daring: 'Another party had not the same good fortune: a tiger darted among them while they were at dinner, seized on one gentleman, carried him off, and he never was more heard of.'

But there is another story, a very sad one, which is pregnant with proof of the tiger's hardihood; we allude to the distressing death of Sir Hector Monro's son. Mr. Wood (*Zoography*) relates the horrible occurrence in a few words:—

'This unfortunate gentleman,' says Mr. Wood, 'accompanied by three of his friends, went on shore, December 22, 1792, on Sawgar Island to shoot deer. They continued their sport till the afternoon, when they retired to the edge of a jungle to refresh themselves; where they had not remained long before one of the party, who was leaving the rest to shoot a deer, heard a dreadful roar, and saw a large tiger spring on poor Monro, and rush with him into the jungle with the greatest ease, dragging him through everything that obstructed his course, as if all were made to yield to his amazing strength. All that his companions could do to rescue their friend from this shocking situation was to fire at the tiger; and it is evident that their shots took place, since, in a few minutes after, Mr. Monro staggered up to them covered with blood, and fell. Every medical assistance that the ship afforded was procured for him immediately, but in vain; he expired in the course of twenty-four hours in the greatest agonies. His head was torn, his skull fractured, and his neck and shoulders covered with wounds made by the claws of the savage beast. It is worthy of observation, that neither the large fire that was blazing close to them, nor the noise and laughter which it seems they were making at the time, could divert this determined animal from his purpose.' Contrast this with the story told by Sparrman, of the adventure of Jacob Kok, of Zee-koe-rivier [LION, vol. xiv., p. 32], in which the Lion, though warmed with the ardour of chasing the terrified Jacob, was daunted when, in his extremity, he faced the infuriated beast from a small heap of stones, presenting the butt-end of his shotless gun to his brutal enemy. This *was* poltroonery, if such a term be applicable to beasts.

But if any doubt as to the courage of the tiger be entertained, Father Tachard's account of a combat between that beast and two elephants at Siam will be sufficient proof. He relates that a lofty bamboo palisade was erected, occupying an area of about 100 feet square. Into this enclosure two elephants were introduced with their heads and trunks shielded by a kind of mask. A large tiger was now brought from its den, and held with cords till one of the elephants approached and inflicted two or three blows on its back with his trunk, so heavily laid on that it fell stunned, as if dead. Then they loosed the tiger. No sooner did he recover than he sprang with a dreadful roar at the elephant's trunk stretched out in act to strike him; but the wary elephant drew up his trunk, and receiving the tiger on his tusks, hurled him into the air. This checked the fury of the tiger, as it well might, and he gave up the contest with the elephant; but he ran several times round the palisade, frequently springing at the spectators. Afterwards three elephants were set upon him, and they in turn dealt him such heavy blows that he again lay senseless, and would have been killed, if the combat, as it is most incorrectly called, had not been stopped. Nothing could be more unfair towards the tiger than the whole of this proceeding; and we will venture to say that no quadruped except a British bull-dog could have shown more 'pluck,' to use a vulgar but expressive term, than this shamefully treated beast.

The older authors generally state that after the tiger has secured its prey it plunges its head into the body of the animal up to its very eyes, as if to satiate itself with blood till the corpse is exhausted, before it tears it to pieces. The best modern accounts tend to prove that the tiger is not more bloodthirsty and has no more blood sucking propensities than the other great cats; and that this blood-drinking habit is grossly exaggerated.

The tigress brings forth three or four, or four or five cubs at a time; and she is a very fond mother, braving every danger for them, and furiously attacking man and beast in their defence. The antients knew this well. See Martial (lib. iii., Epig. 44):—

'Non tigris catulis citata raptis,' &c.;

and Juvenal (*Sat.*, vi.):—

'Tunc gravis illa viro, tunc orba tigride pejor:'

and though it is on record that a tigress in modern times devoured her cub, one should remember that this unnatural act was done in captivity, and that rabbits, sows, and cats have done the same. But that in a state of nature the maternal feeling is very strong in the tigress, there can be no doubt. Captain Williamson, for example, relates that two tiger-cubs were brought to him when he was stationed in an Indian district. The country-people had found four in the absence of the tigress. The two brought to the captain were put in a stable, where they made a loud noise for several nights. The bereaved mother arrived at last, replying to their cries with fearful howlings, and the cubs were let loose under the apprehension that the infuriated tigress might break in. In the morning it was found that she had carried them away.

For an account of the *hybrids* between the Lion and Tiger, see the article LION, vol. xiv., p. 35.

Various devices have been put in requisition to take or annihilate this destructive quadruped, and we shall mention one or two of them before we advert to the chace of the animal upon a grander scale. Ten rupees were formerly offered by the East India Company for every tiger destroyed within the provinces where their power and influence extended: a small reward, but sufficient, conjointly with the depredations of the animal, to stimulate the poorer classes to destroy it.

A kind of spring-bow was formerly laid in its way and discharged a poisoned arrow, generally with fatal effect, when the animal came in contact with a cord stretched across its path, and this method is said still to be in use in ome places. Again, a heavy beam was suspended over he way traversed by the tiger, which fell and crushed him on his disengaging a cord which let the beam fall. A Persian device is said to consist of a large spherical trong interwoven bamboo cage, or one made of other uitable materials, with intervals throughout, three or four nches broad. Under this shelter, which is picketed to the ground in the tiger's haunt, a man provided with two or hree short strong spears takes post by night, with a dog or a goat as his companion, wraps himself in his quilt and goes to sleep. A tiger arrives, of whose presence the man is warned by the dog or the goat, and generally, after melling about, rears himself up against the cage, upon which the man stabs him resolutely with his short spear hrough the interstice of the wicker-work. It seems ludirous to talk of taking a tiger with birdlime; but it is said o be so captured in Oude. When a tiger's track is ascerained, the peasants, we are told, collect a quantity of leaves esembling those of the sycamore, and common in most ndian underwoods; these they smear with a kind of birdime which is made from the berries of an indigenous and by no means scarce tree, and strew them with the adhesive ubstance uppermost in some gloomy spot to which the iger resorts in the heat of the day. If he treads on one of he limed leaves, he generally begins by trying to shake it rom his paw, and not succeeding, proceeds to rub it gainst his jaw in order to get rid of it. Thus his eyes nd ears become agglutinated, and the uneasy animal rolls, perhaps among many more of the smeared leaves, till he becomes enveloped: in this state he has been compared o a man who has been tarred and feathered. The tiger's rritation and uneasiness find vent in dreadful howlings; on which the peasants hasten to the spot, and shoot him without difficulty.

The plan of the box-trap and looking-glass, a device to e found in antient sculpture according to Montfaucon, is aid to be practised among the Chinese at the present day.

So much for the trapping of the Tiger. The tiger-hunt is perhaps the grandest and most exciting of wild-sports. Upon such occasions the whole neighbourhood is on the move, and two hundred elephants have been known to ake the field; from ten to thirty of these gigantic animals, ach carrying sportsmen armed with rifles, have not unfrequently started for the jungle.

Captain Mundy gives a short but spirited description f a tiger-hunt. The party, he tells us, found immense uantities of game, wild-hogs, hog-deer, and the Neilghie;* they, however, strictly abstained from firing, eserving their whole battery for the nobler game of which hey were in pursuit. They had to pass through a thick orest, and the author gives a very interesting description f the power and dexterity of the elephants in overthrowng trees to make a road:—'On clearing the wood,' says he, 'we entered an open space of marshy grass, not three eet high; a large herd of cattle were feeding there, and he herdsman was sitting singing under a bush, when, just as the former began to move before us, up sprang the very iger to whom our visit was intended, and cantered off across a bare plain dotted with small patches of bush-jungle. He took to the open country in a style which would have more become a fox than a tiger, who is expected by his pursuers to fight and not to run, and as he was flushed on the flank of the line, only one bullet was ired at him ere he cleared the thick grass. He was unhurt; and we pursued him at full speed. Twice he threw us out by stopping short in small strips of jungle, and then heading back after we had passed; and he had given us a very fast trot of about two miles, when Colonel Arnold, who led the field, at last reached him by a capital shot, his elephant being in full career. As soon as he felt himself wounded, the tiger crept into a close thicket of trees and bushes, and crouched. The two leading sportsmen overran the spot where he lay, and as I came up I saw him, through an aperture, rising to attempt a charge. My mahout had just before, in the heat of the chase, dropped his ankors, or goad, which I had refused to allow him to recover, and the elephant being notoriously savage, and further irritated by the goading he had undergone, became consequently unmanageable; he appeared to see the tiger as soon as myself, and I had only time to fire one shot, when he suddenly rushed with the greatest fury into the thicket, and falling upon his knees, nailed the tiger with his tusks to the ground. Such was the violence of the shock, that my servant, who sat behind, was thrown out, and one of my guns went overboard. The struggles of my elephant to crush his still resisting foe, who had fixed one paw on his eye, were so energetic, that I was obliged to hold on with all my strength, to keep myself in the houdah. The second barrel too of the gun, which I still retained in my hand, went off in the scuffle, the ball passing close to the mahout's ear, whose situation, poor fellow, was anything but enviable. As soon as my elephant was prevailed upon to leave the killing part of the business to the sportsmen, they gave the roughly used tiger the coup-de-grace. It was a very fine female, with the most beautiful skin I ever saw.'

In the 'Asiatic Annual Register,' for 1804, a gentleman who had been present at the killing of above thirty tigers gives an account of a hunting-party of the Nawab Asuf-ud-Dowlah. After describing the immense cavalcade of the Nawab, he says:—'The first tiger we saw and killed was in the mountains; we went to attack him about noon; he was in a narrow valley, which the Nawab surrounded with above two hundred elephants; we heard him growl horribly in a thick bush in the middle of the valley. Being accustomed to the sport and very eager, I pushed in my elephant; the fierce beast charged me immediately; the elephant, a timid animal, turned tail, and deprived me of the opportunity to fire. I ventured again, attended by two or three other elephants; the tiger made a spring, and nearly reached the back of one of the elephants on which were three or four men; the elephant shook himself so forcibly as to throw these men off his back, and they tumbled into the bush; I gave them up for lost, but was agreeably surprised to see them creep out unhurt. His Excellency was all this time on a rising ground near the thicket, looking on calmly, and beckoning to me to drive the tiger towards him. I made another attempt, and with more success; he darted out towards me on my approach, roaring furiously and lashing his sides with his tail. I luckily got a shot and hit him; he retreated into the bush, and ten or twelve elephants just then pushed into the thicket, alarmed the tiger, and obliged him to run towards the Nawab, who instantly gave him a warm reception, and with the assistance of some of his omras, or lords, laid the tiger sprawling on his side. A loud shout of *wha! wha!* proclaimed the victory.'

There is in Bishop Heber's 'Journal' a most graphic description of a tiger-hunt, but our limits will not permit us to indulge in more of these stirring accounts.

Those who have represented the tiger as untameable have no ground for the assertion. It is as capable of being tamed, and of attachment, even to fondness, for its keeper, as any other animal of its kind. We have seen many instances of this mutual good understanding between the man and the beast, and Mr. Bennett mentions a remarkable example in his 'Tower Menagerie.' A tigress of great beauty, in the Tower when he wrote, and scarcely a year old, had been, during her passage from Calcutta, allowed to range about the vessel unrestricted, and had become perfectly familiar with the sailors, showing not the slightest symptoms of ferocity. On her arrival in the Thames, the irritation produced by the sight of strangers instantly changed her temper, rendering her irascible and dangerous. So sulky and savage was she, that Mr. Cops, who then kept the lions in the Tower, could hardly be prevailed on by her former keeper, who came to see her, to allow him to enter her den; but as soon as the tigress recognised her old friend, she fawned on him, licked him, caressed him, and manifested the most extravagant signs of pleasure; and when, at last, he left her, she cried and whined for the remainder of the day. The tame tigers of the mendicant priests, or Fakirs, of Hindustan, are well known.

But whilst there can be no doubt of the tameable qualities of the tiger, and indeed of all the great cats, they are not to be incautiously trusted. The natural disposition is always ready to break out; and the mildest of them, though

——'Ne'er so tame, so cherish'd, and lock'd up,
Will have a wild trick of his ancestors.'

Thus Bontius states that, in 1628, a tiger at Batavia, which had been brought up from a cub, and accustomed to men all its life, escaped from its cage, fastened on a horse which was feeding near, and killed it; so that the citizens rose upon the tiger with fire-arms and slew it in its turn, to prevent further mischief.

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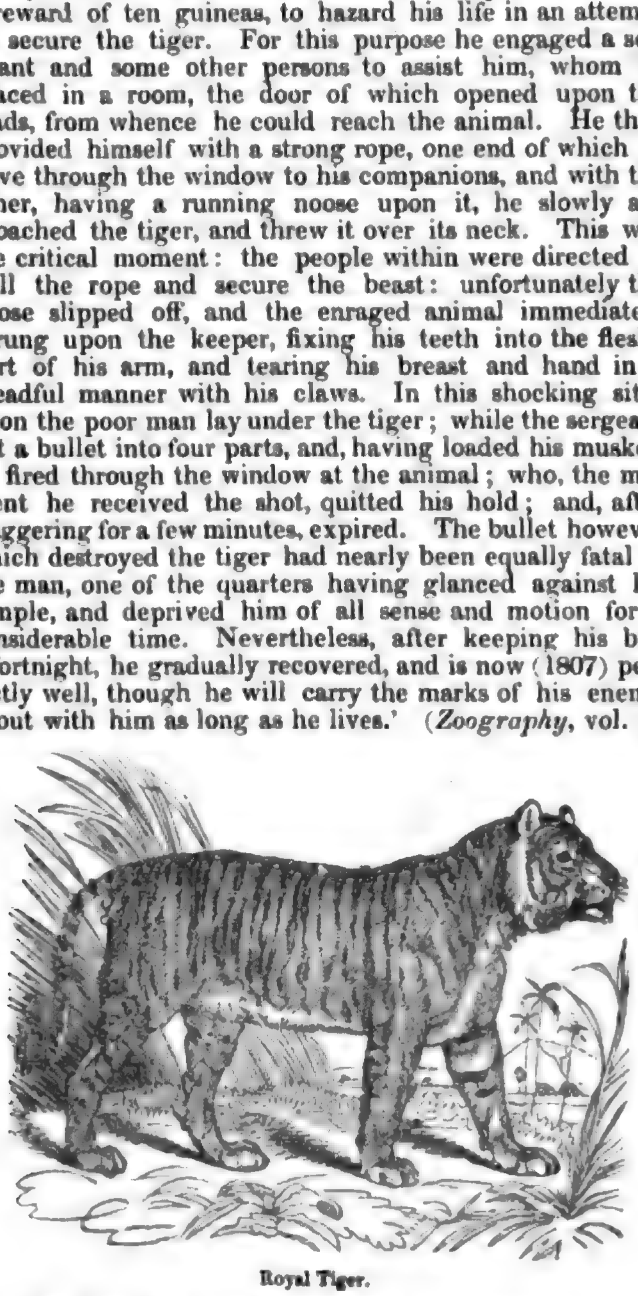
* Nyl-Ghau. [ANTELOPE, vol. ii., p. 76.]

We conclude this part of our sketch with the account given by John Mason, who formerly kept the beasts in Exeter Change, to Mr. Wood, of his fearful encounter with one of these captives.

About the year 1802 a tiger had been purchased by Mr. Alpey to send to the emperor of Germany, and placed in the Tower, there to remain for a few days, till the ship destined to convey the animal abroad was ready. The beast was confined in a large, sufficiently ventilated, wooden case, lined with iron hoops, some of which he ripped off during the first night of his confinement, and gnawed the case partly through. This being perceived, the next day the case was repaired by the addition only of a strong piece of wood nailed on the outside. 'The consequence,' says Mr. Wood, 'might well be expected. The tiger renewed his efforts, and in the course of the following night made his escape, and sprung upon a wall ten feet high, where he remained till Mason came in the morning. The fear of losing such a valuable animal induced this poor fellow, for a reward of ten guineas, to hazard his life in an attempt to secure the tiger. For this purpose he engaged a sergeant and some other persons to assist him, whom he placed in a room, the door of which opened upon the leads, from whence he could reach the animal. He then provided himself with a strong rope, one end of which he gave through the window to his companions, and with the other, having a running noose upon it, he slowly approached the tiger, and threw it over its neck. This was the critical moment: the people within were directed to pull the rope and secure the beast: unfortunately the noose slipped off, and the enraged animal immediately sprung upon the keeper, fixing his teeth into the fleshy part of his arm, and tearing his breast and hand in a dreadful manner with his claws. In this shocking situation the poor man lay under the tiger; while the sergeant cut a bullet into four parts, and, having loaded his musket, he fired through the window at the animal; who, the moment he received the shot, quitted his hold; and, after staggering for a few minutes, expired. The bullet however which destroyed the tiger had nearly been equally fatal to the man, one of the quarters having glanced against his temple, and deprived him of all sense and motion for a considerable time. Nevertheless, after keeping his bed a fortnight, he gradually recovered, and is now (1807) perfectly well, though he will carry the marks of his enemy about with him as long as he lives.' (*Zoography*, vol. i.)



Royal Tiger.

In the East the tiger is associated emblematically with power. Thus the Chinese mandarins covered their seats of justice with its skin. In pl. 17 of the atlas to Sir George Staunton's 'Embassy to China,' representing a military post, two swordsmen are habited and shielded so as to exhibit a tigerine aspect. The tiger soldiers of Hyder Ali and Tippoo Saib were among the choicest of their troops. The tiger's head, gorgeous with jewels, that formed the principal ornament of the throne of Hyder and Tippoo, and was taken by the British among the spoils of the latter at Seringapatam, is well known; as is the automatic representation, clumsy enough it must be admitted, of a royal tiger tearing to pieces a soldier in the pay of the British, and imitating the growling of the beast and the cries of the man, taken also upon the same occasion. (See the Museum at the India House.)

The term 'Tiger' is locally and erroneously applied to the Jaguar. [LEOPARDS, vol. xiii., p. 436.]

FOSSIL TIGERS, &c.

Professor Buckland notices the remains of the Tiger in the cave at Kirkdale, at Plymouth, and in the breccia of Antibes. The great fossil Tiger or Lion (*Felis spelæa*, Goldfuss), and other extinct cats, lived before man was in existence. The following fossil cats are enumerated by Von Meyer, besides the great species above-mentioned:—*Felis antiqua*, Cuv.; *F. Issiodorensis*, Croiz. and Job.; *F. brevirostris*, Croiz. and Job.; *F. Pardinensis*, Croiz. and Job.; *F. Arvernensis*, Croiz. and Job.; *F. Megantereon*, Brav.; *F. cultridens*, Brav.; *F. aphanistes*, Kaup; *F. Ogygia*, Kaup; and *F. prisca*, Kaup. [FELIDÆ, vol. x., p. 224.]

Dr. Lund, in his 'View of the Fauna of Brazil previous to the last Geological Revolution,' remarks that the Hunting Leopard (*Felis jubata*, Linn.; *Cynailurus*, Wagl.), which differs from the rest of the Cats in many essential characters, has been very properly formed into a separate genus; for its claws are not retractile, it is gregarious, and of so mild a disposition that it is frequently tamed and employed in the chace. But, he observes, as a remarkable contrast to this, that its dental system is upon a more murderous plan than that of the true *Feles*, not having the flat projection on the large tearing molar of the upper jaw, which is found in all the other predaceous genera, and the development of which is in inverse proportion to the animal's carnivorous propensities. Dr. Lund recognised this form of dentition in a small animal of the extinct Fauna of the Brazilian region, which was the scene of his valuable labours, not exceeding a domestic cat in size; and he has named it *Cynailurus minutus*. Besides this he discovered the remains of two species of the normal feline form, one as large as the long-tailed tiger-cat (*Felis macroura*, Pr Max.), the other larger than the Jaguar (*Felis Onca*, Linn.), and comparable to the Tiger and the Lion, the largest species of the Old World.

TIGER-CATS.

Under this title may be classed all those lesser striped and spotted Asiatic, African, and American Cats which do not come under the well-understood denominations of Tigers, Leopards, and Panthers.

Before we proceed to any description or illustration of this beautiful group, it will be advantageous to the student to be put in possession of M. Temminck's well-considered and digested monograph of the genus *Felis* divided into two sections according to their geographical distribution.

Section 1.

This comprises the *Felidæ* of the Old Continent and its archipelago.

Species.

1. *Felis Leo*, including the three varieties of *Barbary*, *Senegal*, and *Persia*. [LION.]

2. *Felis Tigris*, the Royal Tiger (here treated of).

3. *Felis jubata*, the Hunting Leopard. [LEOPARDS, vol. xiii., p. 433.]

4. *Felis Pardus*, the Panther. [LEOPARDS.] Of this M. Temminck gives the following character:—When adult, less than the Leopard: tail as long as the body and the head, its extremity when turned back reaching to the tip of the nose: colour of the fur deep yellowish fulvous, its internal part marked with rose-like spots of the same hue as the ground-colour of the fur; the numerous spots closely approximated; the rose-like spots from 12 to 14 lines at the utmost in diameter: caudal vertebræ 28. N.B. The number of caudal vertebræ assigned to the Leopard by M. Temminck is 22. It would appear that there is no correct figure of the true Panther.

The Black Tiger, *Felis melas*, *Rimau Kumbang* of Sir Stamford Raffles, is considered as only a dark variety of the Leopard.

Felis Uncia is considered as also to be erased from the list of species, as it is only the young of the Leopard or Panther.

6. *Felis macrocelis*, the *Rimau-Dahan*. [LEOPARDS, vol. xiii., p. 432.]

7. *Felis Serval*, comprising *F. Serval* and *F. Capensis*, Linn., the *Chat-pard* of Desmarest, and the *Caracal* of Bruce.

8. *Felis cervaria*. For the characters of this and the seven species of Lynx which follow it in M. Temminck's monograph, see LYNX, vol. xiv., p. 217.

16. *Felis Catus*. [FELIDÆ, vol. x., p. 221.]

17. *Felis maniculata*. [FELIDÆ, p. 222.]

18. *Felis minuta*, identical with the *Felis Javanensis* of Horsfield's 'Zoological Researches in Java,' and therefore not to be adopted.

Section 2.

This comprises the *Felidæ* of the New Western World.

19. *Felis concolor*, the *Puma*. [LION.]

20. *Felis Onça*, the *Jaguar*. [LEOPARDS, vol. xiii., p. 434.]

21. *Felis Jaguarondi*.

22. *Felis celidogaster*. Bought by M. Temminck at the sale of Mr. Bullock's collection, for the museum of the Netherlands.

23. *Felis rufa*, Guldenst. Bay-Cat of Pennant: with this M. Temminck describes also a specimen brought from Mexico, which may prove distinct. Bought by M. Temminck at Mr. Bullock's sale for the museum of the Netherlands.

24. *Felis pardalis*, the Ocelot.

25. *Felis macroura*.—N.B. These two last confounded together by Linnæus under the name of *F. pardalis*. The Mexican Tiger of Pennant is said to appear to be a representation of *F. macroura*.

26. *Felis mitis*, the *Chati*, F. Cuv.

27. *Felis tigrina*.

This monograph, as far as it goes, has been of great benefit; but the student should examine the menageries and museums, as well as the works of other authors, and he will find several cats noticed both before and since the publication of M. Temminck's catalogue. Among other authorities the publications of d'Azara, of Sir Stamford Raffles, of M. F. Cuvier, of M. Desmarest, of Mr. J. E. Gray, of Dr. Horsfield, and Mr. Vigors in the *Zoological Journal*, of Dr. Horsfield in the *Zoological Researches in Java*, of Prince Maximilian, of M. Lesson, of Sir William Jardine (*Naturalist's Library, Mammalia*, vol. ii., *Felinæ*), and of Mr. Darwin (*Zoology of the Beagle*), may be consulted with advantage.

Dr. Horsfield and Mr. Vigors (*Zool. Jour.*, vol. iv., p. 380) remark that they are not of M. Temminck's opinion, that the determination of species in such groups as these rests upon any examination, however acute, of preserved specimens in cabinets, or in any research, however extensive, into the stores of furriers. Such examination, they think, leads to conjecture; probable and plausible conjecture, it may be true, but still conjecture, and not facts. They add that we are in this way as likely to fall into the error of confounding true species as into that of creating nominal ones, and they express their opinion that the truth can be satisfactorily attained only by diligent researches in the native country of these animals, or by accurate observations on their changes and differences as to sex, age, and season, when in a living state and in confinement.

M. Temminck, in his *Tableau Méthodique* (1827), states that then there were known *thirty* distinct species of cats and seven or eight other doubtful indications.

ASIATIC TIGER-CATS.

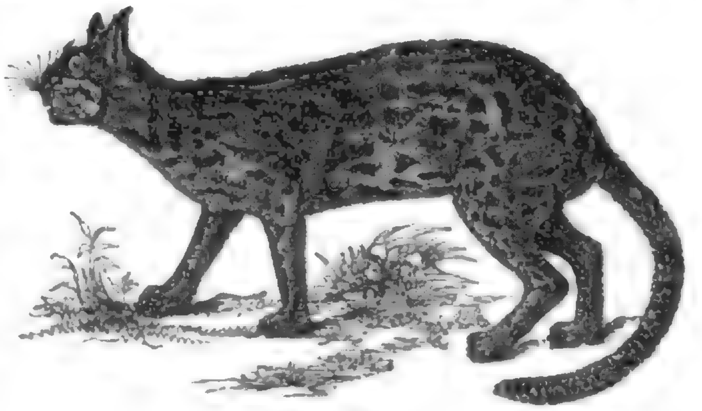
Example, *Felis Nepalensis*, Horsf. and Vig.

Description.—Size of *Felis Javanensis*, Horsf., but its habit more slender, the tail and neck proportionally elongate. Ground-colour grey, with a very slight admixture of tawny; bands and spots of the head, back, neck, throat, abdomen, and thighs, deep black; superior longitudinal bands resembling those of *F. Javanensis*. Ground-colour of throat and abdomen nearly white; the lower flanks marked with a faint tawny longitudinal streak. Cheeks streaked with two parallel longitudinal lines, at the termination of which follows a transverse lunar mark which passes with a bold curve to the angle of the mouth, near which a very narrow band crosses the throat. Sides of the neck appearing marked with two broad waving bands, at the termination of which stands an oblong regularly transverse band. Neck underneath nearly immaculate. Shoulder and flanks exhibiting irregular, diversified marks, the anterior oblong, the posterior angular, of a mixed tawny and black, and, individually, above or posteriorly with a broad dash of saturated black: they are scattered over the sides without any regular longitudinal disposition; but they have generally an oblique direction. Abdomen marked throughout with uniform oval spots; anterior thighs within exhibiting one, the posterior thighs two broad black bands. Rump and thighs marked externally with roundish or oblong spots. Tail above, to within about an inch of the tip, with uniform roundish spots, arranged posteriorly in regular transverse bands. Head above and ears agreeing generally with those of *F. Javanensis*. Length from extremity of nose to root of tail, 1 foot 10½ inches. Length of tail 10½ inches. (Vig. and Horsf.)

Dr. Horsfield and Mr. Vigors observe that the distinguishing characters of this species are, its comparatively lengthened habit; the slenderness and proportional length of the tail; the disposition of the marks on the flanks, and the character of these marks as far as regards their diversified form; and the saturated black patch with which they are individually marked at their upper or posterior edge.

'In the *Bengal Cat*,' say those zoologists, 'these marks have a different disposition; they are oblong, and arranged on the flanks in regular succession longitudinally. The materials contained in the museum at the India House have enabled us to make this statement, which is founded on the examination of a specimen brought by General Hardwicke, and on a careful drawing prepared under the eyes of Dr. Hamilton. We have thus two distinct species of small *cats* from India, and the elucidation of this point is of some importance, as it appears, from the following remark in M. Temminck's monographs, "*l'existence de cette espèce dans l'Inde n'est pas constatée*," that he entertained some doubts on the existence of the *Bengal Cat*. It is not our intention, at present, to give a comparative analysis of all the species which resemble our animal. The discrimination of many species of *Felis* is at all times a difficult subject; and on many of them naturalists still disagree. Our immediate object is to indicate a new form of *Felis*, from the upper provinces of India, differing essentially from that which is found in the plains of Bengal; and so direct the attention of naturalists in that country to a more careful investigation of the various Oriental species of this interesting genus.'

The same authors state that the specimen in the collection of the Zoological Society of London was presented by Captain Farrer, of the East India Company's service. It came immediately from Calcutta, where it was said to have been sent from Nepâl. It lived some time in the Society's gardens, but was extremely wild and savage. It generally remained in a sitting posture, like that of the common *Domestic Cat*, and never paced its den in the manner of most other animals of the group. (*Zool. Journ.*, vol. iv.)



Felis Nepalensis.

AFRICAN TIGER-CATS.

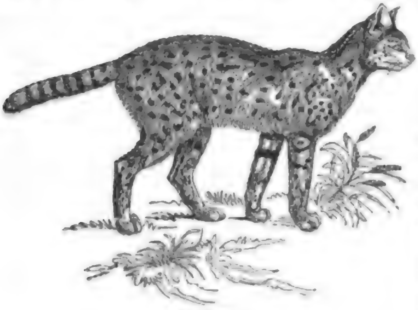
Example, *Felis Serval*, the Serval.

Description.—Upper parts clear yellowish, with black spots; lower parts white, with black spots also, but they are less numerous. Upon the head and neck the markings are most conspicuous, and form symmetrical lines on each side directed towards the shoulders. On the other parts of the body they are placed irregularly. On the back they are lengthened, and show a disposition to form four rows; on the body and thighs they are larger and round, and they are smaller but equally round on the extremities. Upon the face and muzzle they are minute.

Back of the ears black at the base, succeeded by a transverse white bar; tips of the ground-colour of the body. On the inside of the fore limbs two conspicuous black transverse bars; the hind limbs with similar markings, but less defined; last joints of the limbs of a paler tint than the rest of the body, the spots on them round and very small. Tail with eight black rings, tip of the same colour. Length, exclusive of tail, 1 foot 11¼ inches; tail 9 inches. Height when standing erect, about 12 inches at the shoulder, and 15 inches at the hind quarters. (F. Cuv.)

The animal from which the above description was taken was a very young male. Its temper was mild and gentle, and its disposition sportive. It played like a domestic cat, or rather kitten, chasing its tail, and amusing itself with anything that it could roll with its paw.

Locality.—The Serval is a native of southern Africa. There are generally some living specimens in our menageries. It has been exhibited in that of the Zoological Society of London, and may be seen there now (1842).



The Serval.

American Tiger-Cats.

But it is in America that the tiger-cats are most numerous and beautiful, and there their manners have been best noticed by competent observers: we select three examples of the varieties of form and colouring exhibited by this group in that quarter of the globe.

Felis pardalis, Linn. The Ocelot. This, the most beautiful perhaps of all the *tiger-cats*, almost defies description. Mr. E. Bennett has however given a very faithful account from two living specimens, one existing when he wrote in the Tower of London, and the other in the garden of the Zoological Society in the Regent's Park.

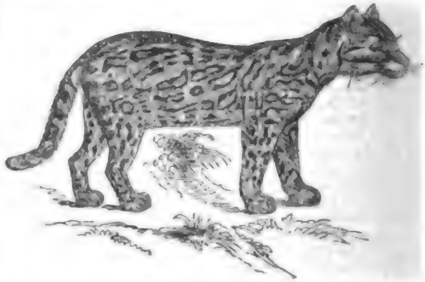
Description.—Body when full grown nearly three feet in length; tail rather more than one; medium height about 18 inches. Ground-colour of fur, grey, mingled with a slight tinge of fawn, elegantly marked with numerous longitudinal bands, the dorsal one continuous and entirely black, the lateral (six or seven on each side) consisting for the most part of a series of elongated spots with black margins, sometimes completely distinct, sometimes running together. The centre of each spot of a deeper fawn than the ground-colour external to them; this deeper tinge is also conspicuous on the head and neck, and on the outside of the limbs, all of which parts are irregularly marked with full black lines and spots of various sizes. From the top of the head, between the ears, there pass backwards, towards the shoulders, two, or more frequently four, uninterrupted diverging bands, which are full black anteriorly, but generally bifurcate posteriorly, and enclose a narrow fawn-coloured space with a black margin; between these there is a single longitudinal, somewhat interrupted, narrow black line, occupying the centre of the neck above. Ears short and rounded, externally margined with black, surrounding a large central whitish spot. Under parts of the body whitish, spotted with black, and the tail, which is of the same ground-colour with the body, also covered with black spots. (Bennett, *Tower Menagerie.*)

Mr. Bennett remarks that he has, in the above description, stated the length of the tail at more than a foot; and that in all the known ocelots, as well as in all the species (of which there are several) that approach it in form and colouring, the proportionate length of the tail is at least equal to that which he has given as its average measurement. The tail however of the Tower specimen did not exceed six or seven inches; its extremity was overgrown with hair, and there was no cicatrix. Still its equality throughout and its abrupt stumpiness induced the belief that this abbreviation was purely accidental; and he felt by no means inclined to regard that specimen as a new species, to be distinguished by the excessive shortness of that appendage, by the unusually pale colour of its markings, and by some slight peculiarity in the mode of their arrangement, which, he observes, varies in every individual that he had seen.

Locality.—Mexico, Paraguay, and probably Peru.

Habits, &c.—The ocelot remains in the deep forests during the day, sallying forth at night in quest of small quadrupeds and birds, the latter of which it successfully chases in the trees, for it is a very expert climber. If it be, as is generally supposed, the *Tlacoozelotl*, *Tlalocelotl*, *Catus Pardus Mexicanus* of Hernandez, it is said to stretch itself out as if dead on the limb of some tree when it spies monkeys in the neighbourhood. They, urged by curiosity, proceed to examine the supposed defunct, and fall victims to their curiosity.

The Ocelot has been so completely tamed as to be left at liberty, and it is said to be capable of strong attachment to its master. Mr. Bennett states that the specimen in the Tower, a male, was perfectly good-tempered, exceedingly fond of play, and had much of the character and manners of the domestic cat. Its food consisted principally of rabbits and birds; the latter it plucked with great dexterity, and always commenced its meal with the head, of which it seemed particularly fond; but it did not eat with the ravenous avidity which characterizes nearly all the animals of this tribe.

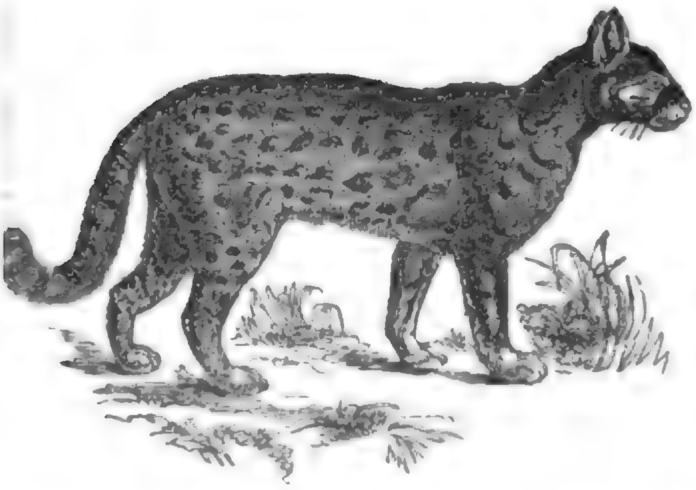


The Ocelot.

Felis mitis, F. Cuv.; The Chati. *Chibiguazu* of *D'Azara? Felis Chibiguazu*, Desm.

Description.—About a third larger than the domestic cat: length, exclusive of tail, rather more than two feet: tail eleven inches, height to middle of back, about one foot two inches. Ground-colour of fur on the upper parts, pale yellowish: on the lower, pure white: at the roots, dull grey, and very thick and close. Body covered with irregular dark patches; those upon the back entirely black and disposed longitudinally in four rows; those upon the sides surrounded with black, with the centres of a clear fawn, arranged in nearly five rows. Spots upon the lower part of the body, where the ground-colour of the fur is white, full, and arranged in two lines composed of six or seven patches on each side. Limbs covered with nearly round spots of smaller dimensions: on the fore-legs, near the body, two transverse bands. On the throat a sort of half collar, and on the under-jaw two crescent-shaped spots. Behind each eye two bands about two inches long, terminating opposite the ear. Forehead bordered by two lines, between which are numerous spots, and, at their origin, a blackish mark from which the whiskers spring. Outside of the ear, black, with a white spot upon the small lobe. Base of the tail spotted with small blotches, which towards the end run into half-rings, which are broadest on the upper surface. Pupil round. (F. Cuv.)

This animal (a female) was extremely gentle; and if those with whom it was familiar passed its cage or did not approach it, it would express its discontent by a short cry. It manifested great delight when it was caressed. It lived



Felis mitis.

the Paris menagerie, and was procured from a dealer in rest. *Locality.*—South America.

Desmarest and others identify this animal with the Chiiguazu of D'Azara. Temminck, who received a skin om Rio de Janeiro, considers it distinct.

D'Azara's description comes very near to that above iven as far as colouring is concerned; but he gives the verage length as three feet six inches; the individual hich he described, the largest male he had seen, was four eet all but an inch in length; tail thirteen inches; height t shoulders one foot and a half, and behind one foot seven nches and a half. It was so fat that immediately after eath it weighed five-and-thirty pounds; the females, he ays, are rather less.

The same acute observer, speaking of his *Chibiguazu*, emarks that some of the Guaranese call the domestic at *Chibi*, and others *Mbracayá*. In the same manner, he ays, some give the wild animal of which he is treating he name of *Chibi-guazu*, and others that of *Mbaracayá-uazu;* both appellations signifying *Great Cat.* Many paniards, he adds, call it *Onza* (Ounce).

He states that the species is so common, that his friend oseda captured eighteen individuals in two years, within wo leagues of his *pueblo;* but he adds that, notwithtanding this abundance, few are acquainted with it, the untsman and dogs never falling in with it, and being nable to penetrate to its haunts: he very much doubts hether any quadruped hides itself more effectually. He escribes it as remaining by day in the most impenetrable laces, and as coming forth after dusk, especially on dark tormy nights, when the chibiguazus daringly enter the orrals and court-yards, though no instance is known of heir detection by the dogs. When the moon shines they bstain from visiting inhabited spots, and never are trapped: o lie in wait for them with a gun is hopeless, so sharp a ook-out do they keep. They carry off domestic fowls rom trees which they climb, sometimes six in one night, nd often leave several dead. Men and dogs are avoided y them with extreme caution, and each pair is supposed o live in a separate district, for a male and female, and no ore, are always caught in the same place. Noseda formed trap of strong stakes, with three divisions: in the middle ivision he placed a white fowl, so that it might not only e heard but seen at a distance: the other divisions were so framed as to shut by the falling of the planks as soon as the chibiguazus entered. This trap was set in the places to which they resorted for prey, and those caught were turned into a great den in Noseda's court-yard. Some of these got away, and were taken again two or three times in the same trap; they were recognised by ear-marks and other proofs: D'Azara infers from this that the idea of danger was obliterated from their recollection by their desire to possess the fowl. He remarked that all which were kept in the den deposited their excrements in their drinking-place, and when he substituted a narrow-necked jug to prevent this, they mounted to its edge for that purpose, and never missed the vessel or its immediate neighbourhood. Nearly the whole day was spent by them rolled up in a ball, and, when a chibiguazu wished to stretch himself, he first licked the one at his side. When straw was put into their den, or so that they could reach it by thrusting their paws through the bars, it was always found that on the day following they had placed it in a heap, after having divided it into bits some quarter of an inch long, and on this they reposed. The small sticks and twigs with which the inside of their den was furnished were broken and torn to pieces in like manner. Twilight and night were passed in pacing to and fro close to the sides of their den; and if crossed or interrupted by another, they fuffed and gesticulated like an angry cat, but without using their paws. They never quarrelled, unless they were very much irritated, and then they struck at each other with their fore-paws. They devoured five pounds of flesh per day when first caught, but afterwards three sufficed. A portion was prepared for each of the twelve or fourteen individuals confined, and they took it with their paws according to the length of time they had been there, without any interference on the part of the others. If however the animal whose turn it was did not take his portion, or disregarded it, another immediately snatched at it without any defence on the part of the right owner except by sneezing, and sometimes by blows with its fore-paws. A walk was made for them, enclosed by a sort of hurdle, so that rats, fowls, ducks, or young dogs could be introduced into it: upon opening the cage it was observed that usually one only went out for each victim, and almost always according to the order of their confinement. Cats and dogs they seized with their mouth by the nape of the neck, overlaid them, and then kept them so that they could not stir, till they were dead. Cats' flesh appeared to produce the mange, fretting the chibiguazus, making them mew like cats, and at last destroying them. Snakes, vipers, and toads were also eaten by them, but this diet occasioned violent and continual vomiting; they wasted to skeletons, and died in a few days. If the dog introduced equalled them in size, they touched him not, for it appears that they do not assist each other. If a chibiguazu cannot master any prey alone, he leaves it. Birds were caught by the head and neck, and thoroughly stripped of their feathers before they were eaten. No unnecessary cruelty was manifested. Noseda observed that one did not kill a fowl put into his den till the third day. D'Azara and his friend frequently closed the doors of the yard, and opened the den that the chibiguazus might leave it: those most lately caught went first; and sometimes the old ones would not go out even when their den was entered that it might be swept. They were left at liberty for several hours, during which they examined every crevice, and then lay down to sleep. When boys persecuted them with sticks, they retreated to their den without turning on their persecutors, even when severely beaten. A male on one occasion becoming very lazy, on entering his den he was abused and bitten by his female, as if to punish him. Some individuals were incarcerated for more than a year without exhibiting any sign of love. In the night their eyes shone like those of a domestic cat, and they resembled that animal in their form and habits, in lying down, licking and cleaning themselves, washing their faces with their paws, fuffing, sneezing,—in fact in every way. D'Azara concludes by stating that his friend caught a young one, and it became so thoroughly tame that it slept in the skirts of his clerical gown, and went about loose. He affirmed that no animal could be more tractable: but it devoured the poultry of his neighbours, and they killed it.

Felis Pajeros.—The Pampas Cat, Pajero, or Jungle-Cat.

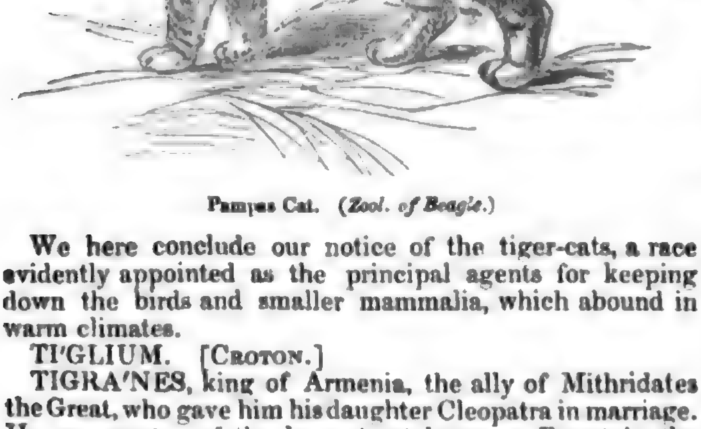
Description.—Fur of great length: longer hairs of the back upwards of 3 inches, and those of the hinder part of the back from $4\frac{1}{4}$ to $4\frac{3}{4}$ inches in length. General colour pale yellow-grey. Numerous irregular yellow or sometimes brown stripes running obliquely from the back along the sides of the body. On each side of the face two stripes of yellowish or cinnamon commencing near the eye, and extending backwards and downwards over the cheeks, on the hinder part of which they join, and form a single line, which encircles the lower part of the throat. Tip of the muzzle and chin white; a spot in front of the eye, and a line beneath the eye, of the same colour; belly, inner side and hinder part of fore-legs, white also. An irregular black line running across the lower part of the chest, and extending over the base of the fore-legs externally: above this line two other transverse dark markings more or less defined on the chest. On the fore-legs three broad black bands, two of which encircle the leg: on the posterior legs about five black bands externally, and some irregular dark spots internally. Feet yellowish, and under side of tarsus of a slightly deeper hue. On the belly numerous large irregular black spots. Ears moderate, with long white hairs internally; externally of the same colour as the head, except at the apex, where the hairs are black, and form a slight tuft. Tail short, somewhat bushy, and devoid of dark rings or spots—the hairs are in fact coloured as those on the back. On the upper part of the body each hair brown at the base, then yellow, and at the apex black. On the hinder part of the back the hairs almost black at the base, and, on the sides of the body, each hair grey at the base; there is then a considerable space of yellowish-white colour: towards the apex they are white, and at the apex black. The greater number of the hairs of the moustaches white. Length from nose to root of tail, 26 inches; of tail (fur included), 11 inches. Height of body at shoulders, 13 inches. Size about equal to that of the common wild-cat of Europe; but the Pampas cat is stouter, its head smaller, and its tail shorter. (Waterhouse.)

Mr. Waterhouse (*Zoology of the Beagle*) observes that the markings of this animal vary slightly in intensity: those on the body, he remarks, are generally indistinct; but the black rings on the legs are always very conspicuous.

Locality.—D'Azara says that he knows not, nor has he heard, that this species exists in Paraguay, although it formerly may have been seen there; but as the country became tolerably well peopled, and there were fewer plains, the inhabitants probably extirpated it. He caught four in the Pampas of Buenos Ayres, between 35° and 36° S. lat., and three others on the river Negro. He says they are found on both sides of the La Plata.

Darwin (*loc. cit.*) gives as its habitat Santa Cruz, Patagonia (April), and Bahia Blanca (August). He states that it is common over the whole of the great plains which compose the eastern side of the southern part of America; and he says he has reason to believe, from the accounts he received, that it is found near the Strait of Magellan, which would give it a range of nearly 1400 miles in a north and south direction, D'Azara having stated that it extends northward as far as 30° S. lat. One of Mr. Darwin's specimens was obtained in 50° S. lat., at Santa Cruz.

Habits, Food, &c.—D'Azara says that the natives call this animal *gato pajero*, because it lives on the plains, concealing itself in jungles, without entering into the woods and thickets. *Apereas*, or guinea-pigs, according to him, form its principal food. Mr. Darwin states that it takes its name from 'paja,' the Spanish word for straw, from its habit of frequenting reeds. The specimen taken by him at Santa Cruz was met with in a valley where thickets were growing. When disturbed it did not run away, but drew itself up and hissed.

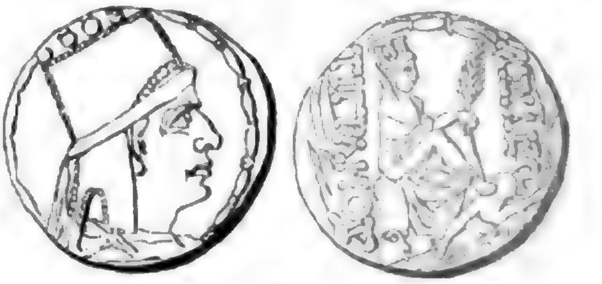


Pampas Cat. (*Zool. of Beagle.*)

We here conclude our notice of the tiger-cats, a race evidently appointed as the principal agents for keeping down the birds and smaller mammalia, which abound in warm climates.

TI'GLIUM. [Croton.]

TIGRA'NES, king of Armenia, the ally of Mithridates the Great, who gave him his daughter Cleopatra in marriage. He was master of the large tract between Egypt in the south-west and the Caspian Sea in the north-east, which was bounded by Assyria and Media on the east, and by the kingdoms of Pontus and of Cappadocia on the west and north-west. The earlier history of Tigranes is little known; Strabo (p. 532, Cas.) and Justin (xxviii. 3) state that he was sent in his youth as a hostage to the king of the Parthians, who afterwards restored him to liberty. He conquered Gordyene and Mesopotamia, and the Syrians chose him for their king in B.C. 84, or, according to Appian (*De Reb. Syr.*, 70), in B.C. 80. Before B.C. 74 he concluded an alliance with Mithridates, who was then about to begin his third war with the Romans. The conditions of this alliance were, that Mithridates should be master of the countries which they hoped to conquer, and that Tigranes should have the inhabitants and all the moveable property that he could carry off. Plutarch states (*Lucullus*, p. 509, Xyland.) that the army of Tigranes was composed of 260,000 men,—20,000 archers, 55,000 horse, 150,000 foot, and 35,000 pioneers and train,—and that Arabs and warlike Albani from the Caucasus abounded in the Armenian camp. The campaign was opened in B.C. 74. Cappadocia and Bithynia were conquered, and Mithridates laid siege to Cyzicus in Bithynia, but Lucullus came to relieve it, and after various reverses Mithridates was compelled to fly to Tigranes (69). The conduct of the Armenian king had been insincere during these events, and, the Romans being now victorious, he not only refused to receive his father-in-law, but set a prize of a hundred talents on his head, on the pretext that the king had persuaded his son, who was likewise called Tigranes, to rebel against his father and to join the Romans. Mithridates nevertheless succeeded in pacifying his son-in-law, and they joined their armies to meet Lucullus, who had crossed the Euphrates and the Tigris, and had laid siege to Tigranocerta, the new capital of the Armenian kingdom. [Tigranocerta.] A battle ensued near this town, in which Tigranes was completely defeated (6th October, 69), and his capital fell into the hands of the Romans. Tigranes and Mithridates having entered into negotiations with Phraates III., king of the Parthians, for the purpose of drawing him into their alliance, Lucullus, who had now carried his conquest in Armenia as far as Artaxata on the upper part of the Araxes, marched to Mesopotamia to attack the Parthians. But a mutiny of his soldiers compelled him to retreat to Cappadocia, where they dispersed, as it seems, by the instigation of Pompey, who aimed at the supreme command in the war (67). The Romans lost Cappadocia, and Tigranes carried off a great number of the inhabitants of this province, as well as of Cilicia and Galatia. Pompey entered Asia Minor in B.C. 66, and in the same year he defeated Mithridates in a great battle on the Euphrates. Mithridates, having experienced the faithless character of his son-in-law, fled to Phanagoria in the island of Taman, while Tigranes humiliated himself before the Romans, then encamped in the neighbourhood of Artaxata. He went to the tent of Pompey, and, kneeling before his victorious enemy, took off his royal diadem, which Pompey however would not accept. The policy of the Romans required an independent kingdom between their dominions and the dangerous power of the Parthians. Tigranes therefore was reinstated in Armenia, except the districts of Gordyene and that of Sophene, or the westernmost part of Armenia Magna, which he was obliged to cede to his rebellious son Tigranes, then an ally of the Romans. Besides these districts, he ceded to the Romans his kingdom of Syria, including Phœnicia and all his conquests in Cilicia, Galatia, and Cappadocia; he paid six thousand talents, and he gave half a mina to each Roman soldier, ten minæ to each centurion, and sixty minæ, or one talent, to each tribune. (Plutarch, *Lucullus*, p. 637, Xyland.; comp. Appian, *De Bello Mithrid.*, c. 104.) It seems that after this humiliation Tigranes led an obscure and tranquil life, for his name disappears from history, and the year of his



Coin of Tigranes.

British Museum. Actual size. Silver. Weight, 245½ grains.

death is unknown. His successor was Artavasdes. [Mithridates; Pompeius; Lucullus.]

(Valerius Maximus, v. 1, 9; Velleius Paterculus, ii. 33, 1, and c. 37; Cicero, *Pro Lege Manilia;* Woltersdorf, *Commentatio Vitam Mithridatis M. per annos digestam sistens*, Goettingae, 1812.)

TIGRA'NES, prince of Armenia and lord of Sophene, was the son of Tigranes, king of Armenia. During the last war between the Romans and Mithridates aided by his ally king Tigranes, prince Tigranes forsook his father and went over to the Romans. When his father humiliated himself before Pompey, he sat by the side of the Roman general, but he did not rise before his father, nor did he show him the slightest degree of filial respect. Having been created lord of Sophene and Gordyene, he refused to surrender the treasures of Sophene to Pompey, who suspected him of being in secret communication with Phraates, the king of the Parthians, whose daughter he had married. Tigranes also became suspected of having formed a plan for seizing or putting to death his father, and accordingly he was arrested by order of Pompey, who sent him to Rome. He figured in the triumph of Pompey.

Appian (*De Bello Mithrid.*, c. 105 and 117) states that Tigranes was afterwards put to death in his prison. [Tigranes.]

TIGRANO'CERTA (*Τιγρανόκερτα*), for some time the capital of Armenia, was built by king Tigranes after he had extended his dominion over Mesopotamia, Syria, and Phœnicia. Artaxata, the old capital on the Araxes, being situated in the north and the neighbourhood of the Caucasian nations, then the allies of Armenia, Tigranes seems to have thought it convenient to have his capital near those countries, which often required his presence on account of their possession being still insecure. This danger arose principally from the neighbourhood of the Romans, who, from the time when Attalus left them his kingdom of Pergamus by testament (B.C. 133), formed designs on all Asia Minor, and at the time of the foundation of Tigranocerta (between 84 and 74 B.C., but nearer to 84) were at war with Mithridates, the neighbour and ally of Tigranes. Tigranocerta was situated a short distance from the Upper Tigris, on the Nicephorius, a river of considerable breadth, as Tacitus states. Seert or Sered, a small town, surrounded by antient ruins, is generally supposed to be on the site of Tigranocerta. Sered is situated on the banks of a small river, the modern name of which is unknown, and which flows into another river of considerable length, the Bedlis of Hájí Khalfah, which has its sources south-east of lake Van, and flows into the Tigris. This latter river is called Khabur by D'Anville, but this is a mistake, the Khabur, according to Hájí Khalfah, cited by Rennell, being another tributary river of the Tigris nearer its middle course. It has been supposed that the river Centrites was also called Nicephorius, and this opinion is principally founded on the circumstance of the river which passes Sered being a very small stream, while the Nicephorius at Tigranocerta was of a considerable breadth. This opinion however is rejected by Rennell, and indeed no ruins have been found on the banks of the Centrites, though it has not yet been shown that there are none. We are likewise ignorant as to the changes which may have taken place in the direction of the Centrites, which, after having left the mountains at the village of Kala Zerke, flows through an open and level country at some leagues distance east from Sered. According to Tacitus, Plutarch, and Appian, Tigranocerta had very strong fortifications; its suburbs contained gardens and fish-ponds. The town was inhabited partly by barbarians, and partly by Greeks, the inhabitants of twelve Greek towns who were transplanted thither by Tigranes after he had ravaged Cappadocia. The military position of Tigranocerta was admirably chosen. By its situation opposite the passage formed by the narrow valley of the Centrites in the Carduchian Mountains, it commanded one of the principal roads which led and still leads from the valley of the Tigris into Armenia across the mountains. It was also opposite the gorge in the Carduchian Mountains, which, a short distance south of the junction of the Centrites with the Tigris, came so close to the Tigris as to render it impossible for an army to move along the left bank of the river. Xenophon, in conducting the retreat of the ten thousand, apparently intended to enter Armenia by the valley of the Centrites, but he found this passage between the Tigris and the Carduchian Mountains impracticable; and taking suddenly a north-east direction, he ascended the steep Carduchian Mountains, and crossed the Centrites in its upper part.

Master of Tigranocerta, the king of Armenia could suddenly invade Cappadocia, Mesopotamia, and Syria; and in case of defeat he could retreat under the walls of Tigranocerta and defend the defiles in the mountains against a superior army. Lucullus, in his campaign against Mithridates and Tigranes, laid siege to this key of Armenia before he ventured to enter the defiles. The united kings hastened to relieve the town, but they were beaten, and Tigranocerta with immense treasures fell into the hands of the victor (6th October, 69 B.C.), who sent the greater part of the Greek inhabitants back to their homes in Cappadocia. After the fall of Tigranocerta, all Armenia was open to the Romans, who overran the country as far as Artaxata. But no sooner was Lucullus informed that Phraates, the king of the Parthians, was about to attack him, than, instead of descending the Araxes and making an attack on the northern part of Media, he hastened back to Tigranocerta. If he had remained a little longer on the Araxes, the Parthians would have forced the position of Tigranocerta, and the Roman army would have been shut up within Armenia. Strabo (p. 532, Cas.) says that, when Lucullus took Tigranocerta, it was only half finished, and that after its destruction there was nothing but a little village on the spot. However it soon became again a town, and in the wars of Corbulo, 63 A.D., it was a considerable and well-fortified place. (Tacitus, *Annal.*, xv. 4.) Hesychius, *s. v. Κίρτα*, says that *κίρτα* signifies a town, in Armenian, and this opinion is corroborated by Stephanus Byzantinus *s. v. Τιγρανόκερτα*, who says that, in the language of the Parthians, *Τιγρανόκερτα* is the same as *Τιγρανούπολις* in Greek. The word 'certa' also occurs in Carcathiocerta, a town which is also called Amida, and is now known by the name of Kárá-Amid and Diyárbekir. Soping, in his notes to Hesychius, says that *κίρτα* or *κάρτα* is the root of Carthago. [Tigranes; Lucullus; Pompey.]

(Strabo, p. 532, 539, 747, Cas.; Appian, *De Bello Mithrid.;* Plutarch, *Lucullus; Pompeius;* Tacitus, *Annal.*, xii. 50; xiv. 24; xv. 4, &c.; Rennell, *Illustrations of the History of the Expedition of Cyrus, and the Retreat of the Ten Thousand Greeks;* Rennell, *Geography of Asia Minor.*)

TIGRIS, River. [See End of Letter T.]

TIGRISO'MA, Mr. Swainson's name for the *Tiger-Bitterns.*

Subgeneric Character.—Bill as in *Ardea*. Face, and sometimes the chin, naked. Legs almost feathered to the knees. Inner toe rather shorter than the outer. Claws short, stout, regularly curved. Anterior scales reticulate or hexagonal. Mr. Swainson considers this to be the rasorial type, and he arranges it as a subgenus of the family *Ardeadæ* [Herons], between *Butor*, Antiq., and *Nyctiardea*. Example *Tigrisoma lineatum*, 'Pl. Col.' 860.

(N.B. According to the principle generally received among zoologists, neither *Butor* nor *Nyctiardea* can be retained as generic names. The first is identical with the *Botaurus* of Brisson and Stephens: for the reasons against admitting the second, see Nycticorax.)

TIJU'CA, M. Lesson's name for a genus of birds (*Chrysopteryx*, Sw.; *Attila*, Less.; *Ampelis*, Nordm). Mr. G. R. Gray arranges it between *Calyptomena*, Raffl., and *Procnias*, Hoffm., under the *Ampelinæ*, Mr. Gray's third subfamily of the *Ampelidæ*.

TILBURG is an inland town in the kingdom of the Netherlands, in the province of North Brabant and district of Bois-le-Duc: it is situated in a heath on the banks of the river Ley, 13 miles east of Breda, 14 south-west of Bois-le-Duc, and 38 north-east of Antwerp. It has three churches, a large castle, and 12,000 inhabitants, of whom between 5000 and 6000 are employed in the manufacture of fine woollen cloth and kerseymeres. They likewise manufacture calmucs, beaver coating, baize, and cloth for the army. Extensive barracks have been built by the present king of Holland. Lying out of the great road from Flanders to Holland, it is little visited by travellers.

TILBURY FORT, a fortification erected on the north bank of the river Thames, opposite to Gravesend, for the purpose of commanding the navigation of the river. It was originally formed as a mere block-house in the time of Henry VIII.; but after the Dutch fleet, under De Ruyter, had advanced into the Thames and Medway in 1667, Charles II. converted it into a regular fortification, to which considerable additions have since been made. The fort stands principally in the parish of West Tilbury, but partially in the adjoining parish of Chadwell. It is surrounded by a deep and wide fosse, which may be filled with water when necessary; and its ramparts present formidable batteries of heavy cannon toward the river. The fort is chiefly of brick; but it has a massive stone portal, the elevation of which renders it a prominent object from the opposite side of the river, which is here about a mile wide. Within the fort are commodious barracks and other accommodations for the garrison, which ordinarily consists of a fort-major and a detachment of invalids; and piers toward the river afford facilities for the landing of troops, stores, &c. Owing to the flatness of the shore, the fort is liable to overflowing during floods and spring-tides, and its situation is by no means salubrious. A view of Tilbury Fort, from the river, is given in No. 120 of the 'Penny Magazine.'

TILE, a kind of thin brick, or plate of baked clay, used chiefly for covering roofs, but occasionally for paving floors, constructing drains, &c. The English name, and those by which tiles are known in other European languages, are derived from the Latin *tegula*, which contains the same element as *tego*, to cover. This becomes, in Saxon, *tigle* or *tigel*; in Dutch, *tegel*, *teghel*, *tichel*, or *tichgel;* in German, *ziegel* or *dachziegel;* in Italian, *tegola;* in Spanish, *teja*, *tega*, or *tegilla;* and in French, *tuile.*

An account of the use of tiles among the antients, illustrated by engravings of roofing-tiles found at Pompeii, is given in the 'Dictionary of Greek and Roman Antiquities,' art. 'Tegula,' in which it is stated that roofing-tiles were originally made, like bricks, of baked clay (γῆς ὀπτῆς), and that Byzes of Naxos introduced tiles of marble about the year 620 B.C. In addition to the superior beauty and durability of such tiles, they were made of much larger dimensions than was practicable in clay, and consequently the effect produced by their parallel joints might be brought into harmony with the rest of the building. A still more expensive and magnificent method of roofing occasionally adopted consisted in the use of tiles made of bronze and gilt. Tiles were originally made perfectly flat, or with nothing more than the hook or nozle underneath the upper border, which fulfilled the purpose of fixing them upon the rafters. They were subsequently formed with a raised border along each side, on the upper surface, and the sides of the tile were made to converge towards the lower end, in order that the raised sides or ledges might not prevent the successive rows of tiles from overlapping each other neatly. The lines of junction between the flat tiles were covered by small semi-cylindrical tiles, called *imbrices*, the rows of which, extending from the ridge to the gutter, divided the surface of the roof into a series of channels, along which water descended to the gutter. Both the *tegulae* and the *imbrices* terminated at the edge of the roof in ornamental pieces; and the whole appearance of the roof was handsome. Another kind of antient tiling, mentioned by Pliny under the name of *pavonaceum*, consisted of tiles of a semicircular form at their lower edges, which, when laid in overlapping rows, somewhat resembled the feathers in the train of a peacock.

The process of making tiles is so similar to that of brick-making [BRICK, vol. v., p. 407], that it will be sufficient to observe that only the best qualities of brick-earth are fit for the purpose. Since the year 1833 no excise-duty has been levied upon the manufacture of tiles, the duty having been found very prejudicial, especially after the repeal of the duty on slates, although it produced a very trifling revenue. The roofing-tiles used in this country are chiefly of two sorts, *plane-tiles*, which are flat, of a rectangular form, and usually about ten inches and a half long, six inches wide, and five-eighths of an inch thick; and *pan-tiles*, which also have a rectangular outline, but are bent in such a manner that, when laid on the roof, the greater part of their surface forms a concave channel for the descent of water, while one side forms a narrow convex ridge, which overlaps the edge of the adjoining tile. These are usually thirteen and a half or fourteen and a half inches long, and about nine inches wide, measured in a straight line from side to side. Plane-tiles are made with a hole near their upper extremity to receive a wooden peg, by which they are hung upon the laths of the roof, and they are laid either with or without mortar in such a manner that the successive rows overlap each other about six inches. Pan-tiles have no holes, but are hung upon the laths by ledges formed at their upper edges; they do not require so great an overlap as plane-tiles, and consequently form a lighter covering. The comparative weight of the two kinds of tiling, and of other kinds of roofing, and the suitable angles of inclination for each, are given under ROOF, vol. xx., p. 143. Tiles of a semi-cylindrical form, laid in mortar with their convex or concave sides uppermost, respectively, are used for covering ridges and gutters.

Drain-tiles are most commonly made in the form of an arch, and laid or bedded upon flat tiles called *soles*. Some useful information will be found in a paper 'On the Economical Manufacture of Draining-Tiles and Soles,' by Mr. Robert Beart, in the second volume of the 'Journal of the Royal Agricultural Society;' and in the same volume is a notice of the admirable tile-making machinery invented by the marquis of Tweeddale, which has been recently brought into extensive operation. Paving-tiles are usually square, and of greater thickness than those used for roofing. In antient as well as in more recent times paving-tiles were frequently decorated with ornamental devices in various colours, so as to produce an effect resembling that of mosaic pavement.

TILE'SIA, a genus of Polypiaria mentioned by Lamouroux.

TILGATE BEDS. A portion of the great series of strata in the Weald of Kent and Sussex, interposed between the green-sands and the Portland oolite, is thus named by Dr. Mantell, who has described the numerous and interesting organic remains which it contains. The reptilian species are described in Professor Owen's 'Report to the British Association,' 1841.

TI'LIA, the name of a genus of plants belonging to the natural order Tiliaceæ. The trees in England are called *Lime-trees*, in Swedish *Linn*, and in German and Dutch *Linden*. They are characterised by possessing a 5-parted deciduous calyx; 5 petals; numerous free or somewhat polyadelphous stamens; a globose, villous, 1-styled, 5-celled ovary. All the species are handsome trees, with alternate, heart-shaped, acute, serrated, deciduous leaves, and fragrant yellowish panicled flowers. The wood is light, smooth, and white, and their sap possesses a considerable quantity of sugar. They are principally natives of Europe and America.

T. Europæa, the European or Common Lime-tree, has petals without scales, and cordate, acuminate, serrated leaves, which are smooth, with the exception of a tuft of hair at the origin of the veins beneath, and are twice the length of the petioles; the cymes are many-flowered, and the fruit is coriaceous and downy. This tree is abundant in the middle and north of Europe. It is very common in Great Britain, although some doubts have been expressed as to its being truly indigenous. It is however admitted into all British Floras; and there can be no doubt, from its wide diffusion, that it is truly naturalised in this country. It was well known to the antients, and is spoken of by both Theophrastus and Pliny. It is a very general favourite in Europe, and is planted in public places, parks, and approaches to residences, in France, Germany, Holland, and Great Britain. For this purpose its large size, handsome appearance, and profusion of sweet flowers well adapt it. The wood is also in considerable request: it is white, close-grained, soft, light, and smooth, and is used by the cabinet-makers for a variety of purposes. It is easily worked, as well as durable, and on this account has been employed for carving. Most of the fine carvings in this country, as those at Windsor Castle, the library of Trinity College, Cambridge, and at Chatsworth, are of this wood. It is also used for wood-cutting. The fibres of the bark are very tough, and ropes and mats are manufactured from them. They are employed for this purpose in many parts of England, but in Russia and Sweden this manufacture forms a considerable branch of commerce. When used for this purpose the trees are peeled in the beginning of the year, and the bark is steeped in water, after which it is hung up to dry; and the layers of bark, being separated, are cut into ribands for making mats, or the fibres are twisted into ropes. The Russian mats used by gardeners and upholsterers are thus made. The flowers secrete a large quantity of nectar, and exhale a delicious scent. On this account they are great favourites with bees, and when expanded they are constantly beset with these insects. The honey thus procured is in great repute, and has given celebrity to the honey of Kowno, on the Niemen, in Lithuania, a small town which is surrounded by a forest of limes. It is chiefly used for making liqueurs. The seed of the lime possesses a large quantity of albumen, which is nutritious and perfectly innocuous. It was proposed by Missa, a French physician, to use it in the same way as that of the cocoa-tree. It was found to answer this purpose, but when prepared it will not keep; hence any extensive manufacture of it, although it was attempted in Germany, has been abandoned. Cattle will eat the leaves of the lime, but it is said to communicate a bad flavour to the milk of cows. The flowers were considered anodyne and antispasmodic by older physicians, and were administered in fevers when the Cullenian doctrine of spasm prevailed. Hoffman strongly recommended them, and relates cures effected by them, and they entered as an ingredient nto most of his prescriptions. They are not much used n modern medicine.

The linden attains a great age; and many specimens, celebrated for their age and size, exist. 'At Neustadt, in Wirtemberg, there is a prodigious lime-tree, which gives ts name to the town, which is called Neustadt an der Linden. This tree is said by Evelyn to have had in his ime a trunk above 27 feet in circumference, and the diameter of the space covered by its branches to have been 403 feet. It was 'set about with divers columns and monuments of stone (82 in number, and formerly above 100 more), which several princes and noble persons have dorned, and which as so many pillars serve likewise to upport the umbrageous and venerable boughs; and that ven the tree had been much ampler, the ruins and disances of the columns declare, which the rude soldiers ave greatly impaired.' Evelyn adds copies of many of ne inscriptions on the columns, the oldest of which is ated 1550, and the column on which it is inscribed now supports one of the largest limbs, but was at a considerable istance from the tree 300 years ago. (Loudon.) This tree is still in existence. There are many other very aged individuals in this country and on the Continent. The family ame of Linnæus is said to have been derived from an ancient linden that grew near their residence. The principal treet of Berlin is called *Unter den Linden*, from the lime-rees which are planted on each side.

Many varieties of this tree are described; and, as is sual in these cases, some authors have elevated them to ne rank and importance of species. The following are found in collections: *T. E. laciniata*, in which the leaves re smaller than those of the common species, and are eeply and regularly cut and twisted. It seldom attains large size. *T. E. aurea*, which differs only in its twigs aving a bright yellow colour. *T. E. dasystyla*, possesses tomentose style, and differs from the species in the form f its fruit. Some botanists admit only one European pecies, the *Tilia Europæa*. Koch, in his 'Flora Germanica,' has two, the *T. grandifolia* and *T. parvifolia*, nd gives *T. Europæa* as a synonyme of the latter. Hooker, n the 'British Flora,' admits all three; and De Candolle, n his 'Prodromus,' has three species, besides the European, hich are as follows:—

T. microphylla, Small-leaved Lime, has its petals without nectaries or scales, cordate, roundish, acuminated, serated leaves, smooth above and glaucous beneath, with cattered as well as axillary hairy blotches, and compound many-flowered umbels. This is identical with the *T. parvifolia* of Ehrhart and other writers. It is a native of subalpine districts in the north of Europe. In Great Britain it is common in the woods of Essex and Lincolnshire; and Mr. E. Forster thinks it probable that this is the only true British species.

T. rubra, Red Lime, has cordate leaves, unequal at the ase, hairy beneath as well as the petioles, with a tuft of hair at the base of the veins; the fruit globose and smooth. It is a native of Taurida, and some few specimens are growing in England. The young branches are of a beautiful oral-red colour, thence it has been called *T. corallina*. This species is by most other writers considered a variety of *T. Europæa* or *T. grandifolia*.

T. platyphylla, Broad-leaved Lime-tree, has petals without nectaries; cordate, serrated leaves, downy beneath; origin of the veins, woolly; branches, hairy; umbels, three-flowered; fruit woody, downy, turbinate, with prominent angles. This is the *T. grandifolia* of Ehrhart and other botanists. It is more common than the other species in Switzerland and the south of Europe. There are several specimens of this tree in England and Scotland, but they can scarcely be said to be wild. Specimens of this tree exist in the churchyard of Seidlitz in Bohemia, with leaves contracted to the form of a hood. They are said to have miraculously assumed this character from the time that the monks of a neighbouring convent were all hanged upon them.

All the foregoing species are distinguished by not having nectaries or scales at the base of their petals; there are six other species characterised by possessing nectaries. Four of these are inhabitants of North America.

T. alba, the White or Silvery Lime, has cordate, serrated leaves, unequal at the base, clothed with white down beneath, but smooth above, and four times longer than the petioles; fruit ovate, with five obscure ribs. This is the *T. argentea* of Desfontaines; *T. panonica* of Jacquin; and *T. tomentosa* of Moench. It is a native of the woods of Hungary, and is very readily distinguished from the other species by the whiteness of its leaves, which becomes especially evident when ruffled by the slightest breeze. It was introduced into this country in 1767, and there are now existing several very fine specimens, one at Walton-on-Thames, 60 feet high, and a number at Highclere in Berkshire. *T. petiolaris* was described by De Candolle from dried specimens sent to him from Odessa, where the tree is cultivated in gardens. The leaves are twice the length of the petioles, and their under surface downy like the last.

T. glabra, the Black or Black American Lime-tree, has leaves deeply cordate, serrated, and somewhat coriaceous and smooth; the petals are truncate and crenate at the apex, and equal in length to the style; the fruit ovate and somewhat ribbed. This tree is a native of North America in Canada and the northern parts of the United States; in the Southern states it is only found at a considerable elevation on the Alleghany mountains. In external character it very much resembles the European species; its flowers and leaves are however larger. Although it was introduced into this country by Miller as early as 1752, it is not much grown, and very few specimens exist. In America the wood and bark are used for much the same purposes as that of its representative in Europe.

T. laxiflora, Loose-flowered American Lime, has cordate, serrated, smooth leaves, loose panicles of flowers, emarginate petals, and globose fruit. It is a native of America, from Maryland to Georgia. It has been known in this country only since 1820, and but few specimens are at present planted. Loudon, in his 'Arboretum' (vol. i., p. 374), states his conviction that this and the other species of American limes are only varieties of *T. glabra*, and he has arranged them accordingly. He has however assigned no other reason for this opinion than their general resemblance.

T. pubescens, the pubescent American Lime, has somewhat cordate and oblique leaves, truncate at the base, and pubescent beneath; the petals emarginate, shorter than the style, and the fruit globose. It is a native of the southern parts of the United States, from Virginia to Georgia, where it is found principally on the banks of rivers. It is a much less vigorous tree than the two last, and has much smaller leaves and more slender branches. There is a variety called by Ventenat *T. p. leptophylla*, which has very thin leaves and delicate serratures.

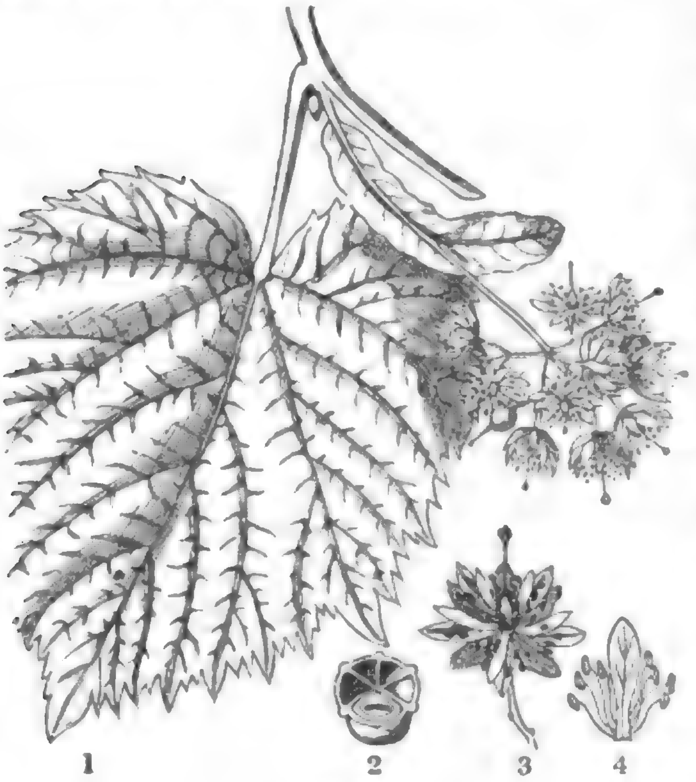
T. heterophylla, the White American Lime, has ovate leaves, downy beneath, sometimes cordate at the base, sometimes obliquely or equally truncate; globose fruit with 5 ribs. This tree is abundant in Maryland, Delaware, and the Western states of America, and is found on the banks of the Susquehanna, Ohio, and Mississippi. The leaves and flowers of this species are larger than any other. It seldom attains a height of more than forty feet in its native districts, and specimens in Europe do not exceed more than twenty feet. It is a handsome ornamental tree, and deserving of cultivation. It has been known in France nearly a century, but was not introduced into England till 1811.

In the cultivation of the lime it should be placed in moist situations, in an argillaceous, loamy soil. It grows better on plains than hills, and in moist than dry places. The trees may be propagated by seeds, which should be sown as soon as they are gathered; but this is a very slow process, and the more frequent mode of propagating them is by layers. In France a tree is cut down to the roots, and the shoots are encouraged to grow, and in the course of two or three years they may be planted in the positions in which they are to stand. Lime-trees will bear transplanting at a greater age than most trees; when large trees are transplanted, they should have their roots cut round three or four feet from the stem the year before they are taken up. This stunts their growth, and makes them bear removal better.

(Loudon, *Arbor. et Frut. Brit.*, vol. i. and iv.; Bischoff, *Lehrbuch der Botanik*; Koch, *Flora Germanica*; Hooker, *British Flora*; Don's Miller's *Dict.*, &c.)

TILIACEÆ, a natural order of plants belonging to the syncarpous group of polypetalous Dicotyledons. This order consists of trees or shrubs, seldom of herbaceous plants, with simple, toothed, alternate leaves, furnished with stipules. The flowers are axillary. The calyx consists of four or five sepals, which are valvular in æstivation; the petals four or five, with mostly a little pit at their base; the stamens are hypogynous, mostly indefinite, with oval or roundish two-celled anthers bursting lengthwise; the disk is formed of glands, which are equal in number to the petals and opposite to them; the ovary is single, composed of from four to ten carpels, with a single style and stigma divided into lobes according to the number of the carpels; seeds numerous, with erect embryo, and abundant albumen. This order is nearly allied to Sterculiaceæ and Malvaceæ, from which it differs in its glandular disk, distinct stamens, and two-celled anthers. The species, of which there are about two hundred and fifty, are arranged in thirty-two genera, and are generally diffused throughout the tropical and temperate parts of the globe.

Tiliaceæ possess no active properties; they abound in a mucilaginous wholesome juice. The fibres of the inner bark are very tough, and are used for a variety of economical purposes. [TILIA.] The wood is generally white, light, and tough; that of *Grewia elastica* is used for making bows in India. The Trincomalee-wood used at Madras for making the Massoola boats is the produce of Berrya Ammonilla. The Corchorus olitorius is cultivated in Egypt for use as a pot-herb.



Tilia alba.

1, cutting, with flowers and leaf; 2, section of ovary, showing the cells; 3, single flower; 4, stamens.

TI'LIQUA, Mr. J. E. Gray's name for a genus of *Saurians*. [SCINCOIDIANS.]

TILLAGE, applied to arable land, is the stirring and preparing of the surface of the soil, so as to render it fit for the vegetation of the seeds committed to it: its object also is the destruction of noxious weeds.

The whole art of cultivation consists in tillage and manuring, and the profit of the husbandman depends on the perfection of the tillage and the economy of labour in producing the effect. A defect in tillage will cause a great deficiency in the crops in ordinary years. To ensure good crops, the soil should be in such a state that the rain and dews may readily be diffused through it, without giving it a wet appearance, or evaporating too rapidly. It requires great knowledge and experience to give any particular soil the exact portion of tillage which is suited to it. A fine garden-tilth, as it is called, is the most perfect for light soils which have been long cultivated and manured; when they can be brought to such a state that after continued rains the surface dries without forming a crust, and crumbles of its own accord, the tillage has been good; and the deeper this soil is stirred, the more it will produce: but where clay abounds in the soil, which in dry weather can be readily pulverised by crushing the dry clods, and be reduced to the finest powder, too much tillage may do more harm than good. The fine clay is soon converted into mud at the surface by the least rain, because it is not sufficiently porous to let the water through it; it dries into a hard crust, which effectually precludes the access of air, and consequently stops the vegetation of the seed. It is only by abundant manuring with organic matter, especially of animal origin, that this natural tendency in clays to cohere can be overcome; and until this is effected it is best to stir clay soils as deep as possible by means of subsoil-ploughs, but they should not be pulverised so that the water cannot run down between the lumps and clods, and especially the surface should be left in such a state of roughness that heavy rains cannot cover it with a coat of mud. The clods which are left on the surface imbibe the moisture more gradually, and in drying fall to pieces, by which the young plants are invigorated, and, as it were, moulded up. This is particularly the case in winter after a frost, as all clay-land farmers are well aware. It is very easily ascertained whether a soil will bear much tillage or not. It is only necessary to try some of it in a large pot or box; make the surface very fine by breaking the clods, then water it abundantly, and let it dry in the sun; if a crust is formed in drying, that soil will not bear too much harrowing and pulverising, and should be left in a moderately rough state after sowing or drilling the seed; but if, after it dries, the surface is loose and porous, then the finer the tillage the better the seed will vegetate. The whole depends on the ready admission of air or its exclusion. When grass-seeds are sown, the surface should be well pulverised; but this cannot be safely done if the soil is apt to run together when much rain falls soon after the seed is sown. Some plants, like beans, will force their way through a very hard surface; but small seeds are too weak to do so, and their growth is entirely stopped by the least crust on the surface. Besides the preparatory tillage of the soil before sowing the seed, there is a great advantage in the stirring of it as the plants are growing. On this depends all the merit of the row-culture for every kind of plant, especially those which have esculent roots or extensive foliage, and which are chiefly cultivated for the sustenance of cattle. The effect of deep tillage is here most remarkable. If rows of turnips or cabbages be sown at such a distance that a small plough or other stirring implement can be used between them, and the intervals be stirred more or less, and at different depths, it will be found that the deeper and more frequent the tillage, until the foliage covers the whole interval or the bulbs swell to a great size, the heavier and more abundant the produce will be. It is worth while to try the experiment:—Sow Swedish turnips or mangold-wurzel in rows three feet apart: let some of the rows be merely kept clear of weeds by surface-hoeing, and the plants be thinned out to the distance of a foot apart: let other intervals be stirred to different depths; some three inches, some six inches, and some nine inches or more. The result will be, that the first rows will appear to have been sown much too far from each other, not half the ground being covered with the foliage of the plants; the others will be covered more and more as the tillage has been deeper, and the last will completely cover the whole intervals. The roots or bulbs will be in exact proportion to the richness of the foliage, and the weight of the deeply tilled rows will far exceed that of any of the others, while the first will, by comparison, appear a poor and scanty crop, however clear of weeds the surface may have been kept. The soil best suited for this experiment is a good light loam on a dry or well-drained subsoil; for stagnant moisture under any soil will chill the fibres and check the growth of the plants, however dry the surface may be. It was this which led Tull, the father of drill husbandry, to the conclusion that tillage was all that the soil required to maintain perpetual fertility. He carried his conclusion too far; but we shall not be wide of the truth if we assert that with proper tillage the soil will be gradually improved, and a much smaller quantity of manure occasionally added to recruit the waste produced by vegetation will render the soil much more fertile than it would be with more manure and less tillage: and as tillage can be increased by mechanical contrivances where labourers are scarce, whereas the supply of manure must generally be limited, it follows that, as a general rule, the land should be well and deeply tilled, due attention being paid to the nature of the soil and its property of retaining or transmitting moisture. Very loose sands should not be much stirred until they are consolidated by the admixture of marl, clay, chalk, or well-rotten dung; but in all cases the manure should be mixed as intimately as possible with the soil, and as deep as the tillage has gone, not including the stirring of the subsoil; for the roots will always penetrate thus far, and find the nourishment which they require. Those plants which throw out roots from the bottom of the stem, as wheat, barley, and oats, require the surface to be most pulverised and enriched to allow these roots to spread; a spring tillage is therefore highly advantageous, which can only be given when the seed has been deposited in rows by drilling or in patches by dibbling. This last method is found to give much finer crops, from the circumstance that the hoe not only loosens the earth between the rows, but also between the different patches of the growing corn, by which the coronal roots are strengthened and the tillering of the stems so much encouraged, that it is not uncommon to see twenty, thirty, or more strong stems all bearing fine ears arising from one tuft of plants, the produce of one or more seeds, whose roots are matted together and send out fibres in every direction. The crowding of several plants does not prevent their growth, provided the fibres can spread around in a rich mellow soil, well pulverised, and admitting the air and moisture readily.

As a perfect tillage requires much labour and minute attention, and in many situations where the farms are large labourers cannot be procured at moderate wages, nor can they always be depended upon to perform the work with sufficient care, mechanical ingenuity has been taxed to invent implements of tillage by which it may be more perfectly accomplished, and at a smaller expense, by using the power of horses instead of that of men, and making implements which will till a considerable breadth at once, and thus save time.

The old plough, and which, however it may be improved, still acts on the same principle of turning up a fresh portion of the soil, burying that which has for some time been at the surface, will probably always continue to be the chief implement of tillage; but the minuter operations, which are taken from garden culture, require particular contrivances to effect them by instruments. The harrows are but an imperfect substitute for the garden rake, and do not stir the soil to a sufficient depth. Other implements have therefore been invented, which by means of wheels can be regulated so as to act at a greater or less depth. These have received the different names of scarifiers, grubbers, cats'-claws, or cultivators, according to the fancy of the inventors. Many of these answer the purpose well, and save labour. They can be used in all directions so as to pulverize the soil to any degree. Heavy rollers with and without spikes around them are used when many clods require breaking; and, although not yet adopted in this country, the Belgian *traineau*, a strong frame of wood boarded over, and loaded with weights if required, is a most effectual instrument in levelling the surface and crushing clods, without dressing them into the soil as the roller frequently does.

It would be endless to enumerate all the implements of tillage which are daily invented: some of the most useful have been already described. [ARABLE LAND; PLOUGH.] As the cultivation of the soil approaches more to that of the garden, more perfect instruments will be used; such as can be directed with great accuracy between parallel rows of growing plants without danger of injuring them. When the width of the stetches or beds accurately corresponds with the width of the instrument, so that the wheels will run in the intervals and the horses step in the same, the soil may be tilled perfectly, although the rows of plants have but a small interval between them: and the largest field will thus present to the eye extended seed-beds or equal rows of growing plants, as we are accustomed to see in a kitchen-garden. The result will be the same as when for the sake of experiment we sow the common grains and leguminous plants of the fields in a plot of garden-ground: in such case the produce is so far greater, that it quite baffles our calculation when extended to a large surface, and hence the incredible results which we continually meet with in the reports of experiments on some new produce lately introduced: everything is on a magnified scale, owing to superior tillage. No doubt many fields possessed of fertile soils might, by attentive tillage, be made as productive as the best garden-ground. The Chinese have, as we are told, already accomplished this by their incredible numbers and indefatigable labour; but science and mechanical contrivance are a substitute for millions of labourers when judiciously applied—as our manufactures fully prove. The same ingenuity applied to tillage might increase the produce of the earth, if not indefinitely, at least far beyond what we may now suspect.

In the early ages of agriculture tillage was almost confined to the ploughing of fallows to clean the land, which was very imperfectly executed, and in ploughing the stubble of one crop to prepare for the seed of another, as long as the land would give a return for the labour. The idea of tillage for the sake of a permanent improvement of the soil was only entertained by a few men who reflected, and that of encouraging the vegetation while the crop was growing was not even thought of. The plough to stir and the harrows to cover the seed were the only instruments in use, and they were very rude of their kind. A return of three or four times the seed sown satisfied the farmer and the landlord; and yet the first was hardly repaid for his toil, and the landlord received for rent what now would scarcely satisfy the tithe-owner. The present state of agriculture may be contrasted with this, and perhaps hereafter the comparison may be as disadvantageous to us as it now appears in our favour when we look back a few centuries.

TILLA'NDSIA, the name of a genus of plants belonging to the natural order Bromeliaceæ. Linnæus says of the plants belonging to this genus, 'Tillandsiæ cannot bear water, and therefore I have given this name to the genus from a professor at Abo, who in his youth having an unpropitious passage from Stockholm to that place, no sooner set his foot on shore than he vowed never again to venture himself upon the sea. He changed his original name to Tillands, which means *on* or *by land;* and when he had subsequently occasion to return to Sweden, he preferred a circuitous journey of 200 Swedish miles through Lapland to avoid going eight miles by sea.' Dr. Elias Tillands whose name and idiosyncracy have thus been perpetuated, was professor of physic at Abo, and died in 1692, at the age of fifty-two. He published in 1683 an alphabetical catalogue of plants in the neighbourhood of his residence, which was afterwards followed by wood-cuts of 158 of the plants in the catalogue.

The genus Tillandsia of Linnæus comprehends the plants described by Sloane as *viscum caryophylloides*, and by Plumier as *Caragata*, and is characterised by possessing a persistent calyx divided into three oblong, lanceolate, pointed segments; a corolla tubular, longer than the calyx, with the limb divided into three segments; six stamens not so long as the corolla, and inserted into it, and the anthers sagittate; the ovary superior, surmounted by a style with a trifid obtuse stigma; the fruit, a trilocular capsule containing several seeds, each of which is supported on a long stalk of aggregate fibres, which in the end constitutes a feathery wing. The species are most of them parasitical, and are natives of South America.

T. utriculata, the Wild Pine of the colonists of Jamaica, has linear, channelled, recurved, dilated leaves, inflated at the base; stem closely panicled. It is found growing on old and decaying trees in the forests of Jamaica. The stem is three or four feet high, and the leaves are a yard long, and placed within one another in such a way that the water which runs down them is retained in their expanded bases. The bases then swell out and form a reservoir or bottle, which, being contracted at the neck, prevents the heat of the sun from evaporating the water. These reservoirs will each hold about a quart of water, and during the dry season they are the resort of all kinds of animals for the sake of the water, and travellers are often able to obtain a supply of water from this source when all others fail. Dampier, in his Travels, gives the following account of this plant:—'The wild pine is a plant so called because it somewhat resembles the bush of leaves which surround the true pine-apple. The wild pines commonly grow from some bunch, knot, or excrescence of a tree, where they take root and spring upright. The root is short and thick, from whence the leaves rise up in folds one within the other, spreading often to the top of the tree. They are of a good thick substance, and so compact as to catch and hold the rain-water when it falls. They will contain a pint, or a pint and a half, or a quart; and this water refreshes the leaves and nourishes the root. When we find these pines, we stick our knives into the leaves just above the roots, and let out the water, which we catch in our hats, as I have done many times myself to my great relief.' The seeds of these plants are furnished with wings, by which they are blown from tree to tree, on which they grow. Unless they possessed such means of transportation, they would fall to the ground, where, being parasitical, the young plants would perish.

T. usneoides, the Long-Moss Tillandsia, or *Barbe de vieillard* of the French, the *Viscum caryophylloides* of Sloane, has a twisted, thread-shaped, scaly stem, much branched, with channelled leaves. This plant is a native of the forests of North America, from Virginia to Florida, also of the West India Islands and the Brazils. It has very minute roots, and its long wiry contorted stems creep over the stems and branches of old trees, sometimes hanging down in a bunch like the hairs of a horse's tail. The flowers are small and of a blue colour, and are developed at the ends of the branches. This plant grows on other trees in dry and arid plains, as well as in alpine districts. It attains a larger size in the more temperate localities. Its filamentous stems, when deprived of their bark, may be used for the same purposes as horsehair, and are used in this manner in America. They are also in some places made into cordage. The only preparation they require previous to being used is being put into water for a fortnight or more, according to the temperature, when, on being taken out and dried, the bark easily separates from the fibres, and they are fit for use. In medicine this plant has been recommended as a remedy in hæmorrhoids, also as an effectual diaphoretic.

T. monostachya, Single-spiked Tillandsia, has the radicle leaves linear, channelled, recurved, broad, and sheathing at the base; the stem simple, clothed with imbricated scales; the spikes simple; the bracteas ovato-concave. This plant is a native of the West Indies. The flowers are of a snow-white colour, appearing in the axils of the bracts, which surround a rachis two or three inches long, and this arises from a mass of leaves arranged in the form of a rosette. As the leaves and bracts are coloured variously, green and red and white, the whole plant looks at a distance like a large flower; and when numerous upon the trees on which they grow, they produce a very handsome and remarkable appearance. The leaves of this as well as most of the other species serve as reservoirs for water. About thirty species have been enumerated by botanists: most of them are inhabitants of South America, especially of Peru, and of the great forests of the Andes; two or three of the species have been found in the southern states of North America.

TILLEMONT, SEBASTIEN LENAIN DE, an historical writer of considerable note, was born at Paris 30th November, 1637. He was the son of Jean Lenain, master of the requests, and his wife Marie le Ragois. His excellence of character was manifested very early; and even as a child he always abstained from those mischievous pranks in which children commonly indulge. When between nine and ten years of age he was placed under the charge of the members of the religious Society then established in the vacant abbey of Port Royal, and under these instructors he devoted himself to the exercises of learning and piety. His favourite author, while at school, was Livy; a preference indicative of the bias of his mind to historical studies. He studied logic and ecclesiastical history under Nicole; and his questions on the latter subject at once evinced the earnestness with which he pursued it, and put the knowledge of his instructor to a severe test. He studied the theology of Estius, from which, when about eighteen years of age, he turned with much satisfaction to the study of the Scriptures themselves, and of the Fathers: and while thus engaged he began to collect the historical notices of the Apostles and Apostolical Fathers, and to arrange them after the plan of Usher's 'Annales.'

The tenderness of his conscience, and the strictness of his notions of duty, kept him for some time undetermined as to the choice of a profession. At the age of 23 he entered the Episcopal seminary of Beauvais, where he was received with such respect from his reputation for historical knowledge, that, fearing it might be a snare to his humility, he contemplated leaving it, but was persuaded to remain by Isaac de Sacy, one of the members of the Society of Port Royal, whom he had chosen for his spiritual guide. He remained three or four years in the seminary of Beauvais. and then spent five or six with Godefroi Hermant, canon of that city. He was much respected and beloved by the bishop of Beauvais, Choart de Buzanval, and fearing still that this estimation would make him vain, he suddenly left the place and returned to Paris, where he remained two years with his intimate friend and school-fellow at Port Royal, Thomas du Fossé; but not finding in Paris that retirement which he desired, he withdrew to St. Lambert, a country parish in the neighbourhood of that city.

In September, 1672, at the mature age of thirty-five, he became subdeacon, and fifteen months afterwards deacon. The following extract from a letter addressed to his brother (Pierre Lenain, then or afterwards subprior of La Trappe evinces at once his piety and his humility. After stating that it was at the desire of Isaac de Sacy, his friend and guide, that he had become subdeacon and was about to take on him the deaconship, he goes on, 'I assure you, my dearest brother, that it is with great agitation and fear that I have resolved to comply with his wish, for I feel that I am far from those dispositions which I myself see to be necessary for entering upon this office; and above all, I am obliged to confess that I have profited little from the grace which I might have received from the order and duties of the subdeaconship. But on the other hand I could not resist one whom I believe I ought to obey in everything, and who, I am well aware, has the greatest love for me. I beg of you then, my dearest brother, to pray to God for me, and to ask him either to cause M. de Sacy to see things in a different light, or to give to me such dispositions that the advice of my friend may be for my salvation and not for my condemnation.'

In A.D. 1676 he received priest's orders, at the further persuasion of De Sacy, who contemplated making him his successor in the office of spiritual director of the Bernardine nuns, now re-established in their original seat, the abbey of Port Royal, to the immediate neighbourhood of which establishment Tillemont removed. He was however, in 1679, obliged to remove, and he took up his residence at the estate of Tillemont, a short distance from Paris, near Vincennes, which belonged to his family, and from which he took his name. In A.D. 1681 he visited Flanders and Holland; and in A.D. 1682 undertook the charge of the parish of St. Lambert, where he had formerly resided, but soon gave it up at the desire of his father, to whom he ever paid the greatest respect and obedience.

Having prepared the first volume of his great work on ecclesiastical history, he was about to publish it when it was stopped by the censor, under whose notice, as a work connected with theology, it had to pass, and who raised some objections of the most frivolous character. Tillemont refused to alter the parts specified, deeming them not justly within the censor's province; and chose rather to suppress the work, upon which however he continued to labour diligently, though without any immediate intention of publishing it.

This exercise of the censorship led to an alteration of his plan: he determined to separate from the rest of his work the history of the Roman emperors and other princes whose actions were interwoven with the affairs of the Christian church, and to publish it separately: the first volume of this work, which, as not being theological, was exempt from the censorship, appeared in 1690, and was received with general approbation. It excited a desire for the appearance of his Church history, and the chancellor Boucherat, in order to remove the obstacle to its publication, appointed a new censor. Thus encouraged, he brought out the first volume in 1693, under the title of 'Mémoires pour servir à l'Histoire Ecclésiastique des Six Premiers Siècles.' A note to this volume, on the question whether Jesus Christ celebrated the Passover the evening before his death, in which he examined the views of Bernard Lami, a learned priest of the Oratory, on that question, involved him in a controversy with that writer, who read Tillemont's note before publication, and examined the arguments contained in it in a subsequent work of his own. Tillemont in consequence addressed to Lami a letter, which is printed at the close of the second volume of his 'Mémoires,' and is remarkable for its spirit of modesty and meekness. Lami replied, but Tillemont declined to continue the discussion, thinking that he had said enough to enable those interested in the question to form a judgment. Faydit de Riom, an ecclesiastic whom the Congregation of the Oratory had expelled from their body, a man of considerable talent, but of jealous disposition, published at Bâle, A.D. 1695, the first number (28 pp. 4to.) of a work, to be continued every fortnight, entitled 'Mémoires contre les Mémoires de M. Tillemont.' It contained several violent and unjust strictures on the work, to which Tillemont did not reply, though some of his friends with needless apprehension procured the stopping of Faydit's work, which never proceeded beyond the first number. Faydit repeated his attack in a subsequent work, but it produced little effect.

The remainder of Tillemont's life was passed in the quiet pursuit of his studies. He was attacked by a slight cough at the end of Lent, 1697, and in the course of the summer was seized with fainting, owing to a sudden chill while hearing mass in the chapel of Notre Dame des Anges: toward the end of September his illness increased so as to excite the anxiety of his friends. He consequently removed to Paris for the sake of medical advice; and there, after an illness which rendered his piety and submissiveness to the divine will more conspicuous, he breathed his last, on Wednesday, 10th January, 1698, aged sixty years. He was buried in the abbey of Port Royal, in which the Bernardine or Cistertian nuns, to whom the abbey had originally belonged, were now again established.

The works by which Tillemont is known are, his 'Histoire des Empereurs,' and his 'Mémoires pour servir à l'Histoire Ecclésiastique.' The first was published in 6 vols. 4to.; the first four during the author's life, at intervals from 1690 to 1697: the remaining two after his death, in 1701 and 1738. The earlier volumes were reprinted at Brussels in 12mo., in 1707, et seq., and a new edition appeared at Paris, in 4to., in 1720-23, with the author's latest corrections. He explains his plan in the 'Avertissement' to the first volume: his intention was to illustrate the history of the Church for the first six centuries; but instead of commencing with the first persecutor, Nero, he goes back to Augustus, whose edict occasioned the journey of Joseph and Mary to Bethlehem, and thus determined the place of our Lord's nativity. The history ends with the Byzantine emperor Anastasius (A.D. 518). The style is unpretending, and consists for the most part of a translation of the original writers with slight modifications, and with such additions (marked by brackets) as were needed to form the whole into one continuous narrative, or such reflections as the author deemed requisite to correct the false morality of heathen writers. To each volume are appended notes relating to difficulties of history or chronology which require discussion of a kind or extent unsuited for insertion in the body of the work. 'There is nothing,' says Dupin, 'which has escaped the exactness of M. Tillemont; and there is nothing obscure or intricate which his criticism has not cleared up or disentangled.'

The 'Mémoires,' &c. extend to 16 vols. 4to., of which the first appeared in 1693; three volumes more during the author's lifetime, in 1694-5-6; and the fifth was in the press at the time of his death. These five volumes came to a second edition in 1701-2, and were followed in 1702-1711 by the remaining eleven, which the author had left in manuscript. This great work is on the same plan as the former, being composed of translations from the original writers, connected by paragraphs or sentences in brackets. Dupin characterizes it as being not a continuous and general history of the Church, but an assemblage of particular histories of saints, persecutions, and heresies, a description accordant with the modest title of the work, 'Mémoires pour servir à l'Histoire,' &c. The author concerns himself chiefly with facts, without entering into questions of doctrine and discipline; and notices not all the saints in the calendar, but only those of whom there are some antient and authentic records. Each volume has notes of similar character to those given in 'L'Histoire des Empereurs.'

Tillemont supplied materials for several works published by others, as for the Life of St. Louis, begun by De Sacy and finished and published by La Chaise; for the lives of St. Athanasius and St. Basil, by Godefroi Hermant; of Tertullian and Origen, by Du Fossé, under the name of La Mothe,' &c.

(*Vie de M. Lenain de Tillemont*, by his friend Trouchay, afterwards canon of Laval, Cologne, A.D. 1711; Dupin, *Bibliothèque des Auteurs Ecclésiastiques du Dixseptième Siècle*; *Biographie Universelle*.)

TILLOCH, ALEXANDER, LL.D., was born at Glasgow on the 28th of February, 1759, and was educated with a view to following the business of his father, who was a tobacconist, and for many years filled the office of magistrate in that city. He was, however, more inclined to the pursuit of scientific knowledge than to the routine of business. His biographer states that in early life his attention was greatly attracted by the occult sciences, and that although he was not long subject to their delusions, he never was inclined to treat judicial astrology with contempt. One of the earliest subjects to which Tilloch applied himself was the improvement of the art of printing; his experiments have been alluded to in a previous volume. [STEREOTYPE, vol. xxiii., pp. 42 and 43.] After carrying on the tobacco business for a time in his native city in connection with his brother and brother-in-law, Tilloch abandoned it, and for several years exercised that of printing, either singly or in partnership with others. In 1787 he removed to London, where he subsequently resided; and in 1789 he, in connection with other parties, purchased the 'Star,' a daily evening newspaper, of which he became editor. This office he continued to hold until within a few years of his death, when bodily infirmities and the pressure of other engagements compelled him to relinquish it. The political opinions of Tilloch were temperate. For many years he devoted attention to means for the prevention of the forgery of bank-notes, and in 1790 he made a proposal to the British ministry on the subject, which met with an unfavourable reception. He then offered his invention to the French government, who were anxious to apply it to the printing of assignats; but, after some experiments had been made, and negotiations had been urgently sought by the French authorities, all communication on the subject was cut short by the passing of the Treasonable Correspondence Bill. In 1797 he presented to the Bank of England a specimen note, produced by block or relief printing, which was certified by the most eminent engravers to be impossible of imitation; yet nothing was done towards the adoption of his or of any similar plan.

Considering that there was room for a new scientific journal, in addition to that published by Nicholson, Tilloch published, in June, 1797, the first number of the 'Philosophical Magazine,' a periodical which has ever since maintained a high reputation as a record of the progress of science, and a digest of the proceedings of learned societies at home and abroad. Of this work he was sole proprietor and editor until a few years before his death, when Mr. Richard Taylor, who succeeded him in its management, became associated with him. In the earlier numbers of the 'Star' Tilloch published several essays on theological subjects, some of which, relating to the prophecies, were subsequently collected into a volume by another person, and published with the name 'Biblicus;' and in 1823 he issued an octavo volume entitled 'Dissertations introductory to the study and right understanding of the language, structure, and contents of the Apocalypse, in which he endeavours to prove that that portion of Scripture was written much earlier than is usually supposed, and before most of the apostolical epistles. His views on this and other points are discussed at length in a notice of this work, published soon after his death, in the 'Eclectic Review.' The last work undertaken by Tilloch was a weekly periodical entitled the 'Mechanic's Oracle,' devoted principally to the instruction and improvement of the working classes. The first number appeared in July, 1824, and it was discontinued soon after his death, which took place at his residence at Islington, on the 26th of January, 1825.

Tilloch married early in life. His wife died in 1783, leaving a daughter, who became wife of Mr. John Galt. His religious opinions were peculiar, and he was one of the elders who acted as ministers of a small body who took the name of Christian Dissenters, and met for worship in a private house in Goswell Street Road. He was a member of many learned societies in Great Britain and elsewhere, and was proposed, about twenty years before his death, as a fellow of the Royal Society of London; but his name was withdrawn before coming to the ballot, in consequence of an intimation that he would be objected to, not on account of any deficiency in talent or character, but solely because he was proprietor of a newspaper. A memoir of Dr. Tilloch appeared in the 'Imperial Magazine' for March, 1825, from which, with the assistance of other obituary notices, the above account is condensed. This was reprinted in the last number of the 'Mechanic's Oracle,' with a portrait.

TILLOTSON, JOHN, D.D. (born 1630, died 1694), a prelate and one of the most celebrated divines of the Church of England. He was born at Sowerby in Yorkshire, a member of the great parish of Halifax, of a Puritan family. His father, who was engaged in the clothing trade, belonged to that extreme section of the Puritans who were for establishing a general system of Independency, and he belonged himself to an Independent church, of which Mr. Root was the pastor. After having been a pupil in the grammar-schools in the country, the writers of his Life not having told us what schools they mean, but doubtless the grammar-school at Halifax was one, he became a pensioner of Clare Hall, Cambridge, in 1647, and a fellow of the college in 1651. It appears that he remained in the University till 1657. Puritanism was at that period in the ascendency at Cambridge; but Tillotson very early freed himself from his educational prejudices, became a great admirer of the writings of Chillingworth, and soon showed himself one of a class of persons who were then beginning to be considerable in England, who, taking their stand on the Scriptures, opposed themselves at once to Romanism on the one hand and to Calvinism on the other. This position he ever after maintained, and his celebrity arises principally from the ability with which he illustrated and defended, both from the pulpit and the press, the principles of Protestantism, and of a rational and moderate orthodoxy. It may be added also, that so much of the effects of his original Puritan education remained with him, that he was in politics a Whig, although it must be owned that he entertained and occasionally expressed notions of the duty of submission, which, if acted upon, would have maintained the House of Stuart on the throne.

Before he entered holy orders, he was tutor in the family of Prideaux, the attorney-general to Cromwell. This led to his residence in London, and brought him into acquaintance with several eminent persons. He was thirty years of age before he received ordination, and the service appears to have been performed with some degree of privacy, as it is, we believe, not known when or where it was performed, and only that the bishop from whose hands he received it was not a bishop of the English church, but the bishop of Galway in Scotland, Dr. Thomas Sydserf. All the supposed irregularities and imperfections of his early religious history, for amongst other things it was even asserted that he had never been baptized, were brought before the public by the non-juring party, when they saw him elevated to the primacy, from which Sancroft had retired.

It is said by his biographer, Dr. Thomas Birch, that he was not perfectly satisfied with the terms of ministerial conformity required by the act of 1662, which restored the Episcopal church of England; yet on the whole he judged it proper to accept of the terms, and to become a regular and conformable minister of that church.

He was for a short time curate at Cheshunt, and also for a short time rector of Ketton in Suffolk, a living to which he was presented by Sir Thomas Barnardiston, one of his Puritan friends. But he was soon called to a wider sphere of duty, being appointed, in 1664, the preacher at Lincoln's Inn, and lecturer at St. Lawrence's Church in the Jewry. Here it was that those sermons were preached which attracted crowds of the most accomplished and the learned of the time, and which have been since read and studied by many succeeding divines of eminence, and are at this day the basis of his fame.

The course of his preferment in the church during the reign of Charles II. was—1669, a prebendary in the church of Canterbury; 1672, dean of Canterbury; 1675, a prebendary in the church of St. Paul; and 1677, a canon residentiary in the same cathedral. But as soon as King William was established on the throne he was made dean of St. Paul's and clerk of the closet; and in April, 1691 he was nominated by the king to the archbishopric of Canterbury, an appointment which appears to have been really received by him with reluctance, and which exposed him to no small share of envy from very different parties. The truth is, that besides his eminent merits as having been the ablest opposer both of popery and irreligion, in a reign when the tendencies of too many persons in exalted stations were in one of these directions, he had a strong personal interest in the new king's affections, who is said, on credible authority, to have declared that there was no honester man than Dr. Tilloston, nor had he ever a better friend. He was archbishop only three years and a half, dying at the age of sixty-four. He was interred in the church of St. Lawrence Jewry, which had been the chief scene of his high popularity.

He died poor. He had survived both his children; but he left a widow, who was a niece of Cromwell and the stepdaughter of Bishop Wilkins, without any provision except the copyright of his works, which it is said produced 2500*l*. The king granted her a pension, first of 400*l*., and afterwards of 200*l*. more, which she enjoyed till her death in 1702.

An account of the Life of Dr. Tillotson was published in 8vo., 1717. There is a much larger Life of him by Dr. Birch, prefixed to an edition of the works of Tillotson, and published also in an 8vo. volume, the second edition of which was printed in 1753, containing additional matter. There is also an account of him in Le Neve's 'Lives of the Protestant Archbishops of England.' Birch's edition of the Works is in 3 vols. folio, 1752.

TILLY, or TILLI, JOHN TSERCLAS, Count of, was the son of Martin Tserclas, of Tilly. The Tserclas, whose name is also written T'Serclaes, were an old patrician family of Brussels; John, a member of this family, acquired, in 1448, the lordship of Tilly, in South Brabant. John Tilly was born in 1559, at the castle of Tilly, and he early entered the order of Jesuits, from whom he acquired that spirit of fanaticism, of blind obedience, and of absolute command, which distinguished him during his whole life. He soon abandoned his ecclesiastical profession, and entered the army of Philip II., king of Spain and lord of the Netherlands, and he learned the principles of war under Alba, Requesens, the governor of the Netherlands, Don Juan of Austria, and Alexander Farnese. In the war of the Spaniards against the Protestant inhabitants of the northern Netherlands he acquired that hatred of heretics and that warlike enthusiasm for the Roman Catholic religion, which became one of the most prominent features of his character. Towards the end of the sixteenth century he entered the service of the emperor Rudolph II., and distinguished himself, first as lieutenant-colonel, and afterwards as colonel and commander of a regiment of Walloons, in the wars against the Hungarian insurgents and the sultans Murad III. and Ahmed I. After the peace of Sitvatorok in 1606, between Rudolph II. and Ahmed I., he was appointed commander-in-chief of the army of Maximilian, duke of Bavaria, which was in a very disorganized state. In 1609 Tilly commanded the expedition against Donauwerth, an imperial town which had been put under the ban for having persecuted the Roman Catholics, and which surrendered to Tilly without defence. The Liga, or the union of the Roman Catholic states in Germany, appointed him commander-in-chief of their troops, and he held this high office until his death. Tilly gained the first great victory in the Thirty Years' War, which broke out in 1618. [THIRTY YEARS' WAR.] After having conquered the Upper Palatinate with the troops of the Liga and those of the duke of Bavaria, he proposed to the Imperial generals to pursue the army of Frederick, king of Bohemia, instead of taking winter-quarters and thus losing all the fruits of their conquests. Warfare in winter was, in the seventeenth century, a very uncommon thing, and Tilly met with much opposition to his plan; but at last the Imperial generals consented to continue the war. Tilly attacked the Bohemians, who had taken up a fortified position on the Weisse Berg, near Prague, and in a few hours the Bohemian army was nearly destroyed (8th of November, 1620), while only some hundreds of the Bavarians were killed. Several of the Bohemian nobles, who lived at Prague or resided in their castles, were warned by Tilly to fly if they would avoid the vengeance of the emperor; but they paid no attention to this generous advice, and were surprised: twenty-seven of them were beheaded.

After the brilliant victory on the Weisse Berg, Tilly hastened to the Rhine for the purpose of preventing the count of Mansfield from joining the margrave of Baden. He succeeded in this object by his skilful manœuvres. The margrave of Baden-Durlach was attacked in the defiles of Wimpfen, and defeated, after an heroic resistance (1622). On the 2nd of June, 1622, he defeated Christian of Halberstadt at Höchst; he pursued Christian and Mansfield to Westphalia; defeated them at Stadt-Loo, near Münster, in a battle which lasted three days (4th to the 6th of August, 1623), and forced them both to disband their troops and to take refuge in England. For his victory at Stadt-Loo, Tilly was created a count of the empire. It has been related, in the article Thirty Years' War, how skilfully Tilly first weakened and then destroyed the army of king Christian IV. of Denmark; but the principal glory of this campaign was earned by Waldstein, who, after having joined Tilly on the banks of the Lower Elbe, persuaded Tilly to turn his arms against Holland, and to leave him the conquest of Denmark. After Waldstein had been deprived of his command in 1630, and Gustavus Adolphus, king of Sweden, had landed in Germany, Tilly was appointed field-marshal and commander-in-chief of the imperial army. He appreciated so justly the military talents of his new opponent, that in the assembly of the electors at Ratisbon he declared Gustavus Adolphus to be so great a commander, that not to be beaten by him was as honourable as to gain victories over other generals.

The first great event of the new campaign was the capture of Magdeburg, on the 10th of May, 1631. The Croats and the Walloons in the imperial army committed unheard-of cruelties against the unhappy inhabitants; 30,000 of them were killed, and the town was entirely destroyed after three days' plunder. It has generally been believed that some Imperial officers besought Tilly to stop the atrocities of the soldiers, and that he coolly answered, 'Let them alone, and come back in an hour.' But this is a mere invention, and however severe Tilly was, he cannot be charged with having urged the commission of cruelty, although he considered the plunder of a conquered town as the fair reward of the soldier. On the 14th of May Tilly made his entrance into the smoking ruins of Magdeburg. In a letter to the emperor he said that since the destruction of Troy and Jerusalem there had been no such spectacle as that which Magdeburg presented. Six months later Tilly, who was in a fortified camp at Breitenfeld near Leipzig, was forced, by the impetuosity of his lieutenant, Pappenheim, to engage in battle with Gustavus Adolphus before his reinforcements had arrived. Tilly himself was successful in his attack on the left wing of the Swedes, which was broken, and the elector of Saxony, who commanded it, fled as far as Eilenburg. But Gustavus Adolphus, who had beaten the left wing of the Imperialists, under the command of Pappenheim, stopped the progress of Tilly, and after a long and bloody struggle the imperial army was routed. When Tilly saw the flight of his soldiers, he swore that he would not survive the day on which he, the victor in thirty-six battles, was to fly for the first time in his life. Alone on the field the old field-marshal, bleeding from three wounds, shed tears of despair, and looked for death as his only consolation. However Duke Rudolph of Saxe-Lauenburg persuaded him to withdraw; and Tilly, putting himself at the head of four regiments of veterans, fought his way through the main body of the Swedish army. He narrowly escaped from the bold attack of a Swedish captain, called 'Long Fritz,' who was killed by a pistol-shot at the moment when he was seizing the field-marshal (17th of September, 1631). After the loss of the battle of Leipzig, fortune abandoned Tilly for ever. Although he afterwards succeeded in driving the Swedes from Franconia, Gustavus Adolphus compelled him to retire beyond the Lech. In order to prevent the Swedes from penetrating into Bavaria, Tilly took up a very strong position near Rain, on the right bank of that river. Gustavus Adolphus, having arrived on the left bank opposite Rain, opened a fire from all his batteries on the Bavarian camp, while his pontooniers endeavoured to construct a bridge over the river (5th of April, 1632). Tilly made the most active resistance, but a ball broke his thigh, and he was removed from the field and carried to Ingolstadt. After the fall of Tilly, the elector of Bavaria abandoned his invincible position, and the Swedes crossed the river. Tilly died on the day after the battle, in his seventy-third year, without leaving any issue.

Tilly was a little ugly man, with red hair, large whiskers, a pale face, and piercing eyes. He continued to lead a monastic life in the midst of the noise and the licence of his camp; he boasted that he had never touched wine nor women; he spoke little, but thought much; he despised honours and money; the emperor wished to confer the duchy of Brunswick-Calenberg upon him, but Tilly refused it, and he died poor.

(Julius Bellus, *Laurea Austriaca;* Breyer, *Geschichte des Dreissigjährigen Krieges;* Schiller, *Geschichte des Dreissigjährigen Krieges;* Leo, *Universal-Geschichte.*)

TILSIT (more correctly TILSE), the chief town of Prussian Lithuania, is situated in 55° 4′ N. lat. and 21° 56′ E. long., in a fertile country on the south bank of the river Memel (called in Russia the Niemen). The little river Tilzele (pronounced Tilshelé) forms on the south side of the town a large basin, and discharges itself, between the town and the suburbs, into the Memel, over which there is a bridge of boats, which is 1150 feet long without the approaches. The thirty-six boats or pontoons are removed at the approach of winter into the Tilzele, and replaced in spring. The master of the Teutonic Order built the old castle in 1289, which was repaired and enlarged in 1356; but the present castle, to the east of the town, was not built till 1537. In process of time a considerable town grew up round the castle; favoured by its excellent situation it became the channel for the great trade between the interior of Russian Poland and the port of Memel, so that it was one of the most flourishing towns in the province. The principal buildings and public institutions are, the castle, the town-hall (built in 1752-55), the German Lutheran church, with a very lofty and curious steeple, the very pretty Lithuanian church, the Calvinist church, and the Roman Catholic chapel on an eminence at a short distance from the town; the gymnasium, founded in 1586; a Lutheran and a Roman Catholic hospital, a poor-house and infirmary, and other charitable institutions. The barracks, 600 feet in length, 36 in breadth, and two stories high, were erected in 1794-1800, by a society of the citizens, that the troops might not be quartered in the houses. The inhabitants, about 12,000 (exclusive of the garrison), chiefly draw their subsistence from the trade in corn, linseed, and timber; many are engaged in agriculture (the town possesses lands of its own, and many of the citizens have considerable estates); and there are likewise breweries, distilleries, tanneries, and all the trades usually carried on in large towns. The shoes of Tilsit are celebrated for durability and neatness, and great quantities of them are exported. There are many good gardens in the town and environs, particularly those of the Horticultural Society.

Tilsit has acquired historical celebrity by the treaties of peace concluded on the 7th and 9th of July, 1807, between France, Russia, and Prussia, the terms of which are too well known to be stated in this place: yet in five years after this peace, which seemed to have laid continental Europe prostrate at the feet of Napoleon, a part of that immense army which was to have subdued Russia (Macdonald's division) was seen to return desponding, silent, and miserable over that same river which had so lately witnessed the triumph and splendour of the conqueror.

(Müller, *Handbuch*; Preuss, *Beschreibung von Preussen*, Hassel, *Geogr.-Handbuch.*)

TILT-HAMMER, a large hammer worked by machinery, impelled either by a water-wheel or a steam-engine. Such hammers are extensively used in the manufacture of iron and steel, and the name *tilt-mill* is sometimes applied to the mechanism of which they form the principal feature.

In the process of *shingling* or *blooming* [Iron, vol.

xiii., p. 34], the heated iron is subjected to a very heavy hammer, the strokes of which not only bring it into a new form, but also force out from its substance considerable quantities of dross. The kind of tilt-hammer formerly used for this purpose is represented by Holland, in his treatise on 'Manufactures in Metal,' in Lardner's 'Cabinet Cyclopædia.' He describes the shaft or helve of the hammer as nine feet in length, and thirty or forty inches in circumference, made of ash, and clamped at intervals with stout iron hoops. This shaft passed through the head of the hammer, which was a mass of cast-iron, weighing seven or eight cwt., and was secured at the opposite end to a massy collar of cast-iron called the *hurst*, the projections or pivots of which formed the axis or centre of motion, and were sustained by a strong frame-work of timber. Above the hammer was placed a very strong but elastic beam, formed of tough ash bound with iron hoops, and against this, which acted as a spring to increase the force of the descending stroke, the head of the hammer was thrown up by the revolution of a ponderous circular frame of iron, with four projecting arms or teeth, which came in contact with the shaft very near to the head of the hammer. This circular frame, or *arm-case*, was fixed immediately upon the axis of the water-wheel which supplied the moving-power. In modern iron-works the shingling-hammers are usually formed entirely of iron, the piece forming the actual head of the hammer being inserted into a ponderous cast-iron helve in such a manner that it may be removed when worn out. The spring-beam is frequently dispensed with, and the hammer is lifted either by cogs or arms acting upon the extremity of the helve, beyond the hammer-head, or by an eccentric, or cam, revolving in contact with a projection from the under side of the helve, between the hammer-head and the axis or centre of motion. Holland represents a tilt-hammer of the latter construction, which is about six tons in weight, and nine feet five inches long from the axis to the centre of the head. The hammer-head itself is circular, and weighs about eight cwt. Such a hammer makes about one hundred and fifty strokes per minute.

The tilt-hammers used in the manufacture of steel are smaller and much more rapid in their action. Instead of receiving the impulse of the cams near their head, such hammers are set in motion by tappets or cogs striking downwards upon the tail of the helve or shaft, which is prolonged beyond the axis. The tail of the helve is thus thrown down forcibly upon an anvil, from which it rebounds with great velocity, causing the hammer to make from three to seven hundred strokes in a minute. Tilt-hammers are applied with great advantage to the forging of anchors, axles, &c.

When tilt-hammers are impelled by water-wheels, it is advisable to fix the cams or arms upon a separate shaft, which may revolve at any required velocity without increasing the velocity of the water-wheel itself, by the intervention of suitable cogged-wheels. Without such an arrangement much of the useful effect of the water may be lost, owing to the necessity of urging the wheel to a high speed.

TIMAEUS (Τίμαιος), the son of Andromachus, was born at Tauromenium in Sicily, whence he is sometimes called a Tauromenian, and sometimes a Sicilian, to distinguish him from other persons of the same name. The year of his birth was B.C. 352. He was a disciple of Philiscus of Miletus, who had himself been instructed by Isocrates. He was driven from his native country by Agathocles, the tyrant of Syracuse, whereupon he went to Athens. This seems to have happened in the year B.C. 310, when Agathocles, after the battle of Himera, and before taking his army over to Africa, confiscated under various pretexts the property of his wealthy subjects, and endeavoured to secure his possessions in Sicily by putting to death or sending into exile such as he thought ill disposed towards him. (Diodorus Sic., xx. 4.) Timaeus spent fifty years at Athens in reading and studying. (Polybius, xii. 25.) About the year B.C. 260, when Athens was taken by Antigonus, Timaeus returned to his native country, either to Tauromenium or to Syracuse, where he spent the remainder of his life, and died, B.C. 256, at the advanced age of ninety-six.

Timaeus wrote a great historical work, the main subject of which was a history of Sicily. It began at the earliest times, and brought the events down to Olympiad 129 (B.C. 264), where the work of Polybius begins. (Polybius, i. 5.) How many books the history contained is uncertain, though we know that there were more than forty. It appears to have been divided into large sections, each of which formed in itself a separate work, whence they are spoken of by several writers as so many independent works. Thus one section bore the title of Σικελικὰ καὶ Ἰταλικά, and contained the early history of Sicily in connection with that of Italy; another was called Σικελικὰ καὶ Ἑλληνικά, and contained the history of Sicily and Greece during the time of the Athenian expeditions to Sicily. Another part again contained the history of Agathocles; and the last the history of Pyrrhus, especially his campaigns in Italy and Sicily. This last section was, according to the testimony of Cicero (*Ad Famil.*, v. 12), a separate work, though, as regards the period which it comprehended, it may be viewed as a continuation of the great historical work.

This history of Timaeus, which, with the exception of a considerable number of fragments, is now lost, was commenced by him during his exile at Athens, and at a very advanced age; but he did not complete it till after his return to his own country; and it was here that he added the history of the last years of the reign of Agathocles and wrote the history of Pyrrhus. As regards the character and value of the work the antients do not agree. Polybius is a vehement opponent of Timaeus, and complains of his ignorance of political as well as military affairs; he further states that Timaeus made blunders in the geography even of places and countries which he himself had visited. His knowledge, he says, was altogether derived from books; his judgment was puerile; and the whole work bore strong marks of credulity and superstition. But this is not all that Polybius blames: he even charges him with wilfully perverting the truth. The fondness which Timaeus himself had for censuring others is said to have drawn upon him the nickname of Epitimæus (fault-finder). (Athenæus, vi., p. 272.) Most parts of this severe criticism of Polybius may be perfectly just; but in regard to others we should remember that these two historians wrote their works with such totally different views, that the work of Timaeus, who knew the world only from his books, must in many respects have appeared absurd to the author of a 'pragmatical' history, and to a statesman and general like Polybius. But the loss of the work of Timaeus, even if he did no more than make an uncritical compilation of what others had told before him, is one of the greatest in antient history. Other ancient writers, such as Diodorus, Agatharchides, Cicero, and others, judge far more favourably of Timaeus. The style of the work, as far as we can judge from the fragments, is justly censured by some antient critics for its rhetorical and declamatory character; although others, like Cicero (*De Orat.*, ii. 14; *Brutus*, 95), speak of it with praise. Timaeus is the first Greek historian who introduced a regular system of chronology, that is, he regularly recorded events according to Olympiads and the archons of Athens; and although, in the early period of his history, his want of criticism led him into gross chronological errors, he set the example which others found very useful and convenient. It must have been with a view to an accurate study of chronology that he wrote a work on the victors in the Olympian Games, of which we still possess a few fragments.

The fragments of Timaeus are collected in Göller's work 'De Situ et Origine Syracusarum,' p. 207, &c., which also contains (pp. 179-206) an elaborate dissertation on the life and writings of Timaeus. The fragments are also contained in C. and T. Müller, 'Fragmenta Historicorum Graecorum,' Paris, 1841, pp. 193-233. Compare Vossius, *De Historicis Graecis*, p. 117, edit. Westermann; Clinton, *Fast. Hellen.*, iii., p. 489, &c.

TIMAEUS (Τίμαιος), a Greek Sophist, who, according to the supposition of Ruhnken, lived in the third century of the Christian æra. Concerning his life nothing is known; his name has only come down to us in connection with a little vocabulary containing the explanation of words and phrases which occur in the writings of Plato. It bears the title ἐκ τῶν τοῦ Πλάτωνος λέξεων, and is dedicated to one Gentianus, of whom likewise nothing is known. Whether we possess the genuine and complete Vocabulary of Timaeus is doubtful; and from the title, as well as from certain articles in it which have no reference to Plato, and must undoubtedly be regarded as interpolations, one might feel inclined to consider the work as it now stands as an abridgment of the Glossary of Timaeus, if Photius, who must have had the genuine work before him, did not describe it as a very little work (*βραχὺ πονημάτιον ἐν ἑνὶ λόγῳ*). But notwithstanding its brevity, the work is very valuable; and Ruhnken owns that he has not discovered in it a single instance of a word or a phrase being explained incorrectly. There is only one MS. of this Glossary, which appears to have been made in the tenth century of our æra, and which was unknown until Montfaucon drew attention to it. It was first edited, with an excellent commentary, by Ruhnken, at Leyden, 1754, 8vo.; a second and much improved edition appeared in the same place, 1789, 8vo. Two other editions have since been published in Germany, with additional notes by G. A. Koch (Leipzig, 1828 and 1833, 8vo.).

Suidas (*s. v.* Τίμαιος) ascribes to Timaeus, the Sicilian historian, a rhetorical work, called Συλλογὴ ῥητορικῶν ἀφορμῶν, in sixty-eight books, which Ruhnken, with great probability, attributes to Timaeus the Sophist, who wrote the Glossary to Plato.

(Ruhnken, *Praefatio ad Timaei Glossarium Platonicum.*)

TIMAEUS (Τίμαιος), of Locri, a Pythagorean philosopher. He was a contemporary of Plato, who is mentioned among his pupils, and is said to have been connected with him by friendship. (Cicero, *De Finibus*, v. 29; *De Re Publ.*, i. 10.) There exists a work, Περὶ τῆς τοῦ κόσμου ψυχῆς ('De Anima Mundi;' or, on the Soul of the Universe), written in the Doric dialect, which is usually ascribed to Timaeus the Locrian. It contains a brief exposition of the same ideas which are developed in the Dialogue of Plato, which is called after him Timaeus. (Tennemann, *System der Platonischen Philosophie*, i., p. 93, &c.) Separate editions of it have been published by D'Argens, at Berlin, 1762, 8vo., with a French translation; and by J. J. de Gelder, at Leyden, 1836, 8vo.

This Timaeus of Locri is said by Suidas to have also written the Life of Pythagoras; but the usual carelessness of Suidas renders this a doubtful point, as he may possibly have confounded the Locrian with the Sicilian Timaeus, who in his great historical work must have treated of the History of Pythagoras at considerable length.

(Fabricius, *Biblioth. Graec.*, iii., p. 94, &c.; Göller, *De Situ et Origine Syracusarum*, p. 200, &c.)

TIMA'LIA, a genus of birds characterized by Dr. Horsfield.

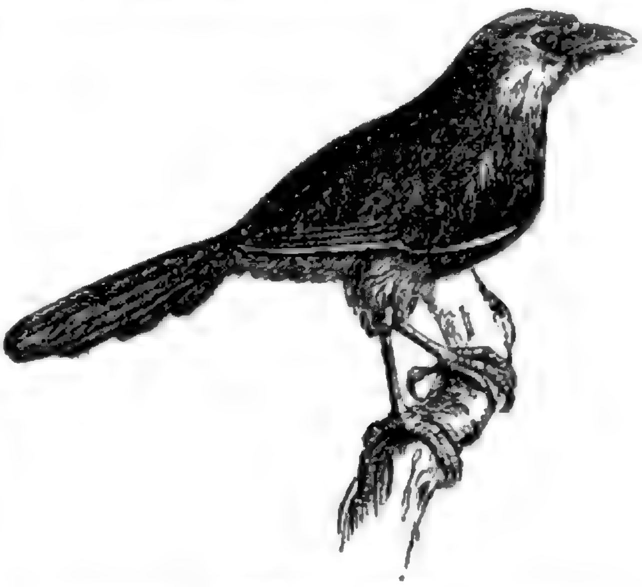
Generic Character.—*Bill* strong compressed, deep (altum). *Nostrils* subrounded. *Wings* short, rounded. *Tail* elongated and graduated. *Feet* strong: hind-claw twice as large as the middle anterior claw.

Dr. Horsfield states that a peculiar character is exhibited in both the species of *Timalia* recorded by him, in the structure of the plumes, which cover the back and the upper parts of the neck, as well as the breast, belly, vent, and thighs. He remarks that the separate filaments (*radii* of Illiger), which constitute the vanes or webs of those plumes, are not in close contact, as is generally the case, but, being inserted into the shaft at a small distance from each other, they diverge with perfect regularity. 'The parts which they cover,' says Dr. Horsfield in continuation, 'are accordingly marked with delicate parallel lines, and wherever several plumes lie over each other, they form a beautiful reticulation. On the posterior part of the abdomen, the vent, and the thighs, the plumes have a similar structure; but the filaments are greatly elongated and pendulous, so as to envelop those parts with a lax plumose covering, which on near inspection appears covered with delicate hairs. This appearance is produced by a series of very minute parallel villi, on each of the separate filaments, arranged with great regularity and beauty. Plumes in which this structure can be discerned with the naked eye are named decompound by Illiger, and described as those whose radii are pinnated with smaller lateral radii; and the effect which the arrangement of these decompound plumes has in the appearance of the bird is exhibited with accuracy both in the figure of *Timalia pileata* and *Timalia gularis*.'

Example, *Timalia pileata*.

Description.—Body ovate, rather stout. General colour above, brown with an olivaceous tint; underneath, testaceous inclining to grey. Head capped with saturated chestnut. Throat and cheeks white. Breast white inclining to grey, marked with intensely black stripes by the shafts of the plumes. A narrow white band commences at the forehead, near the base of the bill, passes backward, encircles the eye, and unites with the white plumes of the cheeks. Axillæ white; which colour also shows itself in a narrow border of the wing. Quills and tail-feathers of a more pure brown colour than the other parts; very narrow transverse undulations, of a darker colour, observable on the tail-feathers by close examination. Plumes of the hypochondriæ, thighs, and vent, long, pendulous, decompound, and villose. Lesser wing-coverts, as well as the plumes which cover the nape and back, greyish-blue at the base; which colour shows itself on the separate filaments or radii, if the plumes are accidentally deranged. Tail underneath brown, with a hoary tint. Bill black and shining. Feet brown. (Horsf.)

Locality, Habits, &c.—Dr. Horsfield observes that the species is not unfrequent in the groves and small woods which abound throughout Java. It often, he says, approaches villages and plantations, constructing its nest in the hedges; and he speaks of it as one of the social birds that delight to dwell in the vicinity of cultivation. In large forests he did not notice it. He describes its flight as low and interrupted, and adds that wherever it resides it is a welcome neighbour, in consequence of the peculiarity and pleasantness of its note, which consists of a slow repetition of the five tones of the diatonic scale (C, D, E, F, G), which it chants with perfect regularity, several times in succession, and at small intervals of time. Dr. Horsfield further remarked that the sixth tone was sometimes added; but as this required apparently an extraordinary effort, it was by no means so agreeable to a musical ear as the simple repetition of the five notes, which appeared to be the natural compass of the bird's organs. (*Zoological Researches in Java.*)



Timalia pileata. (Horsf.)

TIMALI'NÆ, Mr. G. R. Gray's name for his third subfamily of *Turdidæ*. [THRUSHES; TIMALIA.]

TIMANEES. [SIERRA LEONE.]

TIMANTHES, a native of Sicyon or of Cythnos, was one of the most celebrated painters of Greece; he was contemporary with Zeuxis and Parrhasius, and lived about 400 B.C. The works of Timanthes were distinguished particularly for their invention and expression, and one of the chief merits of his invention was, that he left much to be supplied by the imagination of the spectator. There is a remark in Pliny (*Hist. Nat.*, xxxv. 36), probably a quotation, which bestows the highest praise upon Timanthes: it says, though in execution always excellent, the execution is invariably surpassed by the conception. As an instance of the ingenuity of Timanthes' invention, the same writer tells us of a picture of a sleeping Cyclops, painted upon a small panel, but in which the painter had conveyed a perfect idea of the giant's huge size, by adding a few satyrs measuring his thumb with a thyrsus.

Though Timanthes was evidently one of the greatest painters of antiquity, antient authors have mentioned only five of his works: Pausanias makes no mention of him at all, and Cicero classes him among the painters who used only four colours.* He painted a celebrated picture of the stoning to death of the unfortunate Palamedes, the victim of the ignoble revenge of Ulysses for having proclaimed his apparent insanity to be feigned: a subject worthy of the pencil of a great master. This picture is said to have made Alexander shudder when he saw it at Ephesus. (Tzetzes, *Chil.*, viii. 198; Junius, *Cat. Artif.*, v. 'Timanthes.') Timanthes entered into competition with Parrhasius at Samos, and gained the victory; the subject of the paintings was the contest of Ajax and Ulysses for the arms of Achilles. [PARRHASIUS.] His most celebrated work however was that with which he bore away the palm from Colotes of Teos; the subject was the Sacrifice of Iphigenia; and perhaps no other work of antient art has been the object of so much criticism, for and against, as this painting, on account of the concealment of the face of Agamemnon in his mantle. The antients have all given the incident their unqualified approbation, but its propriety has been questioned by several modern critics, especially by Falconet and Sir Joshua Reynolds; Fuseli however, in an elaborate and excellent criticism in his first lecture, has probably finally settled the matter in favour of the painter. The Sacrifice of Iphigenia was given as the subject of a prize-picture to the students of the Royal Academy in 1778, and all the candidates imitated the 'trick' of Timanthes, as Sir Joshua Reynolds terms it, which was the origin of his criticism upon the subject in his eighth lecture: he says, 'Supposing this method of leaving the expression of grief to the imagination to be, as it was thought to be, the invention of the painter, and that it deserves all the praise that has been given it, still it is a trick that will serve but once; whoever does it a second time will not only want novelty, but be justly suspected of using artifice to evade difficulties.'

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* See 'Dictionary of Greek and Roman Antiquities,' art. 'Colores.'

The shallow remark of Falconet about Timanthes' exposing his own ignorance by concealing Agamemnon's face, is scarcely worthy of an allusion. It may be questioned whether Agamemnon, under such circumstances as he was placed, could have been well or even naturally represented in any other way: although many things might combine to render his presence at the sacrifice absolutely necessary, still it is not to be supposed that he could calmly stand by and be an eye-witness of his own daughter's immolation; notwithstanding his firm conviction that his attendance was necessary to sanction the deed, he could not look upon it; it would be unnatural. The criticism of Quintilian, Cicero, and others, that the painter, having represented Calchas sorrowful, Ulysses much more so, and having expressed extreme sorrow in the countenance of Menelaus, was in consequence compelled to conceal the face of the father, is not more pertinent than that of the modern critics. 'They were not aware,' says Fuseli, 'that by making Timanthes waste expression on inferior actors at the expense of a principal one, they call him an improvident spendthrift, and not a wise economist.'

Falconet observes that Timanthes had not even the merit of inventing the incident, but that he copied it from Euripides: upon this point Fuseli remarks—'It is observed by an ingenious critic that in the tragedy of Euripides the procession is described; and upon Iphigenia's looking back on her father, he groans and hides his face to conceal his tears: whilst the picture gives the moment that precedes the sacrifice, and the hiding has a different object, and arises from another impression' (v. 1550).

'I am not prepared with chronologic proofs to decide whether Euripides or Timanthes, who were contemporaries about the period of the Peloponnesian war, fell first on this expedient; though the silence of Pliny and Quintilian on that head seems to be in favour of the painter, neither of whom could be ignorant of the celebrated drama of Euripides, and would not willingly have suffered the honour of this master-stroke of an art they were so much better acquainted with than painting, to be transferred to another from its real author, had the poet's claim been prior.' As far as regards priority, the 'expedient' was made use of by Polygnotus long before either Timanthes or Euripides; in the Destruction of Troy, in the Lesche at Delphi, an infant is holding his hands over his eyes, to avoid the horrors of the scene. (Pausanias, *Phoc.*, x. 26.)

The fifth work of Timanthes mentioned by the antients was the picture of a hero, preserved in the time of Pliny in the Temple of Peace at Rome, an admirable performance.

There was another antient painter of the name of Timanthes; he was contemporary with Aratus, and distinguished himself for a painting of the battle of Pellene, in Arcadia, in which Aratus gained a victory over the Ætolians, Olym. 135.1 (240 B.C.). Plutarch praises the picture; he terms it an exact and animate representation (*Aratus*, 32).

TIMBER-TRADE. Several centuries ago the woods and forests of England were sufficient to supply all the timber required for the building of ships and houses, as well as for fuel. In the sixteenth century we begin to hear complaints of their exhaustion. An act having been passed in 1531 requiring coopers to sell their barrels at fixed prices (23 Hen. VIII., c. 4), they were allowed by another act (35 Hen. VIII., c. 8), passed twelve years afterwards, to increase their prices. Various circumstances rendered this change necessary; but at the time, the greater scarcity of timber, though only one cause of the rise of the material, was regarded as the sole cause, as is evident from an act passed during the same session, 'for the preservation of woods' (35 Hen. VIII., c. 17), in the preamble of which 'the decay of timber and woods universally within this realm of England' is said to be so great, 'that unless speedy remedy in that behalf be provided, there is great and manifest likelihood of scarcity and lack as well of timber for building, making, repairing of houses and ships, as also for fuel and fire-wood.' The act relating to the price of barrels required, amongst other things, that the exporters of beer should import clapboards sufficient to replace the barrels sent out of the country: and the other act was designed to enforce certain restrictions respecting the felling of trees, and to prevent the conversion of woodlands into pasture or tillage. The wealds of Kent, Sussex, and Surrey, where iron-works had been carried on from very antient times, were excluded from the provisions of this act. In 1558 however an act was passed (1 Eliz., c. 15), entitled 'An Act that timber shall not be felled to make coles for the making of iron,' which prohibited the use of timber one foot square in iron-works within fourteen miles of the sea, or within the same distance of eight of the principal rivers of England, or any navigable stream having an outlet on the coast: but the three southern counties previously mentioned were exempt from the operations of the act. The design seems to have been to encourage the trade in timber fit for building, and to benefit those parts of the country which did not possess a sufficient supply. Iron-works having been subsequently erected not far from London, and within the prescribed distance of the Thames, as well as within other limits, and which required so much fuel that the woods 'daily decay and become scant,' an act was passed in 1580 (23 Eliz., c. 5) to prevent the erection of new iron-works within the limits mentioned by the act of 1558, and the restrictions respecting felling trees were renewed. In 1592 the subject again attracted notice, and an act was passed (35 Eliz., c. 11), which, amongst other things, prohibited aliens exporting fish, unless they imported clapboards; and altogether prohibited the exportation of wine-casks. In the following century the scale of prices turned in favour of pit-coal. Before the discovery of the process of smelting iron with pit-coal, the transfer of this branch of industry to the colonies in North America was seriously entertained, and was carried into effect to some slight extent. It was also suggested that the waste lands of England should be planted; and the woods of Ireland being less exhausted than those of England, a considerable quantity of iron was for some time smelted there.

During the decline in the internal supply of timber, it gradually became an article of extensive demand from other countries. In 1830, according to a statement of Mr. Huskisson, the fir timber used in England for building purposes was nearly all brought from abroad. The proportion of timber of native production used for similar objects is not known or even guessed at. The north of Europe, especially the countries on the Baltic, and our colonies in British North America, are the great sources of supply. Teak is brought from the west coast of Africa, mahogany from the Bay of Honduras and other places, and fancy and dye woods from a number of other quarters; but none of these come into competition with the building timber of the Baltic or of our North American possessions. The timber of the north of Europe is generally of excellent quality, and much superior to the colonial timber. Sir Robert Seppings, formerly surveyor of the navy, stated before a parliamentary committee, 'that Canada timber is peculiarly subject to dry-rot; that frigates built of fir, the growth of North America, did not average half the durability of other timber; and that the Royal Navy had suffered so much from the use of Canada or North American timber, that its use was now altogether discontinued, except for deals and masts.' A number of timber-merchants, builders, and carpenters gave evidence before the same committee as to the inferior quality of the colonial timber. One of the witnesses said:—'It is not allowed to e used in government buildings, nor is it ever used in the est buildings in London. It is only speculators who use :, from the price of it being much lower than the Baltic timber.' The inferior colonial timber is forced into use y enormous differential duties, which, before the recent alteration of the tariff, amounted to a bonus of 1000 per ent. in some cases, as the following table shows:—

	Duty on Foreign Timber. £.	s.	d.	Ditto from British possessions. £.	s.	d.	Differential duty per cent.
Battens, per 120	10	0	0	1	0	0	1000
Deals, ditto	22	0	0	2	0	0	1000
Lath-wood, per fathom	4	5	0	0	15	0	566†
Masts, 12 inches and upwards, each	2	15	0	0	10	0	550
Staves, average duty per 120	3	0	0	0	6	0	1000
Oak planks, per load	4	0	0	0	15	0	533†
Fir timber, ditto	2	15	0	0	10	0	550
Oak ditto, ditto	2	15	0	0	10	0	550
Wainscot logs	3	15	0	0	12	0	625
Unenumerated timber	1	8	0	0	5	0	560

n 1787 the duty on foreign timber was only 6*s*. 8*d*. the load of fifty cubic feet, but it was raised at different times, until, in 1804, it amounted to 25*s*. In 1810 the duty was raised to 54*s*. 8*d*.; and from 1814 to 1820 it was 64*s*. 11*d*. and 65*s*. the load. The trade in colonial timber had scarcely any existence before 1803, although until 1798 t had been admitted free of duty; and the duty imposed n that year was only 3 per cent. *ad valorem*, which was changed in 1803 to a specific duty of 2*s*. the load. In consequence of the war there was a great rise in the price f European timber, and Memel fir advanced from 78*s*. to 120*s*. the load. In order therefore further to encourage he supply from our own colonies, North American timber was again, in 1806, admitted duty free. The stimulus was o doubt justifiable, but it was continued after the temporary causes in which it originated had passed away. The following table shows the effect of the differential duties n substituting colonial timber for that of the north of Europe:—

Average Quantities in periods of Five Years.		Baltic. Lds.	N. A. Colonies. Lds.	Total. Lds.	Per Centage proportion. Baltic.	Colonial.
1788 to	1792	219,396	2,660	222,057	99	1
1793	1797	164,000	1,825	165,825	99	1
1798	1802	178,019	2,916	180,935	99	1
1803	1807	232,477	16,533	249,070	94	6
1808	1812	73,718	120,537	194,255	38	62
1814	1818	125,855	147,597	273,453	46	54
1819	1823	116,600	335,556	452,158	26	74
1824	1828	191,890	410,903	602,793	32	68
1829	1833	192,783	412,632	635,466	24	76

The return to a sounder principle of taxation has been ery slow. In 1821, in consequence of recommendations from both Houses of Parliament, the duty on European timber was reduced from 65*s*. to 55*s*. the load, and a duty f 10*s*. was imposed on colonial timber, leaving a preference duty of 45*s*. still in operation. In 1831, the government of Earl Grey proposed, by gradual reductions, spread ver three years, to lower the duty on European timber 5*s*., which would still have left it at 40*s*., or 30*s*. higher han colonial; but the measure was defeated in the House of Commons by a majority of 236 to 190. A committee of the House of Commons which inquired into the timber duties in 1835, recommended a very inadequate reduction (similar to that proposed by Earl Grey's government), but t was not followed by any result; and in 1841 the government of Lord Melbourne proposed a reduction from 55*s*. he load to 45*s*. on foreign timber, and an increase from 10*s*. the load to 15*s*. on colonial; but subsequent party changes prevented this alteration being effected. In the tariff of 1842 (5 & 6 Vict., c. 47), the duty on colonial timber has been reduced to a merely nominal sum, namely, 1*s*. the load, and to 2*s*. on deals, and 6*d*. on lathwood. The reduction on foreign timber is partly prospective. Until the 10th of October, 1843, the duty will be 30*s*. the load on timber, and after this date 25*s*.; on foreign deals the reduction in the first instance is to 35*s*., and after October, 1843, it will be 30*s*., and the duty on lath-wood is at once reduced to 10*s*. the load. In 1841 the duty on timber produced 1,566,291*l*., and, without allowing for an increase of consumption in the first year, the loss of revenue is estimated at 601,491*l*.; and for the year ending October, 1844, when the reduced duties will be fully in operation, the loss to the revenue will be 589,991*l*. according to the estimate of the minister, who allows for an increase of 12 per cent. on foreign and 20 per cent. on colonial timber, and 20 per cent. on foreign and 24 per cent. on colonial deals. (Speech of Sir R. Peel, 11th March, 1842.) The mode of charging the duty has been improved and rendered less complex under the present arrangement. Planks, deals, and battens were formerly charged by the great hundred (120) in classes, and the duty was disproportionably heavy on the smallest and least valuable kinds. In measuring timber in logs, or unsawn, the cubic contents were, it is alleged, not fairly calculated, but were over-estimated to the extent of from 10 to 20 per cent.; and the sawyers complained that timber partly cut up was charged with a lower proportional duty than in the log, by which their interests were needlessly injured. The public however have still reason to complain that the duties are calculated, as before, to interpose restrictions on the use of superior timber, in order to benefit those who are engaged in supplying the inferior article. The direct loss sustained previous to the recent alteration of duty was estimated at 1,500,000*l*. annually; and a great sacrifice of revenue has now been made without attaining the benefits which might have attended a return to a better policy, though the disproportion will be only 24*s*. instead of 45*s*. the load. Prussia, Norway, Sweden, and other countries are still restricted in the means of exchanging their products for British manufactures; the preference duty on Canadian timber prevents a supply of timber being derived from the forests on the banks of the Danube and on the countries bordering the Black Sea; and the general shipping interests have been sacrificed to the owners of six or seven hundred half worn-out ships. In the colonies the monopoly duty has diverted industry from agriculture. It has been repeatedly shown that neither to any portion of the shipping interest here nor the timber interest of the colonies would a complete equalization of the timber duties be more than temporarily injurious. The fixed capital embarked in saw-mills does not, it is believed, exceed 200,000*l*., and some descriptions of Canadian timber would command the English market under any circumstances, while there is a growing demand for all kinds in the Northern states of the American union. The floating capital now engaged in the trade of 'lumbering' could of course be transferred with little difficulty to the cultivation of the soil, and the export of flour, tobacco, hemp, flax, and ashes, would fill up the vacuum occasioned by the diminished export of timber, and would require the shipping which had not found full employment in the new channels to which the timber-trade would be directed.

The consumption of timber in the United Kingdom in 1841 was as follows:—

	Great Hunds.	Gross Revenue.
Battens and Batten Ends	18,969	£156,120
Deals and Deal Ends from British America	44,148	90,113
Deals and Deal Ends from other parts	24,242	491,980
Staves	89,699	40,777
Timber 8 in. sq. and upwards from British America	Loads. 613,679	337,795
————from other parts	131,479	370,302

Other sorts are technically called 'woods,' meaning fancy woods for furniture, &c., and dye-woods. Of mahogany the consumption was 18,170 tons in 1841, having been 20,451 tons in 1840. (*Report of Committee on Timber Duties*, 1835; *British and Foreign Review*, No. 4; Porter's *Progress of the Nation*, vol. ii.)

TIMBER AND TIMBER-TREES.—Timber-trees are those the wood of which is used for building or repairing houses. Oak, ash, and elm, of the age of twenty years and upwards, are the trees most generally included under that denomination; but there are many other kinds of trees, such as beech, cherry, aspen, willow, thorn, holly, horsechesnut, lime, yew, walnut, &c., which are, by the custom of certain parts of England, considered as timber-trees, as being those used in building. (Cruise, *Dig.*, t. 3, c. 2, ss. 6, 7.) Most of the cases upon the question as to what trees are to be considered timber, have arisen in reference to the stat. 46 Edw. III., c. 3, whereby it was enacted that great or grosse wood of the age of twenty, thirty, or forty years, or upwards, should not be titheable, but that *sylva cædua*, or underwood, should be titheable. Lord Coke says that two doubts arose on the construction of this statute: first, what should be considered as high or great wood; and secondly, of what age those grosse or timber trees should be. As to the first, the answer was, that in this act the word *grosse* signified such wood as had been or was, either by common law or the custom of the country, timber; for the act did not extend to other woods that had not been or would not serve for timber, though they were of the bigness or greatness of timber. As to the second question, of what age those grosse or timber trees should be, the statute resolved this doubt in these words: 'Great wood of the age of twenty years or upwards;' which words were considered as declaratory of the common law on the subject. (2 *Inst.*, 642, 643; 3 *Rep.*, 12.) It appears now to be settled, though there have been contradictory decisions on the point, that trees of the growth of twenty years and upwards, sprung from old stools or roots, are within the exemption of this statute, and are consequently to be considered as timber. (4 M. & C., c. 600.)

The timber-trees growing upon land belong to the owner of the inheritance. A tenant for life has only a qualified interest in them, in so far as they afford him shade and shelter, and a right to take the mast and fruit. If the tenant for life fells timber-trees on the land to any amount greater than he is entitled to as estovers, that is to say, the allowance of wood necessary for the reparation of houses and fences, he becomes liable to an action of waste [WASTE]; and the trees, which by these or any other means, accidental or otherwise, have become severed from the land, may be seized by the owner of the inheritance, or an action may be brought by him for them. (3 P. W. 267.) If, however, the estate of the tenant for life be without impeachment of waste, he has the full right to fell timber, and also the property in all timber-trees felled and blown down during his life.

The Court of Chancery has sometimes directed the timber growing on an estate, whereof a person was tenant for life, to be cut down, for the purpose of paying debts and legacies charged upon the inheritance. (2 Vern., 152.) The Court of Chancery has also directed timber in a state of decay to be cut down for the benefit of the person entitled to the inheritance, provided no damage were done to the tenant for life. (2 Vern., 218.) The practice in these cases is to order the money arising from the sale of the timber to be invested, and the interest of it paid to the tenant for life.

In leases for lives, when timber is included, if the lessor fells the trees, the lessee may maintain an action of trespass against him, because the lessee, though he may not cut down the trees without being subject to an action of waste, has an interest in them for shade and shelter, and a right to take the mast and fruit, and may also lop them if they be not thereby injured. But where the trees are excepted in a lease, which is usually done, the lessee has no interest whatever in them, and the lessor may bring an action of trespass against him if he fells or damages them. The lessor has also a power, incident to the exception, of entering on the land in order to fell and take away the trees; though this power, for the sake of avoiding questions, is often expressly reserved.

The timber growing on copyhold estates is, by the general custom of most manors, the property of the lord, who may cut it down, provided he leaves a sufficient quantity for the repairs of the copyhold, which the copyholder is entitled to of common right. But the general right of the copyholder to have timber for the reparation of houses and for ploughbote and hedgebote may be restrained by custom, namely, that he shall not take it without assignment from the lord or his bailiff. (13 *Rep.*, 68.) Where the custom of the manor is that the copyholder shall employ the timber cut down in the reparation of his tenements, he may sell the tops and bark towards defraying the expenses of the repairs. (3 Buls., 282.) A copyholder in fee may, by the particular custom of the manor, have a right to cut timber-trees growing on his copyhold, and sell them at his pleasure; and the same right may belong by custom to a copyholder for life, who is entitled to nominate his successor, as being a *quasi* copyholder in fee: but a custom that a copyholder for life may cut down timber is unreasonable and void, as being a destruction of the inheritance, and contrary to the nature of a life estate.

Ecclesiastical persons being considered in most respects as tenants for life of the lands held by them *jure ecclesiæ*, are not permitted to cut down timber except for repairs; but by the 56 Geo. III., c. 52, the incumbent of any benefice, with the consent of the patron and bishop, is enabled to pay the moneys to arise by sale of any timber cut from the glebe-lands of such benefice, either for equality of exchange, or for the price of houses or lands purchased by him under the statutory powers vested in him for such purposes.

Trustees to preserve contingent remainders are bound to preserve not only the limitations of the settlement under which they are trustees, but also the inheritance of which the timber is part; and the Court of Chancery will interfere at their suit to prevent the owner of the particular estate joining with the person entitled to the inheritance for the time being to cut down the timber on the estate. (2 Swanst., 144.)

TIMBREL, a musical instrument of the highest antiquity; the *tympanum leve* of the Roman poets, and, in the opinion of all writers of any authority, the same, in an almost unaltered state, as that now known in every part of Europe under the names of tabor, tambourine, *tambour de Basque*, &c.

TIMBUCTU' (TEMBOCTU, TOMBOOKTOO, &c.) is placed by Mr. Arrowsmith, after careful criticism and collation of a number of routes, in 17° 8′ N. lat. and 2° 38′ W. long. Mr. M'Queen, to whom we are so much indebted for the extension and correction of our geographical knowledge of Africa, had placed it in 17° 40′ N. lat. and 2° 30′ W. long.; but 'readily yields the palm of accuracy to his (Mr. Arrowsmith's) researches in preference to my own. The position assigned by Mr. Arrowsmith may be assumed to be as exact as can be obtained until the point is fixed by astronomical observations on the spot: or even then, unless they may be made by more competent observers than the discrepancies among the statements of those who have attempted to ascertain the positions of places on the Lower Niger show some or all of these gentlemen to have been.

The position of Timbuctú is one which is most important to have ascertained, not merely on account of its being the centre of so many routes, and therefore a useful starting-point whence to calculate the horizontal bearings and distances of many places; but also as being, what the circumstance of so many routes meeting there might of itself have shown, the index of the comparative elevations, slopes, and depressions of the interior of Western Africa. It is for the same reason an important position relatively to the history of the migrations of African tribes, of the development of the trade of Africa, and of its progress in general civilization.

The rude map of the northern curve of the Kowara by the schoolmaster of Sultan Bello, the sketch of the position of Timbuctú given to Mr. Park by an old Somonu Moor, and the delineation of central Libya according to Ptolemy, all concur in representing the Niger at the most northern point of its course as forming a great curve—flowing first to the north, then to the east, and ultimately to the south. The discoveries of modern English travellers on the Upper and Lower Niger place it beyond a doubt that these representations must be in the main accurate; and the routes between a great number of different places obtained from Arab travellers from the coast-towns of Marocco, Algiers, Tunis, and Tripoli, to the interior, as well as from the natives of the interior themselves, all harmonize with and corroborate these conclusions. It is because the statements of M. Caillié agree with this view that we feel assured he has not intentionally deviated from veracity, and because we place a reliance on his account of the appearance and condition of individual places and persons which we can by no means accord to his bearings and distances.

Timbuctú appears to stand on the declivity of an inconsiderable eminence about eight miles north of the Niger. 'Nothing,' says Caillié, 'is to be seen in all directions but immense plains of loose shifting sands of a yellowish-white colour.' From the point where Caillié quitted the Niger, to Cabra, the port of Timbuctú, a distance of three miles, he passed along a narrow canal, and as he remarks that 'the negro slaves hauled the canoe along by a rope, as the pole would not have been sufficient to move it,' the natural inference is that he was proceeding up the stream. Between Cabra and Timbuctú he passed two lakes. These appearances coincide with the statements of Arabian geographers that a wady, filled during the rainy season with a stream of water, extends from north-east of Timbuctú, and, passing to the south of that town, disembogues into the Niger to the south-west of it. The same authorities mention a number of similar wadys at a distance of eight or ten days' journey to the north-east of Timbuctú, extending over a tract of country nearly 60 miles in breadth, and all apparently converging as they descend towards it as to a central point. The Gozen Zair, which falls into the Niger a short way to the south-east of Kabra, flows from the west. All these circumstances concur to indicate a strong analogy between the great northern curve of the Niger south of Timbuctú and the great northern bend of the Hoanghó. Both rivers, descending from elevated mountain ridges in a general northerly direction, are encountered by the slope of an extensive elevated plain, run some time in a direction from west to east at its side, and then turning to the south flow off through mountain defiles. It is this peculiarity in the structure of the plain on which Timbuctú is situated that has rendered that site from a remote antiquity the meeting-place of so many converging lines of traffic. It is the nearest point at which the traders from the commercial districts that skirt the coasts of the Mediterranean west of Barca, and of the Atlantic north of Cape Nun, can strike, after crossing the great desert, the fertile lands extending to the south-east and south-west along the Upper and Lower Niger.

Leo Africanus states that Timbuctú was built by Mansa Suleiman, about the year 610 of the Hejira (A.D. 1214), and that it soon became the capital of a powerful state. Seeing however that Ptolemy places towns of the name of Kúpha (Καφη) and Nigeira Metropolis (Νιγειρα Μητρόπολις), the former nearly in the probable meridian of Timbuctú, and the latter somewhat to the east, at the confluence of a tributary with the Niger, there can be little doubt that the town built by Mansa Suleiman was not the first important commercial station in those regions. Indeed an author quoted by Cooley (*Negroland of the Arabs*, p. 68) would lead us to believe that a town bearing the name Tombuti existed in those regions as early as the year 297 of the Hejira. Rulers with the title Mansa continued to govern Timbuctú from 610 to 792 of the Hejira.

The chiefs of Marocco and Fez rendered Timbuctú tributary, and from that time the communications of the Arabs with that country became more frequent and regular. Leo Africanus mentions that the grand mosque of the town and the palace of the king were built by an architect from Granada. The Arab conquerors allowed however the native dynasty to remain on the throne. The expulsion of the Arabs from Spain, and the weakening of the Arab power in North Africa by the Turkish conquests in Tunis, Tripoli, and Algiers, in the course of the fifteenth century, increased the impunity of the predatory nomade hordes; and about the same time, or a little later, the formation of settlements on the west coast of Africa, first by the Portuguese and afterwards by the English and French, by creating a new line of traffic with the interior, diminished the importance of Timbuctú as a commercial entrepôt. About the year 1500 a negro general of Soniheli, king of Timbuctú, raised the standard of revolt on the death of his master, overturned the Moorish supremacy, conquered a number of the neighbouring provinces, and recalled to Timbuctú a part of the trade which had left it for Jenné on the Niger. When Leo Africanus visited this part of Africa, the territories of Abu-Bekr-Ishieh, the negro conqueror, extended from Agadez on the north to Kashnah on the south. Marmol (1573) describes the commerce of Timbuctú as in a flourishing condition in his day. According to the information collected by Mr. Jackson, Timbuctú would appear, about 1668 or 1670, to have fallen under the dominion of the king of Bambarra; for Mullah Arshid, of Tafilet, having driven Sidi Ali of Suz from his territories, the fugitive was protected by the king of Bambarra, and created by him commandant of Timbuctú. Sidi Ali made his peace with Mullah Ismael, successor of Mullah Arshid, and the consequence was that Timbuctú became tributary to the prince of Tafilet. This connection terminated with the death of Mullah Ismael (1727), and since that time Timbuctú appears to have been governed by a negro ruler, that is, by one who is neither an Arab, nor a Tuarik, nor a Fellatah. The security of person and property, and the commerce of Timbuctú, appear to have fallen off since the accession of the negro dynasty.

Caillié estimates the permanent inhabitants of Timbuctú at from 10,000 to 12,000. After the arrival of the caravans the town assumes for a portion of the year a much more populous and probably a much more bustling appearance. During his stay it was dull and listless. The streets are clean, and wide enough to allow three horsemen to pass abreast. The houses are of sun-dried bricks, and consist entirely of a ground-floor; in some a sort of closet is constructed over the entrance; the apartments are built on the four sides of an open court in the centre. Both within the town and round about it there are numerous straw huts of a conical form. The town is not walled. In the centre of the town is a square surrounded by circular huts, and planted with a few trees: in the middle of it a large hole is dug as a receptacle for filth. Two enormous heaps outside of the town appeared to be accumulations of rubbish. Some buildings on the east side of the town are overwhelmed with sand. There are seven mosques; two of them large, and part of the largest apparently of considerable antiquity; each is surmounted by a brick tower. To the west-south-west of the town are large excavations from 35 to 40 feet deep, which collect in the rainy season the supplies of water which serve the inhabitants for drinking and culinary purposes throughout the year. There is no spontaneous vegetation near the town except some stunted mimosa-trees. Near the reservoirs are some small plantations of bad tobacco. The inhabitants of Timbuctú draw from Jenné their supplies of millet, rice, vegetable butter, honey, cotton, Soudan cloth, pepper, onions, dried fish, pistachias, &c. Fire-wood and timber for building, and provender for cattle, are brought from Cabra. They purchase cattle from the nomades of the tribe of Zawat, who possess the country two days' journey distant from Timbuctú to the north-east; from the people of Sala, ten days journey to the east; and from the Tuariks, who are the most powerful race, on all sides. They procure salt for their own consumption and for the trade with Soudan from Tádeini, which lies twenty days' journey north-west of the town.

The negro and Arab inhabitants of Timbuctú are exclusively engaged in trade. Great part of the Moors are from the sea-coast; they start with an adventure to Timbuctú, reside for some years there, and when they have acquired enough, return to their native country. The negro inhabitants dress like the Moors, and are zealous Mohammedans. They have several wives, whom, as well as their slaves, they employ in menial affairs. The Moors, who are only temporary residents, cohabit with their slaves. Caillié represents all classes of the inhabitants as cleanly both in their persons and houses. Several villages on the Niger are subject to Timbuctú. Cabra, the port of Timbuctú, is secured against the inundations by being slightly elevated above the marshes; the sandy desert commences immediately to the north of it. This place appeared to Caillié to contain about 1000 or 1200 inhabitants, all of the poorer class, engaged in the service of the merchants of Timbuctú. The dwellings are either mean houses or small huts; the street is neat, but the landing-place is dirty. The merchandize is conveyed between the port and Timbuctú on asses and camels: these belong in general to the inhabitants of Cabra; but sometimes the poorer Tuariks hire their camels for the purpose. The Tuariks are the terror of the surrounding country: they exact tribute from the inhabitants of Timbuctú, and tolls from all merchants who pass to the town overland or by the Niger. The nomade Arab tribes appear to stand in awe of them: the Fellatah to the south keep their ground against them; but as they surround Timbuctú for some distance on all sides, they hold the entire trade of these regions at their mercy.

(C. Ptolemaei *Geographia*, lib. viii.; James M'Queen, *A Geographical Survey of Africa;* C. A. Walckenaer, *Recherches Géographiques sur l'Intérieur de l'Afrique;*

Cooley, *Negroland of the Arabs; Travels* of Park, Lyon, Denham, Clapperton, Caillié, &c. &c.)

TIME. This word may be considered either with reference to our abstract idea of the thing signified by it, or to the measures of it which have been contrived for use in the business of life. Something on the first point of view will be found in the article SPACE AND TIME, to which the following may be added.

When we think of time in the usual manner, it is of a real thing external to ourselves, which we cannot help imagining to have an existence and a measure, both of which would remain though those who now speculate upon the conception were annihilated. A little more consideration shows that we are indebted for the idea to successions of observed events, or at least for the power of applying the idea to external objects. No description can be adequate; if we say that *change* necessarily implies *time*, and that the perception of that which *is* being different from that which *was*, suggests the notion of an interval, we see that we have already fully assumed the idea of time in the words *is* and *was*. But we may say that space and the objects which fill it exist independently of ourselves, and would undergo changes though we were not in existence to perceive them, and that therefore the times which those changes require would also exist; this involves the whole of the most abstruse part of metaphysics, and is much beyond the scope of our article. We shall therefore turn to the mode of measuring time; we have a thorough conviction that time is a magnitude, that is, has its *more* and *less*. We must ask ourselves in the first instance what we mean by a greater or a smaller time.

In the perception of time as a magnitude, that is, of intervals of time as containing more or less of duration, we refer in the first instance to a habit derived from continual acquaintance with those great natural successions on which the usual actions of our lives depend, with which we can constantly, though unconsciously, compare the duration of our thoughts and actions. There is no more an absolutely long or short time than there is an absolutely great or little space; these words are only comparative. If, for example, any one were to affirm that the universe was continually growing less and less, all its parts altering in the same proportion, and the dimensions of the human race with the rest, in such manner that the whole solar system would now go into a nut-shell, such as nut-shells were a thousand years ago, it would be impossible either for him to prove it, if true, or for any one else to prove the contradiction, if false. In like manner if any one were to say that the revolutions of all the heavenly bodies were continually accelerating, but that the properties of matter were also continually altering, and the speed with which ideas are formed and communicated, and muscular efforts made, continually increasing: it would be impossible to prove a contradiction. The oriental story is the best illustration of this:—A prince was ridiculing the legend of Mohammed being taken up by an angel, and holding many long conferences with his Creator, and having many views of heaven and hell to the smallest details, in so short a time, speaking with reference to things upon earth, that on his being brought back, the water had not quite flowed out of a jug which he had dropped from his hand when the angel caught him. A magician at the court of this prince checked his laughter by offering to prove the possibility of the story, if his highness would only dip his head into a basin of water. The prince consented, and the instant his head was immersed, found himself lying by the sea-shore in a strange country. After a reasonable quantity of malediction upon the magician, he found himself obliged by hunger to go to a neighbouring town, and seek the means of support. In time he became independent, married, and brought up a family, but was gradually stripped of all his substance by losses, and buried his wife and children. One day he threw himself into the sea to bathe, and on lifting his head out of the water, found that he had only lifted it out of the basin, the magician and the other courtiers standing round. On his bitterly reproaching the magician, the latter assured him, and was confirmed by all the bystanders, that he had done nothing but just dip his head into the basin, and lift it out again. Of course the prince expressed no more doubts about the story of Mohammed, and however much any reader of the two tales may think that neither *is* true, a little reflection will show that either *might* be so. Perhaps the allegory might have been suggested by what is known to take place in dreams; there is evidence enough that many of the longest of these illusions really occupy no more than, if so much as a second or two by the pendulum. [DREAM, p. 143.]

In the laws of motion it seems as if, so to speak, matter took cognizance of time; a particle of matter will continue to describe equal spaces in *equal times*, until acted on by force from without. Yet it would be possible to state this law as follows, in such a manner as to avoid the comparison of quantities of duration. If two particles acted on by no external forces, are at A and *a* at the same epoch of duration, and at B and *b* at the same subsequent epoch, then if A C be *m* times A B, and if *a c* be *m* times *a b*, the law of motion is that C and *c* will be respectively attained at the same instant. The mathematician will readily see that the equations of motion do not depend upon the absolute recognition of time as a measurable quantity, but that any moving particle, as A, being acted on by no force, the distance A C, described in the time *t*, might be introduced into all formulæ instead of the time, without any question as to whether, time being physically considered, the space A C varies as the time. It is enough that the uninfluenced motion of any other particle should be connected with that of the standard particle by the law above described. But though we can thus avoid the idea of measurement of time, we cannot get rid of its existence or of the notion of succession of epochs; grant that we can reduce dynamics to a *theory of simultaneous positions* of particles of matter, without reference to the absolute length of time employed in passing from one position to another, there is still the notion of time in the notion of simultaneous. But, nevertheless, the idea of succession thus introduced is hardly, if at all, more physical than that which comes into most of the branches of pure mathematics, a point on which it will be worth while to dwell for a moment.

When Newton, in his doctrine of fluxions, or flowing quantities, imagined length, space, solidity, and even number, to be generated by a continual and gradual flow, as a line by the motion of a point, a surface by that of a line, and so on, it was objected that he introduced the ideas of time and motion, both of which were foreign to pure mathematics, and properly belonged to mechanics. To get rid of these intruders, the theory of limits, which the notion of fluxions immediately requires, was attached, not to flowing quantities, but to variable quantities. Let *x* be a variable quantity, is one of the most common phrases of the systems which have superseded that of Newton. Now variation means change; it is never pretended that a variable has two values at once. All the difference is, that by Newton the object of consideration is supposed to grow larger or smaller, while the moderns pass in thought from a larger quantity to a smaller, or *vice versâ*, taking one first and the other afterwards. If so slight a difference as this be worth a contest, the distinction of pure and mixed science must be trivial enough: the fact is, that both systems consider successive values, and *succession is time*. If two computers were to quarrel which was the purer arithmetician, the one who stood still and counted the carriages as they passed by him, or the other who walked from one to another and counted them as they stood still, they would, to us, much resemble some of the disputants for and against the principle of fluxions.

The actual measure of time depends upon our being able to secure successions of similar events which shall furnish epochs separated by equal intervals of time. We cannot do this by our thoughts, except approximately, and for short periods. The memory of a musician, aided by the sentiment or feeling of time which is part of a good ear for music, will do remarkably well for a short period: a person who could not well preserve the division of a second into eight parts at least would make a poor figure in an orchestra. As to the judgment of considerable periods of time, it is materially influenced by the manner in which it has been spent: a time which *seems* to have been long through weariness *has* been long, and the contrary, on grounds already alluded to. Thus a year of mature age is really, to the thoughts, of a different length from one of childhood. Again, when we talk of a long period of time having passed quickly or slowly, we speak not of the time, but of our mode of remembering it. A person of rapid recapitulation always says that time has passed quickly, another of a contrary habit the contrary; and this whether the rapidity is a consequence of quickness of ideas, or of having little to recall.

In all the more correct machines which have been invented to measure time, there is but one principle: a vibration is kept up by the constant application of forces only just sufficient to counteract friction and other resistances, and machinery is applied to register the number of vibrations. The remarkable law noted under ISOCHRONISM and VIBRATION makes it comparatively immaterial whether the vibrations are of precisely the same extent. But the imperfections of such instruments, or rather, our ignorance of the precise action of disturbing causes, and particularly of changes of temperature, renders them comparatively useless for measuring long periods, so that if we could not have recourse to the motion of the heavenly bodies, there would be no permanent measure of time. And even in astronomical phenomena there is no absolute recurrence at equal intervals, though nearly enough for common purposes. The value of such phenomena for the most accurate measures consists in most of their irregularities being truly distributed about a uniform mean, so that the excesses of some periods are compensated by the defects of others, giving, in the long run, power of determining that mean with as much accuracy as our modes of measurement can appreciate. The determination of time for civil reckoning may be divided into two parts: first, the mode of making the different periods derived from the sun and moon agree with each other so as to afford an easy method of reckoning co-ordinately by both [PERIODS OF REVOLUTION]; secondly, the mode of procuring true and convenient subdivisions of the natural unit consisting of a day and night. To the second of these we now turn our attention.

The actual revolution of the earth, as measured by the time elapsed between two transits of the same star over the meridian, is called a *sidereal* day. It is divided, as are all other days, into twenty-four hours of sixty minutes each, &c. The time so given is called sidereal time. If the sun were a fixed star, this sidereal time would be the common mode of reckoning. But the sun having its own slow motion in the ecliptic, in the same direction as the revolution of the earth, the interval between one meridian transit of that body and the next is [SYNODIC] longer than the simple revolution of the earth, for just the same reason that the time which the minute-hand of a watch moves from coincidence with the hour-hand to coincidence again is longer than the hour, or simple revolution of the minute-hand. If the sun moved uniformly, and in the equator, the real solar day, which means the interval between two meridian transits of the sun, would always be of the same length, and a little longer than the sidereal day. But the sun neither does move uniformly, nor in the equator; and each of these circumstances causes a slight irregularity in the absolute length of the solar day, or, as it is called, the *real* solar day. This is the reason why the time shown by a sundial does not agree with the watch. To remedy this inconvenience, a fictitious sun is supposed to move in the ecliptic, and uniformly, while another fictitious sun moves in the equator, also uniformly. Both the fictitious bodies have the average motion of the real sun, so that the years of the three are the same; and the fictitious sun of the ecliptic is made to coincide with the real sun at the perigee and apogee, or nearest and farthest points from the earth; while the fictitious body in the equator is made to coincide with the fictitious body of the ecliptic at the equinoxes (from which it arises that there is also a coincidence at the solstices). This fictitious sun of the equator is that to which clocks are adjusted; the interval between two of its transits, which is always of the same length, is called a *mean solar day*, which is divided into twenty-four mean solar hours, &c. The difference between time as shown by the real sun and the fictitious sun in the equator, is called the equation of time.

The determination of the equation of time is a mathematical problem of some complexity: what we have here to notice is, that owing to the joint action of the two sources of difference, it presents a very irregular series of phenomena in the course of the year. If the sun moved regularly, but in the ecliptic, there would be no equation of time at the equinoxes and solstices: if the sun moved with its elliptic irregularity, but in the equator instead of the ecliptic, there would be no equation of time at the apogee and perigee. Between the two the equation of time vanishes only when the effect of one cause of irregularity is equal and opposite to that of the other; and this takes place four times a year. In this present year (1842) the state of the equation of time is as follows:—January 1, the clock is before the sundial $3^m\ 51^s$, and continues to gain upon the dial until February 11, when there is $14^m\ 35^s$ of difference. This then begins to diminish, and continues diminishing until April 15, when the two agree, and there is no equation. The dial then is before the clock until May 14, when the equation is $3^m\ 55^s$, which diminishes until June 15, when there is again no equation. The clock is now before the dial, and the equation increases till July 26, when the equation is $6^m\ 10^s$, which diminishes until the 1st of September, when there is no equation, for the third time. The dial is now again before the clock; and by November 2 the equation has become $16^m\ 18^s$, from which time it falls off until December 24, when it is nothing for the fourth and last time. The clock then gets gradually before the dial till the end of the year. The phenomena of the next year present a repetition of the same circumstances, with some trivial variations of magnitude. There are several slight disturbing causes to which we have not thought it worth while to advert in a popular explanation: in particular, the slow motion of the solar perigee [YEAR; SUN], which will in time wholly alter the phenomena. For instance, when the perigee comes to coincide with the equinox, there will be only two periods at which the equation of time vanishes, namely, when the sun is at either equinox.

The sidereal day is $23^h\ 56^m\ 4^s.09$ of a mean solar day, and the mean solar day is $24^h\ 3^m\ 56^s.55$ of a sidereal day. We have in this article only to do with the mode of obtaining a uniform measure of time, or of intervals of time; this being premised, the subject will be taken up again in the article YEAR.

TIME BARGAIN. [STOCKS.]

TIME OF DESCENT, the technical term for the time employed by a material particle in falling down an arc of a curve under the action of gravity, the mode of obtaining which is explained in VELOCITY. When any number of curves are drawn from a given point, and another curve is so drawn as to cut off from every one of them an arc which is described by a falling particle in one given time, that curve is called *tautochronous*, or a *tautochron*. But when a curve is such as the cycloid, namely, that a particle, wherever placed, will fall to the lowest point in the same time, such a curve is also called *tautochronous* by various writers, and *isochronous* by others. Our only object in inserting this article has been to note this confusion of language.

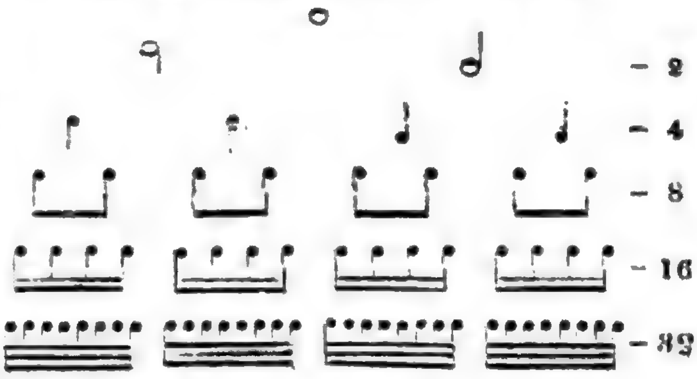
TIME (in Music) is:—

I. The measure of the duration of sound.

II. That which divides a bar into two or three equal parts, and subdivides these.

III. The movement—*i.e.* the quickness or slowness—of a composition.

1. The degree of sound, or pitch, is shown by the place on the staff of any one of the characters called notes; but its duration is known by the particular note; that is, as minim, or crotchet, &c. The longest note, in relation to time, used in modern music, is the semibreve, which is considered the measure-note, and its average length is about four beats of a healthy man's pulse. The five other notes are proportionate parts of this. Thus the minim is in duration ½ of a semibreve; the crotchet is ¼, &c.: consequently two minims, or four crotchets, &c., are equal to one semibreve, as exhibited in the annexed table:—



2. Time is either duple or triple. The former divides every bar, or measure, into 2, or 4, &c. equal parts; the latter into 3, or 6, &c. Times are marked by the letter C,—also by this letter barred (₵), and by figures. The C, whether barred or not, indicates *Common Time;* that is, duple time, having one semibreve, or its equivalent in notes, in each bar. Figures represent the fractions of a semibreve, the upper figure the numerator, the lower the denominator. When the numerator is 2 or 4, the time is duple; when 3, it is triple; when 6 or 12, it is compound-common; and when 9, it is compound-triple. But in reality, there are only two times,—binary and ternary; or, duple and triple; a fact which would long ago have been recognised and acted on, had music, as a system, made those advances which have long been witnessed in the other arts and sciences.

3. The term *Time* has hitherto had a third meaning annexed to it in musical language, by its employment in the sense of movement, a practice which has produced some confusion. The Italian word *Tempo*, signifying the same, is now growing into use—a manifest improvement, which, it is to be hoped, will not have to encounter those professional prejudices under which music has so long laboured. [METRONOME.]

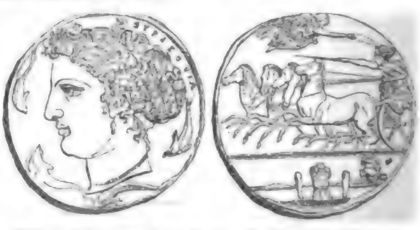
On the subject of Time (*Tems*) Rousseau has well remarked, that a succession of sounds, however skilfully arranged as to high and low, produces only vague effects. It is measure, the duration, relative and proportional, of sounds, which fixes the true character of the music, and endows it with all its energy. Time (under which term he, of course, includes rhythm) is the soul of song. Airs whose movement is slow make us pensive; but a gay, spirited, and well cadenced air inspires us with joy, and our feet can hardly be restrained from dancing. Break the measure, confound the relative times of the sounds, and the very same airs which proportion had rendered so agreeable, at once lose all their character, all their charms, and are incapable of exciting the slightest degree of pleasure. Time, on the contrary, possesses a force, a power, in itself, and acts independently of a diversity of sounds. The drum furnishes a proof of this, rough and imperfect as the instrument is, because (the author ought to have said) its beats are in rhythm, though the sound is unvaried.

TIMO'LEON (Τιμολέων), a Greek general and statesman. He was a native of Corinth, and the son of Timodemus and Timariste. Respecting his youth we know nothing, except that he was no less distinguished by his noble character and his love of freedom than by his illustrious descent. When he had grown up to manhood, his elder brother Timophanes, who had been elected general by the Corinthians, assumed the tyrannis in his native city by the help of his friends and his mercenaries. Timoleon at first only remonstrated with his brother, but when this was useless, he formed a plot against him, and Timophanes was killed. Soon after this event, which threw all Corinth into a state of violent agitation, some extolling the conduct of Timoleon as magnanimous and worthy of a real patriot, others cursing and condemning him as a fratricide, there arrived at Corinth ambassadors from Syracuse soliciting the aid of the Corinthians against its oppressors. This was a favourable opportunity for the party hostile to Timoleon to get rid of his followers, while at the same time it opened to Timoleon a field of action in Sicily, where he might act according to his principles and deliver the island from its oppressors. Timoleon was accordingly sent to Syracuse with a small band of mercenaries, which he himself had raised, 344 B.C. Syracuse was then divided into three parties: the popular party, which had engaged the service of Timoleon; a Carthaginian party; and the party of Dionysius, the tyrant, who had returned from Italy in B.C. 346. Dionysius had already been driven out of a part of the city by Hicetas, the tyrant of Leontini, who supported the Carthaginian party. On the arrival of Timoleon, Hicetas was compelled to withdraw to Leontini, and Dionysius, who was reduced to surrender himself and the citadel to Timoleon, was allowed to quit the island in safety, and he withdrew to Corinth, in B.C. 343. [DIONYSIUS.] Syracuse had almost become desolate by the successive revolutions and party warfare. During the winter and the spring following his victory over Dionysius, Timoleon endeavoured as much as was in his power to restore the prosperity of the city by recalling those who had been exiled, and by inviting colonists from other parts of Sicily and assigning lands to them. After this he continued to carry on petty warfare partly against the Carthaginians and partly against Hicetas. The Carthaginians in the meantime collected a new army, which is said to have consisted of 70,000 foot and 10,000 horse, and which was conveyed to Sicily by a large fleet. Timoleon could muster no more than 3000 Syracusans and 9000 mercenaries, but in order to strengthen himself he concluded a peace with Hicetas, some of whose troops now joined his army. He marched out against the enemy, and by his superior generalship he succeeded in gaining a brilliant victory over the Carthaginians on the banks of the river Crimessus, and confined them to the part of Sicily between the river Halycus and the western coast, B.C. 339. After this victory and the conclusion of a peace with Carthage he directed his arms against the tyrants in other towns of Sicily, whom he compelled to surrender or withdraw, partly by the terror of his name and partly by force of arms. Hicetas was made prisoner, and condemned to death by the Syracusans, with his wife and family.

After freedom and the ascendency of Syracuse were thus restored in the greater part of Sicily, Timoleon directed his attention to the restoration of the prosperity of the towns and the country. The former, especially Syracuse, were still thinly peopled, and he invited colonists from Corinth and other parts to settle there, and distributed lands among them. He himself, with the consent of the Syracusans, undertook to revise and amend their constitution and laws, and to adapt them to the altered wants and circumstances of the state. Although it would have been easy for him to establish himself as tyrant and to secure to his descendants the kingly power at Syracuse, he fulfilled the duties of the office entrusted to him with a fidelity which has rarely been equalled. He had no other end in view but the establishment of popular liberty, for which he prepared and trained the people. Some acts of cruelty and apparent injustice with which he is charged, find their excuse in the character of those whom he had to deal with, for the Syracusans at that time were a motley and demoralized people, who could not be managed without Timoleon's assuming at times the very power which it was his wish to destroy. But Syracuse and Sicily felt the benefits of his institutions for many years after his death, and continued to enjoy increasing prosperity.

During the latter part of his life Timoleon was blind and lived in retirement, respected and beloved by the Sicilians as their liberator and benefactor. He died in the year B.C. 337, and was buried in the Agora of Syracuse, where subsequently his grave was surrounded by porticoes and adorned with a gymnasium called the Timoleonteum.

(Plutarch, and C. Nepos, *Life of Timoleon;* and Diodorus Siculus, lib. xvi.)



Decadrachm of Syracuse, inserted as a sample of the Coins of Syracuse.
British Museum. Actual size. Silver. Weight, 625 grains.

TIMO'MACHUS, a celebrated antient painter, a native of Byzantium, and said to have been the contemporary of Julius Cæsar. Pliny (*Nat. Hist.*, xxxv. 40) informs us that Cæsar purchased two pictures in encaustic by Timomachus, for 80 Attic talents, about 17,280*l.*; one representing Ajax the son of Telamon brooding over his misfortunes; the other, Medea about to destroy her children: he dedicated them in the temple of Venus Genetrix. These pictures have been much celebrated by the poets; there are several epigrams upon them in the Greek anthology, and they are alluded to by Ovid in the two following lines:—

'Utque sedet vultu fassus Telamonius iram,
Inque oculis facinus barbara mater habet.' (*Trist.*, ii. 525.)

('Ajax the son of Telamon is seated, showing his anger by his countenance; and the barbarous mother betrays by her eyes her intended crime.')

We learn from Pliny also that the picture of Medea was not finished; its completion was interrupted apparently by the death of the painter, yet it was admired, he says, more than any of the finished works of Timomachus, as was the case likewise with the Iris of Aristides, the Tyndaridæ of Nicomachus, and a Venus by Apelles, which were more admired than any of the finished works of their respective masters. This picture is noticed also by Plutarch (*De Aud. Poet.*, 3) in a passage where he speaks of the representation of improper subjects, but which we admire on account of the excellence of the execution.

In the common text of Pliny, Timomachus is said to be the contemporary of Cæsar ('Julii Cæsaris aetate'), but Durand, in his 'Histoire de la Peinture Ancienne,' &c., expresses an opinion that the word *aetate* is an addition of the copyist, for which he assigns several reasons. The conjecture has much in its favour; the price of these pictures (17,280*l.*) is enormous, if we suppose it to have been paid to a living painter; but on the contrary it is a case with many parallels if we suppose the money to have been paid for two of the reputed masterpieces of antient painting. The fact of the Medea being unfinished puts it beyond a doubt that the picture was not purchased of the painter himself; and from a passage in Cicero (*In Verr.*, l. iv., c. 60) it seems equally clear that both pictures were purchased of the city of Cyzicus; and from the manner in which they are mentioned with many of the most celebrated productions of the antient Greek artists, it would appear that they were works of similar renown, and were likewise the productions of an artist long since deceased. Timomachus was therefore most probably a contemporary of Pausias, Nicias, and other encaustic painters, about 300 B.C. Pliny himself, elsewhere speaking of Timomachus, mentions him together with the more antient and most celebrated painters of Greece, with Nicomachus, Apelles, and Aristides, as in the passage above quoted.

Pliny mentions also the following works of Timomachus: an Orestes; an Iphigenia in Tauris; Lecythion, a gymnasiast; a 'cognatio nobilium;' two philosophers or others, with the pallium, about to speak, one standing, the other sitting; and a very celebrated picture of a Gorgon.

TIMON (Τίμων), a Greek poet and philosopher who lived in the reign of Ptolemaeus Philadelphus, about 270 B.C. He was the son of Timarchus, and a native of Phlius in the territory of Sicyon. He studied philosophy under Stilpo, at Megara, and under Pyrrho, in Elis. He subsequently spent some time in the countries north of the Ægean, and thence went to Athens, where he passed the remainder of his life, and died in the ninetieth year of his age.

Diogenes Laertius, who has written an account of Timon (ix., c. 12), ascribes to him epic poems, 60 tragedies, satyric dramas, 30 comedies, silli (σίλλοι), and cinaedi (κίναιδοι) or licentious songs. The silli however appear to have been the kind of poetry in which he excelled. They were satires directed against the arrogance and pedantry of the learned. Timon wrote three books of silli (Athenaeus, vi., p. 251; vii., p. 279), in which he parodied all the dogmatic philosophers of Greece: he himself was a Sceptic. The metre of these poems was the hexameter, and it appears that sometimes he took whole passages from Homer which he applied as parodies. In the first book Timon spoke in his own person; in the second and third the form of the poems was that of a dialogue, in which he conversed with Xenophanes of Colophon, who was supposed to have been the inventor of the silli. (Diogenes Laert., ix. 111.) We now only possess a few fragments of these poems, which show that in their way they must have been admirable productions. They are collected in H. Stephanus, 'Poesis Philosophica;' in F. Paul, 'De Sillis Graecorum,' Berlin, 1821, p. 41, &c.; in Brunck's 'Analecta,' ii. 67; and iv. 139. Respecting the other works ascribed to him we possess no information.

(J. F. Langheinrich, *De Timone Sillographo*, in 3 parts, Lipsiae, 1720-23.)

TIMON (Τίμων), surnamed the Misanthrope, was a son of Echecratides, and a native of Colyttus, a demos in Attica. (Lucian, *Timon*, c. 7; Tzetzes, *Chil.*, vii. 273.) He lived during the Peloponnesian war, and is said to have been disappointed in the friendships he had formed, in consequence of which he conceived a bitter hatred of all mankind. His conduct during the period that his mind was in this state was very extraordinary. He lived almost entirely secluded from society, and his eccentricities gave rise to numerous anecdotes, which were current in antiquity. The sea is said to have separated even his grave, which was on the sea-coast, from the mainland, by forming it into an island and thus rendering it inaccessible. (Plutarch, *Anton.*, 70; Suidas, *s. v.* ἀποῤῥῶγας.) The comic poets, such as Phrynichus (Bekker. *Anecdota*, p. 344), Aristophanes (*Lysistr.*, 809, &c.; *Aves*, 1548), Plato, and Antiphanes, ridiculed him in their comedies. Antiphanes wrote a comedy called 'Timon,' which perhaps furnished Lucian with the groundwork for his dialogue in which this misanthrope acts the most prominent part. His name has remained proverbial to designate a misanthrope down to the present day, and is immortalized by the genius of Shakspere.

(Hemsterhuis, *On Lucian*, vol. i., p. 99, of the smaller edition.)

TIMOR. [SUNDA ISLANDS, LESSER.]

TIMORLAUT. [SUNDA ISLANDS, LESSER.]

TIMOTE'O DA URBI'NO, or DELLA VITE, a celebrated Italian painter of the Roman school, was born at Urbino in 1470, or rather 1480. In about his 20th year, by the advice of a brother living in Bologna, he repaired to that city to learn the business of a jeweller, &c.; but displaying a power of design worthy of a greater purpose, he devoted himself to painting, and according to Malvasia attended the school of Francia in Bologna for about five years: Vasari however says that Timoteo was his own master. At the age of 26 he returned to Urbino, where in a short time he so far distinguished himself, says Vasari, as to receive an invitation from his cousin Raphael in Rome to repair thither and assist him in some of his extensive works. This statement creates a difficulty not easy to be cleared up: Vasari says that Timoteo died in 1524, aged 54; yet we find him in his 27th or 28th year, consequently in 1497 or 1498, going to Rome to assist Raphael, who however did not go to Rome himself until 1508: 1524 was very probably therefore a misprint for 1534 in the original edition of Vasari, and the error has found its way into all the later works. By this supposition and by allowing a year or two to have elapsed between his return to Urbino and his visit to Rome, the various dates may be easily reconciled, and what Vasari says about Timoteo's assisting Raphael to paint the Sibyls in the Chiesa della Pace, which were painted in 1511, becomes quite consistent. He did not remain long in Rome, but returned to his native place at the solicitation of his mother, much to the displeasure of Raphael. He remained however quite long enough to learn to appreciate and to imitate the beauties of Raphael's style, and to become one of the most distinguished painters of the Roman school; yet there are in all his works traces of the style of Francia, a certain timidity of design, a delicacy of execution, and a richness of colouring. His chief works are at Urbino, at Forlì, and in the neighbourhood; he executed many of them in company with Girolamo Genga, as a chapel at Forlì and part of the paintings in the chapel of San Martino in the Cathedral of Urbino; the altar-piece was painted entirely by Timoteo: he executed also some excellent works in fresco at Castel Durante. Further, in Urbino there are—in the Cathedral, a Magdalen; in San Bernardino, outside the city, a celebrated picture of the Annunciation of the Virgin; and another fine picture with several figures in Santa Agata; also in the residence of the Dukes of Urbino, an Apollo and two of the Muses, extremely beautiful; besides many other works. Vasari remarks that he left some works unfinished at his death, which were afterwards completed by others, and he adds that there could not be a more satisfactory evidence of the general superiority of Timoteo. He was of a cheerful disposition, and used to play every kind of instrument, but especially the lyre, which he accompanied with his voice, with extraordinary grace and feeling. Lanzi says that the Conception at the Observantines at Urbino, and a *Noli me tangere* in the church of Sant' Angelo at Cagli, are perhaps the best of his works that remain. The same writer observes that Pietro della Vite, the brother of Timoteo, also a painter, was probably the priest of Urbino mentioned by Baldinucci (vol. v.) as Raphael's cousin and heir.

(Vasari, *Vite de' Pittori*, &c.; Lanzi, *Storia Pittorica della Italia*.)

TIMO'THEUS (Τιμόθεος), son of Conon of Athens. He inherited from his father a considerable fortune, and if we may judge from his intimacy with Isocrates, Plato, and other men of talent, and from the manner in which others speak of him, he received a most excellent education; but no important particulars are known respecting his earlier life. The first time that he comes prominently forward in the history of his country, was during the war between Thebes and Sparta. In the year B.C. 375, after the battle of Naxos, the Thebans, who were threatened with an invasion by the Lacedæmonians, requested the Athenians to avert this danger by sending a fleet round Peloponnesus, as they had done at the beginning of the Peloponnesian war. The request was readily complied with, and Timotheus was appointed commander of a fleet of sixty ships, with which he was to sail round Peloponnesus and along the western coasts of Greece. In this expedition he first took Corcyra, which he treated with the utmost mildness and without making any use of his right as conqueror. The consequence was, that he had very easy work with Cephalenia and Acarnania, and that even Alcetas, king of the Molossians, was induced to join the Athenian alliance. But while Timotheus was thus reviving the power of Athens in that part of Greece, the Lacedæmonians sent out a fleet against him, under the command of Nicolochus. A battle was fought near the bay of Alyzia, in which the Spartans were defeated. Soon after Nicolochus offered another battle, but as the fleet of Timotheus had suffered too much to allow him to accept it, Nicolochus raised a trophy. But Timotheus soon restored his fleet, which was increased by reinforcements of the allies to seventy ships, against which Nicolochus could not venture anything. The original object of the expedition however was now accomplished, as the Spartans had not been able to make their projected invasion of Bœotia, and Thebes was thus enabled to direct her forces against the Bœotian towns which asserted their independence. Timotheus at the head of his large fleet had no means of maintaining it, for Thebes herself had contributed nothing towards it, and Athens, which was not in a very prosperous condition, had been obliged to bear all the expenses of the fleet, with the exception of what Timotheus himself had furnished from his private purse. Athens therefore concluded a separate peace with Sparta, and sent orders to Timotheus to return home. On his way thither he landed at Zacynthus a body of exiles who probably belonged to the democratical party of the place, and who had sought his protection. He provided them with the means of opposing and annoying their enemies, the oligarchical party of Zacynthus, which was in alliance with Sparta. The oligarchs sent envoys to Sparta to complain, and Sparta sent envoys to Athens to remonstrate against the conduct of her admiral. But no satisfaction was given, as the Athenians would not sacrifice the Zacynthian exiles for the purpose of maintaining the peace. The Spartans therefore looked upon the peace as broken, and prepared for new hostilities.

Soon after these occurrences Corcyra was hard pressed by the Peloponnesian fleet, and implored the Athenians for protection. Timotheus, who, on his former expedition, had given such great proofs of skill and talent, was again entrusted with the command of sixty ships. But Athens, which was itself in great financial difficulties, had not the means to equip them, and Timotheus in the spring of 373 B.C. sailed to the coasts and islands of the Ægean to request the Athenian allies to provide him with the means of assisting the Corcyraeans. He appears to have received some support from Bœotia (Demosth. *in Timoth.*, p.1188), and in Macedonia he formed friendly relations with king Amyntas. His proceedings however went on very slowly, and apparently without much success, for he was of too gentle a disposition to force the allies to furnish what they could not give conveniently. At last however he had sailed as far as the island of Calaurea, where his men began to murmur because they were not paid. The state of affairs in Corcyra had grown worse every day. His enemies at Athens seized upon the slowness of his progress as a favourable opportunity for aiming a blow at him. Iphicrates and Callistratus came forward to accuse him, whereupon he was recalled, and the command of his fleet given to his accusers and Chabrias. His trial was deferred till late in the autumn; but he was acquitted, not indeed on account of his innocence, though it was well attested, but on account of the interference of Alcetas, the Molossian, and Jason of Pherae, who had come to Athens to protect him.

In B.C. 361, after the removal of his rival Iphicrates Timotheus received the command of the fleet on the coast of Macedonia. He took Potidaea and Torone from Olynthus, and these conquests were followed by the reduction of all the Chalcidian towns. From thence he proceeded to the Hellespont, where, with the assistance of Ariobarzanes, he again gained possession of several towns. In the year following he commenced his operations against Amphipolis, in which however he had no success at all, probably on account of the interference of the Macedonians, who supported the town, and Timotheus was nearly compelled to take to flight.

In the year 357 B.C. Timotheus and Iphicrates, who had for some time been reconciled to each other through the marriage between a daughter of the former and a son of the latter, obtained the command of a fleet of 60 sail against the rebellious allies of Athens, especially against Samos. But the Athenian arms were unsuccessful, and a treaty was concluded between the belligerents, which put an end to the Social War. The Athenian generals however, Timotheus, Iphicrates, and Menestheus, were charged with having caused the ill-luck of the Athenians, and brought to trial. Timotheus in particular was accused of having received bribes from the Chians and Rhodians. His colleagues, who were themselves in the greatest danger, were so convinced of his innocence, that they declared they were willing to take all the responsibility upon themselves. But he was nevertheless condemned to pay a fine of 100 talents. As he was unable to pay the sum, he withdrew to Chalcis in Eubœa, where he died soon after, in B.C. 354. The injustice of this sentence was tacitly acknowledged by the Athenians after the death of Timotheus, by the manner in which his son Conon was allowed to settle the debt of his father.

Timotheus was no less distinguished as a man than as a general. He was of a very humane and disinterested character. He sacrificed all his property in the service of his country, while other men of his age used public offices only as a means of enriching themselves. When Alcetas and Jason came to Athens to protect him, they lodged in his house, at which time he was so poor, that he was obliged to borrow furniture to receive his illustrious friends in a manner worthy of their station. Even his enemies, when they came to know him, could not help feeling attachment and esteem for him.

(Xenophon, *Hellen.*, v. 4, 63, &c.: vi. 2, 11, &c.; Isocrates, *De Permutatione;* C. Nepos, *Timotheus;* Diodorus Sic., xv. and xvi.; compare Thirlwall, *History of Greece*, vol. v.)

TIMO'THEUS (Τιμόθεος) of Miletus, a Greek musician and lyric poet. The time when his reputation had reached its height was about the year B.C. 398. (Diodorus Sic. xiv. 46.) He was a contemporary of Euripides, and spent the last years of his life at the court of Macedonia, where he died in B.C. 357, at the advanced age of 97. He increased the number of the strings of the lyre to eleven, an innovation which was considered by the Spartans, who would not go beyond the number of seven strings, to be a corruption of music, and a decree was passed at Sparta, which is still extant in Boëthius, condemnatory of his innovation. (Plutarch, *De Mus.*, p. 1141, ed. Frankf.; Athenaeus, xiv., p. 636.) Suidas mentions a great number of poetical compositions of Timotheus, which were in their time very popular in Greece; among them are nineteen nomes, thirty-six prooemia, eighteen dithyrambs, and twenty-one hymns. All these works are now lost, with the exception of a few fragments which are preserved in Athenaeus and the grammarians.

(Vossius, *De Poetis Graecis*, p. 46; Bode, *Geschichte der Lyrischen Dichtkunst der Hellenen*, vol. ii., p. 305, &c.)

TIMO'THEUS (Τιμόθεος), an Athenian poet of the so-called middle comedy. Suidas mentions the titles of several of his plays, and Athenaeus (vi., p. 243) has preserved a fragment of one which bore the title 'The Little Dog.' (Compare A. Meineke, *Historia Critica Comicorum Graecorum*, p. 428.)

TIMOTHY, EPISTLES OF ST. PAUL TO. Timothy, to whom these Epistles are addressed, was a native of Lystra, a city of Lycaonia, in Asia Minor. His father was a Greek, or Gentile, but his mother, Eunice, was a Jewess. Both his mother and grandmother Lois were Christian believers (2 *Timoth.*, i. 5), who were probably converted to the faith by the preaching of Paul and Barnabas on the occasion of their first apostolical journey among the Gentiles. Whether Timothy was himself converted by St. Paul or by the teaching of his mother does not appear; but it is certain that she had taken great pains with her son's education, for from a child, as St. Paul says, 'he had known the Holy Scriptures.' (2 *Timoth.*, iii. 15.) His devotion to his new faith was so ardent, and the progress he made in the knowledge of the gospel so great, that he gained the esteem and good word of all his Christian acquaintance. Accordingly when St. Paul paid his second visit to Lystra, the believers both of that city and Iconium commended him so highly to Paul, that he 'would have Timothy go forth with him' as the companion of his travels. Previously to commencing them however St. Paul circumcised Timothy, 'because of the Jews,' who were numerous and powerful in those parts, and likely to take offence at the preaching and ministration of an uncircumcised teacher. (*Acts*, xvi. 1-3.) He was then solemnly admitted and set apart to the office of an evangelist, or preacher of the gospel, by the elders of Lystra and St. Paul himself laying their hands upon him (1 *Tim.*, iv. 14; 2 *Tim.*, i. 6), though he was probably not more than twenty years of age at the time. From this period (A.D. 46) mention is frequently made of Timothy as the companion of St. Paul in his journeys, as assisting him in preaching the gospel, and in conveying his instructions to the different Christian churches. His first mission was in company with St. Paul and Silas, when they visited the churches of Phrygia and delivered to them the decrees of the council of elders at Jerusalem, by which the Gentiles were released from the obedience to the law of Moses as a requisite for salvation. From Phrygia he proceeded in the same company to Troas, and thence to Macedonia, where he assisted in founding the churches of Philippi, Thessalonica, and Berœa, at the last of which cities he and Silas were left when St. Paul was driven from Macedonia by the persecution of the Jews in that country and retired to Athens. In this city St. Paul was subsequently joined by Timothy (1 *Thess.*, iii. 1), who gave him such an account of the afflicted state of the Thessalonian Christians as induced him to send Timothy back to 'establish and comfort them, concerning their faith': a charge both of difficulty and danger. From Athens St. Paul went to Corinth, where he was joined by Timothy and Silvanus, who both assisted him in converting the Corinthians and establishing the Corinthian church, for a period of a year and a half. (2 *Cor.*, i.) When St. Paul left Corinth, Timothy appears to have accompanied him on his return to Asia, where they resided nearly three years, without interruption, except during the visit of St. Paul to Jerusalem, to keep the feast there, in which however it does not appear that he was accompanied by Timothy. Towards the expiration of their residence at Ephesus, St. Paul despatched Timothy and Erastus together to precede himself on a journey to Macedonia. (*Acts*, xix. 22.) It would also seem (1 *Cor.*, iv. 17) that St. Paul at the same time charged Timothy to visit the church of Corinth. On returning from Corinth to Macedonia, Timothy was joined by St. Paul from Ephesus, and henceforward they were frequently together, till Timothy was appointed by St. Paul to govern the church of Ephesus. In the interval between St. Paul's joining Timothy in Macedonia and the appointment of the latter to the superintendence of the church at Ephesus, Timothy appears either to have accompanied St. Paul on his first journey to Rome, or to have visited him there. St. Paul, as is well known, was a prisoner at Rome, though under but little restraint, and from *Hebrews* (xiii. 23) we may conclude that Timothy also suffered imprisonment either at Rome or elsewhere in Italy; and that he was released before St. Paul left that city. The subsequent history of St. Paul and Timothy is not clearly given either in the *Acts of the Apostles* or the Epistles of the New Testament; but it is reasonable to suppose that when they were both set at liberty, they renewed the journeys made for founding new churches and revisiting old. (See *Hebrews*, xiii. 23; *Philipp.*, i. 1; ii. 19; 1 *Tim.*, i. 3.)

Timothy was eventually left with the charge of the church at Ephesus, where St. Paul had made his head-quarters in Asia. How long Timothy exercised this office is not known, nor can we determine the time of his death. An ecclesiastical tradition relates that he suffered martyrdom, being killed with stones and clubs (A.D. 97) while he was preaching against idolatry in the neighbourhood of the temple of Diana at Ephesus. His supposed relics were removed to Constantinople, with great pomp, A.D. 356, in the reign of the emperor Constantine. Shortly after Timothy's appointment to the superintendence of the church at Ephesus, St. Paul wrote to him his first Epistle; the date of which was probably about A.D. 64, *after* St. Paul's first imprisonment at Rome. Some critics indeed assign to it as early a date as A.D. 56, supporting their opinion by 1 *Tim.*, i. 3, from which it appears (1.) that Timothy was in Ephesus when the Apostle wrote his first letter to him; (2.), that he had been left there when Paul was going from Ephesus into Macedonia. A careful examination however of the narrative in the *Acts* will convince the reader that the contemplated journey into Macedonia, of which the Apostle speaks (1 *Tim.*, i. 3), is some journey not mentioned in the *Acts*, and therefore subsequent to St. Paul's release from his first confinement at Rome. But whatever doubt there may be as to the *date* of the first, there is none about the genuineness of either of the two Epistles to Timothy. They have always been acknowledged to be the undisputed production of the Apostle Paul. The object and design of the First Epistle to Timothy were such as we might have expected from the relation between St. Paul the writer, and Timothy, to whom it was addressed. It was written with the view of guiding and directing the latter in his responsible and difficult ministry as the head of the church at Ephesus, to instruct him in the choice and ordination of proper officers, and to warn him against the false teachers (Michaelis thinks they were Essenes) who had 'turned aside' from the simplicity of the gospel, to idle controversies and 'endless genealogies,' and who, setting themselves up as teachers of the Law of Moses, had insisted upon the necessity of obedience to it as a requisite for salvation.

In chap. i., accordingly, St. Paul alludes to the commission given by him to Timothy at parting, and specifies the particular errors which he was to condemn, together with the truths which he was to inculcate.

In chap. ii. the apostle describes the manner in which the public worship of the church at Ephesus was to be conducted.

In chap. iii. St. Paul explains the qualification of the persons whom Timothy was to ordain as bishops and deacons, and tells him that he had written the letter with a view of teaching him 'how he ought to behave himself in the house of God, which is the church of the living God, the pillar and the ground of truth.'

The last verse of this chapter has occasioned much controversy respecting the reading of the word Θεός, or 'God,' for which one MS. has ὃς, 'who,' and another ὃ, 'which.' The majority of the MSS. read Θεός, or 'God,' and several of the antient versions express the ὃ or 'which,' instead of Θεός.

In chap. iv. St. Paul foretells the heresies which were to arise in the church in after-times, and strongly condemns them. He also exhorts Timothy to a faithful and exemplary discharge of his duties, and to a steadfast continuance in the doctrines of the Gospel.

In chap. v. St. Paul instructs Timothy in the right method of admonishing the old and the young of both sexes. He also describes the age and character of such widows as were to be employed by the church in teaching the younger women the principles of religion, for which it would seem that the former received some recompense from the funds of the church.

In chap. vi. St. Paul describes the duties which he wished Timothy to inculcate on Christian slaves, as owing from them to their masters, whether infidels or believers. He also reprobates strifes about words, and perverse disputings, which seem to have been rife in the Ephesian church; condemns an inordinate love of money, exhorts Timothy to charge the rich to be 'rich in good works,' and concludes with a most solemn charge before God and Jesus Christ, that he should keep 'the commandment,' without spot and unblameable.

The Epistle was written from Nicopolis in Macedonia (*Titus*, iii. 12), and not from Laodicea, as the subscription informs us. The undesigned coincidences between it and the *Acts of the Apostles* are given in Paley's 'Horæ Paulinæ,' p. 323-338.

The Second Epistle of Paul to Timothy.—From chap. i., vers. 8, 12, 17, it appears that this Epistle was written by St. Paul while he was a prisoner at Rome; but whether he wrote it during his first imprisonment, recorded in *Acts*, xxviii., or during a *second* imprisonment, has been much questioned. According to the uniform tradition of the antient church, it was written during the second confinement. The modern critics, who refer it to the time of the *first*, are for the most part anti-episcopalians or Romanists: the former being concerned to deny the permanency of Timothy's charge at Ephesus; the latter not knowing how to account for the omission of Peter's name in the salutations from Rome. The arguments adduced by Macknight (Preface to 2 *Timothy*) in support of the opinion of the antient church are, we think, conclusive. St. Paul, it is generally agreed, returned to Rome after his first imprisonment, early in A.D. 65; where, after being kept in bonds as an 'evil doer' for more than a year, he is believed to have suffered martyrdom, A.D. 66. As therefore the Apostle requests Timothy (iv. 21) to come to him at Rome before winter, it was probably written in July or August, A.D. 65; and it is generally supposed that Timothy was at Ephesus when St. Paul addressed it to him.

The immediate design of St. Paul in writing this Epistle was, it would seem, to apprise Timothy of the circumstances that had recently happened to himself at Rome, and to request his immediate presence there. Accordingly we gather from the last chapter of this Epistle, that St. Paul was closely confined as a malefactor for some crime laid to his charge; that when he was brought before the Roman magistrates to make his first answer, 'no man stood by him, but all men forsook him;' that only Luke was with him: that being thus deserted by almost all, he was greatly desirous of seeing Timothy, 'his dearly beloved son in the gospel,' before the 'time of his departure,' which he knew 'was at hand.' He therefore requested him to come to Rome immediately, but being uncertain whether he should live to see Timothy again, he gave him in this Epistle a variety of admonitions, charges, and encouragements. This Epistle in fact is an appropriate and affecting sequel to the first, the principal injunctions and warnings of which it repeats, but with additional earnestness and fervour. St. Paul, as if for the last time (chap. i.), conjures Timothy to apply himself with all his gifts of grace to his holy work, to hold fast the doctrine which he had received from him, and not to be ashamed either of the testimony of the Lord or of St. Paul's own sufferings.

In chap. ii. St. Paul again cautions Timothy against heretics and 'foolish questions,' and exhorts him to personal holiness. In chap. iii. he gives a description of the 'perilous times which should come,' and which were to be anticipated by every possible exertion in performing the duties of a Christian minister. To this work, in chap. iv., he exhorted him by a solemn charge before 'God and the Lord Jesus Christ, the judge of the quick and the dead.' He then depicted his own present state, and his presentiment of an approaching martyrdom; and after requesting the immediate presence of Timothy, concluded by sending to him the greetings of some of the brethren of the Church at Rome. Whether Timothy arrived at Rome in time to find St. Paul alive, does not any where appear: the latest authentic information we have concerning him being given in this letter.

The Epistles to Timothy, in conjunction with those to the Thessalonians and Titus, are extremely valuable, as furnishing very strong evidence to the truth of many of the facts related in the *Acts of the Apostles*. The undesigned coincidences between the *Second Epistle to Timothy* and the *Acts* are given by Paley, in his 'Horæ Paulinæ,' pp. 339-356. Their value in another respect is thus described by Macknight, Preface to 1 *Timothy*—'These Epistles are likewise of great use in the church, as they exhibit to Christian bishops and deacons in every age the most perfect idea of the duties of their functions: teach the manner in which these duties should be performed: describe the qualifications necessary in those who aspire to such offices, and explain the ends for which they were instituted, and are still continued in the church.'

To the *Epistle to Timothy*, that addressed by St. Paul to Titus, nearly at the same time, is both a companion and an illustration. The subject matter is nearly the same in both, and it is important to observe, that in none of these Epistles, addressed to intimate and tried friends, do we perceive any doctrine or precept at all different from what is enforced in the Epistles addressed to and designed whole churches. The views and hopes and motives action are the same in both: a proof of the Apostl sincerity, and an evidence that he did not teach double doctrine, one for the learned and the other for th vulgar.

(Horne's *Introduction to the Critical Study of th Scriptures*, vol. iv., p. 378; Macknight, vol. iii.; Bens Preface to 1 and 2 *Timothy*; Evans's *Scripture Bi graphy*.)

TIMOTHY-GRASS, so called from a person of th name who successfully cultivated it in North Americ where it seems to grow more luxuriantly than any othe kind of grass. Its botanical name is *Phleum pratens* and its common English name is *Meadow Cat's-tail Gras* It has been highly extolled by many agriculturists for th profusion of hay which it makes, and also for its rapi growth when depastured. It is but a coarse grass whe allowed to stand till it is fit for hay; and in rainy weather it so readily imbibes moisture, that the harvest is very precarious. This is a principal reason why its cultivation ha not been much extended in England. It is said to give a very sweet and early herbage for sheep in spring, and, mixed with other grasses, may be very useful in laying down land to pasture for a few years.

The soil which suits timothy-grass best is a good moist and rather stiff loam. On gravel or chalk it soon dies off. It is scarcely to be recommended without a mixture of other grasses, although very heavy crops of it have been grown; and from its strong stem, when full grown, it should always be fed off when young, or cut for soiling horses and cattle before the stem has acquired its full growth. That it is not a grass naturally suited to the climate of Great Britain appears from its not being generally found in the best natural pastures. In rich land which is tired of clover it may form a very good substitute, to cut up green and depasture afterwards. The experiments which have been made with timothy-grass are not sufficiently satisfactory to form a decided opinion of its real merits, and it well deserves the attention of experimental agriculturists.

TI'MUR, SULTAN, KIAMRAM KOTB-ED-DI'N GURGAN SA'HEB-KIRA'N JIHA'NGIR, that is, 'Sultan Timur, the fortunate, the axis of the faith, the great wolf, the master of time, the conqueror of the world.' Timur, a name which frequently occurs among the princes of the Eastern Turks, signifies 'iron' in the Jagataï dialect, and corresponds to the Osmanli 'demur.' Timur was born on the 5th or 25th of Sha'bán, 736 A.H. (A.D. 1335), at Sebz, a suburb of Kesh, a town south-east of Samarkand. He was the son of Táraghaï-Nowian, who was chief of the Turkish tribe of the Berlas, which inhabited the district of Kesh. Timur was descended from a younger son of Bardam-Khan Behadir, or Baghatur, whose eldest son, Yessugaï, was the father of Genghis-Khan, and he was a direct descendant of Genghis-Khan on the female side. He was consequently of Mongol origin, and, being of royal blood, he held a high rank among that Mongol nobility which was founded by Genghis-Khan among the Eastern Turks. [TARTARS.] This rank is expressed by the title Nowian, which was added to the name of his father. Yet the power of his family was not great. Timur was a soldier at the age of twelve years, and he spent his youth in the continual feuds between the nobles of those different kingdoms and principalities into which the empire of Genghis-Khan was divided by his successors. After the death of his father, his uncle Seïf-ed-din became chief of the Berlas, being the eldest of the family; but a war having broken out between Husein, khan of Northern Khorásán, and Mawerainnehr (Mawar-el-nahr), or Jagataï, and Timur-Togluk, khan of the Getes (Getae), in Northern Turkistan, young Timur actively supported Husein, and was appointed chief of the tribe of the Berlas in A.H. 763 (A.D. 1361). In this war Timur received a wound in his thigh, in consequence of which he became lame. From this he was called Timur-lenk, or the lame Timur, which has been corrupted by Europeans into Tamerlane, by which name Timur is as well known in Europe as by his real name. Husein rewarded him also with the hand of his sister Turkan, A.H. 765 (A.D. 1363). Notwithstanding these favours, Timur intrigued against his protector; and after the death of his wife he openly rebelled against him, A.H. 767 (A.D. 1365). With a body of only 250 horsemen he surprised and took Nakhshab, a town which was defended by a garrison of 12,000 men, among whom there were most probably a great number of traitors. In A.H. 768 (A.D. 1366) he defeated Husein near his capital, Balkh, and this prince was murdered by some emirs, who, seeing heir former master forsaken by fortune, endeavoured to obtain the favour of Timur by putting his rival to death. Balkh, which was defended by the adherents of Husein, was taken by storm and destroyed by fire after a siege of hree years, A.H. 771 (A.D. 1369), and Timur was proclaimed khan of Jagataï in the same year by the Kurultaï, or the general assembly of the people. He chose Samarkand or his capital. Husein-Sofi, khan of Khowaresm (Khiwa), having imprisoned Timur's ambassadors, was attacked by Timur, who, after five campaigns, at last succeeded n taking the town of Khowaresm, in A.H. 781 (A.D. 1379). The town was destroyed, and the principal inhabitants, especially artists and scholars, were transplanted o Kesh, which became the second capital of Timur's empire. Previously to this the khan of the Getes, who was master of the country between the Sihun, or Jaxartes, and the Irtish, had likewise been compelled to pay homage to Timur, who thus became master of a part of Siberia and of the whole country which we now call Turkistan, and which was formerly known by he name of Great Tartary. After these conquests Timur thought himself strong enough to carry into effect the plan of making himself master of all those ountries which had once obeyed his ancestor Genghis-Khan. He first attacked Khorásán, or the north-eastern part of Persia, which was then divided between Gaiyáth-ed-dín-Pir-'Ali, who resided at Herat, and Khojah-'Ali-Murjid, whose capital was Sebsewár. Khojah-'Ali-Murjid, whose dominions were on the boundaries of Jagataï, paid homage o Timur as soon as he was summoned; but the master of Herat prepared a vigorous resistance. Timur took Herat by storm, but did not destroy it. He carried off as his only trophy the iron gates of this town, which were noted for their beautiful workmanship, and which he ordered to be transported to his birthplace, Kesh. The larger towns of Khorásán surrendered without resistance, and Timur was only checked by several strong fortresses, such as Shaburgán, Kabushán, and especially Káhkáha, between Balkh and Kelat, in the mountains of the Hindu-Kush. When hese fortresses fell, all Khorásán was under his yoke. The nhabitants of Sebsewár having revolted, Timur took the own by storm: two thousand of the inhabitants were placed alive one upon the other, till they formed a mass ike a tower, and each layer of human beings was fastened o the rest by mortar, as if they were so many bricks.

Beginning his career at an age when other conquerors are satisfied with their laurels, Timur had employed twenty years in reflecting on the principles of warfare. He ed his armies with the prudent boldness of an experienced general, but not with the superiority of genius. The differences between the numerous successors of Genghis-Khan enabled Timur to attack them one after another, and each was pleased with the fall of his rivals. He employed the same policy in his war against Persia. This ountry was governed by several princes. Shah-Sheja, of he dynasty of Mozaffer, who reigned in Fars and southern rák, or in that part of Persia which was most exposed to any army from the east, submitted to Timur without resistance. Thus Sultan Ahmed, of the house of the Ilkhans, he master of Northern Irák and Azerbiján, or Western Persia, had alone to sustain the attacks of the Tartars, A.H. 788 (A.D. 1386). Timur entered the dominions of Ahmed by following the coast of the Caspian Sea. In one campaign he conquered the provinces of Mazanderán, Rei, and Rustemdar, and took the towns of Sultania, Tabris, and Nakhshiwán. He crossed the Araxes at Julfa on a magnificent bridge, which was strongly fortified on both sides, but which is now destroyed. Kars, now the key of Eastern Turkey, fell into his hands; Tiflis surrendered, and the prince of Georgia purchased his protection by adopting the Mohammedan faith. The prince of Shirwán sent tribute to the camp of Timur, nine pieces of each thing sent (nine was a holy number among the Mongol princes), but only eight slaves; the ninth was himself. On these terms he was allowed to remain in possession of his dominions. Taherten, king of Armenia, submitted to Timur without any resistance; but Kára-Yúsuf, prince of Diyarbekir, and master of the country round Lake Wan, prepared to defend himself. A body of Timur's army marched against him, and took the fortresses of Akhlat and Adiljuwáz by storm; and Timur himself conducted the siege of Wan. This famous fortress fell after a siege of twenty days, the garrison was cast from the steep rock on which this town is situated, and the fortifications were razed by ten thousand miners and pioneers. Ready to cross the Carduchian Mountains and to descend into the valley of the Upper Tigris, Timur was obliged, by a revolt of the inhabitants of Ispahan, to march suddenly to southern Persia. He took Ispahan by a general assault: he spared the lives and the houses of artists and scholars, but the remainder of the city was destroyed, and the inhabitants were massacred. More than 70,000 heads were laid at the feet of the conqueror, who ordered his soldiers to pile them up on the public places of the town, A.H. 789 (A.D. 1387).

Satisfied with having conquered the greater part of Persia, Timur turned his arms towards the north, and overran the kingdom of Kiptshak, which was then governed by Toktamish-Khan. This war lasted from A.H. 789 to 799 (A.D. 1387 to 1396). [TARTARS, *Kiptshak*.] We shall here only mention the march of Timur in the campaign of A.H. 793 (A.D. 1391). According to Sheref-ed-dín, Timur started from Tashkend, on the Jaxartes, on the 13th of Safer, A.H. 793 (19th of January, 1391). He marched in a northern direction, and passed by Kárá-suma, Yázi, Kárá-chuk, and Sabrán, until he reached Sárik-Uzen, on the river Arch: thence he proceeded as far as Mount Kuchuk-dagh, and subsequently crossed Mount Ulu-dagh, or the range of the Altai. He then took a north-western direction until he reached the upper part of the river Tobol in Siberia, and thence proceeded westward, crossing the Ural Mountains, and the upper part of the river Ural, or Yaïk, where he drew up his army on the banks of the Bielaya, a southern tributary of the Kama, which flows into the Wolga. Toktamish, who awaited Timur in the environs of Orenburg, was not a little astonished to find him so far advanced towards the north; but being informed of his having taken that direction, he hastened to the country of the Bielaya (Bashkiria), and fought that dreadful battle which took place on the 15th of Rejeb, A.H. 793 (18th of June, 1391), in which his whole army was slaughtered.

In the following year (A.H. 794; A.D. 1392) Timur returned to his residence at Samarkand, and he left the war with Kiptshak to his lieutenants; he only appeared in the field in A.H. 797 (A.D. 1315) in order to stop the progress of Toktamish in the Caucasian countries. Meanwhile troubles broke out in northern Persia, which were put down by Timur's generals, who committed unheard-of cruelties, especially in the town of Amul, where the whole tribe of the Fedayis was massacred. Timur himself attacked southern Persia after his first return from Kiptshak. The country of Fars was governed by several princes of the dynasty of Mozaffer, vassals of Timur, who aimed at independence. After having occupied Loristán, Timur entered Fars by the mountain-passes east of Shiraz, which were defended by the stronghold of Kalaï-zefid; but this fortress and the capital Shiraz were taken, the princes were put to death or fell in battle, and Timur's son Mirán-Shah was invested with the government of Fars and Khuzistán. From Shiraz Timur marched westwards to attack the king of Bagdad, Ahmed Jelair, of the house of Ilkhan. Bagdad surrendered without resistance, and Sultan Ahmed and his family fled towards the Euphrates, accompanied by a small body of cavalry. Timur and forty-five emirs mounted on the swiftest Arabian horses pursued the sultan, and came up with him before he had reached the Euphrates. In the engagement which ensued Ahmed was again defeated and compelled to fly, leaving his harem and one of his sons in the hands of the victor. The scholars and artists of Bagdad were transplanted to Samarkand; Timur remained at Bagdad for two months, allowing so little licence to his soldiers that he ordered all the wine which was found in the town to be thrown into the Tigris.

During this time Kárá-Yúsuf, prince of Diyarbekir, had recovered part of those districts round Lake Wan which Timur had taken from him in a former campaign; and several princes in Armenia and Georgia were still independent. Timur resolved to bring them to submission, and after having succeeded in this, to attack the kingdom of Kiptshak on its boundaries in the Caucasus. Starting from Bagdad in A.H. 797 (A.D. 1394), he marched to the Upper

Tigris by Tekrit, Roha or Edessa, Ho-su, and Keif, all situated in Mesopotamia. He laid siege to Mardin, a strong place in the mountain-passes south-east of Diyarbekir, but not being able to take it, he contented himself with the promise of an annual tribute which Sultan Iza, the master of Mardin, engaged to pay, and he marched to Diyarbekir. This town was taken and plundered. From Diyarbekir Timur marched to Akhlat, north of Lake Wan, crossing the mountains, as it seems, by the passes of the Bedlis, or Centrites. [TIGRANOCERTA.] After having subdued all Armenia and Georgia, Timur reached the river Terek in the Caucasus, and there fought another bloody battle with the khan of Kiptshak. In A.D. 1395 and 1396 Timur conquered all Kiptshak, and penetrated as far as Moscow, whereupon he left the command of these countries to his lieutenants, and returned to Samarkand, in order to prepare for a campaign against India.

After the death of Firus-Shah, the master of India between the Indus and the Ganges, several pretenders made claims to the vacant throne. At last Mahmud succeeded in making himself master of Delhi, and in establishing his authority all over the empire of Firus-Shah. Under the pretext of supporting the rivals of Mahmud, Timur declared war against India; and such was the renown of his name, that ambassadors from all the countries of the East arrived at Samarkand and congratulated him on his new conquests before he had obtained any triumph. Timur left his capital in A.H. 801 (A.D. 1398). He took his way through the passes in the Ghur Mountains, or the western part of the Hindu-Kush; and on the 8th of Moharrem, A.H. 801 (19th of September, 1398), he crossed the Indus at Attock, where Alexander had entered India [ALEXANDER THE GREAT], and where Genghis Khan had been compelled to give up his plan of advancing farther. Timur traversed the Punjab in a direction from north-west to south-east, crossing the rivers Behut, Chunab, Ravee, the Beeah, the Hyphasis of the antients, where Alexander terminated his conquests, and the Sutlej, the easternmost of the five great rivers of the Punjab. Although no great battle had been fought, the Tartars had already made more than 100.000 prisoners; and as their number daily increased, Timur ordered them all to be massacred, to prevent any mutiny, which might have become fatal to him in case of a defeat. At last the Indian army was defeated in a battle near Delhi, and this town, with all its immense treasures, fell into the hands of the conqueror. Delhi was plundered, and a part of it was destroyed, the inhabitants having set fire to their houses, and thrown themselves with their wives and children into the flames. Several thousands of artists and skilful workmen were transplanted to Samarkand. Timur pursued the army of Mahmud as far as the sources of the Ganges, and after having established his authority in the conquered countries, returned to Samarkand in the same year in which he had set out for the conquest of India.

Meanwhile troubles had broken out between the vassal princes in Persia and the countries west of it; and Timur's own sons, who were governors of this part of his empire, had attacked each other, and one of them was accused of having made an attempt to poison his brother. These events became as many occasions of new conquests for Timur, who overran the whole country between Persia and Syria. Siwas (Sebaste), one of the strongest towns of Asia Minor, which belonged to the Osmanlis, was taken after a siege of eighteen days. The Mohammedan inhabitants were spared; the Christians, among whom were more than 4000 Armenian horsemen, were interred alive. (A.H. 803; A.D. 1400.) Among the prisoners was Ertoghrul, the son of Bayazid, sultan of the Osmanlis, who defended the town for his father, and who was put to death after a short captivity. The fall of Siwas and the murder of Ertoghrul were the signals for war between Timur and Bayazid, who had filled Europe with the terror of his name, and who was then besieging Constantinople. The rapidity of his marches and the impetuosity of his charges had procured him the surname of 'Ilderim,' or the 'Lightning;' and accustomed to victories over the knights of Hungary, Poland, France, and Germany, he did not dread the Tatars of Timur. Previously to the siege of Siwas, he had negotiated with Timur about some Turkish emirs in Asia Minor, and especially about Taherten, king of Armenia, a vassal of Timur, who had been deprived by Bayazid of several of their best towns, and whom Timur protected. To humble his pride, Bayazid imprisoned the Tatarian ambassadors, and Timur in revenge carried devastation into the dominions of the Osmanlis.

Before Bayazid had crossed the Bosporus, Timur, offended by Ferruj, Sultan of Egypt, overran Syria, then a dependence of Egypt. The army of Ferruj was routed with dreadful slaughter at Haleb, and this populous town was taken by the Tatars, who entered it with the flying Egyptians. Plunder, bloodshed, and cruelties signalized this new conquest (11th to 14th of Rebuil-ewwal, A.H. 803; 30th of October to 2nd of November, 1400 A.D.), which was followed by the fall of Damascus (9th of Sha'bán, A.H. 803; 25th of March, 1401). Artists and workmen were as usual carried off to Samarkand and other towns of Turkistan. Ferruj became a vassal of the Tatars. Bagdad having revolted, Timur took it by storm on the 27th of Zilkide, 803 A.H. (9th of July, 1401 A.D.), and 90,000 human heads were piled up on the public places of the town.

Hitherto negotiations had still been carried on between Timur and Bayazid, who had advanced into Asia Minor with a well-disciplined although not very numerous army. But Bayazid having discovered that Timur had bribed several regiments of Turkomans that were in the army of the Osmanlis, the negotiations were broken off, and the two greatest conquerors of their time advanced to meet each other in the field.

After the fate of Haleb, Damascus, and Bagdad, Timur had assembled his army near Haleb, and, crossing the range of the Taurus, he had proceeded north-westwards to the northern part of Anatolia. At Angora he met with Bayazid. The battle, one of the most eventful which have ever been fought, took place on the 19th of Zilhije, 804 A.H. (20th of July, 1402 A.D.). After an obstinate resistance the Osmanlis, who were much less numerous than the Tatars, were routed. Old Bayazid, to whom flight was unknown, despised every opportunity of saving himself, and so strong was the habit of victory in him, that he could not conceive his defeat even when he saw the general rout of his warriors. At the head of his janissaries, Bayazid maintained himself on the top of a hill; his soldiers died of thirst or fell by the sword and the arrows of the Tatars; at last he was almost alone. When the night came he tried to escape; his horse fell, and Bayazid was made a prisoner by the hand of Mahmud Khan, a descendant of Genghis Khan, and who was under-khan of Jagataï. One of his sons, Muza, was likewise made prisoner; another, Mustafa, fell most probably in the battle, for he was never more heard of; three others, Soliman, Mohammed, and Iza, escaped with part of their troops. Timur received his royal prisoner with kindness and generosity. Afterwards, when some faithful Osmanlis tried to save their master, he was put into chains, but only at night. Accompanying Timur on his march, he sat in a 'kafes,' that is, in a sedan hanging between two horses, and this was the origin of the fable that Timur had put Bayazid in an iron 'cage' like a wild beast, a fable which has chiefly been propagated by Arabshah and the Byzantine Phranzes (i., c. 26). Bayazid died in his captivity at Akshehr, about a year after the battle of Angora (14th of Sha'bán, 805 A.H.; 8th of March, 1403 A.D.), and Timur allowed Prince Muza to carry the body of his father to Brusa.

The sons of Timur pursued the sons of Bayazid as far as the Bosporus, but having no fleet, they did not cross this channel. They ravaged the country, and afterwards joined their father Timur, who with the main body of his army took Ephesus and laid siege to Smyrna. This town, which belonged to the Knights of St. John at Rhodes, fell after a gallant resistance, in the month of December, 1402. However, the conquest of Asia Minor from the Osmanlis was only a temporary triumph, for a short time afterwards it was recovered by Mohammed I., the son and successor of the unfortunate Bayazid. After having thus carried his arms as far as the shore of the Ionian Sea, Timur withdrew to Persia to quell an insurrection, and then retired to Samarkand. He was preparing for the conquest of China, but he died on his march to that country, at Otrar on the Jaxartes, on the 17th of Sha'bán, 807 A.H. (19th of February, 1405), in his seventy-first year, after a reign of thirty-six years, leaving thirty-six sons and grandsons, and seventeen granddaughters. A considerable part of Timur's western and northern conquests, Asia Minor, Bagdad, Syria, Georgia, Armenia, and the whole kingdom of Kiptshak, were lost by his successors almost immediately after his death. In

Persia and Jagataï his descendants reigned for a century; and for three centuries they ruled over Northern India under the name of the Great Moguls.

Timur has been compared with Alexander, but he is far below him. It is true, that except in India, Alexander found only effeminate nations on his way, while Timur fought with the most warlike nations of the world; but he enemies of Alexander formed great political bodies which were governed by one absolute master, while the warlike nations which were subdued by Timur were divided into a multitude of tribes and governed by numerous princes, each of whom was jealous of his neighbour. Timur overran the territory of two mighty nations, the Turks-Osmanlis, and the Tatars of Kiptshak, but he was not able to subdue them. Both Alexander and Timur protected the arts and sciences, but Timur could only transplant them by force from one place to another, while poets and scholars flocked to Alexander because he could appreciate their talents. Timur's cruelty was the consequence of his savage and barbarous temper; Alexander only forgot the laws of humanity when he was overpowered by wine or by passion. Timur was a man of extraordinary talents, who accomplished great things after long experience and severe struggles: Alexander, a true genius, came, saw, and vanquished. The greatness of Timur inspires awe, and we shrink from it with terror; the greatness of Alexander attracts us because it is adorned with the amiable qualities of his character.

The life of Timur is the subject of many valuable works. Sheref-ed-dîn-'Ali wrote the history of Timur in Persian, which has been translated into French by Pétis de la Croix, under the title 'Histoire de Timur-Bec, connu sous le nom du Grand Tamerlan,' &c., Paris, 1722. This is the best work concerning Timur, although the author often flatters. Arabshah, a Syrian, on the contrary, depreciates the character of Timur; his history, or rather his epic, has been translated under the title 'Ahmedis Arabsiadae Vitæ et Rerum Gestarum Timuri qui vulgo Tamerlanes dicitur, Historia,' Lugduni-Batavorum, 1636. Longdit, Argote de Molina, Petrus Perundinus Pratensis, Boekler, Richerius, &c., have also written the life of Timur. Among the Byzantines, Ducas, Chalcondylas, and Phranzes contain many valuable accounts, though Phranzes is less critical than the others. A very interesting book is 'Schildtberger, eine Wunderbarliche und Kurzweilige Historie,' &c., 4to. The same book was translated into modern German by Penzel, München, 1813. Schildtberger, a German soldier, was made prisoner by the Turks in the battle of Nicopolis (1396), when he was only sixteen years old. In the battle of Angora he was taken by the Tatars, and became a kind of secretary to Shahrokh and Miran-Shah, the sons of Timur. He finally returned to Germany in 1427, after a captivity of thirty years, and then wrote the history of his adventures.

Gibbon gives a splendid view of Timur's conquests in the 'Decline and Fall,' chap. lxv. Another most valuable work is Clavijo, 'Historia del gran Tamerlan, e Itinerario,' &c. Clavijo, ambassador of king Henry III. of Castile at the court of Timur, was present at the battle of Angora. (Desguignes, *Histoire des Huns*, vol. ii.) Timur may be considered as the author of the 'Tufukat, or the Code of Laws.' This work was originally written in the East-Turkish language, and was translated into Persian. The Persian version, with an English translation and a most valuable index, was published by Major Davy and Professor White, Oxford, 1783, 4to.; and Langlès has translated the Persian version into French, under the title, 'Instituts Politiques et Militaires de Tamerlan,' Paris, 1787. This work is of great importance for the history of Timur; we see that this Tatarian conqueror was provided with maps and works concerning geography, which were composed by his order.

TIN. This metal is one of those which were earliest known, though it occurs in comparatively few countries: the acquaintance of the antients with this metal, though it does not occur in the native state, is accounted for by the circumstances that the ore is found frequently near the surface, and is easily reduced by charcoal and a moderate degree of heat to the state of metal.

According to Berzelius, tin is found in England, Saxony, Bohemia, Hungary, the isle of Banca, the peninsula of Malacca, in Chili, and Mexico: Malacca furnishes the purest tin, and Cornwall the largest quantity.

Tin occurs in two states of combination, the peroxide and double sulphuret of tin and copper: this last is rather a rare substance, and it is from the former that the metal is almost entirely obtained.

The peroxide of tin is found in Cornwall in two forms:—1. In veins in primitive countries, where it is intimately mixed with several other metals, as arsenic, copper, zinc, and tungsten: this is common *tinstone*. 2. In loose rounded masses, grains, or sand in alluvial soil, in which state it is called *stream-tin*. The former, when reduced to the metallic state, yields *block-tin*; while the latter yields *grain-tin*, which is the purer of the two.

Oxide of Tin—Tinstone—Occurs in attached and imbedded crystals, and massive. Primary form a square prism, which is commonly terminated by four-sided pyramids. Cleavage parallel to the lateral planes and both diagonals. Fracture uneven or imperfectly conchoidal. Hardness 6 to 7: gives sparks with steel, and is brittle. Colour white, yellow of various shades, red, brown, and black. Streak paler. Lustre adamantine, vitreous. Transparent, translucent, opaque. Specific gravity 6·96. Insoluble in acids. Before the blow-pipe, in powder on charcoal, it is reduced to the metallic state. Fine crystals of this substance occur, more especially in Cornwall and Saxony.

Analysis of the oxide of tin of Cornwall by Klaproth:—

Tin	77·5
Oxygen	21·5
Iron	0·25
Silica	0·75
	100·0

The *Massive Varieties* of oxide of tin are called stream-tin. What is termed *wood-tin* is found in reniform and botryoidal masses, or in wedge-shaped pieces, which have arisen from their partial destruction: the surfaces are generally water-worn. Wood-tin exhibits various shades of brown, which sometimes appear in concentric bands, giving it a ligneous appearance, whence its name.

Stream-tin has evidently been derived from the destruction of tin veins or lodes, the lighter portions of stony matter having been carried away by the water, which has rounded the fragments of the ore.

At Finbo in Sweden oxide of tin has been met with containing nearly 2·5 per cent. of oxide of columbium.

Tin Pyrites.—Sulphuret of Tin, a double Sulphuret of Tin and Copper, is a rare substance, having been found only in Cornwall at Huel Rock, in the parish of St. Agnes.

Occurs crystallized and massive. Primary form of the crystal a cube. Cleavage parallel to the faces of the primary form. Fracture uneven, with a metallic lustre. Hardness: readily scratched and reduced to powder; brittle. Colour steel-grey, mixed with yellow. Specific gravity 4·35.

Massive Variety.—Fracture granular and uneven, with a metallic lustre. Hardness 4. Brittle. Opaque. Specific gravity 4·35 to 4·76.

Analysis by Klaproth:—

Tin	34
Copper	36
Iron	2
Sulphur	25
	97

Having now described the ores, we proceed to state the *Properties of Tin.*—This metal is of a silver-white colour, very soft, and so malleable that it may be reduced into leaves 1-1000th of an inch thick, called tin-foil: it suffers but little change by exposure to the air, and that which does occur arises rather from impure sulphurous vapours than from oxidation; for it is not oxidized even by the combined action of air and moisture. Its tenacity is but slight, so that a wire 1-15th of an inch in diameter is capable of supporting only about 31 pounds: a bar a quarter of an inch in diameter was broken by 296 pounds weight. Tin is inelastic, but very flexible, and when bent it produces a peculiar crackling noise. When rubbed it imparts to the fingers a peculiar smell, which remains for a considerable time. Its specific gravity is about 7·29; at 442° Fahr. it fuses, and if exposed at the same time to the air, its surface is tarnished by oxidizement, and eventually a grey powder is formed. When heated to whiteness it takes fire, and burns with a white flame, and is converted into peroxide of tin. If slowly cooled after fusion, it exhibits a crystalline appearance on solidifying.

Oxygen and Tin do not readily combine at common temperatures: they unite in three proportions, forming the protoxide, sometimes called stannous acid, the sesquioxide, and the per- or bin-oxide, frequently termed stannic acid. Protoxide of tin cannot be procured perfectly pure by direct action: the best method of preparing it is to procure a solution of protochloride of tin, evaporate it carefully to dryness, and then triturate it in a mortar with excess of crystallized carbonate of soda, which decomposes the chloride, and leaves the protoxide of tin.

When this has been washed, and dried carefully on the sand-heat, it is of a fine bluish-black colour, is very soluble in hydrochloric acid, and when heated in the air it takes fire, burns, and is converted into peroxide: the density of protoxide of tin is 6·666: it is soluble in solution of potash and soda, but not in ammonia, nor do the alkaline carbonates dissolve it. It is composed of—

One equivalent of oxygen . .	8
One equivalent of tin . . .	58
Equivalent . .	66

The alkaline solutions of this oxide gradually deposit metallic tin, and peroxide remains in solution. Its salts very readily absorb oxygen from the air, and form compounds which readily yield oxygen; and it is on this account that it converts the sesquioxide of iron into protoxide, and precipitates silver, mercury, and platina in their metallic state. With gold a purple compound is formed, known by the name of the purple powder of Cassius. The hydrate of this oxide of tin is white.

Sesquioxide of Tin is formed by mixing fresh precipitated and moist hydrate of peroxide of iron with a solution of protochloride of tin, as free as possible from hydrochloric acid: by the mutual action of these substances a slimy grey matter is thrown down, which is generally slightly yellow, from the presence of a little peroxide of iron. It is composed of—

One equivalent and a half of oxygen	12
One equivalent of tin . . .	58
Equivalent . .	70

It is soluble in hydrochloric acid, and also in ammonia, which last property distinguishes it from the protoxide; and it is distinguished from the peroxide by giving a purple precipitate with the salts of gold.

Peroxide or Binoxide of Tin, or Stannic Acid.—This is readily prepared by the action of strong nitric acid slightly diluted upon tin: violent action occurs, and the binoxide formed remains in the state of hydrate: after washing and drying and exposure to a red heat, the binoxide remains pure, and is of a straw-yellow colour: the perchloride of tin, when decomposed by an alkali, also yields binoxide of tin: when it has been rendered red-hot it is quite insoluble in acids, and acts as an acid by forming soluble compounds with the alkalis, which are called *stannates*: the moistened hydrate acts as an acid also in reddening litmus-paper. When melted with glass it forms a white enamel.

It is composed of—

Two equivalents of oxygen . .	16
One equivalent of tin . . .	58
Equivalent . .	74

Chlorine and Tin combine to form the protochloride and the perchloride. The protochloride is prepared by dissolving the metal in hot hydrochloric acid till the evolution of hydrogen gas ceases: the solution is colourless, and deposits crystals, which sometimes are acicular, and at others prisms of considerable size. They consist of—

One equivalent of chlorine . .	36
One equivalent of tin . . .	58
Three equivalents of water . .	27
Equivalent . .	121

When heated to about 212°, the whole of the water is nearly expelled; at a higher temperature hydrochloric acid is evolved, and oxichloride of tin remains. It is soluble in a small quantity of water, but decomposed by a large quantity, oxichloride of tin being precipitated.

The protochloride of tin is used as a mordant in calico-printing, and in chemical investigations as a de-oxidizing agent, acting in the mode already described.

Protochloride of tin may also be obtained by distilling a mixture of equal weights of granulated tin and bichloride of mercury, or of protochloride of mercury, or by transmitting hydrochloric acid gas over tin heated in a glass tube; in all these cases it is procured free from water, and is a grey solid, of a resinous lustre, which fuses below redness and sublimes at a high temperature.

Bichloride of Tin may be prepared in several modes: first, by heating the protochloride in chlorine gas; second by dissolving the hydrated peroxide in hydrochloric acid: third, by putting tin into the mixture of hydrochloric and nitric acid, called *aqua regia*, which yields nascent chlorine; fourth, when a mixture of 1 part of tin with 4 parts of bichloride of mercury is distilled with a gentle heat, a colourless limpid liquid is obtained, which fumes strongly in moist air; this is the bichloride of tin, formerly known by the name of the fuming liquor of Libavius; it boils at 248°. is rendered solid by the addition of one third of its weight of water, and dissolves in a larger quantity; by the action of alkalis it is decomposed, hydrated peroxide of tin being precipitated.

It consists of—

Two equivalents of chlorine	72
One equivalent of tin . .	58
Equivalent . .	130

A solution of this salt under the name of nitromuriate of tin is extensively used in dyeing and calico-printing.

Sulphur and Tin combine in three proportions: the protosulphuret is prepared by adding to melted tin an equal weight of sulphur, and stirring the mixture till combination is effected; the product is to be powdered when cold, mixed with an equal weight of sulphur, and thrown in small portions into a hot crucible and eventually heated to redness. Its properties are, that it is of a bluish-black colour, has a metallic lustre, fuses at a red heat, and when cooled has a lamellated texture. When hydrosulphuric acid gas is passed into a solution of protochloride of tin, a similar compound is obtained; hydrochloric acid dissolves protosulphuret of tin with the evolution of hydrosulphuric acid gas, a solution of the protochloride of tin being formed.

It is composed of—

One equivalent of sulphur .	16
One equivalent of tin . .	58
Equivalent . .	74

Sesquisulphuret of Tin.—To prepare this, finely powdered protosulphuret of tin is to be mixed with a third of its weight of sulphur, and the mixture is to be heated to moderate redness until sulphur is no longer volatilized. It has a deep greyish-yellow colour, and when strongly heated is reconverted to the state of protosulphuret; when heated in hydrochloric acid, hydrosulphuric gas is given out.

It is constituted of—

One and a half equivalent of sulphur	24
One equivalent of tin . .	58
Equivalent . . .	82

Bisulphuret of Tin may be prepared in different modes when hydrosulphuric acid or hydrosulphate of ammonia is added to a solution of bichloride of tin, a bulky precipitate of a dirty yellow colour is obtained; this is hydrated bisulphuret of tin: in the dry way it is procured by heating in a retort twelve parts of tin amalgamated with six parts of mercury, rubbed up with seven parts of sulphur and six of hydrochlorate of ammonia; the mercury facilitates the combination of the tin and sulphur, and the ammoniacal salt, by its evaporation, appears to prevent the temperature becoming so high as to decompose the bisulphuret of tin formed. This substance, formerly known to the alchemists by the name of *Aurum musivum*, or *Mosaic gold*, is in crystalline scales, and sometimes in six-side plates, of a golden-yellow colour and metallic lustre. It is not soluble in any acid, but nascent chlorine, in the form of what was formerly called *aqua regia*, dissolves it; it is soluble also in solution of potash and soda, forming what have been called *sulphur salts*.

It consists of—

Two equivalents of sulphur	32
One equivalent of tin .	58
Equivalent . .	90

Phosphuret of Tin is readily formed by adding phosphorus to the melted metal; it is of a silvery-white colour, and soft enough to be cut with the knife. After fusion it crystallizes on cooling; when thrown upon a red-hot coal, the phosphorus burns. This compound does not appear to have been accurately analyzed; but when phosphuretted hydrogen is made to act upon a solution of protochloride of tin, a terphosphuret is formed, which is readily oxidized by the action of the air.

It consists of—

Three equivalents of phosphorus	48
One equivalent of tin . .	58
Equivalent . .	106

Iodides of Tin.—To prepare the protiodide, two parts of granulated tin are to be heated with five parts of iodine; the resulting iodide is a red translucent substance, very fusible, soluble in water, and volatile at a high temperature.

It consists of—

One equivalent of iodine .	126
One equivalent of tin .	58
Equivalent . .	184

The *Periodide of Tin* is formed by dissolving the hydrated peroxide of tin, precipitated by an alkali from the solution of the bichloride, in hydriodic acid; it forms crystals of a silky lustre, which are resolved by boiling water into peroxide of tin and hydriodic acid.

Seleniuret of Tin.—When tin is fused with selenium, they combine with the evolution of light. The compound formed is a spongy mass, of a grey colour and metallic lustre; when heated, selenium is expelled and peroxide of tin remains.

OXISALTS OF TIN.

Protonitrate of Tin is formed by dissolving either the metal or the protoxide in dilute nitric acid; a yellow uncrystallizable solution is obtained; by exposure to the air it absorbs oxygen, and peroxide of tin is precipitated.

It is probably composed of—

One equivalent of nitric acid .	54
One equivalent of protoxide of tin	66
Equivalent . . .	120

Pernitrate of Tin.—When tin is acted upon by strong nitric acid, the peroxide formed remains entirely insoluble in the acid; to procure the pernitrate it is best to cause the hydrated peroxide to dissolve in dilute nitric acid. The solution is colourless and yields no crystals; when diluted or heated, it is rendered turbid.

Sulphates of Tin.—By boiling excess of tin in sulphuric acid, a solution is obtained from which colourless acicular crystals of sulphate of tin are deposited. When, on the other hand, tin is boiled in excess of sulphuric acid, or hydrated peroxide of tin is dissolved in the acid, persulphate of tin is obtained in solution, but it cannot be made to crystallize.

Carbonate of Tin.—When carbonate of potash is added to protochloride of tin, a white precipitate is formed, which, supposing it to contain carbonic acid while moist, loses it during washing and drying; it appears therefore that a permanent carbonate of this metal is not attainable.

Phosphates of Tin.—When phosphate of soda is added to a solution of protochloride of tin, an insoluble white precipitate of protophosphate is obtained; the perphosphate, also an insoluble colourless precipitate, may be procured by adding the phosphate of soda to a solution of perchloride of tin.

Having described the principal and best known oxisalts of tin, we shall mention the characters of the salts of tin, as given by Dr. Thomson; they are as follows:—The protosalts of tin are white, and the solutions of them are usually colourless; their taste is astringent and metallic, and highly disagreeable; when in solution, they rapidly absorb oxygen, and are converted into the corresponding persalts.

When a plate of lead or zinc is put into a solution of tin, it is thrown down in the metallic state. Ferrocyanide of potassium occasions a white gelatinous precipitate when dropped into these solutions, and sulphuret of potassium occasions a coffee-brown precipitate in the salts of the protoxide of tin; but neither gallic acid nor infusion of galls occasions any precipitate. When chloride of gold is poured into solutions of protoxide of tin, a purple-coloured precipitate falls. A solution of potash throws down a white precipitate, which dissolves in excess of the alkali. If the solution be boiled, a black powder falls, which is metallic tin; while a compound of peroxide of tin and potash remains in solution. Ammonia throws down a white precipitate, not soluble in excess of the alkali.

ALLOYS OF TIN.

Most of the malleable metals are rendered brittle by alloying with tin; it combines readily with potassium and sodium, forming brilliant white alloys, which are less fusible than tin; the potassium alloy burns readily when it contains more than one-fifth of potassium. With arsenic it forms a metallic mass which is whiter, harder, and more sonorous than pure tin. With antimony tin forms a white, hard, and sonorous alloy. Bismuth forms with tin an alloy which is more fusible than either of the metals separately, a mixture of equal weights melting at 212°; this compound is hard and brittle. Copper and tin form alloys which are well known and highly useful; they are bell-metal and bronze. With mercury tin readily amalgamates, and the compound is used for silvering mirrors. With iron tin forms white compounds which are more or less fusible according to the proportion of iron they contain; tinplate is of all the alloys of tin the most useful, and the preparation of this and of pewter are the most extensive applications of this very valuable metal.

TIN, MANUFACTURE OF. Under this head may be noticed, first, the processes required to bring tin into a marketable state, embracing the smelting and refining of the metal; secondly, the manufacture of tin-ware, or of articles of tin-plate; and, thirdly, a few of the manufactures of compound metals in which tin forms the principal ingredient. The process of TINNING, or of covering plates of iron, the inner surfaces of vessels of iron or copper, &c., with a thin coat of tin, forms the subject of a separate article.

Smelting and Refining of Tin; preparation of Block and Grain Tin.—The processes by which tin-ores are mechanically separated from the grosser impurities which are usually found with them, and broken into fragments convenient for the subsequent operations, are briefly noticed in the article MINING, vol. xv., pp. 244 and 245. After being thus reduced to a coarse powder, the ore is roasted or calcined in a reverberatory furnace, until it ceases to exhale arsenical vapours, by which, together with some subsequent processes, it is further cleansed from the admixture of foreign matter and prepared for smelting. A very full account of all the processes connected with the preparation and smelting of tin-ore, as practised about sixty years since, is given in the 'Mineralogia Cornubiensis' of Pryce, of Redruth; but, although most of the processes are still performed with little alteration, we have depended more for the following account of them upon an extensive article on 'Tin,' in Dr. Ure's recently published 'Dictionary of Arts, Manufactures, and Mines,' in which the previous operations of mining are also minutely described.

The ores of tin raised in Cornwall and Devonshire are always reduced, or smelted, within those counties, their exportation being prohibited; but this arrangement is stated not to be injurious to private interests, because the vessels which bring the fuel from Wales for the smelting-furnaces return to Swansea and Neath laden with copper-ores. The smelting-works do not generally belong to the proprietors of the mines, but to other parties who purchase the ore from them, their value being determined by a kind of assay. When several bags of ore, of nearly uniform quality, are taken to the smelting-works, a small sample is taken from each, and these samples, after being blended together, are mixed with about four per cent. of ground coal, placed in an open earthen crucible, and heated in an air-furnace until the ore is reduced. As the furnace is made very hot before the crucible is introduced, the assay is finished in about a quarter of an hour; after which the melted metal is poured into a mould, and the drossy substances which remain in the crucible are pounded in a mortar, in order to separate, and to add to the ingot, any minute granules of tin remaining among them. Dr. Ure observes that a more exact assay would be obtained by fusing the ore, mixed with five per cent. of ground glass of borax, in a crucible lined with hard-rammed charcoal. A gentle heat should be applied to the crucible during the first hour, a stronger heat during the second hour, and, finally, an intense heat for a quarter of an hour. This process brings out from four to five per cent. more tin than the other; but it is stated that it has the inconvenience of reducing the iron, if any be present, which may be readily ascertained by subsequent solution in nitric acid. This mode of assaying, it is admitted, would be too tedious for ordinary adoption, as the smelter may have occasion to try several samples in one day; and that first described, while imperfect in a chemical point of view, affords a similar result to that realised by the smelter on a large scale.

The smelting of tin-ores is effected by two different methods, which may be briefly described by stating that in the first and most common, the ore, previously mixed with culm, is exposed to heat upon the hearth of a reverberatory furnace, in which pit-coal is used as fuel; while in the second, which is applied merely to *stream tin* (the tin procured from stream-works), and which is followed in order to obtain tin of the finest quality, the ore is fused in a blast-furnace, called a blowing-house, in which wood-charcoal is used for fuel.

In the former process the prepared ore, which is called *schlich*, is mixed with from one-fifth to one-eighth of its weight of powdered anthracite, or culm, to which a little slaked lime or fluor-spar is sometimes added as a flux. These substances are carefully blended together, and a little water is added to the mixture to facilitate the operation of charging the furnace, and to prevent the charge from being blown away by the draft at the commencement of the smelting process. From twelve to sixteen cwt. of the above mixture forms an ordinary charge; but in the smelting-furnaces at St. Austle, or Austell, in Cornwall, of which representations are given by Dr. Ure, each charge amounts to from fifteen to twenty-four cwt. The charge is spread upon the concave hearth of the furnace, and then the apertures by which it is inserted are closed and luted, and the furnace is gradually heated, and kept hot for six or eight hours, by which time the reduction of the ore is complete. The gradual application of the required temperature is necessary to prevent the tin oxide from uniting with the quartz of the gangue, or refuse portion of the ore, and forming a kind of enamel. When the fusion or reduction of the ore is considered to be finished, one of the apertures of the furnace is opened, and the melted mass is stirred up to complete the separation of the tin from the scoriæ, which are then drawn out by means of an iron rake. These scoriæ consist principally of masses of refuse matter from which no more tin can be profitably extracted, and which are therefore immediately thrown away; but among them are pieces which yet retain a considerable quantity of tin, and which are separated and reserved for further processes. So soon as these refuse matters are removed, a channel is opened, by which the melted tin flows from the hearth into a large vessel called the basin of reception, where it is allowed to rest for some time, in order that the impurities yet remaining with the metal may separate, by their different specific gravities. When it has settled, the tin is ladled into moulds, so as to form it into large blocks or ingots.

The ingots produced by the above process frequently contain portions of iron, copper, arsenic, and tungsten, together with small quantities of sulphurets and arseniurets that have escaped decomposition, unreduced oxide of tin, and earthy matters which have not passed off with the scoriæ. To remove these the tin is subsequently exposed to the process of *refining*, which commences by placing the blocks or ingots on the hearth of a second reverberatory furnace, similar to that used for reducing the ore, and applying a moderate heat, which causes the tin to melt, and to flow into a basin provided for it, leaving upon the hearth a residuum which consists of a very ferruginous alloy. Fresh blocks are then placed in the furnace, without removing the unmelted remains of the former, until about five tons of tin have flowed into the basin. This part of the process is termed a *liquation*, and is followed by the actual refining, which is usually effected by plunging billets of green wood into the melted tin in the refining basin, by means of an apparatus erected by it. The heat occasions the disengagement of considerable volumes of gas from the wood, and thus a kind of ebullition is produced in the tin, which causes the lighter impurities to rise to the surface in a frothy form, and the heavier to fall to the bottom. The froth or scum, which consists chiefly of the oxides of tin and foreign metals, is skimmed off and returned into the furnace; and when the tin is sufficiently boiled, the green wood is lifted out, and the whole is allowed to settle, in doing which the purest tin rises to the top, that with a trifling admixture of foreign metals remains in the middle, while the foulest portion sinks to the bottom. When the mass becomes so cool that no further separation can take place, the tin is again ladled into moulds; the quality of the blocks thus produced varying according to the order in which the moulds are filled. The blocks formed from the lowest part of the tin are usually so impure as to need a repetition of the refining process. The operation as above described requires five or six hours; of which the first is occupied in filling the basin, the three following in boiling the tin with the billets of wood, and the remaining time in subsidence. A similar effect is sometimes produced by an operation called *tossing*, in which, instead of the ebullition produced by the green wood, the mass of melted tin is agitated by a workman repeatedly lifting a quantity of tin in a ladle, and letting it fall into the basin from a considerable height. After continuing this agitation for some time, the surface is skimmed carefully; and if the upper part of the tin be yet too impure for the market, the refining is rendered more perfect by keeping the metal in a fused state, without agitation, until the impurities separate spontaneously. After refining, the tin is cast into blocks of about three cwt. each. The moulds used for this purpose are frequently made of granite; and the tin thus prepared is sold as *block tin*. From a very remote period, almost to the present time, a duty was paid upon all tin raised in Cornwall to officers appointed by the duchy, who required all blocks, before being sent to market, to be taken to them for the purpose of being *coined*, or marked with a distinguishing stamp. The mode of collecting the duty on tin was very inconvenient, as it required all tin to be cast into blocks for coining, although it might have to be subsequently re-cast into some other form for sale in foreign markets; besides which the miner or smelter had to bear the expense of sending it to one of the places appointed for coining, and the inconvenience of waiting for one of the periodical coinages, which were usually three months apart. These duties were abolished by 1 & 2 Vict., cap. 120, which settles a perpetual annuity on the duchy of Cornwall equal to the average produce of the tin duties for ten years previous to its coming into operation.

It has been stated that the richer portion of the scoriæ left by the process of smelting is reserved for further operations. Such as contain small grains of tin among the slag or refuse are taken to a stamping-mill, and broken and washed in a similar manner to the ore; while those which contain much tin are re-smelted without any previous preparation. From these scoriæ, which are called *prillion*,* an inferior kind of tin is produced by a second smelting. The inferiority of this product may be readily imagined, observes Dr. Ure, since the metal which forms the granulations among the scoriæ is what, being less fusible than the pure tin, solidified quickly, and could not flow off into the metallic bath, or basin of reception. The dross or residuum of the refining furnace is fused by increasing the fire after the removal of the refined tin, and is then run out into a separate basin, in which it is allowed to settle. The upper portion is then cast into moulds as impure tin, which needs a second refining, and the inferior part of the mixture becomes deposited on the bottom and sides of the vessel in the form of a brittle white alloy, with a crystalline fracture, which contains so large a proportion of foreign metals that no use is made of it.

The average quality of the tin-ore, as prepared for the smelting-furnaces, is such that 20 parts of it yield from 12½ to 13 parts of metallic tin, or from 62½ to 65 per cent., and the quantity of coal required for producing one ton of is about a ton and three-quarters. Respecting the ie when this economical fuel was substituted for wood- arcoal in the smelting of tin-ores, authorities are at va- nce. Pryce, in his 'Mineralogia Cornubiensis,' p. 282, 's that 'Necessity at last suggested the introduction of -coal for the smelting of tin-ore, and, among others, to Bevil Granville, of Stow, in this county (Cornwall), np. Car. I., who made several experiments, though with- t success;' and he adds that the 'effectual smelting of -ore with pit-coal' did not take place till the second ar of Queen Anne, 'when a Mr. Liddell, with whom r. Moult, a noted chemist, was concerned, obtained her ajesty's patent for smelting block tin with fossil coal in on furnaces.' 'The invention of reverberatory furnaces iilt with brick, stone, sand, lime, and clay, soon followed is discovery; the form of which,' he states, writing about 78, 'has admitted little improvement to the present me.' Holland, after observing that the commencement this important substitution is generally supposed to ave been about 1680, states that the question as to the scovery of the fitness of pit-coal for the purpose lies etween Pryce's account, as above cited, and that of Becher whose name he incorrectly gives Beecher), an ingenious erman who, in consequence of persecutions in his own ountry, visited England in the reign of Charles II., and itroduced several improvements in the art of mining; and e quotes a passage, but without referring to his authority, which Becher claims for himself the credit of the in- roduction of coal for smelting tin. Whatever may have een the precise time or manner of this improvement, its mportance is indisputable; and such is the effect of the uperior economy of this and other metallurgic operations s performed in England, that experiment has shown the ossibility of bringing tin-ore from the Malay countries to his island for the purpose of smelting, and sending the in back to the East at a lower price than it can be pro- luced for on the spot.

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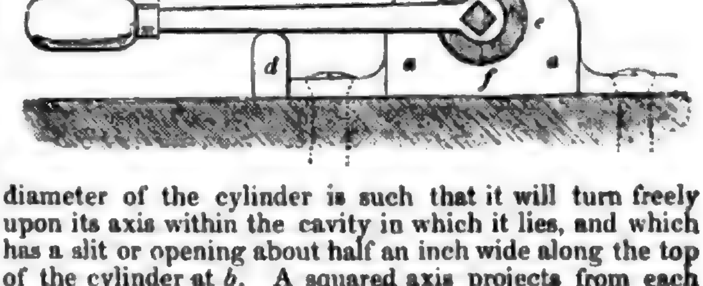
* So Dr. Ure; but Pryce, in his 'Mineralogia Cornubiensis,' uses the word *pillion*, or *pillion-tin*, and defines it (p. 325), 'The tin which remains in the scoriæ or slags after it is first smelted, which must be separated and re-melted.' He applies the name *prill* to copper in a similar state.

The smelting or reduction of tin by the blast-furnace, with wood-charcoal, is practised on a limited scale for the production of tin of the greatest possible purity. The finest ores supplied by stream-works, and the finer tin sands, are selected for this operation, and as these are free from many of the impurities found in other ores, they do not require calcination. The works in which blast-furnaces are employed are commonly called *blowing-houses*. The furnaces used are about six feet high, from the concave hearth to the throat, or commencement of the long narrow chimney, which, after proceeding for some distance in an oblique direction, contains a chamber in which the metallic dust carried off by the blast is deposited. The furnace is lined with a vertical cylinder of cast-iron, coated internally with loam; and it has an opening called the *tuyère* near the bottom, by which the blast is introduced, either from large bellows or from cylinders. No substance is added to the ore and charcoal, unless it be the residuary matter of a previous smelting; and the proportion of charcoal consumed is about one ton and six-tenths for every ton of tin produced. The melted tin runs from the furnace into an open basin, whence it is run off into a large vessel in which it is allowed to settle. The scoriæ which run with the metal into the basin of reception are skimmed off, and separated into two portions, one consisting of such as retain tin oxide, and the other of such as have no oxide, but contain tin in a granulated state. The subsequent operations of refining by allowing the mass of metal to rest, and then submitting the upper and purer portion to the refining basin, and re-melting the lower part, and of agitating the tin by the green-wood ebullition, are much the same as with block tin prepared in a reverberatory furnace with pit-coal. In order to convert the blocks of tin produced by the blast-furnace process into the form known as *grain tin*, or, according to the more appropriate French term, *étain en larmes*, 'tears of tin,' they are heated until they become brittle, and made to fall from a considerable height in a semi-fluid state, thus producing an agglomerated mass of elongated grains.

From a comparison of the results of the two methods of smelting above described, Dr. Ure shows that the reverberatory furnace with pit-coal occasions less loss of metal than the blast-furnace, and is by far the most economical. To produce a ton of metal by the former process requires, as before stated, a ton and three-quarters of pit-coal, while a ton and six-tenths of wood-charcoal is consumed in producing the like quantity of metal by the blast-furnace; and as one ton of wood-charcoal is about equivalent, in calorific effect, to two tons of pit-coal, the difference in favour of the reverberatory plan is very great. The superior quality of the tin produced by the other process is attributable partly to the greater purity of the fuel, and partly to the finer quality of the ore selected for the purpose.

Manufacture of Tin-ware.—It is unnecessary here to enumerate the various purposes to which tin is applied in the useful arts, either as an ingredient in many useful alloys, for which its ready fusibility, its cleanliness, and its beautiful appearance render it especially valuable, or as the basis of chemical compounds used in dyeing, &c. It is rarely employed alone in our metalline manufactures, but when laid in a thin coat upon the surface of sheet-iron by the process of TINNING, it produces a material of such extensive use in the manufacture of culinary and other articles, that a more detailed notice may be given. Holland observes that in this country the greater portion of the tin used in the manufacture of articles composed exclusively of that metal is that which is expanded by rolling or hammering, or by a combination of the two operations into leaves or sheets barely one-thousandth part of an inch in thickness, under the name of *tin-foil*. This is the substance which is laid upon the back of glass mirrors, and there amalgamated with mercury, so as to form what is called the *silvering*.

The art of tin-plate working, or of forming sheets of tinned iron into an almost endless variety of useful vessels and utensils, depends more, observes the author just cited, on the manual dexterity of the workman than upon any peculiarity in the tools which he requires, which are few and simple, consisting of bench and hand-shears, mallets and hammers, steel heads and wooden blocks, soldering-iron and swages. In the formation of a vessel the first operation is to cut the plate to the proper size and form with shears; and when the dimensions of the article require it, to join them together, which is done either by simply laying the edge of one plate over that of the other, and then soldering them together, or by folding the edges together with laps, and then soldering them. Similar joints are required when gores or other pieces are to be inserted, and also at the junction by which a cylinder is closed in. The usual method of forming laps, bends, or folds for this or other purposes is to lay the plate over the edge of the bench, and to bend it by repeated strokes with a hammer; but as it is impossible by this means to make the bend as even, or at as true an angle as is desirable, Mr. J. Basset, of Birmingham, contrived a simple and effectual apparatus for the purpose, for which he was rewarded by the Society of Arts in 1831. An end view of this apparatus is given in the subjoined cut, in which *a a* represents a metal block screwed down firmly to a bench, and having a longitudinal cylindrical cavity, within which is laid a long iron cylinder, the end of which is distinguished in the cut by a tint. The diameter of the cylinder is such that it will turn freely upon its axis within the cavity in which it lies, and which has a slit or opening about half an inch wide along the top of the cylinder at *b*. A squared axis projects from each end of the cylinder to receive [illegible] handle *c c*, which, when the instrument is at rest, lies in an horizontal position, and is supported by the block *d*. These handles are not fixed to the square axes of the cylinder, but are capable of being



taken off and put on again in any position of the cylinder, the length of which should be equal to that of the longest laps or bends. Longitudinal cuts, wide enough to receive the edge of a tin-plate, are made in the cylinder from the circumference towards the centre to any required depth or at any required angle, as at *b*, *e*, and *f*. In order to make a right-angled lap, such as is shown in the marginal figure G, the cylinder is turned into the position shown in the figure, with one of the radial cuts under the longitudinal opening in the block *a a*; the handles are put on, and the edge of the tin-plate *g* is inserted in the uppermost slit in the cylinder. The handles are then moved in the direction indicated by the arrow and dotted lines, and the plate is forced to assume the position of the dotted lines *g′*, receiving at the same time the required lap or bend. By returning the handles towards their original position, the plate may be easily removed. If, in addition to the making of the lap, the plate is to be bent so as to form a hollow cylinder or tube, the motion of the handles is continued until the cylinder is turned completely round, by which means the plate will be wrapped or rolled round it. The cavity in the block *a a* is made large enough to receive the cylinder with this addition to its thickness; and if this operation be intended, one side or cheek of the cavity is made moveable on a pivot, so that it may be opened for the purpose of lifting out the cylinder. The pipe is subsequently removed from the cylinder by detaching the handles and sliding it off longitudinally. Appended to the description of this apparatus, in the Society's 'Transactions,' is an account of a method of bending pipes of tin, copper, or brass, by filling them with hard solder, and passing them through two thick rings of the same substance, one of which is fixed in a vice or work-bench, while the other is attached to a handle of such length as to give the operator sufficient leverage for bending the pipe in that portion which intervenes between the rings. As the solder is softer than the material of the pipe, the rings will give way to any dangerous pressure sooner than the pipe itself. When the required curvature is obtained, the solder is melted from the inside of the pipe. It is observed that in performing this operation upon brass pipes, they should be previously tinned on the inner surface, in order to secure a perfect union between the tube and the core of solder.

After a tin vessel has been rounded upon a block or mandril, by striking it with a wooden mallet, and the seams finished as above described, all its exterior edges are strengthened by bending a thick iron wire into the proper form, applying it to what would otherwise be the raw edges of the metal, and dexterously folding them over it with a hammer. By this means the appearance of the articles is improved, and their durability and strength are greatly increased. A superior kind of tin-ware, commonly known as block-tin, is carefully finished by beating or planishing with a polished steel hammer upon a metal stake; by which means the surface, which otherwise appears somewhat wavy, is made very smooth and silvery, especially after it has been polished with dry whiting. It is principally in the production of block-tin wares that *swaging* is resorted to as a ready means of producing grooved or ridged borders or other embossed ornaments. This process consists in striking the metal between two steel dies or swages, the faces of which bear the desired pattern, and are made counterparts to each other. The mouldings round the edges of dish-covers and other similar articles are produced in this way; the swages embossing the pattern in short lengths, and the article being gradually turned round until every part of its circumference has been submitted to their action. It was formerly usual to make such mouldings separately for large articles, and to attach them with solder; and Holland states that the practice of swaging them was introduced by Mr. King, a tinman in Holborn, who executed very bold and handsome mouldings by placing the outside of the article upon a concave bed of lead, having a hollow line or groove sunk into it, into which the rim of the cover or vessel was forced by the application of a huge hammer on the inner side, until the required degree of projection was obtained. The border was then completed by the application of swages, as before described. The lower die is usually fixed in an apparatus to which moveable guides are attached to insure the correct position of the article to be operated on, and the upper is made in the form of a hammer, the handle of which is pivoted so as to insure its descent in precisely the right position. Sometimes the requisite power is applied by simply working the upper swage or swage-hammer itself; but in other cases the head of the swage-hammer is struck with a mallet. Very many ornamental articles are produced by embossing or stamping tin-plate, in the same manner as other metallic sheets, with a fly-press or other machinery. Many cheap coffin-plates are manufactured at Birmingham in this way; and these and similar articles are sometimes lacquered, painted, or japanned. A very beautiful method of ornamenting tin wares by producing a crystallized appearance on the surface was much practised a few years since, under the name of *moirée metallique*, or crystallized tin-plate. It consists in applying diluted nitro-muriatic acid to the surface of the plate while slightly heated, and then washing with water, and covering with a lacquer varnish, without which the lustre of the crystalline appearance is speedily lost by the action of the air. Dr. Ure observes that 'it would seem that the acid merely lays bare the crystalline structure really present on every sheet, but masked by a film of redundant tin;' and he gives the following directions for performing the process:—The tin-plate, slightly heated, is to be placed over a tub of water, and to have its surface rubbed with a sponge dipped in a liquor composed of four parts of aquafortis and two of distilled water, holding one part of common salt or sal-ammoniac in solution. When the crystalline spangles appear to be thoroughly brought out, the plate should be immersed in water, washed with a feather or a little cotton (taking care not to rub so hard as to disturb the crystallized film of tin which constitutes the feathered surface), dried with a gentle heat, and immediately coated with lacquer. If the whole surface be not plunged at once in cold water, but partially cooled by sprinkling cold water upon it, the crystallization will be variegated with large and small figures. 'Similar results will be obtained,' he adds, 'by blowing cold air through a pipe on the tinned surface, while it is just passing from the fused to the solid state; or a variety of delineations may be traced by playing over the surface of the plate with the pointed flame of a blow-pipe.' (*Dict. of Arts*, p. 863 and pp. 1253, 1254.) By using coloured varnishes very beautiful boxes and other ornamental articles may be produced by this process.

Manufacture of Tin Alloys.—Britannia Metal.—Tin forms the principal ingredient in various kinds of pewter and other white metallic alloys, which are manufactured into domestic utensils by casting, stamping, and other processes in which much ingenuity is displayed. Holland gives an interesting account of the manufacture of teapots and similar articles of Britannia metal, which may be briefly noticed here. This manufacture was commenced on a large scale at Sheffield, where it is still carried on, about the year 1770, by two individuals of the names of Jessop and Hancock; and the brilliancy, lightness, and cheapness of the wares, which, when well made, greatly resemble silver, have secured for them a very extensive sale in this and other countries. The extreme facility with which such alloys may be worked into any shape leads however to the manufacture of many articles of so flimsy a character that they speedily lose their form and beauty. Various authorities differ greatly as to the composition of Britannia metal, but the proportions given by Holland are 3½ cwts. of the best block-tin, 28 lbs. of martial regulus of antimony, 8 lbs. of copper, and 8 lbs. of brass. The tin is first melted and raised to a red heat in a stout cast-iron pot, and then the antimony, copper, and brass are successively poured into it from the crucibles in which they have been melted; the mass being stirred during the operation, to complete the mixture. The fusion being completed by the continued application of fire under the pot, the metal is removed by ladles to cast-iron boxes or moulds, in which it is cast into slabs fifteen inches long, six inches wide, and one inch thick; or if for casting small articles, into smaller moulds to form it into convenient ingots. The thick slabs of metal are then extended by passing them between polished steel rollers until they are reduced to the required degree of tenuity. This operation is performed without any annealing or softening; and the edges of the sheet become a little shattered or cracked by it.

Although most articles manufactured in silver are also produced in Britannia metal, and in other alloys of similar aracter, the principal consumption is in candlesticks, -pots, coffee-biggins, and other vessels for containing uids. The feet of candlesticks, the bodies of tea-pots, d other articles containing embossed work, are stamped tween dies; and when the shape of the article will not ow it to be stamped in one piece, as in the case of a lindrical vessel with raised work upon the sides, it is metimes stamped in halves, which are subsequently fitted id soldered together. Articles approaching the globular rm may in like manner be stamped in three or more eces. In stamping brass, silver, and plated metal the es must in almost every case be of steel, and the patterns pon them are executed at a very great expense, but in e manufacture of Britannia metal a cheaper process is llowed. Plaster casts are produced of the required pat- rns, either from original models or designs, or from ma- ufactured articles of silver, and from these are made oulds or dies of fine hard pig-iron, which, with a very ttle finishing, form dies fit for stamping so tractable a etal. When very thin, it may even be stamped in dies f brass or of spoon-metal.

The great facility with which this alloy may be moulded o any required form is illustrated by the operation termed *pinning*, by which the bodies of tea-pots witn concentric ircular swells are usually formed. A wooden chuck or nodel of so much of the intended vessel as may be slipped ff the chuck when completed is fixed in a lathe worked oy steam-power, and to this is applied a circular piece of sheet-metal cut to the proper size with shears. This is pressed against the centre of the chuck by a circular piece of wood with a blunt centre-pin; and as the whole revolves rapidly, the workman bends the plate over the model-chuck by pressing it with tools of hard wood or polished steel until it is brought into precisely the same form. The tools are applied at first very gently, so as to avoid crumpling or lacerating the metal; and such is the dexterity acquired by some workmen, that Holland states that some individuals can spin twenty dozen of these teapot bodies in a day. The form is perfected upon a second chuck; and in some cases articles are partially formed by a stroke in a die previous to the spinning. Spherical articles are, as in the case of stamping with dies, usually formed in two or more parts; but in some instances they are made to overlap the model, which is then composed of several segments, that may be taken out of the finished vessel by removing a centre-piece, in a similar manner to a boot-last.

Many small vessels, spoons, and other articles are cast in an alloy somewhat harder than that which is rolled into sheets. The facility with which Britannia metal may be run into any shape and cut in the lathe, as for turning measures and small vessels previously formed by casting, is a great recommendation to the manufacturer. Articles of this metal are cleaned from the oil, rosin, and other impurities acquired during their formation, by boiling in water containing sweet soap; after which they are polished, either by hand, or more commonly by the buff and brush set in motion by a steam-engine. The buff is a solid cylinder of wood, resembling a grindstone in form, the rim or periphery of which is covered with buff leather dressed with fine sand from the bed of the river Trent, which, after being dried and sifted, is mixed with oil. The brush is a similar but smaller circle of wood set all round with four or five rows of bristles; it, as well as the buff, is dressed with sand and oil, and afterwards for finishing with powdered rotten-stone and oil. The brush is used generally for such articles as from their form cannot be applied to the buff, and also for all stamped or embossed work. After buffing and brushing, the articles are boiled in a solution of pearlash, and finally hand-brushed and hand-polished by an application of soft soap, a little oil, and powdered rotten-stone. This operation is usually performed by females, as it is found that no instrument can supply an effectual substitute for a soft hand, which is one of the first requisites inquired into when persons apply for work in this department.

(Ure's *Dictionary of Arts, &c.*: *Manufactures in Metal* (by Mr. Holland), in Lardner's *Cabinet Cyclopædia*, vol. iii.; *Transactions of the Society of Arts*, vol. xlviii., pp. 244-248.)

TIN TRADE. The history of the trade in tin commences with the very earliest records of commercial intercourse with the British islands. [CASSITERIDES; and *Pict. History of England*, vol. i., pp. 91-95.] We shall only notice this trade as it has existed within the last two centuries. Davenant gives some interesting information concerning it soon after the middle of the seventeenth century. In 1663 our exports of tin to all foreign countries amounted to 153 tons; in 1669 to 240 tons; in the three years of peace, from 1698 to 1700, on an average to 1297 tons; and in the ten years of war, from 1700 to 1710, on an average to 1094 tons. In these last ten years the annual purchases of the Dutch amounted to 300 tons, of the estimated value of 21,374*l*. Davenant accounts for the great increase in the exportation as follows:—'All our neighbours,' says he, 'as well as ourselves, have increased in the luxurious way of living; such who heretofore were content with pewter are now served in plate; and such as made use of trenchers, wooden platters, and earthenware, will now have pewter; all which is visible within forty years, and has occasioned this great call of a commodity almost peculiar to us.' But the produce of the mines more than kept pace with the increased demand; and when Davenant wrote, Queen Anne had between 4000 and 5000 tons of tin on hand, a quantity equal to four or five years' consumption. 'As the case stands at present,' he adds, 'Holland is the great magazine for tin: the necessities of such as have it upon their hands, either in merchandize or security, drive it thither, and the Dutch set what price they please upon this rich product of England, to the damage of the public.' He proposed that a thousand tons of the dead stock should be coined into tin half-pence and farthings. The produce of the mines went on increasing, and the accumulation to which Davenant alludes is only about a year's produce of the mines at present.

In the 'Journal of the Statistical Society of London' (vol. ii., part iv.), there is a valuable paper, by Joseph Carne, Esq., on the 'Statistics of the Tin-Mines in Cornwall, and of the Consumption of Tin in Great Britain,' from which we borrow some of the following statements. From 1750 to 1785 the produce of the mines varied from 2273 tons, the lowest amount, to 3005 tons, which was the greatest quantity in any one year: the average production for this period was 2757 tons, and the average price 64*s*. 6*d*. per cwt. From 1789 to 1816 the annual average quantity was 2875 tons, at 79*s*. 9*d*. per cwt. From 1817 to 1837 inclusive, the annual average was 4211 tons, and the average price paid to the tinner was 73*s*. the cwt. In 1787 Banca tin was imported into this country for the first time, and the price of Cornish tin soon fell to 58*s*. the cwt., and would have declined still further if a new market had not been opened. It appears that the purser of an Indiaman, who took some tin from the Molucca islands to China in 1787, found the speculation so profitable that the East India Company were induced to direct their attention to the trade, and the Company shortly entered into arrangements with the Cornish tinners for an annual supply. The purchases of the Company were made at low prices, but the tinners were indemnified by the artificial scarcity which raised prices in the home market. At first the Company paid only 68*l*. 13*s*. 4*d*. the ton, delivered on board in London; in 1792 they gave 71*l*.; and on the renewal of the Company's charter they agreed to purchase 800 tons annually at 75*l*., and offered to take half as much more at 68*l*. 13*s*. 4*d*. In 1809 the difference between the prices paid by the Company and the prices in the home market was so great that the tinners refused to supply the Company, and their exports ceased; but in 1811 they agreed to pay 78*l*., and in 1812, 80*l*. per ton. The connection finally ceased in 1817, as the supply of the home market had become more profitable.

The gradual increase in the consumption of tin in Great Britain is shown in the following table:—

Periods.		Annual Average.
1783 to 1790	.	926 tons.
1791 to 1800	.	754
1800 to 1810	.	1118
1811 to 1820	.	1600
1821 to 1830	.	2616
1830 to 1837	.	3363

Until 1838 all the Cornish tin paid a duty of 4*s*. per 120 lbs. to the duchy of Cornwall, which, with the fees, was equivalent to 5*s*. This duty is now abolished. About 10,000 men, women, and children are supposed to be employed in the Cornish mines.

From 1783 to 1790 the proportion of British tin exported was 7-10ths of the produce of the mines; in the next ten years it was 3-4ths; from 1800 to 1820 one half; from 1820 to 1830 it had diminished to 2-5ths; and from 1830 to 1837 to 1-5th. The quantity of foreign tin imported, the greater part of which is intended for re-exportation, since 1815, was as follows:—From 1815 to 1831 the annual average quantity imported was 213 tons; exported annually during the same period 224 tons. From 1831 to 1838 the imports of foreign tin averaged annually 1527 tons, and the exports were 1482 tons. This foreign tin can be supplied cheaper in Europe and America than the Cornish tin. In 1841 the imports were 28,434 cwt., or 1421 tons, of which 17,915 cwt. were from Singapore, 6197 cwt. from Java, and 5324 cwt. from the East India Company's territories. In the same year the exports of foreign tin were 25,344 cwt., or 1267 tons, principally to the United States, Holland, Russia, France, Italy, and Germany. The exports of British tin in 1841 were 1267 tons. France took 8905 cwt.; Turkey, 4061 cwt.; Russia, 2780 cwt.; the United States, 1753 cwt.; and Italy, 1329 cwt.; being more than three-fourths of the whole. In the Custom-House records the quantity of tin manufactures exported is not distinguished, but in 1840 the exports of 'tin and pewter wares and tin plate' were valued at 360,816*l*. Under the tariff of 1842 (5 & 6 Vict., c. 47), foreign tin-ore will be admissible for the first time, on paying a duty, which is 10*s*. the ton if from a British possession, and if of a foreign, 50*s*. But as none of the British possessions contain tin likely to be brought into the English market, the real duty is 50*s*. The former duty of 10*s*. the cwt. was prohibitory. The quantity of tin annually produced in Banca is estimated at 2700 tons, and in the Malayan peninsula about 1300 tons; and these are the parts from which a supply of ore, if any, is likely to be received.

TIN (*Medical Properties of*). It cannot be confidently asserted that tin in a metallic state has no influence over the human system, as many respectable writers affirm that tin-filings are decidedly anthelmintic, and that this is not owing to mechanical irritation of the worms causing them to be detached from the surface of the intestines; it is stated that water in which tin has been boiled, and wine digested in a tin vessel, are also anthelmintic. Others, denying to tin any inherent power over worms, have attributed these effects to the presence of a small portion of arsenic. Be this as it may, it is a very crude method of treating worms to exhibit such a material as tin-filings. [ANTHELMINTICS.] Even oxide of tin is of doubtful efficacy, as might be expected from its extreme insolubility. Its powers may be heightened by occasionally meeting with acids in the stomach, such as the hydrochloric, and therewith forming a chloride. Two compounds of chlorine with tin are known, one the protochloride, the other the bichloride. Both of these are exceedingly soluble; the latter so much so that it can with difficulty be kept in the solid state, and more frequently occurs in the liquid state, and is then called the spiritus fumans Libavii, or butter of tin. The former is much used by dyers, among whom, when in the solid state, it is called *salt of tin*, and when liquid, *spirit of tin*. In the former condition, it has sometimes been mistaken for common salt: it has thus been the source of poisoning, though it is not very active when introduced into the stomach. A few grains of it injected into the jugular vein prove rapidly fatal to dogs. In case of any of it being swallowed, emetics or the stomach-pump, demulcent drinks, and, if necessary, moderate venesection, may be employed, followed after a time by vital stimulants. It has been thought by some to be dangerous to allow fluids containing acids, such as the weak acid wines, or cyder, or even fatty, saline, or albuminous substances, to remain long in tin-vessels, as an injurious action of these on the tin is supposed to occur. If any serious effects have ever followed from such a cause, it is most likely that these vessels were only coated superficially with tin, which being rubbed off, exposed the more potent metal beneath to the solvent power of these substances. It is therefore prudent to examine from time to time all copper and other vessels to see that the tinning is entire.

TIN PLATE. [TINNING.]

TIN PYRITES. [TIN.]

TINACTOR, Prince Maximilian's name for one of the Ant-Thrushes (*Formicarinæ*, G. R. Gray). This genus is the *Oxypyga*, Menetr. (1834), and belongs to *Myiothera*, Cuv., and *Thamnophilus*, Vieill.

Example, *Tinactor fuscus*, Guer. *Mag. de Zool.*, t. 10. [THRUSHES.]

TINA'MIDÆ. [TINAMOU.]

TINAMO'TIS, Mr. Vigors's name for a genus of birds (*Eudromia*, D'Orb. and J. Geoffr.). [TINAMOU.]

TI'NAMOU (*Tinamus*, Lath., *Tetrao*, Linn., *Tridactylus*, Lacép., *Crypturus*, Ill., *Pezus*, Spix), a genus of birds placed by Cuvier, Mr. Vigors, and Mr. Swainson among the TETRAONIDÆ, in which article the account given by the last-mentioned zoologist of their habits and utility to man will be found.

The Prince of Canino (*Birds of Europe and North America*) has a family *Crypturidæ*, noticed in the article TETRAONIDÆ (vol. xxiv., p. 255), and, we presume, would there place the Tinamous.

Mr. G. R. Gray makes the *Tinamidæ*, the sixth family of the *Gallinæ*, according to his arrangement, consist of the following subfamilies and genera:—

Subfam. 1. Turnicinæ.

Genus:—*Turnix*, Bonn.

Subfam. 2. Tinaminæ.

Genera:—*Tinamus*, Lath.; *Nothura*, Wagl.; *Rhynchotus*, Spix; *Tinamotis*, Vig.

This family is placed by Mr. G. R. Gray (*loc. cit.*), next to the *Chronididæ*, and at the end of the *Gallinæ*, the next order to which is formed by the *Struthiones*.

We proceed to illustrate the present article by one of the Tinamous properly so called.

Generic Character of Tinamus.—Bill moderate, depressed, broader than high, tip obtuse, back broad. Nostrils lateral, medial, ovate, expanded, and open. Feet four-toed, cleft; hind toe very short. Tail none, or very short, concealed by the rump-feathers. Wings short. (Sw.)

Example, *Tinamus Tataupa*, Var.

Description.—Tinamou with the body above dusky-rufous, immaculate. Head and neck dusky-black; chin white; throat, neck, and breast cinereous; body beneath whitish; vent and flanks rufous-black, the feathers margined with white. Bill and irides red. Total length 8½ inches. (Sw.)

Mr. Swainson, in his work on the 'Classification of Birds,' expresses his opinion that the Tinamous probably represent the group of Bustards in the New World [TETRAONIDÆ, vol. xxiv., p. 255]; but in a previous publication (*Zoological Illustrations*, 1st series), he says that they there 'seem to hold the same scale in creation which the partridges do in the Old Continent.' He refers, in the book last mentioned, to the work of M. Temminck (*Pig. et Gall.*), who, he observes, has described twelve species, and he states that the bird under consideration is the smallest of its family. He found it only once in the interior of Bahia, where, he says, it must be very rare, or frequent in particular districts only. Though differing in some respects from M. Temminck's description, he is inclined to consider it only a variety.

Tinamus Tataupa, Var. (Sw.)

Mr. Darwin, in his graphic description of the country around Maldonado, when he had reached the farthest oint which he was anxious to examine, says:—'The ountry wore the same aspect, till at last the fine green urf became more wearisome than a dusty turnpike-road. We everywhere saw great numbers of partridges (*Tinamus ufescens*). These birds do not go in coveys, nor do they conceal themselves like the English kind. It appears a ery silly bird. A man on horseback, by riding round and ound in a circle, or rather in a spire, so as to approach closer each time, may knock on the head as many as he pleases. The more common method is to catch them with a running noose or little lazo, made of the stem of an ostrich's feather, fastened to the end of a long stick. A boy on a quiet old horse will frequently thus catch thirty or forty in a day. The flesh of this bird, when cooked, is delicately white.' (*Journal of Researches in the Countries visited by H. M. S. Beagle.*)

TINCA, a genus of fishes founded by Cuvier, and which has for type the common tench, *Cyprinus tinca*, Linn.; *Tinca vulgaris*, Cuv. This fish belongs to the carp family (*Cyprinidæ*), and is separated generically on account of the small size of the scales with which the body is covered, combined with the small antero-posterior extent of the dorsal and anal fins, both of which are destitute of the anterior bony spine or any such as are observable in some allied fishes—as in the dorsal fin of the barbel for instance; the barbules to the mouth are very small.

The tench, observes Mr. Yarrell, inhabits most of the lakes of the European continent. In this country, though frequent in ornamental water and ponds, it is but sparingly found in the generality of our rivers. There is some doubt whether, like the carp, its origin be not foreign, and whether those rivers that can now boast of it are not indebted for it to the accidental escape of fish from the preserved waters of neighbouring gentlemen. The rivers it is mostly in are those which are slow and deep, and in such situations it does not appear to be so prolific as in ponds. Cuvier observes that the tench inhabits by preference stagnant waters. This is in accordance with the observations of Mr. Yarrell, and, rivers being an unnatural habitat for the fish, will account for their being less prolific in such situations.

The author of the interesting work on British Fishes, just mentioned, quotes the following account illustrative of the habits of the tench and of its tenacity of life: it is from Daniel's 'Rural Sports:'—'A piece of water which had been ordered to be filled up, and into which wood and rubbish had been thrown for years, was directed to be cleared out. Persons were accordingly employed; and, almost choked up by weeds and mud, so little water remained, that no person expected to see any fish, excepting a few eels, yet nearly two hundred brace of tench of all sizes, and as many perch, were found. After the pond was thought to be quite free, under some roots there seemed to be an animal which was conjectured to be an otter; the place was surrounded, and on opening an entrance among the roots, a tench was found of most singular form, having literally assumed the shape of the hole, in which he had of course for many years been confined. His length from eye to fork was thirty-three inches; his circumference, almost to the tail, was twenty-seven inches; his weight eleven pounds nine ounces and a quarter; the colour was also singular, his belly being that of a char, or vermilion. This extraordinary fish, after having been inspected by many gentlemen, was carefully put into a pond, and at the time the account was written, twelve months afterwards, was alive and well.'

Experiments have shown that a tench is able to breathe when the quantity of oxygen is reduced to a five-thousandth part of the bulk of the water: ordinary river water generally containing one per cent. of oxygen.

The general colour of the tench is greenish brown, or olive having a golden hue, which latter tint is most conspicuous on the under parts of the fish. From the carp it is readily distinguished by the small size of its scales, and also the small extent of the dorsal fin: its form is rather less deep in proportion to the length. It spawns usually about the middle of June, and deposits its ova on weeds.

TINCTURES are solutions of the active principles, mostly of vegetables, sometimes of saline medicines, and more rarely of animal matters, in certain solvents. From possessing more or less of colour, they have obtained this name. They are distinguished according to the kind of solvent employed. When alcohol is used, they are termed *alcoholic* tinctures, or more generally simply *tinctures*; when sulphuric æther is used, they are denominated *ætherial* tinctures. When wine is used, though differing little from pure alcohol, the term *medicated wines* is applied to them; and when the process of distillation is employed to aid the extraction, particularly of volatile oils, the result is termed a *spirit*, such as of rosemary. Ammonia is sometimes conjoined, and the proceeds termed an *ammoniated* tincture. In some cases less of the principal ingredient is taken up or dissolved when ammonia is used, than when simple alcohol is employed, as in the tinctura guaiacum ammoniatum. Formerly some tinctures were called *essences*, from the term *esse*, it being thought that they contained only the purer or more refined portion, the alcohol leaving all the baser principles, such as the starch, gum, woody fibre, &c., undissolved: *quintessence* was a still higher degree of this. These terms are now disused by pharmaceutists, though retained by the people. *Elixirs* differ only from being of a greater consistence: they are not unfrequently turbid from the extractive matter suspended in them. Tinctures are further distinguished into simple and compound. They are called *simple* when one substance only is submitted to the solvent; *compound*, when two or more are. Another important distinction among tinctures is founded upon the degree of strength of the alcohol employed. Where the active principle is nearly pure resin, a strong spirit is needed; when much gum is associated with the resin, a weaker is required. Hence some tinctures are prepared with *proof* spirit, as the greater number; a few with *spirit above proof;* and some with *rectified spirit*.

A well-prepared tincture should be clear, possessing the colour of the article which is its base, and partaking in an eminent degree of its characteristic odour and taste. As a general rule, five or six parts of the liquid chosen is to be used for one part of the solid material, which is to be bruised or comminuted before being submitted to maceration. The maceration, which should be conducted in well-stopped glass vessels, is generally continued for fourteen days, during which the ingredients are to be frequently shaken, and at the end strained. The pure tincture is then to be preserved in a tightly-stopped bottle, which should be opake, or sheltered from the light. From several tinctures a deposit falls down, either from some slow chemical change taking place among the ingredients, or from the evaporation of some of the spirit. This renders old tinctures not unfrequently turbid, and of variable strength. Thus tincture of opium when newly prepared contains one grain of opium in nineteen minims, but after some time one grain of opium is contained in only fourteen minims. This inconvenience may be avoided with all recent vegetables, by forming what are termed 'vegetable juices.' These are merely the juices of the fresh plant expressed by a powerful wooden press, and the juice allowed to stand twenty-four hours, during which a copious precipitation of feculent matter takes place, which is further promoted by adding alcohol 56° over proof, in the proportion of four fluid ounces to every sixteen fluid ounces of the juice. After standing for twenty-four hours, the juice is to be filtered through bibulous paper (prepared from wool), when it will keep unimpaired for a length of time.

These vegetable juices always retain their purity, and are of the same degree of strength at last as at first. By this means not only is the process simplified, and the time required for their preparation greatly abridged, being reduced from fourteen days to two; but their medicinal efficacy is greater than that of the ordinary tinctures, and, from containing less alcohol, they can be given in cases where the stimulating action of this principle interferes with the effect of the substance dissolved in it, or renders its exhibition improper, as in the case of young children.

In preparing the officinal *spirits*, the directions of the Pharmacopœia are rarely complied with. Most chemists content themselves with dissolving some of the essential oil of the plant in alcohol of the requisite strength, by which much expense and trouble, as well as loss of time, are avoided.

(See a pamphlet on *The Best Method of Obtaining the Most Powerful Vegetable Preparations for Medical Use*, by Edward Bentley.)

TINDAL, MATTHEW, LL.D., was the son of the Rev. John Tindal, parish clergyman at Beer-Ferres in Devonshire, where Matthew was born about the year 1657. In 1672 he was admitted of Lincoln College, Oxford, where Dr. Hickes was his tutor; but he afterwards removed to Exeter College; and he was finally elected to a law fellowship at All Souls, soon after he had taken his degree of B.A., in 1676. He proceeded LL.B. in 1679, and was created LL.D. in 1685. If we may believe certain charges which were long afterwards made in print by the opponents of his theological opinions, his debaucheries while he resided at Oxford were so scandalous as to have drawn down upon him on one occasion a public reprimand from his college. Soon after he obtained his doctor's degree he went over to the Church of Rome, not without subjecting himself to the imputation of having an eye to the worldly advantages which such a step might seem to promise under the popish king just come to the throne. It does not appear however that he actually obtained any court favour or patronage by his change of religion; and, according to his own account, given in a pamphlet he published in his own defence in 1708, he reverted to the Church of England some months before the Revolution, having attended mass for the last time at Candlemas, 1688, and publicly received the sacrament in his college chapel at Easter following. He asserts that his mind, which came a *tabula rasa* to the university, had been prepared for being seduced by James's Romish emissaries by the notions as to the high and independent powers of the clergy which then prevailed there, and which he had adopted without examination. Accordingly, when he threw off popery, he abandoned his high-church principles at the same time; or rather, as he puts it, he discovered that these principles were unfounded, and that at once cured him of his popery. 'Meeting,' he says, 'upon his going into the world, with people who treated that notion of the independent power as it deserved, and finding the absurdities of popery to be much greater at hand than they appeared at a distance, he began to examine the whole matter with all the attention he was capable of; and then he quickly found, and was surprised at the discovery, that all his till then undoubted maxims were so far from having any solid foundation, that they were built on as great a contradiction as can be, that of two independent powers in the same society. Upon this he returned, as he had good reason, to the Church of England, which he found, by examining into her constitution, disclaimed all that independent power he had been bred up to the belief of.' The Revolution having taken place, he now also, naturally enough, became a zealous partizan of that settlement. The history of the rest of his life, during which he appears to have resided mostly in London, consists almost entirely of that of his successive publications and of the controversies in which they involved him.

He first appeared as an author in November, 1693, by the publication, in 4to., of 'An Essay concerning Obedience to the Supreme Powers, and the Duty of Subjects in all Revolutions, with some considerations concerning the present juncture of affairs.' This was followed in March, 1694, by 'An Essay concerning the Law of Nations and the Rights of Sovereigns,' a second edition of which, with additions, was brought out in the same year. This year also he published 'A Letter to the Clergy of both Universities,' in recommendation of certain alterations which there was then some talk of making in the Liturgy; and in 1695 another pamphlet in support of the same views. But the first work by which he attracted general attention was an 8vo. volume which he published in 1706, entitled 'The Rights of the Christian Church Asserted, against the Romish and all other priests who claim an independent power over it.' This work, which is an elaborate attack upon the theory of hierarchical supremacy, or what are commonly called high-church principles, immediately raised a vast commotion. It is related that to a friend who found him one day engaged upon it, pen in hand, he said that he was writing a book which would make the clergy mad. Replies to it were immediately published by the celebrated William Wotton, by Dr. Hickes (Tindal's old college tutor), and others; the controversy continued to rage for several years: a bookseller and his shopman were indicted for selling the book. In 1707 Tindal published 'A Defence' of his work, and, a few months after, 'A Second Defence,' both of which he republished together, with additions, in 1709: the same year he also reprinted his two Essays on Obedience and the Law of Nations, along with 'A Discourse for the Liberty of the Press, and an Essay concerning the Rights of Mankind in matters of Religion:' about the same time he came forth with a fresh pamphlet, entitled 'New High Church turned Old Presbyterian,' in exposure of the pretensions put forward by Sacheverell and his party; upon which the House of Commons, which the day before had condemned Sacheverell's sermons to be burned, on the 25th of March, 1710, impartially ordered Tindal's 'Rights of the Christian Church' and the second edition of his two 'Defences' to be committed to the flames at the same time. This proceeding drew from Tindal the same year three more pamphlets:—the first, entitled 'A High-Church Catechism;' the second, 'The Jacobitism, Perjury, and Popery of the High-Church Priests;' the third, 'The Merciful Judgments of High-Church triumphant, on Offending Clergymen and others, in the reign of Charles I.' The next year, on the Lower House of Convocation having drawn up and printed 'A Representation of the present state of Religion, with regard to the late excessive growth of Infidelity, Heresy, and Profaneness,' Tindal forthwith replied in 'The Nation Vindicated from the Aspersions cast on it' in the said representation. The second part of this performance is occupied with an explanation and defence of what has since been called the doctrine of philosophical necessity, in opposition to the assertion of the Convocation, that such views went to overturn the foundations of all morality, and of all religion, natural as well as revealed. For some years from this date Tindal's active pen was exclusively occupied with the politics of the day; but his performances do not appear to have been very effective at the time, and have been long forgotten. It is remarkable however that in so voluminous a work as Coxe's 'Memoirs of Sir Robert Walpole,' no notice should be taken of a personal controversy in which Tindal became involved with that minister after his resignation in 1717, and which produced various pamphlets on both sides. Tindal considered himself to have been ill-used by Walpole, who, according to his account, had first courted his alliance, and then suddenly dropped him after he had so far committed himself in writing that it was imagined his hostility in print was not to be dreaded. Walpole, on the other hand, or his friends, accused Tindal of a treacherous desertion to the opposite faction as soon as he found that Walpole had been or was about to be deprived of power. It is probable that there was some misunderstanding on both sides. In any case this ministerial rupture was merely a personal quarrel, in which little or no public principle was involved; and it implies therefore no political versatility or inconsistency in Tindal that a few years after this, in 1721, 1722, and 1723, when Walpole was at the head of the ministry, he came forward as a strenuous defender of his government in a succession of pamphlets. He did not return to his original field of theological polemics till 1728, when he published 'An Address to the Inhabitants of the two great Cities of London and Westminster,' in reply to a pastoral letter which the bishop of London, Dr. Gibson, had addressed to the people of his diocese on the subject of Anthony Collins's 'Scheme of Literal Prophecy Considered,' and other recent deistical writings. A 'Second Pastoral Letter,' soon after published by the bishop, called forth a 'Second Address' from Tindal; and both addresses were reprinted the same year, in an 8vo. volume, with alterations and additions.

From this date Tindal seems to have remained quiet till the year 1730, when he produced, in a 4to. volume, the work by which he is now chiefly remembered, his 'Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature.' The object of this work, as is indeed sufficiently declared in its title, is to contend that there is nothing more in Christianity, properly understood, than what the human reason is quite capable of discovering for itself, and by implication to deny that any special revelation has ever been made by the Deity to man. It did not however contain any express denial of the truth of Christianity; of which indeed the author and his partizans rather professed to think that he had found out a new defence stronger than any that had been previously thought of. 'Tindal,' said Warburton, some years after, 'a kind of bastard Socrates, had brought our speculations from heaven to earth; and, under pretence of advancing the antiquity of Christianity, laboured to undermine its original.' The book made a great noise, and arious answers to it soon appeared, he most noted of hich were—Dr. Waterland's 'Scripture Vindicated,' 1730; The Usefulness, Truth, and Excellency of the Christian Revelation defended,' by Mr. (afterwards Dr.) James Foster (the eminent dissenting clergyman), 1731; 'A Deence of Revealed Religion,' by Dr. Conybeare (afterwards Bishop of Bristol), 1732; and 'An Answer to Christianity as Old as the Creation,' by the Rev. John (afterwards Dr.) Leland (another learned and distinguished dissenting divine), 1733. The book is also discussed in the last-menioned writer's more celebrated work, his 'View of the Principal Deistical Writers,' published in 1754. Tindal defended himself in 'Remarks on Scripture Vindicated, and some other late Writings,' published along with a new edition of his 'Second Address to the Inhabitants of London and Westminster,' in 1730. But this was his last publication; his health now began to give way, and he expired on the 16th of August, 1733, at a lodging in Cold Bath Fields, to which he had been prevailed upon to remove a few days before from his chambers in Gray's Inn. Tindal never held any preferment except his fellowship; but it is stated, in the 'Biographia Britannica,' that in the reign of King William he frequently sat as judge in the Court of Delegates, and had a pension of 200*l*. a year granted to him by the crown for his services in that capacity. It is added that he 'rarely, if ever, practised as an advocate in the courts of civil or ecclesiastical law;' which would seem to imply that he had been called to the bar, or been admitted an advocate at Doctors' Commons, although that fact is not mentioned. A new edition of his 'Essay on the Law of Nations' was published the year after his death; but the publication of a second part of his 'Christianity as Old as the Creation,' which he left ready for the press, is said to have been prevented by the interference of Bishop Gibson. A will, in which he left nearly all he had to Eustace Budgell, in whose hands he was for some time before his decease, was contested by his nephew, the Rev. Nicholas Tindal, and was at last set aside: the will was printed in a pamphlet, with a detail of circumstances connected with it, in 1733.

Of the amount of talent and learning shown in Tindal's writings very different estimates have been formed by his admirers and his opponents. Waterland, in the Introduction to his 'Scripture Vindicated,' characterises his antagonist in the following terms:—'His attacks are feeble, his artillery contemptible; he has no genius or taste for literature, no acquaintance with the original languages, nor so much as with common critics or commentators; several of his objections are pure English objections, such as affect only our translation: the rest are of the lowest and most trifling sort.' Dr. Conyers Middleton, on the other hand, in a letter which he addressed to Waterland immediately after the latter had published his book, says, 'For my own part, to observe our English proverb, and give the devil his due, I cannot discover any such want of literature as you object to him; but, on the contrary, see plainly that his work has been the result of much study and reading; his materials collected from a great variety of the best writers; his pages decently crowded with citations; and his index of authors as numerous as that of most books which have lately appeared.' Tindal's English style is unaffected and perspicuous.

TINDAL, REV. NICHOLAS, was the son of a brother of Dr. Matthew Tindal, and was born in 1687. Having studied at Exeter College, Oxford, and taken his degree of M.A. in 1713, he was afterwards elected a Fellow of Trinity College in that university. In 1722 he was presented by his college to the vicarage of Great Waltham in Essex; in 1738 Sir Charles Wager, then first lord of the admiralty, with whom he appears to have some years before sailed for a short time as chaplain, appointed him chaplain to Greenwich Hospital; in 1740 he is said to have been presented to the rectory of Colbourne in the Isle of Wight, upon which he resigned Great Waltham; and very soon after he appears to have obtained his last preferment, the rectory of Alverstoke in Hampshire, from the bishop of Winchester (Hoadley). He died at Greenwich Hospital on the 27th of June, 1774.

Mr. Tindal's first literary attempt was a work published in monthly numbers in 1724, under the title of 'Antiquities, Sacred and Profane, being a Dissertation on the excellency of the History of the Hebrews,' &c., which is described as a translation from the French of Calmet. This was followed by two numbers of a History of Essex, which was then dropped. He then engaged in his most memorable undertaking, the translation, from the French, of Rapin's 'History of England,' which appeared in a succession of octavo volumes in 1726 and following years, and was reprinted in two volumes folio in 1732. This second edition was dedicated to Frederick, prince of Wales, who in return presented the translator with a gold medal of the value of forty guineas. In 1744 a Continuation of Rapin, by Tindal, began to be published in weekly folio numbers, which was completed in two volumes (commonly bound in three), in 1747, the history being brought down to the end of the reign of George I. A second folio edition of this Continuation appeared in 1751, and a third, in 21 vols. 8vo., in 1757, with the addition of the reign of George II. down to that date. The translation and continuation of Rapin were very successful speculations; and the publishers, the Messrs. Knapton, of Ludgate Street, evinced their gratitude by making Tindal a present of 200*l*. It is generally stated that he was assisted in both undertakings by Mr. Philip Morant, to whom solely is attributed the Abridgment or Summary of the History and Continuation given at the end of the latter, and also printed in 3 vols. 8vo. in 1747; but it does not appear upon what authority it is asserted by Coxe, in the Preface to his 'Memoirs of Sir Robert Walpole,' that the Continuation, though published under the name of Tindal, 'was principally written by Dr. Birch.' There is no hint of this in the very full and elaborate Life of Birch, in the second edition of the 'Biographia Britannica,' which is stated to be compiled from his own papers and the communications of surviving relations and friends. 'His papers,' Coxe proceeds, 'in the Museum and in the Hardwicke Collection, which I have examined with scrupulous attention, and various other documents which were submitted to his inspection, and to which I have had access, prove great accuracy of research, judgment in selection, and fidelity in narration. He derived considerable assistance from persons of political eminence, particularly the late Lord Walpole, the late earl of Hardwicke, and the Honourable Charles Yorke. The account of the Partition Treaty was written by the late earl of Hardwicke. The account of Lord Somers's argument in Barker's case was written by his great-nephew the late Mr. C. Yorke. I can also trace numerous communications by Horace Walpole, though they cannot be so easily specified. Birch was a stanch Whig, but his political opinions have never led him to forget his duty as an historian. He has not garbled or falsified debates, or misstated facts; he has not wantonly traduced characters, or acrimoniously reviled individuals because they espoused the cause which he disapproved; but in his whole work, whether he praises or blames, there is a manly integrity and candid temperance, which must recommend him to the discerning reader.' This is a sufficiently just character of the Continuation of Rapin: but, although in some parts the work has a claim to be considered as an original authority, it is in the greater part not only a compilation, but a mere transcription from preceding writers. The authors indeed frankly state in their prefatory notice that they have not scrupled to copy or imitate any part of the several authors they have made use of, when conducive to the usefulness of the work, or where there was no occasion to alter or abridge. The numerous documents inserted at full length make the Continuation a convenient repertory of authentic information; and the notes which accompany the translation of the preceding part of the work add greatly to the value of the original text. Tindal's other publications were—the pamphlet relating to his uncle's will, an abridgment of Spence's 'Polymetis,' under the title of 'A Guide to Classical Learning for Schools,' and a translation, from the Latin, of Prince Cantemir's History of the Growth and Decay of the Othman Empire, which appeared in a folio volume in 1734.

TINIAN is one of the Ladrone or Mariane Islands [vol. xiii., p. 269]: it lies near 15° N. lat. and 146° E. long. It is uninhabited and of small extent. It owes its name in the world not to its real importance, but to the circumstance that Lord Anson, just one hundred years ago remained there nearly two months, from 26th of August to the 21st of October, 1742, and that in the account of his voyage a description of the island is given in glowing colours. It extends about 12 miles from south-south-west to north-north-east, and the breadth is about half as much. The soil is somewhat sandy, but very dry and healthy. The land rises in gentle slopes from the beach to the middle of the island, but the ascent is often interrupted by small level valleys, many of which wind irregularly through the country. These valleys and the gradual swellings of the ground are most beautifully diversified by an alternation of woods and lawns, which traverse the island. The woods consist of tall and well-spread trees, mostly without under-wood, and the lawns are covered with a clean turf composed of very fine trefoil and intermixed with a variety of flowers. There are no running streams, but good water is found by digging a few feet below the surface, and near the middle of the island there are three small lakes. Black cattle, in a wild state, are numerous, and at the time of Anson's visit the number was computed to amount to at least ten thousand. Our common domestic fowl is plentiful in the woods, and several kinds of wild fowl are found in the lakes. There is also an abundance of wild hogs. Besides the cocoa-nut palm and the bread-fruit tree there are guavas, limes, and sweet and sour oranges, and antiscorbutic plants in great abundance, by the use of which the crew of the Centurion, the vessel commanded by Lord Anson, which suffered much by the scurvy, was restored to health in a short time. There is no harbour, but only an open roadstead near the south-western extremity of the island, which is dangerous during the prevalence of the western monsoon, from June to October, but tolerably safe during the remainder of the year.

(Anson's *Voyage round the World*; Kotzebue's *Voyage of Discovery into the South Sea, &c.*)

TINNEVELLY. [HINDUSTAN, p. 203.]

TINNING, TIN-PLATE MANUFACTURE. The art of tinning, or of coating other metals with a thin layer of tin, so as to protect them from oxidation, was known to the antients, although it does not appear to have been very extensively practised. Professor Beckmann, in his investigation into the early history of tin and tinning (*History of Inventions*, English edit. of 1814, vol. iv., pp. 1-45), states that we have no account of the process antiently employed in tinning, although the use of the words *incoquere* and *incoctilia* by Pliny seems to indicate that it was performed by immersing the vessels in melted tin. The degree of perfection to which the process was carried is indicated by his statement, accompanied by an expression of wonder, to the effect that the tinning did not increase the weight of the vessels, which shows that the tin must have been applied, as at present, in a very thin layer.

The art of tinning plate-iron is more modern than that of coating copper vessels with tin, and is supposed to have been invented either in Bohemia or in Germany. Mr. Parkes, in a paper on the manufacture of tin-plate, or tinned sheet-iron, addressed to the Literary and Philosophical Society of Manchester, in 1818, which was published in their 'Memoirs' (Second series, vol. iii., pp. 347-380), states that our ancestors, from time immemorial, procured that article from Bohemia and Saxony, where the manufacture was established near the tin-mines of the Erzgebirge mountains, which were the most extensive in Europe after those of Cornwall. From the time of the invention of tin-plate down to the close of the seventeenth century, if not later, both England and the whole continent of Europe depended upon the above-named countries for their supply of tin-plate; but about the year 1665 an attempt was made to introduce the manufacture into England, by some gentlemen who sent the ingenious Andrew Yarranton into Saxony to obtain information respecting it. Yarranton's account of the experiment, which is quoted at length by Parkes, was published in 1681, in the second part of his curious work entitled 'England's Improvement by Sea and Land,' now very rare. He was allowed freely to inspect the tinning establishments, and he became so well acquainted with the process, that after his return to England he made many thousand plates of iron, from the Forest of Dean, tinned with Cornish tin, the quality of which was admitted to be even superior to that of the German tin-plates, which they surpassed in toughness and flexibility. Before however the new manufacture could be fairly established, its promoters were stopped by a patent, which Yarranton says was 'trumped up' for the purpose by parties possessing court influence. The patentees did not understand the art sufficiently to enable them to succeed, and thus England remained dependent for some years upon the Continent for a manufacture for which she possessed the greatest facilities. Parkes states that he does not find that any manufacture of tin-plate was established in this country until between 1720 and 1730, and that the first was at Pontypool, in Monmouthshire, where, according to Watson's 'Chemical Essays,' it was practised as early as 1730. Shortly before that time the art was introduced into France by M. Réaumur, who communicated an account of the process, as practised by the Germans, to the French Academy of Sciences in the year 1725, in a paper which was translated by Rutty, and published in the 35th volume of the 'Philosophical Transactions' (No. 406, published in December, 1728). In his introductory remarks Rutty states that the making of tin-plates, or, as they were sometimes called, *latten* or *lattin*, was not commonly practised in England, notwithstanding the great consumption; and that we were obliged to export our own tin to Germany, and to receive it back again when manufactured. Anderson (*Hist. of Commerce*, vol. iii., p. 226) states that about 1740 the manufacture of tin-plate was brought to such perfection in England that very little was imported from foreign countries, and that the British manufacture was superior to the foreign in glossiness of surface, owing to the plates being drawn under a rolling-mill, instead of being hammered, as was common in those made beyond sea. The difficulty of extending iron, in what may be deemed the infancy of the manufacture, into thin uniform sheets, with a perfectly smooth and clean surface, which is essential to the adhesion of the tin in an equal film, was one of the principal obstacles to the progress of this department of the art of tinning.

The process of tinning depends upon the strong affinity which exists between tin and the metals to which it is applied, and it consists, essentially, in rendering the surface to be tinned perfectly clean and free from oxide, and then bringing it into contact with melted tin, which forms an alloy with the harder metal, imparts to it a bright silvery appearance, and protects it from oxidation. The tinning of sheet-iron, as the most important application of the process, will be first noticed. This operation is minutely described by Mr. Parkes, in the paper above cited, from which, with occasional reference to more recent accounts, the following description is condensed. Réaumur's account of the German process, in the 'Philosophical Transactions,' may also be consulted by those who are curious as to the details of the earlier method of tinning, which resembles that about to be described in all essential points.

The finest English or Welsh bar-iron, prepared with charcoal, instead of mineral coke, and known to the trade as *tin-iron*, is used for making tin-plates. This material is first made into flat bars, or slabs, about thirty inches long, six inches wide, and weighing eighty pounds. These bars are made red-hot, and extended by passing them repeatedly between rollers, until they are reduced to about three-eighths of an inch in thickness. When cooled, these pieces are cut by shears, worked by machinery, into plates about ten inches by six, which are repeatedly re-heated and rolled, until they are reduced to as thin a state as the process will conveniently allow. The sheet is then doubled and again rolled until reduced in thickness one-half, after which it is doubled again, and rolled until still further diminished in thickness. When thus brought to the required tenuity, the thin sheet is cut into plates of the sizes required to suit the market (most commonly about thirteen inches by ten), and then the several thicknesses or laminæ are separated,—an operation which needs the application of considerable force, as the compression of the rollers causes them to adhere strongly together. Parkes states that the cutting of the plates was, when he wrote, usually performed with hand-shears, but that an ingenious white-smith in Glamorganshire had invented a machine for the purpose, which was impelled by a water-wheel, and would cut a quantity equal to a hundred boxes (of two hundred and twenty-five plates each) in a day, which is four times as much as a hand-shearer could accomplish. After shearing, the plates are piled in heaps, one being laid cross-wise at intervals, to separate the number required to form a box. That name is technically applied to the number of plates just mentioned in all the subsequent processes, although it is not until they are completed that the plates are actually placed in boxes.

The next operation to be performed is the removal of ery particle of oxide or other impurity from the surface the plates. For this purpose each is bent to an angle about 60°, so as to bring it into the form of an inverted or ∩, and then steeped for a few minutes in a leaden ugh containing a weak solution of muriatic acid. Four unds of acid to three gallons of water makes a mixture the proper strength, and sufficient for eighteen hundred ates. After being immersed for four or five minutes in s cleansing liquid, the plates are taken out, arranged on e floor in rows, and then removed, by means of an iron l, to a reverberatory furnace or oven, in which they are bmitted to a red heat. The reason for bending the ates now becomes obvious, because if they were flat, the o sides could not be equally exposed to the flame by ich the furnace is heated; whereas by bending them, and acing them upon their edges, the flame is allowed to ay upon both sides. The heat to which the plates are posed, combined with their previous washing in the acid, uses them to throw off a scale of rust or oxide, whence is operation is termed *scaling*. If well performed, it ves to the iron a mottled blue and white surface, someiat resembling marbled paper. The plates are then ttened by beating them upon a cast-iron block, and subitted to a second or *cold* rolling, which removes any arping acquired in the previous processes, gives a high gree of smoothness to their surfaces, and imparts elasity to the iron. The rollers, or *rolls*, employed in this eration are formed of cast-iron, rendered very hard by sting in thick cold iron boxes or moulds, and their surces are carefully polished. Parkes states that rollers of out thirty inches diameter are much better than those of aller dimensions for this purpose: the length of the rolls usually seventeen or eighteen inches. After the *cold lling* the plates are immersed singly, in a vertical posion, in an acidulous preparation called the *lyes*, consisting water in which bran has been steeped for nine or ten ys, until it has fermented and become slightly acid. In is the plates are kept for ten or twelve hours, and occaonally turned, to insure an equal exposure of every part their surface; and from the lye-trough they are transrred to a leaden vessel containing diluted sulphuric acid, e strength of which is varied according to the judgment the workman. This trough is divided into compartents, which will contain a box of plates each; and both and the lye-trough are slightly heated by flues, to assist e action of the acid menstrua. Parkes states that a temerature of 90° or 100° Fahrenheit is sufficient for this opetion, which is called *pickling*, and which requires some cety, to prevent the plates from being strained or blisred by remaining too long in the acid. They are usually itated in the weak sulphuric acid for about an hour, ntil they become bright and free from black spots. They e then removed into pure water, in which they are oured with hemp and sand, to remove any remaining xide; and in this bath of pure water the plates remain ntil wanted for tinning, because, even if left for months, ey will remain perfectly free from rust.

As the sole object of these operations is to cleanse the on plates from rust and dirt, it is evident that the details ay be varied considerably; but it is not necessary to otice particularly any deviations from the usual process. he *tinning* of the plates is effected in a range of caston pots heated by flues, and forming together an apparatus called the *stow*. The plates are removed one by one om the last-mentioned bath of pure water, and dried by bbing with bran, after which they are immersed singly a pot filled with melted tallow or grease, in which they re left for about an hour. The grease preserves the surce from oxidation, and appears also to increase the affiity of the iron for tin; and for this purpose burnt grease, r any kind of empyreumatic fat, is found preferable to ure fresh tallow. From the grease-pot the plates are removed, with the grease which adheres to their surfaces, nto the metallic bath, which contains a mixture of block nd grain tin, covered with a quantity of grease sufficient o form a layer four inches deep. Parkes states that the nixture of block and grain tin usually contains about qual quantities of each; but he conceived that manufacurers would find it advantageous to use grain-tin alone; ince, although it would be rather more expensive, its greater purity and fluidity would occasion it to adhere to ne iron in a thinner film. The tin-bath or pot is heated to such a degree as almost to inflame the fatty mixture upon the surface of the tin; and its dimensions are such that it will receive two or three hundred plates standing upright on their edges. The precise size is immaterial, so that the number of plates put in is such as to prevent any from falling down; but it is convenient to make it large enough to hold a box and a half of plates, or about three hundred and forty. When the plates have remained in the tin-bath a sufficient time (usually about an hour and a half, but more for thick plates), they are lifted out with tongs, and placed upon an iron grating, to allow the superfluous tin to drain off; but as there still remains upon them much more than the proper quantity of tin, they are afterwards subjected to a process called *washing*, which consists in dipping them into a pot containing a quantity of pure grain-tin in a melted state, then rubbing them with a peculiar kind of brush made of hemp, plunging them again for a moment into the melted tin in the wash-pot, and then into a pot filled with clean melted tallow, or lard free from salt, which contains pins, to prevent the plates from touching each other. The heat of this second tin-bath melts and detaches the superfluous and coarser portions of the tin from the plates, and the drossy impurities rise to the surface; while the other portions unite with the grain-tin, and so deteriorate its quality, that, after washing sixty or seventy boxes, it becomes necessary to remove about three cwt. of tin from the wash-pot, and to supply its place by a block of pure grain-tin. The impure tin thus removed from the wash-pot is put into the bath in which the plates receive their first tinning. As it is desirable, in the final dipping of the plate, to preserve it from contact with the dross or scum which collects upon the surface of the bath, a partition is inserted in the wash-pot, to keep one compartment free of scum. The last dip serves to eradicate the marks of the brush, and to replenish the coat of tin wherever it may have been rubbed too thin; and the subsequent immersion of the plates in the grease-pot causes any superfluous metal to run off. The heat of the tallow-bath, and the period of immersion in it, must be regulated with care. Thick plates require the tallow to be cooler than for thin ones, because they retain more heat in themselves; and if a thick plate were placed in a bath of proper temperature for thin plates, it would come out of a yellow instead of a silvery-white colour; while, on the contrary, a bath intended for thick plates would be too cool to effect the required purpose upon thin sheets. Too short a period of immersion has a similar effect, and leaves too much tin upon the surface, and that in a wavy irregular film; while if left too long in the grease-pot, the tin would run off to such a degree as to render another dipping necessary. So soon as the workman employed in washing has placed five plates in the grease-pot, a boy lifts the first from it into a draining-pan with a grated bottom; and when the man has placed the sixth in the tallow, the boy removes the second. Notwithstanding the apparently complicated character of the operations just described, they are performed so rapidly, that an expert wash-man will wash and brush twenty-five boxes, or five thousand six hundred and twenty-five plates, in twelve hours.

Owing to the vertical position of the plates during the preceding operations, a selvage of tin accumulates along their lower edge, which is removed by the process called *listing*. This is performed by taking the plates one by one, as soon as they are cool enough to handle, and dipping their lower edges into a pot called the *list-pot*, or *listing-pot*, which contains enough melted tin to form a layer a quarter of an inch thick. The selvage of tin being thus melted, is shaken off by a smart blow with a stick, leaving only a faint stripe, which may be discerned upon all finished tin-plates. After listing, the plates are cleaned from grease by rubbing them, while yet warm, with dry bran; after which they are packed in boxes of wood or sheet-iron.

The tinning of the inner surfaces of cooking utensils and other vessels of capacity is performed by scouring the surface until it is perfectly bright and clean; then heating the vessel, pouring in some melted tin and rolling it about, and rubbing the tin all over the surface with a piece of cloth or a handful of tow: powdered rosin is used, as in soldering, to prevent the formation of oxide, which would impair the mutual affinity of the metals Pure grain-tin should be used for this purpose, but it is frequently adulterated with lead. By this means vessels of copper, brass, and cast-iron are tinned internally, and thereby rendered fit for the most delicate culinary operations; and in a similar way any small portions of iron-plate may be coated with tin. Bridle-bits, stirrups, and many other small articles, are tinned by immersing them in fluid tin. Mr. Gill, in the eleventh volume of the 'Technical Repository,' p. 290, describes an ingenious method of tinning nails or tacks and other small wares, which consists in cleaning the surface by pickling the articles in diluted sulphuric, muriatic, or nitric acid, washing them afterwards in water, and then putting them into a gallon bottle of stone-ware, with an oval body and a narrow neck, together with a quantity of bar or grain tin, and of sal-ammoniac. This vessel is then to be closed, and laid on its side over a charcoal fire, made upon a forge-hearth, and by turning it round, and frequently shaking it, the tin is to be uniformly distributed over the surfaces of the inclosed articles. When tinned they are taken out, washed in water to remove the sal-ammoniac, and dried in warm sawdust. The great advantage of the process consists in the employment of the stone-ware bottle, which prevents the dissipation of the fumes of the sal-ammoniac, and gives up the whole of the tin, which no metallic vessel would do. The method of tinning pins is described under Pin, vol. xviii., p. 161.

(*Memoirs of the Literary and Philosophical Society of Manchester*, second series, vol. iii., pp. 347-80; *Philosophical Transactions*, December, 1728; *Manufactures in Metal* (in Lardner's 'Cabinet Cyclopædia,' vol. iii.); Ure's *Dictionary of Arts*, &c.)

TINNI'TUS AU'RIUM, ringing in the ears, may arise from many different conditions. It is sometimes due to an unnatural state of the circulation in some part of the ear, the movement of the blood producing a vibration of the nerve which the mind does not distinguish from that produced by sonorous vibrations of the air. But most frequently the sensation is due to some disordered state of the auditory nerve, and is entirely subjective. It is thus perceived in some diseases of the brain, in nervous persons, and in those who are much debilitated; and is a common sign of organic disease of the auditory nerve itself. It is analogous, in these cases, to the subjective sensation of sparks and flashes of light which is perceived in cases of disease of the retina or optic nerve. It may therefore be a sign of a dangerous condition, or a prelude to complete deafness; but in the great majority of cases it is unimportant, depending on some local temporary affection of the ear, or on some disturbance of the digestive organs with which part of the brain sympathizes.

TINNU'NCULUS, Vieillot's name, after the antients, for a genus of *Falconidæ*. Type, *Tinnunculus alaudarius*, Briss.; *Falco Tinnunculus*, Linn., of which we proceed to give M. Temminck's

Description.—Wings reaching to three-fourths of the length of the tail; upper plumage of the male varied with numerous black spots; quills striped internally; claws always black.

M. Temminck states that this short indication is inserted to enable the observer to distinguish at the first glance this species from the *Falco tinnunculoides* (*Cresserelette*, or *Lesser Kestrel*), and he then proceeds to give the following details relating to the former:—

Male.—Top of the head bluish-grey; upper parts reddish-brown, regularly sprinkled with angular black spots; lower parts white, slightly tinged with reddish and with oblong brown spots; tail ash-coloured, with a wide black band towards its extremity, and terminated with white; bill bluish; cere, space around the eyes, iris, and feet yellow. Length about 14 inches.

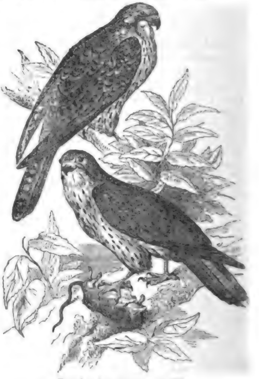
Female, larger than the male; all the upper parts of a brighter reddish; lower parts yellowish rusty, with oblong black spots; tail reddish, with nine or ten narrow black bands, and with a large band of that colour near its extremity, which is terminated with reddish-white.

Varieties.—With the upper parts of a reddish hue spotted with black; the top of the head more or less clouded with bright blue; the plumage variegated with white; sometimes entirely white.

The *Young* have the top of the head, the nape, and the mantle brown-rusty streaked with black; these streaks form the angle of the back; on the first quills are seven reddish and whitish spots; tail reddish, undulated with grey-ash and transversely striped as in the female; throat reddish-white; at the opening of the bill a small black stripe which is prolonged on the upper part of the neck; the rest of the lower parts whitish-rusty with oblong black spots; iris brown; cere yellowish-green.

This is, there can be little or no doubt, the Κεγχρὶς (*Cenchris*) of Aristotle (*Hist. Anim.*, ii. 17; vi. 1; vi. 2; viii. 3), and so most zoologists are disposed to consider it, as well as that it is the *Tinnunculus* of the antient Italians. (Pliny, *Nat. Hist.*, x. 37.) It is the *Foutivento*, *Canibello*, *Tristunculo*, *Acertello Falchetto di Torre*, *Gheppio*, and *Gavinello* of the modern Italians; *Cercrelle*, *Quercerelle*, *Cresserelle*, and *Epervier des Alouettes* of the French; *Turmfalke*, *Roethel-geyer*, *Mausefalke*, *Windwachl*, *Rittlweyer*, and *Wannen-weher* of the Germans; *Kyrko-falk* of the Swedes; *Kestrel*, *Stannel*, *Stonegall*, and *Windhover* of the modern British; and *Cudyll côch* of the antient British.

Geographical Distribution.—Europe generally, but not habitually beyond the regions of the arctic circle, where its place is occupied by the Merlin. England, Scotland, and Ireland. Smyrna, in winter at least (Strickl.). Africa, from the north to the south, according to Temminck. Senegal, according to the same authority. The Zoological Society have received it from the Cape of Good Hope. Asia, India (Selby); banks of the Ganges (Yarrell); Java (Horsf.); Japan (Siebold and Bürger). Mr. Yarrell states that figures of it occur in drawings from China.



Kestrel, male and female. (Gould.)

Habits, Food, &c.—The provincial name 'Windhover' well expresses the most striking characteristic of this hawk. With its head to windward, whence Mr. Mudie suggests that one of its designations should be written 'Standgale,' not 'Stonegall,' it remains with outspread tail and winnowing wings suspended high in air, so that its piercing eye may include a considerable area, in which no field-mouse is safe: when the bird sees one, it drops unerringly on the surprised prey. When thus poised above the fields, it sometimes is within the range of a gun, and we have heard farmers exult in bringing one down, little thinking that the bird was then on the watch for one of their greatest enemies. Mr. Waterton has pleaded the cause of the Kestrel well, and shown how greatly it is the friend of the agriculturist. But though mice are its staple, it undoubtedly preys upon small birds, and also on beetles and their larvæ, and earthworms. Mr. Selby saw one hawking after cockchafers (*Melolontha vulgaris*) late in the evening. He watched one with a glass, and saw the ird dart through a swarm of those insects, seize one in ach claw, and eat them on the wing. The kestrel returned o the charge again and again, and Mr. Selby ascertained he fact beyond doubt, for he afterwards shot the bird.

If a kestrel can find the nest of a crow or a magpie as a eceptacle for its eggs, it will not take the trouble to make ne ; indeed, it probably never does build : sometimes it ays upon the bare ledges of rocks and in old ruined owers. The number of eggs is four or five, and their round-colour reddish-white, which is mottled closely with ark reddish-brown and sometimes blotched with reddish-rown. The young come forth from the egg towards the nd of April or beginning of May, and are covered with a ellowish-white down.

In the *Portraits d'Oyseaux*, the following quatrain sums p the qualities of the Kestrel :—

> 'Mulots, Lezars, Rats, et autre vermine
> Sont la viande à nostre Cresserelle.
> Elle est amye avec la Colombelle,
> Qu'elle deffend des oyseaux de rapine.'

he allusion here made to the friendship of the Kestrel r the Dove is probably taken from the passage in Pliny which we have above called attention.

N.B. M. Brehm would make three distinct species from is hawk, under the names of, 1st, *Hochköpfiger* (high-eaded); 2nd, *Mittlerer* (middle); and 3rd, *Plattköpfiger* lat-headed). Upon this M. Temminck drily observes, at those who wish to multiply the catalogue of names nd of species in favour of each accidental or local variety, ay consult the work of M. Brehm. [FALCONIDÆ, vol. ., p. 182; KESTREL.]

TINO. [TENOS.]

TINO'PORUS. [FORAMINIFERA, vol. x., p. 348.]

TINTAGELL. [BOSSINEY.]

TINTERN ABBEY. [MONMOUTHSHIRE.]

TINTORETTO, JA'COPO, one of the most celebrated ainters of modern times, and one of the heads of the enetian school, was the son of a dyer (Tintore), whence e agnomen of Tintoretto: his family name was Robusti; nd he was born at Venice in 1512. He exhibited a markable facility for drawing at a very early age, which duced his parents to place him in the school of Titian. en days however after young Tintoretto had entered the hool of the great painter, he was sent home again to his arents; Titian's attention being attracted by some very pirited drawings he saw in his studio, he inquired who did em, and upon Tintoretto's acknowledging himself the uthor, Titian ordered one of his scholars to conduct the oy home.

This remarkable rebuff in the career of the young painter eems to have added vigour to his energies, and he commenced a course of indefatigable application. He purhased some casts from the antique and some from the odels of Daniel da Volterra, from the statues of Michael ngelo of Morning, Twilight, Night, and Day, at the mb of the Medici, in San Lorenzo at Florence, resolving follow the style of Michael Angelo in design, and to ombine with it the colouring of Titian,—which intention e proclaimed to his visitors by the following line, which e wrote upon the wall of his apartment :—

> 'Il disegno di Michel Angelo, e 'l colorito di Tiziano.'

By day he copied pictures by Titian; and by night he ade drawings upon coloured paper, with chalk, from his asts, lighted merely by a candle; by which means he cquired a taste for strong contrasts of light and shade, a eculiarity for which all his works are conspicuous. To hese studies he added the occasional study of the living odel and of anatomy; and to attain a still greater mastery f chiar'oscuro, he used to make models of figures in wax, nd place them in pasteboard cases, making apertures for he light as he required it: he also suspended models and asts from the ceiling, for the purpose of becoming familiar ith various perspective views of the figure. In addition o these studies, he is said to have received much gratuitous ssistance from Schiavone in colouring. Tintoretto's first icture which attracted notice was one containing portraits f himself and his brother, by candle-light, himself holdng a cast in his hand, and his brother playing the guitar. le exhibited this picture in public, and shortly afterwards e exhibited a large historical piece upon the Rialto, which ave him a rank amongst the great painters of Venice. le undertook every commission which offered itself, and requently painted large works merely for the price of the materials. It would be impossible to enumerate all his works here; they amounted to many hundreds. One of his first great works in fresco was a façade in the Arsenal, which he painted in 1546, representing Balshazzar's Feast and the Writing upon the Wall. Of his first oil pictures, the following were most remarkable:—The Tiburtine Sibyl, for the church of Santa Anna; the Last Supper, and the Washing of the Disciples' Feet, for the church of Santa Marcola; for San Severo, a Crucifixion, very large; and in the church of the Trinità, the Temptation of Eve and the Death of Abel, besides some others.

Tintoretto was so eager for employment, and so desirous of public notice and applause, that rather than be inactive or unoccupied with any public work, he frequently volunteered his services, or at most required no further outlay from his employer han would cover the cost of the materials. He painted upon such terms the façade in fresco of a large house near the Ponte dell' Angelo; on the lower part of the house he painted a very spirited representation of a cavalry battle, above which he placed an ornamental cornice in bronze; over this he painted a large historical composition containing many figures; between the windows he introduced various figures of women; and at the top a rich frieze: the great extent and the boldness of these paintings astonished the Venetian painters of that period. Upon very similar terms he executed two of his greatest works, at Santa Maria dell' Orto, where he painted, for 100 ducats, two immense pictures fifty feet high. In one was the Procession of the Jews with the Golden Calf, and Moses upon a rock in the background receiving the Tables of the Law, which were supported by a group of naked angels; the other was a representation of the Last Judgment, containing an immense number of figures; an extraordinary work, which, in the opinion of Vasari, would have been perhaps without its rival as a work of art, if the execution of the parts had been equal to the conception of the whole.

The following works also are accounted amongst Tintoretto's masterpieces:—Saint Agnes restoring to life the son of the Præfect, painted for the chapel of Cardinal Contarino; the Miracle of St. Mark, called 'Il Miracolo dello Schiavo,' where the saint delivers a Venetian, who had become a Turkish slave, from a punishment ordered by his master, by rendering him invulnerable, so that hammers and other instruments of torture were broken upon his body without hurting him; this picture, which is generally considered the best of all Tintoretto's works, was painted in his thirty-seventh year, for the brotherhood of St. Mark, and when it was finished and put up, the worthy friars disputed with one another about the price, a dispute which Tintoretto settled by ordering the picture to be taken down and sent home, and telling the brotherhood that they should not have it at any price. He however, after some entreaty, restored it to its place and received his own price, and the friars further gratified him by ordering him to paint three other subjects from the life of the same saint,—the Exhumation of the Body of the Saint at Alexandria, through the two Venetian merchants Buono da Malamocco and Rustico da Torcello; the Transport of the Body to the Ship; and the Miraculous Preservation at Sea of a Saracen Sailor through the Saint: the miracle of the slave is in the Academy of Venice; it has been engraved by J. Mathan; the other three are in the Scuola di San Marco. Pietro di Cortona is reported to have said, that if he lived in Venice, he would never pass a holiday without going to see these works; he admired chiefly the drawing. The pictures he painted for the Scuola di San Rocco are equally celebrated: they consist of the famous Crucifixion, which was engraved by Agostino Carracci, to the greatest satisfaction of Tintoretto; the Resurrection of Christ, engraved by E. Sadeler; the Slaughter of the Innocents and the Miracle of the Loaves and Fishes, engraved by L. Kilian; and several others of less note. To these must be added three painted for the Padri Crociferi, an Assumption of the Virgin, and a Circumcision of the Infant Christ, painted in competition with Schiavone; and a Marriage at Cana, now in the church of Santa Maria della Salute. The Miracolo dello Schiavo, the Crucifixion at San Rocco, and the Marriage at Cana, are said to be the only pictures to which Tintoretto put his name. There is an engraving of the Marriage at Cana, by Volpato, and a spirited etching by E. Fialetti.

Tintoretto executed many great works for the govern ment of Venice, both in oil and fresco; and such was his activity, perseverance, and success, that he left little to be done by others. He was always occupied, and he worked with such unexampled rapidity that he used to be called Il Furioso. Sebastian del Piombo said that Tintoretto could do as much in two days as he could do in two years. He painted for the senate, in the council-hall, the Coronation of Frederick Barbarossa, by Pope Adrian IV., at Rome; and in consequence of Paul Veronese painting a picture in the same hall, Tintoretto procured permission to paint another, in which he represented Pope Alexander III. surrounded by cardinals and prelates, excommunicating the same emperor: the pope was represented throwing the extinguished candle amongst the populace, and a crowd of people was rushing forward to endeavour to catch it. He painted also for the senate, in the hall dello Scrutinio, the celebrated naval victory of the Venetians over the Turks in 1571. He painted many other works in the ducal palace, historical and allegorical, commemorating the history of Venice, of which the most famous are the capture of Zara by storm; and the great picture of Paradise, upon canvas, 74 feet by 34, containing a surprising number of figures. This was his last great work; he commenced it in several pieces in the Scuola Vecchia della Misericordia, and finished it, with the help of his son, in its place on the ceiling of the great council-hall of the Senate, now the library.

Tintoretto painted at Venice eight friezes for the duke of Mantua, recording the duke's feats, to be placed in his castle, and he visited the duke at Mantua, with all his family, and was splendidly entertained by him. He painted also the portrait of Henry III. of France and Poland, when that king visited Venice; of which picture Ridolfi relates a curious history. Tintoretto was engaged with Paul Veronese in painting some figures in chiar'oscuro upon the arch of triumph erected by Palladio at Venice in honour of the landing of Henry III., king of France and Poland; but wishing to take a portrait of the king as he landed, he prevailed upon Paul Veronese to complete the arch; and he dressed himself as one of the doge's attendants, and went in the Bucintoro, the state barge, with the others to receive the king, whose portrait he drew in small, in crayons, unknown to the king, whilst he was proceeding in the barge to the landing-place. This portrait he afterwards enlarged in oils, and procured permission from the king to retouch it from life. The king expressed himself very much pleased with the portrait, and accepted it from the painter, whom he wished to create a cavaliere; but Tintoretto declined the honour, upon the plea that to bear a title was inconsistent with his habits. Henry III. afterwards presented the portrait to the doge Luigi Mocenigo. Tintoretto painted many portraits, all in a remarkably bold style; he painted several of the series of doges' portraits along the frieze of the great council-hall.

It has been said above that Tintoretto was a remarkably rapid painter: he was however as careless about the execution of the parts as he was bold. There are pictures by him painted in his youth that are extremely carefully finished, but these are very few: Susanna at the Bath with the two Elders, is of this class; several of his large pictures are merely dead coloured, and many of them were painted off without the slightest previous preparation. His rapidly-executed and low-priced productions were a frequent source of complaint to his fellow-artists. Upon one occasion, when the brotherhood of San Rocco requested Paul Veronese, Salviati, Zuccaro, Schiavone, and Tintoretto to send them designs for a picture of the Apotheosis of San Rocco, that they might select the best of them, Tintoretto sent his finished picture as soon as the others sent in their designs, affirming that he had no other way of drawing; and to ensure its being fixed in its destined place, he made the institution a present of the work. Although Tintoretto professed to draw in the style of Michel Angelo, and to colour like Titian, there are few traces of either quality in the great majority of his works; they are however all conspicuous for his own peculiar style of chiar'oscuro, which is frequently both heavy and cold. In his larger compositions a principal characteristic is the number of figures, which are often crowded and confused, and the spectator looks in vain for a spot of repose to relieve the mind: this is however not the case with such pictures as the Miracolo dello Schiavo and other earlier productions. Annibal Carracci has eloquently expressed the inequality of this great painter—that if he was sometimes equal to Titian, he was often inferior to Tintoretto. The Venetians used to say that he had three pencils, one of gold, one of silver, and the other of iron. In his design Tintoretto was muscular, but lean, and often incorrect; and in the casts of his draperies frequently mean and confused; his colouring was not gaudy, like that of many of the Venetians, but was often even cold, and shadow predominates in perhaps all his pictures. He was once asked which were the prettiest colours, and he answered 'black and white.' It was also a maxim of his that none but experienced artists should draw from the living model, as they were not capable of distinguishing between the beauties and the imperfections of an individual model. Tintoretto painted Aretin's portrait, and Ridolfi relates the following anecdote connected with it:—Aretin was a great friend of Titian's, and was in the habit of abusing Tintoretto occasionally: the latter one day meeting the poet, invited him to come and sit to him for his portrait, to which Aretin assented; but he had no sooner seated himself in the painter's studio, than Tintoretto pulled out with great violence a pistol from underneath his vest and came towards him: up jumped Aretin in a great fright, and cried out 'Jacopo, what are you about?' 'Oh! don't alarm yourself,' said Tintoretto, 'I am only going to measure you;' and suiting the action to the word, he said, 'you are just two pistols and a half.' 'What a mountebank you are!' returned Aretin; 'you are always up to some frolic.' The poet was afterwards more cautious, and they became friends. Ridolfi records a few other whimsical feats of Tintoretto's. He died at Venice in 1594, aged eighty-two. He had two children—a son, Domenico, and a daughter, Marietta—who both practised painting. Domenico was born in 1562, and died in 1637. He followed in the steps of his father both in history and portrait; but, says Lanzi, as Ascanius did those of Æneas, non passibus aequis. Marietta was born in 1560, and died before her father, in 1590. She painted very excellent portraits.

(Ridolfi, *Le Maraviglie dell' Arte, ovvero le Vite degli Illustri Pittori Veneti, e dello Stato*; Zanetti, *Della Pittura Veneziana, e delle Opere pubbliche de' Veneziani Maestri*, &c.)

TIOOMEN. [Siberia.]

TIPERAH MOUNTAINS. [Hindustan, p. 216; Silhet.]

TIPPERARY, an inland county of the province of Munster in Ireland. It is on the northern border of the province, and is bounded on the north-east by King's County and Queen's County, and on the east by the county of Kilkenny, all in the province of Leinster. On the south-east and south it is bounded by the county of Waterford, on the south-west by that of Cork, and on the west by those of Limerick and Clare, all in Munster. On the north-west it is bounded by the county of Galway in Connaught, from which, as well as from Clare, it is separated by the river Shannon or the lakes through which it flows. It is one of the largest of the Irish counties, being exceeded only by those of Cork and Kerry in Munster, Galway and Mayo in Connaught, and Donegal in Ulster: its greatest length is from north to south, from the junction of the Lower Brusna with the Shannon to the Arra glen, 68 miles; the greatest breadth is from the border of the county of Limerick, between Tipperary and Bruff (in Limerick), to the border of the county of Kilkenny, north of Carrick-on-Suir, about 41 miles. The area is variously estimated. In the Population Returns (*Parl. Papers*, 1833, vol. xxxix.), and in the table annexed to the Useful Knowledge Society's Map of Ireland, it is given at 834,910 English acres (=1305 square miles); by Dr. Beaufort (*Memoir of a Map of Ireland*), at 882,398 English acres (=1379 square miles); and by Mr. R. Griffith, in his evidence before the Lords' Committee on Tithe (*Lords' Sessional Papers*, 1831-2), at 1,013,173 acres (=1583 square miles); comprehending according to this last estimate 819,698 acres (=1281 square miles of cultivated land), 182,147 acres (=284 square miles) of unimproved mountain or bog, and 11,328 acres (=18 square miles) of lakes. The excess of this last estimate above the previous ones is remarkable, and would render it liable to suspicion if it were supported by a less eminent authority. The population, in 1831, was 402,564, giving 308, 292, or 254 inhabitants to a square mile, respectively, to the three estimates of the area of the county. Clonmell or Clonmel, the chief town, is on the Suir, 90 miles a direct line south-south-west of Dublin, or 103 miles the road through Naas, Castle-Dermot, Carlow, Leighlin idge, Kilkenny, and Callen.

Surface; Geology; Bogs.—The Knockmeledown Moun- ns, on the south border of the county, where it is conterminous with Cork, rise to the height of 2700 feet above e level of the sea. They are placed in 'a table-land of ay-slate, partly bordered on the flanks by sandstone, and the higher grounds sustaining isolated caps of the same ck, or upholding more continuous mountain-masses.' ne position of the sandstone on the flanks is generally onformed to the inclination presented by the surface of e subjacent clay-slate, but the masses on the higher rounds approach more and more to a horizontal arrangement. This tract (of clay-slate) is surrounded by floetz mestone on the north, the west, and the south: 'this mestone tract on the north separates the Knockmeledown Iountains from the Galtees, of which the principal summits (3000 feet high) are in this county. The general irection of these two ranges is nearly east and west: the ntermediate limestone plain or valley is watered by two treams (with their respective affluents), one, the Tar, lowing eastward into the Suir; the other, the Funcheon, vestward into the Blackwater. North of the Galtees, from which they are separated by a narrow valley (the Glen of Aherlow), rise the Slievh-na-Muck Mountains, which form a subordinate and lower range, and have the same general direction of east and west. Both the Galtees and the Slievh-na-Muck are composed wholly of sandstone, and the intermediate valley or glen appears to be occupied by the same formation. The northern face of the Galtees, towards this narrow valley, is in many parts extremely precipitous, and even inaccessible: the southern face, towards the broader valley or limestone plain, which separates them from the Knockmeledown Mountains, is of a tamer character. The strata of the sandstone are, in the upper region of the Galtees, almost horizontal, yet gently curved, following the form of the summit, and precipitously broken off on the sides, where they frequently crop out. On the flanks, where they are not abruptly broken off, they become more inclined, and appear to be conformed to the surface of the clay-slate on which they rest. The sandstone varies much in character, but in general it is a fine-grained rock, composed of grains of quartz closely aggregated. The sandstone of Slievh-na-Muck yields excellent flags.

In the south-eastern corner of the county, north of Clonmell and Carrick-on-Suir, is a group of hills called Slievh-na-Man, the geological character of which is similar to that of the mountains already described: the group 'consists of a nucleus of clay-slate, surrounded and surmounted by sandstone.'

In the centre of the county is another important range. It commences in the county of Limerick, north of the little river Mulkerne, or Bilboa, which joins the Shannon a short distance above Limerick. At this extremity the range is known as the Doon Mountains; but as it extends north-eastward into Tipperary, the most important summits are known as the Bilboa and Keeper Mountains (the latter 2100 feet high) and the Devil's Bit: it crosses the county of Tipperary in a north-eastern direction by Templederry and Roscrea, becoming narrower as it advances, and enters Queen's County and King's County, which it separates from each other, and where it is known under the designation of Slievh Bloom. The geological character of these mountains is similar to those already described: Keeper and Bilboa and the adjacent parts of the range consist of clay-slate, generally flanked by sandstone, except for a small space on the north-west side, near the village of Silvermines, where, at the foot of the hills, the clay-slate comes in contact with and immediately supports the floetz limestone. To the north-east of Templederry the range is entirely composed of sandstone. The direction of the strata of the clay-slate varies in this mountain-range. The sandstone in one part, near Newport, on the west side of the range, is a coarse red conglomerate, and rests unconformably on the clay-slate. Copper was formerly dug in these mountains, at Lackamore, five miles east of Newport. There are three veins, one of them thicker than the rest, and bearing rich copper-ore in bunches. The workings on this vein extended above 700 feet in length and 150 feet in depth. An attempt was made early in the present century to renew the works, but the machinery was insufficient to keep the mine free from water.

Considerable quantities of lead mixed with silver were obtained last century in an opening at the junction of the clay-slate with the floetz limestone, near the village of Silvermines. This opening had been filled with clay, sandy clay, sand, decomposed slate, and scattered blocks of limestone, Lydian-stone, and sandstone, the whole mass being penetrated or cemented by metallic depositions of various kinds; and in this 'softness,' as the miners termed it, the operations were conducted.

Near the lower part of Lough Derg, one of the lakes through which the Shannon flows, are the Arra Mountains, a group occupying a small part of this county on the western side, and extending across the Shannon into the county of Clare (where they are known by the name of Slievh Bernagh); they consist partly of clay-slate and partly of sandstone. There are quarries in these mountains which yield slate not inferior to that of North Wales.

The rest of the county is occupied by the floetz limestone, except a portion of the district between the southern groups of mountains (Slievh-na-Man and the Galtees) and the Central range, which is occupied by the coal-field of Killenaule; and one or two small tracts on the western side of the county, where trap rocks appear interstratified with the limestone. This floetz limestone presents in its connection with other rocks and in its organic remains several features similar to those of the mountain limestone of Derbyshire and the north of England; but differs in this, that the tract occupied by it forms an extensive plain, marked only by slight undulations.

The coal-field of Killenaule extends about eighteen miles in length from north-east to south-west, from near the river Nore to the neighbourhood of Cashel, and about six miles in breadth. It is partly in this county and partly in that of Kilkenny. There are two very small outlying portions near Cashel. This coal-field forms a low range of hills, placed upon the floetz limestone, and elevated above it. It varies in its elevation, being highest and most abrupt on the north-western side, where the hills rise from 300 to 600 feet above the limestone plain. On this side the dip both of the limestone and superincumbent coal strata is greater than on the other side. Towards the south-east the surface declines gradually, and the streams which water the tract mostly flow in that direction. The strata are more gently inclined here. The aspect of the hills varies, but they are commonly rounded with intervening hollows. The junction of the limestone with the coal-formation is generally at the foot of the hills, but sometimes half-way up their side. Immediately above the limestone, shale and gritstone alternate, there being two beds of each: the upper gritstone, when not covered by the superior beds, constitutes the main body of the elevated part of the coal-hills: it is marked by repeated undulations, forming unequal ridges, with intervening hollows or troughs, having their greatest extension or length generally from north-east to south-west. In these troughs the coal-beds ar found resting upon fire-clay, which intervenes between them and the gritstone and forms the floor of the coal, and covered by shale, grit, and then shale again. Sometimes this series is repeated so as to give two seams of coal. The troughs are generally from fifty to seventy yards deep from the surface to the coal, near the centre of the trough, and from 500 to 700 yards wide at the surface. The coal is of the nature of blind-coal or anthracite. The coal-works have been carried on with increased activity of late years: before 1825 the yearly produce was valued at about 12,000*l.*; since that period it has been nearly doubled.

The principal bogs are in the eastern and central part of the county: one continuous line of bog extends from near the border of the coal-field, near Killenaule, to the south-eastern foot of the central range of hills at Roscrea, a distance of nearly 30 miles; and there are smaller detached bogs westward of this, and some in the northern part of the county, between the Lower Brusna and the Shannon.

Hydrography and Communications.—The greater part of the county is comprehended in the basin of the Barrow and the Suir, two rivers which unite in Waterford Haven. A small part on the eastern border is drained by the Minster, or King's River, a small affluent of the Nore, which itself is an affluent of the Barrow. The Nore rises in this county, but has its course chiefly in that of Kilkenny. But most of the waters flow into the Suir, which rises north of Templemore, on the south-eastern slope of the mountains that there cross the county, and flows by Thurles, Golden, and Cahir, to the junction of the little river Nier; after which it flows along the border of this county and Waterford, first northward, and then westward, by Clonmell and Carrick, below which it quits the county altogether. Its course in Tipperary may be estimated at about 76 miles. It receives a number of tributaries, most of them small. On the right bank the Multeen joins it above Golden Bridge; and the river which waters the glen of Aherlow, between the Galtees and Slievh-na-Muck, and the Tar, which drains part of the limestone valley between the Galtees and Knockmeledown, join it lower down. The Nier, which joins it on the border of the county, on the same bank, belongs to the county Waterford. Two streams join it on the left bank, one below Clonmell, and another on the border, below Carrick. The Suir is navigable by large barges up to Clonmell.

That part of the county which lies north-west from the central chain of mountains (the Keeper, Bilboa, and Devil's Bit) belongs to the basin of the Shannon. The Shannon itself, and Lough Derg, through which it flows, skirt the north-western border for about 45 miles, being navigable throughout. The streams which flow from the north-western slope of the central chain are affluents of the Shannon, but none of them are navigable: the principal are the Nenagh, which passes the town of Nenagh, and the Lower Brusna or Brosna, which skirts the north-eastern border, and unites with the Shannon at the northern point of the county.

There are no lakes in this county; but Lough Derg is on its border. There are no navigable canals. The road from Dublin to Cork enters the south-eastern side of the county, and passes through Clonmell and Clogheen. Another road from Dublin to Cork by Athy passes through Cashel and Cahir. The road from Dublin through Kildare and Maryborough (Queen's County) to Limerick crosses the northern part through Roscrea, Toomevara, and Nenagh: another road from Dublin through Tullamore and Parsonstown (both in King's County) unites with the foregoing at Nenagh. The road from Waterford to Limerick enters the county on the south-east at Carrick-on-Suir, and passes through Clonmell, Cahir, and Tipperary. There are roads from Clonmell to Cashel and to Cahir, and from Tipperary to Cashel, besides other roads of less importance, which do not require description. In the evidence taken before the Irish Poor Commissioners (*Parl. Papers*, 1836, vol. xxxiii.), the roads in the barony of Middlethird—which, as comprehending part of the mountainous country (including Slievh-na-Man) and part of the valley or plain between the central and southern mountains, may be taken to represent the county at large—are described as good and sufficiently numerous.

Agriculture and Condition of the People.—The information which we give under this head, extracted from the Appendix to the Irish Poor Commissioners' Report (*Parl. Papers for* 1836, vol. xxxiii.), has reference to the barony of Middlethird, from which alone witnesses were examined; but it may probably be regarded as in a great degree applicable to the rest of the county.

The land in the barony was estimated in the county books (though the measurement was old, and regarded as inaccurate) at 58,833¼ plantation acres: the plantation or Irish acre being equal to about an English statute acre and five-eighths, or accurately, to 1a. 2r. $19\frac{21}{121}$p. The land was held as follows:—

70 persons held above 100 acres.
20 " from 80 to 100.
127 " 50 to 80.
551 " 20 to 50.
759 " 10 to 20.
745 " 5 to 10.
1056 " 1 to 5.
280 " less than 1 acre.

The soil of the barony is chiefly a rich loam of some depth on a substratum of limestone, and is equally adapted to tillage or pasture ground. There is no public common land, nor any woodland except from 150 to 200 acres in gentlemen's demesnes: there are only about 500 or 600 acres of bog, and that in the northern part of the barony: in the southern part the want of fuel is severely felt. Of the remainder of the barony, after these trifling deductions, one-third or one-fourth is pasture-land, and the rest in tillage. Grazing-farms are chiefly large, and are occupied by gentlemen, but there are not many of them: the quantity of grazing-land had however increased in the five years preceding the inquiry; though previously to that period the converse had taken place, pasture having been converted into tillage. Farms are generally bounded by double ditches; fields are divided by single ditches. These fences are generally in good condition, and the loss from cattle trespassing is trifling. The quantity of land wasted in fences in this barony is greater than in others.

Rents have been decreasing: it was estimated that they had fallen in the twelve years preceding the inquiry from 20 to 30 per cent. The Irish acre is in general use. Farms at the time of the inquiry were generally held under lease, but the granting of leases was going into disuse, and farms of which the leases had fallen in during the preceding six years were generally held by tenants at will. The ordinary term of farm leases is thirty-one years, or three lives. Cottage and glebe lands are commonly let for twenty-one years. Since the subletting act, it has not been usual to grant leases to tenants in common; such leases had been found injurious; they had prevented draining and inclosing, and other improvements. About one-fourth of the barony was at the time of the inquiry held under middle-men, but the system is going into disuse; and though leases do not usually contain any prohibitory clause, yet there is an understanding that the lessee is not to sublet. There has been a disposition in the landowners to consolidate small holdings; but where ejectments have taken place they have been resisted by the peasantry, and threats have been used and outrages committed upon those who succeed to the occupation of the vacated land: considerable difficulty has thus been placed in the way of consolidation.

The average rent of land is not given; the competition for small holdings is however so great that when a vacancy occurs men will bid more than will allow them to make a subsistence from the land: and in most cases the cottier tenant cannot obtain more than a bare subsistence. The rent of these small holdings is generally paid in labour. This competition for land has been a fruitful source of crime. Good land may probably be worth from 2*l.* 10*s.* to 3*l.* per acre; but when let as con-acre it brings in a higher rent, which is usually paid in money, except when a farmer lets land to his own labourers. Dairy-land is worth 10*s.* an acre more than tillage-land, and grazing-land is yet more valuable.

The usual rotation of crops is threefold; potatoes, wheat, and oats form the series, and if the land will bear it, this is repeated. The potatoes are manured chiefly with 'town manure,' which sells in the towns for 2*s.* and 2*s.* 6*d.* for 15 cwt. The farmers, especially the smaller ones, keep very little stock; and stall-feeding for the purpose of making manure is not practised in the district; but weeds, furze, and bog-earth are carried to the dung-yard to be trodden down. Manure is the great want of the farmer, and various expedients are resorted to in order to procure it. The potatoes grown both by the farmers and the peasantry are commonly the white potatoes, because, though of inferior quality, they grow more freely and on more exhausted land. Potatoes are generally cultivated with the spade, but the practice of drilling them in by the plough is becoming more common: fallows are occasionally resorted to, though as much to give rest to the land exhausted by the frequency of the potato crop as to clean it from weeds: fallows are generally manured with lime, which is burned with culm or small-coal from the collieries in the county.

Wheat is more commonly grown after potatoes than after fallow: the seed is generally steeped in brine to preserve it from smut; and the crop while growing is usually weeded once, and rolled. Many of the smaller farmers break the lumps with a wooden mallet. None of the wheat is of the first quality: a good deal is threshed out by the small farmers immediately after harvest to pay their rent or other debts: the large farmers do not off thresh any before November.

The cultivation of clover, rye-grass, and vetches has much increased of late years; but neither turnips nor mangel-wurzel are cultivated: the potato is generally used for feeding cattle. The clover is left on the ground only one year, and is mown twice and then ploughed in.

After the common rotation of crops has been taken once or twice, or on some of the best lands three or four times, the ground is left to grass for six or eight years.

ass or clover seeds are usually sown with the oats the st crop of the tillage course; and for the two following ears the produce is mown, and then grazed until the land again broken up by the plough. Small farmers fre- ently do not sow any grass seeds nor mow the crop; ey also break up the ground after a shorter interval. wing to the warmth and moisture of the climate, and om the later period (the month of August) at which they e cut, the crops of hay are heavier than would be pro- uced by land of equal goodness in Great Britain; but it probable that from its more succulent nature the hay will ot support or fatten cattle better than a smaller quantity English hay.

The long-horned Leicester breed of cattle was intro- uced many years ago; but the Durham and Hereford reeds are more in request. The common Irish (Limerick) reed is however most generally used, as being the most ardy. The stock of all kinds is very good. There are ot so many cattle fattened for export as there were for- nerly, still some are fed for the English market, and are xported from Waterford to Liverpool. Cattle are fit for laughter from three years and a half old; they weigh when fat from four cwt. to six cwt. Many young bullocks re sold at a year old to Roscommon and Galway men; thers for grazing are bought in the neighbourhood or at Ballinasloe. The Ayrshire and Kerry cows are not much used except by gentlemen. The quantity of butter made s not great, but the quality is in general good, and the node of preserving it is improving: Clonmell is the prin- ipal market. Very little cheese is made.

There are not many sheep kept: they are in general a cross of the Leicester breed, and are large well-made animals. There are no large flocks, and folding sheep is not in use; the small farmers keep two or three sheep for the sake of the wool; and those who have dairies mix some sheep in their pastures with their horned stock.

The horses are of an active light-boned sort, very useful for all farming purposes. Oxen are never employed in labour. Pigs are numerous, and of an improved breed: they are considered to be still improving.

Agricultural implements have undergone much improvement of late years. An iron plough, after the form of the Scotch plough, has superseded the old-fashioned one, which is now seldom seen in use: the harrows, though not so well made, yet, from the friable nature of the soil, do their work efficiently: rollers are getting more common every year; and these, as well as the harrows, are borrowed by the farmers from each other. The carts are of cheap construction, with narrow wheels and low sides formed of rails; they carry only a small load, and are drawn by one horse. The plough is used in the cultivation of every crop except potatoes, for which, among the small farmers, the spade is used; but the use of the spade is diminishing every year. The flail is used in threshing, except when the straw is wanted for thatching, and then the corn is often knocked out against a board by the hand.

The dairy-farmers have in general more capital than other farmers. They have better houses, and these, with their cattle-sheds and other farm buildings, are usually in good condition. Mud-walls are found to answer best for dairies, and little air is admitted.

Many of the resident gentry have set an example of superior cultivation, and have been the means of introducing improved stock and implements. They crop the land less severely than the common farmers, and give it longer intervals of rest or more manure, in which they are followed by the larger farmers.

The con-acre system is common; these allotments are commonly taken by the cottiers to raise their own food, but a considerable number are taken by servants and women with a view to profit from the sale of the produce. The usual quantity taken by a family is a quarter to half an acre; and the labouring class are always anxious to obtain it.

The demand for labour at the time of the inquiry was considered to have decreased, while the population had increased. Wages, which had in the course of ten years undergone a diminution of about two-pence per day, were usually for men 6*d*. a day with food, and in harvest 1*s*. a day with food; or when hired for a whole year, 7½*d*. a day in summer, and 6*d*. a day in winter, without food. Boys under sixteen received 8*d*. a day in harvest-time, or if hired by the year 15*s*. per quarter, or in some baronies 20*s*. per quarter. If a labourer worked 250 days in the year, at 8*d*. a day, he received 8*l*. 6*s*. 8*d*., which may be considered as the full average of the yearly earnings of the class. In the seasons when work is slack, mid-winter and a month before harvest, many of them resort to begging. To this the labourer may add a little by eggs and about 3*l*. by his pigs. When food is dear, the labourer has to work sometimes for six weeks in July and August, merely for his food, consisting generally of potatoes and milk. When a farmer feeds his labourer, he gives him commonly better food than he would have at home. If a labourer has a cottage, potato-garden, and milk from his employer, as is usual, these are considered equivalent to a third or a half of his wages. The labourers in the richest grazing districts are the worst off. The labourers when they obtain permanent employment, at fixed wages, exhibit generally increased cleanliness and decency of appearance, and their cabins are better furnished.

There is no employment for women, except in some of the baronies in harvest-time, and perhaps in the potato-planting and digging seasons, when they earn about 6*d*. a day. Formerly they spun wool for their own clothes, but this practice has ceased for several years, probably because the manufactured article can now be purchased cheaper. The rearing of fowls is the source of some profit; and a couple of pigs will bring in about 3*l*., which is depended upon to pay the rent of the potato-garden. There is no work for children under fourteen years of age: they are not employed in hoeing or weeding corn or other crops.

The cottier tenants, occupiers of less than ten acres of land, are enabled to feed and clothe their families better than a labourer, but are themselves worse fed than the labourers who are dieted by the farmers. Cottiers seldom keep a cow; they hold their land from year to year, and are generally in arrear for rent, which is always (if a man holds five acres or more) expected to be paid in money.

The potatoes which the labourer or small cottier grows constitute the food of his family; he himself is frequently fed by his employer. Milk is not used in more than one half of the families. The greatest expenditure on tobacco is 6*d*. a week. Candles for six months amount to 3*d*. per week, and other necessaries, under the general designation of 'kitchen,' cost from 1*l*. 10*s*. to 2*l*. 10*s*. for the year. The labourers do not consume any description of groceries. The fees to the Roman Catholic clergy form an important item in a labourer's outlay. The fee for marriage is 25*s*., for churching a woman 2*s*. 6*d*., and for blessing the clay and saying mass at a funeral 5*s*.; at confession at Easter and Christmas 1*s*. is expected: but these fees are often remitted.

The dwellings of the labourers are of the most wretched description, nor has any perceptible improvement taken place of late years. During the alarm of cholera they were whitewashed, but that is now neglected. They are generally 20 feet long by 12 broad, with walls from 7 to 8 feet high, divided into two or perhaps three very small apartments, and never having a second story; covered only with a thatch of straw, and having nothing but the bare ground for the floor, and that often full of holes, which in wet weather become little pools of water. A hole in the roof allows the escape of the smoke, and their windows, 15 inches square, are more commonly without glass than with it, and almost universally destitute of shutters. They have rarely any outhouse except a pigsty, and in many cases where they have not even that, the pig sleeps in the house. These wretched hovels usually cost in erection about 10*l*., and the tenant pays from 20*s*. to 30*s*. a year as rent; with a rood of land, the rent is near 2*l*. 10*s*. The cabins are always kept in repair by the tenant. They are usually built separate, not grouped in villages or hamlets, and for convenience near the road-side.

It rarely happens that there is more than one bed for the whole family; a bedstead, a dresser, two chairs, a large iron pot, and some crockery, all of the worst description, usually complete the catalogue. In some wretched cabins even these are not found, and the family lie on the floor.

The chief article of food is the potato: the peasantry grow this in preference to corn, because it yields a more abundant supply with less care and less manure. A labourer, when employed, gets three meals of potatoes a day, his wife and children only two. In July and August, when the old potatoes have become unfit for food, and the new crop is not ready, colic or other bowel complaints are produced by the unwholesomeness of the diet; and the failure of the potato crop is always productive of great distress: the labourer is then obliged to procure provision upon credit, which he obtains with great difficulty and by paying double the market-price.

In respect of clothing, considerable improvement has taken place, though the peasantry are still very indifferently clad. No material for clothing is of home manufacture, but the women generally make up their own dresses: sometimes however they are unable to do this, and have to pay for getting them made. The use of shoes and stockings is increasing. Old clothes, brought from London and Liverpool, are much worn. The yearly expenditure of a labourer's family on clothes is seldom less than a pound.

The ordinary fuel is turf: near the bogs this is cheap, but to one living at a distance of 8 or 10 miles from a turbary, the cost is doubled. When fuel is scarce, pilfering and the destruction of woods and fences are common. Straw and dried cow-dung are used as a substitute for turf. The county has always been one of the most disturbed in Ireland; 'although there is an ebb and flow of crime in other counties, Tipperary has always kept up steadily to high-water-mark.' This was the statement of the resident police magistrate of Cashel. (See *Parliamentary Papers* for 1836, vol. xxxii., p. 357.)

Divisions, Towns, &c.—The county is divided into eleven baronies, as follows:—

Barony.	Situation.	Pop. in 1831.
Clanwilliam . . .	W.	48,152
Eliogarty	Central	38,531
Iffa and Offa (East) .	S.E.	38,702
Iffa and Offa (West)	S.W.	40,192
Ikerin	N.E.	27,077
Kilnemanagh . .	W.	30,774
Middlethird . . .	Central	44,103
Ormond (Lower). .	N.	45,006
Ormond (Upper) .	Central	24,807
Owney and Arra. .	W.	32,454
Slievardagh . . .	E.	32,765
		402,563

It contains the county-town of Clonmell or Clonmel [CLONMEL]; the city of Cashel [CASHEL]; the ex-borough (formerly parliamentary) of Fethard; the market-towns of Cahir, Carrick-on-Suir [CARRICK-ON-SUIR], Clogheen, Killenaule, Nenagh, Roscrea, Templemore, Thurles, and Tipperary; the post-towns of Burris-o'-Leagh, Burris-o'-Kane, Cloghjordan, Golden, Littleton, New Birmingham, and Newport; and the villages of Ballina, Emly, Mullinahone, Silvermines, Toomavara, and others. Some of these are described as referred to above: of the others we give some account here.

Fethard is in the barony of Middlethird, 100 miles from Dublin by Kilkenny and Callen, and 9 miles north from Clonmell. The town contained, in 1831, 582 houses, inhabited by 689 families; 39 houses uninhabited, and 5 building, with a population of 3405: the whole parish contained 678 houses, inhabited by 797 families; 41 houses uninhabited; and 7 building; with a population of 4050. The town is irregularly laid out on both banks, but chiefly on the left or north-eastern bank of a small stream, the Glashall, which ultimately joins the Suir below Clonmell. Fethard is an antient and decayed town, in a bye situation, with little trade. Of the houses about 120 are slated, and chiefly of two stories: the rest are thatched cabins, and of the poorest description. There are a parish church; a Presbyterian and a Primitive Methodist meeting-house; two Roman Catholic chapels, one the regular parish chapel, the other attached to an Augustinian friary. The parish church, of which the chancel is in ruins, and the friary chapel, are antient structures. There is a good slated school-house. The town was formerly walled, and some portions of the walls and of the gateway towers remain. There are (or were lately) four mills and a tan-yard or two: the principal trade is shoemaking; but the chief occupation of the labouring class is agriculture.

The town was incorporated at an early period: the oldest known charter is dated 49 Edward III., A.D. 1376; but the corporation has been dissolved by the late Irish Municipal Reform Act. The borough sent two members to the Irish parliament, but was disfranchised at the Union. There is a market on Saturday, but it is of minor importance: the yearly sale of wheat is about 8000 barrels, of oats about 3000 or 3500 barrels. There are a dispensary and a charitable loan-fund: and (by returns to the House of Commons, printed in 1835) ten schools of all kinds, including a national school with 186 boys on the books, and an average daily attendance of 130.

Cahir, or Caher, is in the barony of Iffa and Offa (West), 111 miles south-west from Dublin by Clonmell, from which it is distant 7 miles west. The town had, in 1831, 5[illegible] houses, inhabited by 706 families; 61 houses uninhabited, and 16 building, with a population of 3408: the whole parish had 1291 houses, inhabited by 1625 families; [illegible] houses uninhabited, and 23 building, with a population of 8594. Cahir is pleasantly situated on the banks of the river Suir, at the eastern end of the valley, between the Galtees and the Knockmeledown Mountains: it is, for an Irish town, very clean, and has been steadily increasing, though not rapidly: the new houses are chiefly of a good description, worth from 10*l*. to 40*l*. per annum, and are respectably tenanted. There are a parish church, a Roman Catholic chapel, and a Quakers' meeting-house. Near the town are extensive cavalry barracks; and on the banks of the Suir are the demesne and residence of the Earl of Glengall. An attempt was made many years ago to establish the linen-manufacture, but it failed: since then the straw-plat has been introduced, and gives employment to a number of females: there are also some extensive flour-mills. The market is on Friday, and is an important corn-market: the yearly sales of wheat had increased from 23,662 barrels in 1826, to 56,131 in 1835: the sale of oats had continued steady through the same period, at 37,000 barrels. There is a bridewell, and a body of constabulary are posted in the town: there are also a dispensary and fever-hospital, and (by returns to parliament in 1835) fifteen schools of all kinds; one of them a national school, with 286 children (boys and girls) on the books, and an average attendance of 150; and two others on Erasmus Smith's foundation, one with 51 girls on the books, and an average attendance of 25; the other containing 11 boys. Near the town, on an island of the Suir, are the picturesque ruins of the castle of Cahir.

Clogheen is in the barony of Iffa and Offa (West), 120 miles south-west of Dublin through Clonmell, and 14[illegible] miles from Clonmell. The town is chiefly in the parish of Shanraghan: it contained, in 1831, 291 houses, inhabited by 357 families; 17 houses uninhabited, and 3 building, with a population of 1928: the whole parish had 108[illegible] houses, inhabited by 1199 families; 39 houses uninhabited, and 4 building: the parish of Tullaghorton, into which the town extends, had 297 houses, inhabited by 305 families; 5 houses uninhabited, and 5 building, with a population of 1965. What portion of these belong to the town we have no means of ascertaining. There is a Roman Catholic chapel in the town: the parish church of Shanraghan is in the immediate neighbourhood. Tullaghorton parish has no church. A large corn-market is held on Saturday, at which the yearly sale of wheat had increased from 42,125 barrels in 1826, to 62,824 in 1835; but that of barley had decreased from 3200 barrels in 1826, to [illegible] in 1835: there are seven flour-mills in and round the town, the flour from which is sent by land to Clonmell, and from thence down the Suir to Waterford, where it is shipped. There is also a large brewery. A body of constabulary are posted in the town; and there are a small cavalry barrack, a small bridewell, and a dispensary and fever-hospital. Near the town are the ruins of an antient parish church and of an antient abbey. Shanbally Castle, the seat of Lord Lismore, is also in the neighbourhood. By the returns to parliament in 1835 there were in the two parishes eight private schools, but not any national or other school supported by subscription or endowment.

Killenaule is in the barony of Slievardagh, 92 miles south-west from Dublin by Urlingford, and 16 north from Clonmell by Fethard. The town, in 1831, contained [illegible] houses, occupied by 321 families; 34 houses uninhabited, and 2 building, with a population of 1578: the rest of the parish had 279 houses, inhabited by 300 families; 9 houses uninhabited, and 3 building, with a population of [illegible]; making a total population of 3467. There are a church, a Roman Catholic chapel, and a dispensary: the church is small and antient. There is a weekly market, and several yearly fairs are held: a portion of the county constabulary is stationed in the town. Several of the collieries of e Killenaule coal-field are in this parish. By the returns parliament, A.D. 1835, there were in the parish six hools, all supported by the payments of the children: hool-houses had been built by subscription for two of ese schools.

Nenagh is partly in Upper Ormond, but chiefly in Lower rmond barony, between 95 and 96 miles south-west of ublin, on the road to Limerick. The town contained, in 31, 1282 houses, inhabited by 1703 families; 55 houses inhabited, and 9 building, with a population of 8466: e remainder of the parish contained 104 houses, inhabited 104 families, and 2 houses uninhabited, with a population of 693; making a total population of 9159. This wn antiently belonged to the Butler family, who had a rong castle here: it had two ecclesiastical foundations; hospital for the canons of St. Augustin, founded A.D. 200; and a friary for conventual Franciscans, deemed the chest foundation of that order in Ireland, founded in the ign of Henry III. The town was burned, A.D. 1550, by e natives under O'Carrol, and the friary was included in e destruction, but the castle was saved by the garrison. ne town was repeatedly taken and retaken in the great vil war in the reign of Charles I. It was taken by the itive forces of James II., A.D. 1688, but after a time abanoned and burned by them. The town stands on the river enagh, which flows with a circuitous course from the eeper Mountains into Lough Derg, and consists of four reets meeting in the centre. The ruins of the castle, nsisting chiefly of a large circular donjon or keep, called enagh Round, are on one side of one of the streets, astle Street. There are a barrack for cavalry; a fever-ospital and dispensary; a church, rebuilt some years nce; a Roman Catholic chapel; and a bridewell, unless it as been disused since the completion of the county gaol, tely erected here. Some remains of the Franciscan friary ay be traced. A portion of the county constabulary are ationed here. There is a well-attended market on Thursay for corn and cattle. The number of barrels of wheat sold the average of the years 1826 to 1835 was above 45,000, barrels of oats about 4500, and of barrels of barley 1300. he sale of bere, which was about 1000 barrels in 1826, ad quite ceased before 1835. There are in or near the own a brewery, a flour-mill, and a small stuff manufacory. There are several yearly fairs. There were in the arish, by the return made to parliament in 1835, eight hools of all kinds, including a national school, with an verage attendance of 190 boys; a parish free-school, with n average attendance of 40 boys and girls; and a school n Erasmus Smith's foundation, with an average attendance f 28 boys and girls.

Roscrea is in the barony of Ikerin, 75 miles west-south-est of Dublin, on the road to Limerick, and about 50 to 2 north of Clonmell. A monastery for regular canons is aid to have been founded here by St. Cronan as early as ne beginning of the seventh century, which became subequently the seat of a bishopric, afterwards united to illaloe. According to Keating (*History of Ireland*) there as antiently a great fair held at Roscrea on the festival f St. Peter and St. Paul, at which fair, about the middle f the tenth century, an army of Danes, collected from imerick and Connaught, attempted to surprise the natives; ut these, having some suspicion of the attack, had brought rms with them, and made so stout a resistance, that they epulsed the enemy, with the loss of their leader and four housand men. In 1213 King John erected a castle at oscrea, of which a circular tower remains; and there is n the centre of the town a square castle of the Ormond amily, occupied as a depôt for the troops quartered in the nfantry barracks. About A.D. 1490 a Franciscan friary vas founded.

The town of Roscrea is in a fertile and pleasant situation: t consists of several streets, irregularly laid out, and had, n 1831, 907 houses, inhabited by 1136 families; 61 houses ninhabited, and 6 houses building, with a population of 512: the whole parish, which extends into the baronies of Ballybrit and Clonlisk in King's County (Leinster), had 1546 houses, inhabited by 1797 families; 79 houses uninhabited, and 12 building; with a population of 9199. The parish church is an antient building, with Norman doorways and niches, and several sepulchral crosses and curious architectural decorations. Near the church is a round tower 80 feet high and 15 feet in diameter, with a window with an arch of the usual form, 15 feet from the ground, and a window with a pointed arch, about 30 feet from the ground. There are some remains of the antient monastery of canons of St. Augustin, consisting of the western gable, having an arched doorway, which forms an entrance to the present churchyard. There are also some remains of the Franciscan convent, which are (or at least were some years since) in good preservation: the tower of the conventual church forms the entrance to the present Roman Catholic chapel. There are a Primitive and a Wesleyan Methodist chapel and a Quakers' meeting-house in the ecclesiastical union of Roscrea (comprehending the parishes of Roscrea and Kyle), but we are not aware whether they are in the town.

The town has considerable trade as the mart for the surrounding district. Formerly there was a considerable manufacture of woollens, especially serges and stuffs, in which a thousand looms are employed; but this had so fallen off about 1835, that it gave employment only to a hundred looms. There were at that time a distillery and three breweries. There are two weekly markets and several yearly fairs for cattle and farming stock: there are public shambles and a commodious market-house. The sale of grain at the markets is considerable: the average yearly sale of wheat had increased in the ten years from 1826 to 1835, both inclusive, from 4140 barrels to 6700; and that of oats from 18,500 to 22,100 barrels; the yearly sale of barley had continued steady at 13,000 barrels. There is a savings' bank, the deposits in which had (in 1835) considerably increased: the depositors were chiefly farmers, small tradesmen, and servants: there were at the same time a fever hospital, a cholera hospital, and a dispensary. The number of places where spirits were sold was very great, amounting to above two hundred in the town alone; of these nearly half were licensed public-houses. There are a small bridewell, an infantry barrack, and a station of the county constabulary. There were, by the Parliamentary Returns for 1835, ten day-schools in the parish, including a national school, with an average attendance of 52 boys; a school on Erasmus Smith's foundation, with an average attendance of 91 boys; and a day-school for young girls in connection with the Ladies' London Association and the Hibernian Society, with an average attendance of 45.

Templemore is in the barony of Eliogarty, about 87 miles south-west of Dublin, and about 39 or 40 north of Clonmell. It is supposed to derive its name from the Knights Templars, who had a house here, of which the remains form an entrance to the demesne of the Carden family. There were in the town, in 1831, 404 houses inhabited by 609 families; 12 houses uninhabited and 7 building; with a population of 2936: the whole parish had 664 houses, inhabited by 885 families; 15 houses uninhabited, and 18 building; with a population of 4583. The town is pleasantly situated near the right or west bank of the Suir, and is (comparatively at least) a well-built and neat town. The church, which has a handsome tower and spire, was rebuilt about fifty or sixty years ago; there are a handsome and spacious Roman Catholic chapel, a good market and court-house, a bridewell, extensive barracks, a fever hospital and dispensary, and ball and news-rooms. The town is approached on all sides by avenues of ash-trees; and there are several gentlemen's seats and the remains of some very antient castles in the neighbourhood. There were, according to the returns of 1835, seven schools in the parish, including a free-school on Erasmus Smith's foundation, with an average attendage of 47 scholars, boys and girls.

Thurles is in the barony of Eliogarty, 96 miles south-west from Dublin by Templemore, and about 32 from Clonmell. It is a place of considerable antiquity, and was in the tenth century the scene of a severe battle between the native Irish and the Danes. There is a tradition that the Knights Hospitallers had a house here, but no record of it has been discovered. A Carmelite monastery was founded here about A.D. 1300; and in the fourteenth century a castle was built by the Butler family, which in the civil war of Charles I. was garrisoned by the Royalists and taken by the Parliamentary forces. Of these buildings there are some remains: a tower and some part of the north transept of the church of the monastery stand on the east side of the Suir; and there are considerable portions of the walls of the castle, inclosing an extensive area, and flanked by towers, some round, others square. There were not long since (and perhaps still are) some remains of St. Mary's church, built in the fifteenth century, and very much dilapidated; there is an extensive mansion, formerly belonging to the earls of Llandaff, now converted into a barrack. There are a neat modern church, a handsome Roman Catholic chapel, which is the cathedral of the Catholic archbishop of the diocese of Cashel and Emly, a Roman Catholic college, two nunneries, one of Ursulines, the other of the order of the Presentation, a Baptist meeting-house, a good market-house, a small barrack for infantry, a neat sessions-house, a well-arranged bridewell, and a dispensary. Considerable trade is carried on in the town: there are two market-days in the week, a monthly fair, and three yearly fairs: the sale of corn in the market is considerable; the wheat sold in the year increased from 30,400 barrels in 1826 to 50,600 in 1835; and that of barley from 9400 barrels in 1826 to 11,000 in 1835: that of oats had continued stationary at from 3000 to 4000 barrels. Some brewing and tanning are carried on. There were, by the Parliamentary Returns of 1835, seventeen schools; including one of 300 girls, taught by the nuns of the Presentation convent; a boarding-school of 60 girls, and a day-school of 120 girls, kept by the nuns of the Ursuline convent; a day-school with an average attendance of 200 boys, under the direction of the Religious Brothers; and a day-school under the superintendence of the curate of the established church and some of the parishioners, with nearly 40 children.

Tipperary is in the barony of Clanwilliam, 110 miles south-west of Dublin, and 23 miles west-north-west of Clonmell. A monastery for Eremites of the rule of St. Augustin was founded here in the reign of Henry III. In the reign of Edward III. (A.D. 1329) the town was burned by the natives under Brien O'Brien. Its former importance is indicated by its having given name to the county, and by the fact of its having been antiently incorporated; but it no longer possesses the same relative importance, and the corporation has long ceased to exist. The town is chiefly in the parish of Tipperary, but extends into those of Curdangan and Kilshane: it had, in 1831, 988 houses inhabited by 1284 families; 36 houses uninhabited and 18 building; with a population of 6972: the whole parish of Tipperary had 1113 houses, inhabited by 1379 families; 36 houses uninhabited, and 16 building; with a population of 7996.

The town of Tipperary stands near the little river Arra, which flows into the Suir, and consists of one principal street, from which smaller streets branch off at right angles. Several of the houses are well built, and of handsome appearance: many old buildings have been taken down and new ones erected in their place, so that the town has a neat and thriving appearance. The inhabitants are supplied with water from a public fountain. The church is a modern structure, and there is a Roman Catholic chapel. There are some remains of the Augustinian monastery, chiefly consisting of an arched gateway in front of the building occupied by Erasmus Smith's classical school, which has obtained from this circumstance the popular designation of 'the abbey school.' The principal trade is in butter, of which a large quantity is sent to Limerick and to Waterford for exportation. There are two weekly markets (for which there are a neat market-house with a news-room over it, in the centre of the town, and shambles) and four yearly fairs. The sale of wheat is small; but it had increased in the ten years from 1826 to 1835, from 1125 to 3160 barrels; that of oats had increased from 7708 to 10,675 barrels: but the sale of barley had declined from 610 to 256 barrels. There are a dispensary, a fever hospital, a temporary barrack, and a small bridewell: a portion of the county constabulary are stationed here. There were in Tipperary parish, according to the return made to parliament in 1835, nineteen schools of all kinds, including a classical boarding-school on Erasmus Smith's foundation (the Abbey School), with about 30 scholars, another school on the same foundation with about 34 children, boys and girls, and national schools for boys and for girls, attended each by about 110 scholars. Kilshane parish had no school, and Curdangan only one, a hedge-school, with 24 scholars in winter and about 70 in summer.

Burris-o'-Leagh, or Burrisillegh, is in the parish of Glankeen, in the barony of Kilnemanagh, 92 miles south-west of Dublin. It had, in 1831, 219 houses, inhabited by 260 families, 14 houses uninhabited and 4 building, with a population of 1304. The parish church and the Roman Catholic chapel are both in the town. There is a small brewery; three yearly fairs are held, one of them a considerable fair for pigs. A body of the county constabulary are posted in the town, and there is a dispensary. There were (*Parl. Returns*, 1835) in the whole parish eleven schools, including three national schools, with an average attendance of from 210 to 220 children; and another school with 23 children, partly supported by private contributions.

Burris-o'-Kane, or Burris-o'-Kean, or Burros-o'-Keane, is in the barony of Lower Ormond, 91 miles west-south-west of Dublin. The town had, in 1831, 206 houses, inhabited by 217 families, 14 houses uninhabited and 1 building; with a population of 1185: the whole parish had 465 houses inhabited by 477 families, 24 houses uninhabited, and 2 building; with a population of 2634. The town has been much improved of late years; many new houses have been built. There are a Roman Catholic chapel and a Wesleyan chapel, besides the parish church, a plain modern building; a dispensary and fever hospital, and a small bridewell. There are some remains of a square castle of massive construction, called Tumbricane. Four fairs are held in the year. There were in the parish, by the returns of 1835, six schools, including three free-schools, one with about 35 children, connected with the Baptist Irish Society; another with 30 boys, in connection with the Society for discountenancing Vice; and a third, with an attendance in summer of 80 girls, supported by private subscription.

Cloghjordan is in the parish of Modereny, in the barony of Lower Ormond, nearly 90 miles west-south-west of Dublin. It had, in 1831, 129 houses inhabited by 144 families, 6 houses uninhabited and 3 building, with a population of 824. There are a district church of the establishment, of light and elegant architecture, built A.D. 1830; and meeting-houses for Baptists, Wesleyans, and Primitive Methodists; also a dispensary and fever hospital. There is a considerable distillery. Three yearly fairs are held. A society for the relief and diminution of pauperism, called 'the deacons' poor fund,' exists in this and the adjacent parishes. There were no schools in the district parish of Cloghjordan in 1835; but in the whole of Modereny parish there were five day-schools, including two parochial schools, one with about 50 boys, and the other with about 60 girls; there were also three Sunday-schools for religious instruction.

Golden is in the parish of Relickmurry, or Religmurry in the barony of Clanwilliam, about 102 miles S.W. of Dublin, between Cashel and Tipperary. There were, in 1831, in the town, 101 houses inhabited by 105 families, 2 houses uninhabited, and 5 building; with a population of 684. It is a neat and improving place, situated in 'the Golden Vale,' one of the most fertile districts of the country, and is divided into two parts by the river Suir, over which is a stone bridge. It has the ruins of an old castle; and in the neighbourhood are the remains of Athassel Augustinian Abbey, originally one of the most splendid ecclesiastical structures in the kingdom; the ruins are extensive and worthy of notice. The parish church and a Roman Catholic chapel are in the town. There are flour and oatmeal mills; and four fairs are held yearly. There is a dispensary. A body of the county constabulary are posted here. The united parishes of Relickmurry and Athassel had, in 1835, six day-schools; one, with 60 children, partly supported by Lady Elizabeth Mathew.

Littleton is in the parish of Borrisleigh, in the barony of Eliogarty, 90 miles S.W. of Dublin. It contained, in 1831, 44 houses inhabited by 54 families, 3 houses uninhabited, and 1 building; with a population of 283. It is a place quite of modern origin, chiefly erected by the late Rev. Thomas Grady. The parish-church, a handsome building, is in the town; and there is also a dispensary: a body of the county constabulary are stationed here. There were, in 1835, five day-schools; one of them was the parish-school with about 30 children; one of the others was held in a school-room erected by subscription.

New Birmingham is in Kilcooley parish, in the barony of Slievardagh, 95 miles S.W. of Dublin. This town owes its origin to the late Sir Vere Hunt, who obtained patents for two weekly markets and twelve yearly fairs; but these have been discontinued, and the place is comparatively deserted. There are a Roman Catholic chapel and a small prison. There were, in 1831, 48 houses inhabited by 62 families, and 1 house uninhabited; with a population of 298.

ewport is in Kilvolane, or Killevolane, parish, in the ony of Owney and Arra, 109 miles S.W. of Dublin, on road to Limerick. It had, in 1831, 127 houses inha- d by 162 families, 24 houses uninhabited, and 12 lding; with a population of 852. The houses are for most part neatly built. The parish-church is in the n; and there are a Roman Catholic chapel, a bride- l, a dispensary, and infantry barracks. There are four rly fairs, one of them a large cattle-fair.

Ballina is in Templeichally, Temple Ichally, or Temple- ly parish, in the barony of Owney and Arra, on the k of the Shannon, near where it leaves Lough Derg, posite Killaloe. This village is connected with Killaloe, which it may be considered as a suburb, by a bridge of ieteen arches over the Shannon. The population of the lage, in 1831, was 832. There is a Roman Catholic apel; and a body of the county constabulary are posted re. There is a yearly fair for pigs. Near the bridge e the remains of a castle erected to defend the passage the river.

Emly is in the barony of Clanwilliam, near the western order of the county, about 9 miles west of Tipperary. is of great antiquity. An abbey of regular canons of . Augustin was early founded here; and the town sub- quently became the seat of a bishop's see. Some the prelates appear to have exercised temporal power well as spiritual; and one of them in particular, in e ninth century, distinguished himself as a warrior gainst the Danes. King John granted to the town the rivilege of holding markets and fairs; but the privilege f a market, if ever used, is now disused. The diocese was nited to that of Cashel A.D. 1568, and the removal of its piscopal seat caused the decline of the place. It had, in 831, a population of 701. A body of the county consta- ulary are posted here; and there are two yearly fairs. The parish church is in the village, and there is a Roman Catholic chapel. There are the ruins of a church and a large stone cross. Some antiquities have been dug up in the neighbourhood.

Mullinahone is in Kilvemnon parish, in the barony of Slievardagh, on the road between Callen and Fethard; it is also between Carrick-on Suir and the Killenaule coal-district, so that it is a common resting-place for the car-drivers in their way from Carrick. A considerable quantity of butter is sold here in a weekly market (though the place ranks only as a village), held on Thursday, and sent to Kilkenny, Clonmell, or Carrick. There are several well-attended yearly fairs for cattle and pigs, and a body of the county constabulary are posted here. There are a Roman Catholic chapel and a dispensary. The population of the village, in 1831, was 1175.

Silvermines is in the parish of Kilmore and the barony of Upper Ormond, about 5 or 6 miles south of Nenagh. It is at the foot of the north-western slope of the central hills, and takes its name from the lead-mines formerly worked, the produce of which yielded an unusual quantity of silver. The population, in 1831, was 791. Some of the houses are neatly built: the parish church and a Roman Catholic chapel are in the village, and there is a dispensary. There are four yearly fairs.

Toomavara, or Toomavarra, is in the parish of Aghnameadle, in the barony of Upper Ormond, between Nenagh and Burris-o'-Leagh; it had, in 1831, a population of 790: there are a Roman Catholic chapel, a national school, and a dispensary in the village. There are at least two yearly fairs, and a body of the county constabulary are posted here.

Divisions for Ecclesiastical and Legal Purposes.—This county was formed at what is commonly deemed to be the first establishment of counties in Ireland, by King John, A.D. 1210; though Sir James Ware has shown that counties or some equivalent divisions must have existed before that time. The county was subsequently enlarged by the annexation of what was called 'Cross-Tipperary,' a district having a sheriff and other officers distinct from the county. Antient records speak of the 'Vice-Comes Croceae Tipperary.'

It contains the whole or part of a hundred and sixty-three parishes. (*Pop. Returns* for 1831.) These parishes constitute or are comprehended in one hundred and nine unions or other ecclesiastical benefices, in several dioceses, as follows:—

Diocese.	Total Number of Benefices.	Rectories and Vicarages.	Perpetual Cures.	Impropriate Cures.	Parishes without cure of souls.
Cashel .	49	39	2	6	2
Emly . .	9	7	1	..	1
Killaloe .	28	24	2	..	2
Lismore .	22	20	..	1	1
Meath .	1	1	..	..	..
	109	91	5	7	6

Cashel was an archbishopric, having in its province the united dioceses of Cashel and Emly, the diocese of Cloyne, the united dioceses of Cork and Ross, of Killaloe and Kilfenora, of Limerick, Ardfert and Aghadoe (which last two were incorporated), and of Waterford and Lismore. By the Act 3 and 4 William IV., c. 37, a further union of the dioceses of Cashel and Emly with Waterford and Lismore was enacted, to take place on the next avoidance; and this union has now been effected. The greater part of the county is in this united diocese. The same Act deprived Cashel of its archiepiscopal rank, on the decease of the then existing holder of the see, and added the province to that of Dublin: this change has been effected. The only part of the county in the diocese of Meath is the parish of Eglish, which is partly in this county and partly in King's County, and is comprehended in the ecclesiastical union of Fircal. The diocese of Meath is in the ecclesiastical province of Armagh; but with the exception of the small part included in that diocese, the rest of the county is in the ecclesiastical province of Dublin.

In the Roman Catholic church the archbishop of Cashel retains his dignity, and is primate of Munster. His cathedral is at Thurles. His province includes the united dioceses of Cashel and Emly, of Cloyne and Ross, and of Waterford and Lismore, and the dioceses of Cork, Kerry, Killaloe, and Limerick. In which of these dioceses the county is included we have no means of ascertaining exactly; but the greater part, if not the whole, is included in those of Cashel and Emly, Killaloe, and Waterford and Lismore.

The county is included in the Leinster circuit; the assizes are held at Clonmell: the county-gaols are at Clonmell and Nenagh, the latter very lately erected; and there are bridewells at Cahir, Clogheen, Tipperary, Cashel, New Birmingham, Thurles, Templemore, Roscrea, Nenagh (we are not sure if this is continued since the completion of the county-gaol), Burris-o'-Kane, Newport, and Carrick-on-Suir. The county-gaol at Clonmell comprehends a gaol, house of correction, and sheriffs'-prison: the house of correction is under very good management; the silent system of prison discipline is acted upon, the prison not being adapted for the introduction of the separate system. Considerable improvements had been made in the sheriffs'-prison according to the 'Nineteenth Report of the Prison Inspectors' (1841), the last we have seen; but a complete system of discipline could not be introduced until the removal of part of the prisoners to Nenagh gaol, which was not then completed. The bridewells are many of them in a bad state; those of Cahir, Cashel, and Templemore are miserably dilapidated, and that at Cahir very badly managed; those of New Birmingham, Burris-o'-Kane, and Tipperary, insecure and altogether insufficient: Carrick bridewell, though new, is badly finished and ill-managed by the keeper; and that at Clogheen, though in tolerable good order, falls very far short of the well-regulated bridewells of other counties: those of Newport, Nenagh, Roscrea, and Thurles (the last a large prison) are in good order. (*Inspectors' Report*, 1841.) It is stated in a note to that Report, that great improvement has been made in several of these prisons since the inspectors' visit.

The number of criminal offenders committed for trial in 1839 was 2110, being greater than in any county of Ireland, except the metropolitan county (including the city) of Dublin; and more than twice as great as in any other county, except only Cork (including the city of Cork); Galway (including the town of Galway); Limerick (including the city of Limerick), and Kerry; and of these the only one which approached it was Cork (1932 committals), which had more than twice the population; the others barely exceed half the number in Tipperary, though Galway rather exceeds it in population; Limerick has about three-fourths of the population of Tipperary, and Kerry nearly two-thirds. So far therefore as the number of committals is a test of the state of crime, Tipperary that year exceeded all other counties in Ireland, except that of Dublin, and in most cases very far exceeded them. Of the 2110 persons committed, 946 were convicted, and 1164 acquitted or discharged; 9 of the convictions were for capital offences, and 4 of the criminals were executed. In 1840 the number of committals was 1642, the county still retaining, or nearly so, its unhappy pre-eminence: of the persons committed, 718 were convicted, and 924 acquitted or discharged; 5 of the convictions were for capital offences, but no persons were executed. A large proportion of the offences were murders, manslaughters, assaults, riots, and other violent offences, indicative of the prevalent tendency to disturbance and insubordination.

The county returns two members to parliament, who are elected at Clonmell; and one member each is returned from the borough of Clonmell and the city of Cashel. The number of registered electors for the county in February of each of the years 1835, 1837, and 1841, was as follows:—

	50*l.* Freeholders.	20*l.* Freeholders.	20*l.* Leaseholders.	10*l.* Freeholders.	10*l.* Leaseholders.	Holders of a rent-charge.	Total.
1835	660	361	2	1459	2	1	2485
1837	854	437	15	1773	51	5	3135
1841	792	316	13	1217	120	44	2502

The number of voters in Clonmell and Cashel, in the same three years, was as follows:—

CLONMELL.

	10*l.* Householders.	5*l.* Householders.	Freemen.	Total.
1835	601	..	84	685
1837	699	..	96	795
1841	587	..	100	687

CASHEL.

	10*l.* Householders.	5*l.* Householders.	Freemen.	Total.
1835	302	..	6	308
1837	353	..	..	353
1841	267	..	..	267

Before the Union the county returned eight members to the Irish parliament, namely, two for the county itself, and two each for Clonmell, Cashel, and Fethard, but the last was disfranchised at the Union, and Cashel and Clonmell reduced to one member each: no change in the number of members was made by the Reform Act.

The amount of grand jury presentments for the years 1839 and 1840 was as follows:—

	1839.			1840.		
New roads, bridges, &c. .	£ 2,219	13	5	£ 3,165	13	0
Repairs of roads, &c. . .	19,871	17	7	24,831	8	1
Court and Sessions houses, erection and repairs of .	950	0	0	6,093	10	0
Gaols, bridewells, &c., erection and repairs of . .	3,999	17	1	4,698	0	11
County gaol and bridewell, and prison expenses . .	6,776	8	1	8,001	13	2
Salaries to officers in gaols	237	0	8	302	13	0
Constabulary police, payments to witnesses, &c. .	17,195	11	2	17,537	15	4
Salaries to county officers, collectors' poundage, &c.	5,074	3	3	5,548	6	1
Public charities . . .	6,408	17	1	7,423	18	1
Repayments to government	1,959	1	11	2,307	11	9
Miscellaneous . . .	2,834	13	7	2,338	13	6
	£67,527	3	10	£82,249	2	11

The county constabulary on the 1st January, 1840, and 1841, consisted of the following:—

	County Inspectors.	Sub-Inspectors.			Head Constables.		Constables.	Sub-Constables.		Horses.
	2nd rate.	1st rate.	2nd rate.	3rd rate.	1st rate.	2nd rate.		1st rate.	2nd rate.	
1840	2	4	4	5	2	15	109	481	170	not stated.
1841	2	3	7	3	2	14	122	531	79	17

The whole expenditure on the constabulary force in the year 1839 was 36,276*l.* 9*s.* 1¾*d.*, and in 1840, 36,595*l.* 15*s.* 10*d.* The amount of the constabulary force and the cost of maintaining it are greater than in any other county in Ireland.

There is a county lunatic asylum at Clonmell; which in the year from March, 1840, to March, 1841, contained 94 patients, and was maintained at an expense of 2227*l.* 3*s.* 3*d.*, or 23*l.* 6*s.* 9*d.* for each patient. There is a county infirmary at Clonmell, into which the following number of patients were admitted:—

	In-Patients.	Out-Patients.	Total.
1835	322	4386	4708
1836	278	4759	5037
1837	326	7760	8086

There are fever hospitals at Burris-o'-Kane, Cahir, Carrick-on-Suir, Cashel, Clogheen, Clonmell, Cloghjordan, Nenagh, Roscrea, Templemore, and Tipperary: and dispensaries at Ballingarry, Ballymackay, Ballymonty or Kilcooley, Ballyporeen, Birdhill, Bourney, Burris-o'-Leagh, Burris-o'-Kane, Cahir, Cappaghwhite, Carrick-on-Suir, Clogheen, Clonmell, Cloghjordan, Drangan, Dundrum, Fethard, Golden, Grangemockler, Killenaule, Kilsheelan, Littleton, Lorrha, Mullinahone, Nenagh, Newcastle, Newport, Portroe, Poulmucca, Roscrea, Rosegreen, Silvermines, Templemore, Templetuohy, Thomastown, Thurles, Tipperary, and Toomavara.

History and Antiquities.—Sir James Ware supposes that the Coriondi (Κοριόνδοι) and the Udiae, or rather Uodiae (Οὐοδίαι), of Ptolemy, occupied this county and the adjacent ones to the west and south-west. We think it not improbable that the Brigantes (Βρίγαντες) may have occupied the south-eastern parts, while the Uodiae occupied the south-western.

In the division which prevailed before the English conquest the following territories are noticed by Sir James Ware as corresponding to portions of this county:—

Aradh-Cliach: probably the half-barony of Arra, in the western part of the county, on the bank of Lough Derg and of the Shannon.

Corca-Eathrach: the territory round Cashel, comprehending part of the Vale of Goulin, or Golden Vale. Some writers consider the territory of North Desies to be identical with this.

Eoganacht: a name common to a sept or clan, and to the territory occupied by them near Thurles.

Hy-Fogarta: the country of the sept of O'Fogarty, in the neighbourhood of Thurles.

Hy-Kerin: the country of the sept of O'Meagher. This territory has retained its name with little alteration, being now the barony of Ikerin.

Muscraige-Thire, or *Muscraighe-Thire:* the country of the sept of Kennedy, now the baronies of Upper and Lower Ormond, a name which signifies East Munster.

In the early periods of Irish history these territories appear to have been divided between the kingdom of Thomond or North Munster, governed by princes of the Dalcassian race; and Desmond, or South Munster, held by princes of the Eoganacht or Eugenian family; the princes of which two kingdoms appear to have possessed in alternate succession the paramount dominion of Munster. Early in the ninth century, soon after the landing of the Northmen or Danes (or as they are usually termed in Irish history, from the position of their original country with reference to Ireland, the Ost-men, or East-men) under their king Turgesius, Feidlim Mac-Crimthan, king of Desmond, held the paramount sovereignty of Munster. The capital of his kingdom was Cashel. His course, which was one of violence and tyranny, was marked by success: he was victorious over the chieftains of Connaught and over the king of Meath, the nominal sovereign of all Ireland. At the commencement of the tenth century the regal and sacerdotal characters were united in Cormac MacCulinan, bishop of Cashel and king of Munster, of the Eoganact race. He was not the first of his family in whom these characters had been combined. In 907 he defeated Flann-Siona, king of Meath and titular monarch of Ireland, on the heath of Moylena, in King's County; but having attempted to enforce the tribute which the people of Leinster had been compelled reluctantly to pay to the kings of Munster, he was defeated and slain (A.D. 908) by the Leinster forces, supported by the monarch of Ireland and the princes of the northern part of the island. Cormac built a chapel at Cashel, which still retains his name, and was the reputed author of the history commonly called 'The Psalter of Cashel.'

Callachan, who was king of Cashel towards the middle of the tenth century, appears in the history of this troubled period as an active but unprincipled warrior. He was surrendered by his own subjects into the hands of Murkertach, heir apparent to the monarchy of Ireland. In the latter part of the same century the throne of Munster was occupied successively by Mahon and his brother Brian Boromh, or Boroimhe, or Boru, two princes of the Dalcassian family, the latter of whom acquired the monarchy of Ireland. At the commencement of the twelfth century (A.D. 1101) Murkertach, king of Munster, gave over the city of Cashel to the church, dedicating it to God and St. Patrick. The holders of the see of Cashel had previously assumed the rank of archbishops.

In the English invasion, Henry II. (A.D. 1172) summoned an assembly of the Irish prelates and princes at Cashel, where the sovereignty of the English king was recognised, and various regulations made, increasing the power of the clergy, and more completely assimilating the practices of the Irish church to those of the church of Rome. Tipperary, or part of it at least, seems to have remained under the dominion of Donald of the sept of O'Brien, native prince of Thomond and Ormond, subject to the nominal sovereignty of the English king. In the irregular warfare which followed Henry's departure from Ireland, a body of Anglo-Normans under Richard, earl of Strigul, surnamed Strongbow, and governor or commander in Ireland, and of Hervey of Mount-Morris, entered the county (A.D. 1174) to attack Donald O'Brien, and advanced as far as Cashel, where they were to be joined either by a department from the Anglo-Norman garrison of Dublin or by a body of Ost-men from that city: but this detachment was surprised near Thurles by Donald, and put to the sword almost without resistance; and Strongbow and Hervey retreated to Waterford. The invaders appear to have crossed the county again the same year, in their march to Limerick (which was also under the dominion of Donald), which they succeeded in taking. In A.D. 1175 a considerable Anglo-Norman force with a body of native allies entered the county under Raymond Le Gros, marching to the relief of Limerick, to which Donald O'Brien had laid siege. The Irish, hearing of their approach, advanced, and entrenched themselves in a defile near Cashel, where they were defeated with great slaughter: the garrison of Limerick was relieved, and on the banks of the Shannon or of Lough Derg, near Killaloe, the victorous Raymond received the submission not only of Donald O'Brien, but of Roderick O'Connor, titular king of Ireland; and exacted hostages from both for the faithful performance of the engagements into which they entered.

This county was probably included in the grant of the principality of Thomond to Philip de Braosa (A.D. 1177), but the prudence or the cowardice of that noble prevented his dispossessing Donald O'Brien, who still retained possession. In A.D. 1185, while prince (afterwards king) John was in Ireland, sent over by his father, as lord of the island, the Anglo-Normans erected castles at Tipperary and Ardfinnan in this county; that of Ardfinnan was however soon taken by Donald, who, in A.D. 1190, defeated the Anglo-Normans under William, earl-marshal (who had married Strongbow's only child and succeeded to the Irish estates of that nobleman) near Thurles. Donald died A.D. 1194. The oldest part of the present cathedral of Cashel was built by him. Tipperary appears to have passed in the course of a few years afterwards into the hands of the Anglo-Normans, as it was one of the counties erected by King John (A.D. 1210), during his expedition to Ireland, at the head of a considerable army. It is probable that the northern part at least of the county was part of the seat of war (A.D. 1274-1277) between the O'Briens, who retained a portion of Thomond, and the Anglo-Norman, or as we may now term them, Anglo-Irish family of the De Clares.

It is probable that the Scots and their Irish allies were in this county (A.D. 1317) in the invasion of Ireland by Edward Bruce and his brother King Robert, since they ravaged the country from Kilkenny as far as Limerick. In A.D. 1328 the royal privileges in the county were granted to James Butler, earl of Carrick, now created also earl of Ormond; these royalties were long retained by the earls of Ormond. In A.D. 1330 Brien O'Brien, prince of Thomond, ravaged the county and burned the towns of Athassel (near Cashel) and Tipperary to the ground. In the period of anarchy which was contemporaneous with the war of the Roses in England, and continued long after that war was closed, the county was included in the scene of the frequent contests between the rival septs or families of the Geraldines, to which belonged the earls of Desmond and Kildare, and of the Butlers, at the head of which was the earl of Ormond. The burning of the cathedral of Cashel was one of the charges brought against the Earl of Kildare in his examination before the privy council (A.D. 1496). His reply to the charge was characteristic: 'Spare your evidence,' said he; 'I did burn the church: for I thought the bishop had been in it.'

In the great civil war in 1642, Clonmell, Cashel, Carrick-on-Suir, Fethard, and all the other towns in Tipperary, were seized by the insurgents, or, as they were termed, 'the Confederates,' almost at the first outbreak in the central and southern provinces. At Cashel, Fethard, and Silvermine; there were some murders committed: those at Cashel were perpetrated by the relatives of some persons recently put to death by Sir W. St. Ledger, president of Munster, who had previously entered the county with two troops of horse and exercised great severity. The Earl of Inchiquin, who commanded in Munster for the parliament, invaded the county A.D. 1647, took Cahir by capitulation, and stormed Cashel, where he mercilessly slaughtered twenty priests and an unresisting multitude who had taken shelter in the cathedral. He levied contributions in all the neighbourhood, and was prevented from taking Clonmell only by want of provisions. When Cromwell invaded Ireland, and (A.D. 1649) was opposed by the Royalists and Confederates, now united under the Earl of Ormond (to whom Lord Inchiquin, shocked at the execution of the king, had joined himself), a detachment from his army took Carrick-on-Suir, where Cromwell himself crossed the river to besiege Waterford. A body of Royalists under Lords Inchiquin and Taafe, attempting to retake Carrick (24th October), was repulsed with severe loss. Ormond with the main body of his army was about this time near Clonmell watching Cromwell, whom sickness and the approach of winter obliged to raise the siege of Waterford; soon after which Ormond withdrew to Kilkenny, having posted a considerable body of Ulster men at Clonmell.

About the latter end of February, 1650, Cromwell opened the campaign by taking Cahir, Cashel, Fethard, Clogheen, and other places in this or the adjacent counties; and in the course of the following April laid siege to Clonmell. This siege cost him more trouble and loss than any other part of his Irish expedition: he lost above 2000 men in a fruitless assault; however after a siege of two months the place was obliged to surrender for want of ammunition: the garrison had previously withdrawn to Waterford without Cromwell's knowledge, and the townsmen obtained good conditions, Cromwell supposing that the garrison was still in the town. In 1651 Ireton, who was after Cromwell's departure, general-in-chief for the parliament, concentrated his army at Cashel and marched to the bank of the Shannon, over which he forced a passage at Killaloe. On the restoration of royalty in Ireland, which rather preceded its restoration in England, Clonmell was one of the towns occupied by the Royalists.

In the war of the Revolution Clonmell was abandoned by the Jacobites on William's advance toward the south after the battle of the Boyne (A.D. 1690). William, after his unsuccessful siege of Limerick, retired with his army to Clonmell, and there leaving them, proceeded to Duncannon and embarked for England.

In the rebellion of 1798 this county was not involved; and though it has been the scene of much agrarian disturbance, there has been no serious outbreak to require particular record.

(*Map of Ireland*, by the Society for the Diffusion of Useful Knowledge; *Second Report of the Irish Railway Commissioners*; *Geological Transactions*; Lewis's and Carlisle's *Topographical Dictionaries of Ireland*; *The Traveller's New Guide through Ireland*; *The Scientific Tourist in Ireland*; *Parliamentary Papers*; Ware's *History and Antiquities of Ireland*; Cox's *Hibernia Anglicana*; Moore's *History of Ireland*; Gordon's *History of Ireland*; Dr. W. C. Taylor's *Civil Wars of Ireland*; &c.)

TIPPOO SAIB, sultan of Mysore, was born in the year 1749. His father Hyder Aly Khan [HYDER ALY], sensible of the disadvantages under which he himself laboured from want of education, procured for his son the best masters in all the sciences which are cultivated by the Mohammedans. But Tippoo, although he had acquired a taste for reading, did not make any considerable progress, and he preferred martial exercises, into which he was initiated at an early age. The French officers in the employment of his father instructed him in tactics; and in 1767, when

Hyder Aly overran the Carnatic, Tippoo was entrusted with the command of a corps of cavalry. He was at that time nineteen years of age; but the success with which he carried on the war in the neighbourhood of Madras sufficiently proved how much he had profited by his European teachers. During the war with the Mahrattas, which lasted from 1775 to 1779, Tippoo acquired the universal esteem of the army; and he rose so high in the favour of his father and his counsellors, that the left division of the Mysore army, consisting of 18,000 cavalry and 6000 regular infantry, was put under his command. With this force Tippoo attacked Colonel Bailey in the neighbourhood of Perimbakum, on the 6th of September, 1780. He was obliged to retire; but on the 10th of the same month an engagement, in which Tippoo Saib is said to have taken an active part, ended in the entire defeat of the English army. The whole of the war in the Carnatic gave him opportunities of perfecting himself in the art of war; and on the 18th of February, 1782, he showed his skill in the attack and complete defeat of Colonel Braithwaite, on the banks of the Kolerun. This was undoubtedly his greatest stroke of generalship. A few months afterwards he was obliged to move towards the south, in order to meet the English troops in the provinces of Tanjore and Malwa, under the command of Colonel Humbertson. On the 20th of November Tippoo found the English at Paniany. He made a vigorous attack, but was repulsed and compelled to retreat. He crossed the river Paniany, and prepared himself for another engagement, when, on the 11th of December, 1782, he received intelligence of the death of his father. On the 20th he was at Seringapatam, where he mounted the musnud without much display or ceremony. He had scarcely performed the funeral rites of his father when he returned to Arcot, and assumed the command of his army. But whilst he was engaged in the Carnatic General Matthews took Onore, and the country of Bednore was in the hands of the English. In order to regain these more valuable possessions, Tippoo was obliged to relinquish his conquest in the Carnatic, and by the end of March, 1783, scarce a Mysorean was left in that country. His operations were so rapid and successful, that on the 28th of April Tippoo Saib had already reduced the garrison of Bednore to the necessity of capitulating. General Matthews and several of the principal officers were barbarously put to death. After the reduction of this city, it was Tippoo's object to repossess himself of Mangalore, the principal seaport in his dominions. But the place was well defended; and in the midst of his preparations for the assault accounts were received in the camp of peace having been concluded between England and France. It was early in July, 1783, when M. de Bussy, in consequence of this news, declined to act any longer against the English. He quitted the camp with his detachment. A considerable reinforcement having arrived under General Macleod, Tippoo agreed to a suspension of arms; and early in the year 1784 Sir George Staunton and two other ambassadors from Madras arrived in the camp, and on the 11th of March a treaty of peace, which stipulated for the liberation of all the prisoners and the restitution of all places taken by either party during the war, was concluded. About the end of the same year Tippoo concluded a treaty of peace with the court of Poonah. He then returned to Seringapatam, and assumed the title of Sultan, thereby throwing off all dependence on or allegiance to the captive Raja (imprisoned by his father) or the Great Mogul.

In 1786 he occupied himself with internal regulations; and from an inventory made at this period we find that the treasure, jewels, and other valuable articles were estimated at eighty millions sterling. He had also 700 elephants, 6000 camels, 11,000 horses, 400,000 bullocks and cows, 100,000 buffaloes, 600,000 sheep, 300,000 firelocks, 300,000 matchlocks, 200,000 swords, and 2000 pieces of cannon, and an immense quantity of gunpowder and other military stores. His regular army consisted of 19,000 cavalry, 10,000 artillery, and 70,000 infantry. He had also 5000 rocket-men, and 40,000 irregular infantry.

During the years 1787 and 1788 the attention of the Sultan was principally engaged in the conversion and subjection of the Naïrs, or chiefs of Malabar. He is said to have carried away from that province 70,000 Christians, and to have made Mussulmans of 100,000 Hindus. This he effected by forcible circumcision, and compelling them to eat beef.

It was about this time that he published an edict for the destruction of all the Hindu temples in his dominions, excepting those of Seringapatam and Mail Cottah. Fortunately his officers did not enforce this barbarous regulation.

Although Tippoo Sultan did not show any overt hostility toward the English after he had signed the treaty of 1784, yet in 1787 he sent an embassy to France, to enter into an offensive and defensive alliance, and to stimulate the court of Versailles to a speedy renewal of hostilities with England. The ambassadors returned to Seringapatam in the month of May, 1789, without having obtained their object. The disappointed Sultan vented his rage by putting two of them to death as having betrayed his interests. Tippoo hated the British power in India, and he took every opportunity to annoy such of the native kings as were under its protection. The Raja of Travancore had by the treaty of Mangalore stipulated for the security of his territories. In April, 1790, Tippoo invaded the country and subjected the whole of the northern district. The reasons assigned by Tippoo for the infraction of the terms of the treaty were that two forts, Cranganagore and Jyacotta, which were on the northern boundaries of the Raja's possession, had belonged to his father. This aggression was considered by the English equivalent to a declaration of war, and Colonel Hartley was sent with a considerable detachment to the assistance of the Raja. At this intelligence Tippoo withdrew his army from Travancore, and returned to Seringapatam, when, to his dismay, he heard that the Mahrattas and the Nizam had promised the English a zealous co-operation with their forces.

On the 15th of June, 1790, the English troops, under the command of General Medows, entered the Sultan's territory, and took possession of the fort of Carur without resistance. Daraporam and Coimbatore were shortly afterwards reduced. About the same time a detachment, under Colonel Stuart, captured Dindigul and Paligautchery. The movements and operations of the English forces were so well conducted, that Tippoo found himself unable to oppose them, and he resolved to follow the plan of warfare adopted by his father: instead of defending his own territories, to lay waste those of his enemy. This he did with considerable ability; for in the beginning of 1791 the English, instead of being masters of great part of Mysore, as they had expected, found themselves attacked and annoyed in the very neighbourhood of Madras.

On the 29th of January, 1791, Lord Cornwallis assumed the command of the army, and on the 11th of the same month he was at Vellore. On the 21st of March the fort of Bangalore was taken by storm. On this event Tippoo retired to some distance, and wrote to Lord Cornwallis, requesting a truce. This was refused, and he proceeded to Seringapatam, leaving his army under the command of one of his generals, to watch the motions of the English. On the 3rd of May Lord Cornwallis was at Arakery, within sight of the Sultan's capital; but his troops had suffered a great deal from want of food and forage, and he was compelled to retreat towards Bangalore. The Mahrattas came however to his assistance, and the warfare was carried on with great success.

However, whilst the English were carrying on their successful operations in the north-west part of Mysore, the Sultan made a diversion towards Coimbatore, situated to the south of Seringapatam; and Lieutenant Chalmers, with the whole of his party, were made prisoners. The skill of Tippoo Sultan enabled him to protract the war till the month of February, 1792, when the allies (the English, the Mahrattas, and the troops of the Nizam) encamped in sight of the capital. But it was not until General Abercromby had united his forces to those of Lord Cornwallis, and had determined to take the town by storm, that the haughty mind of the Sultan was humbled. He agreed to give the allies one half of his dominions, and to pay them in the course of twelve months the sum of three krores and thirty lacs of rupees (3,030,000*l.*), to restore all the prisoners, and to deliver up as hostages two of his sons. Abdulkhalik and Moäz Addeen were the names of the two princes, and the attention and kindness evinced by Lord Cornwallis towards them were such as to afford the highest gratification to the Sultan their father. By signing the definitive treaty of the 16th March, 1792, the Sultan lost one half of his dominions. Soon after this the allies quitted the neighbourhood of Seringapatam, and Tippoo sought e means of replenishing his treasury. This was soon one by imposing exorbitant and extraordinary taxes, hich were chiefly levied upon the agriculturists.

Notwithstanding this seeming tranquillity from 1792 to 796, the Sultan was engaged in inciting all the native hiefs against the British power in India; but it was not ntil 1798 that the whole extent of his secret machinaons and intrigues became known. At the commenceent of this year ambassadors were sent from Seringapaam to the Mauritius. Their object was to renew the ultan's relations with France, and to solicit the aid of 0,000 European and 30,000 negro troops. The proceedngs of the embassy were first made known in the month of June to the Marquis Wellesley, the governor-general. About the same time intelligence was received in India of the operations of the French in Egypt. Circumstances like these left no doubt as to the intentions of the Sultan, and on the 3rd of February, 1799, orders were issued for the British armies and those of the allies immediately to invade the dominions of Tippoo. Hostilities commenced on the 5th of March; and, on the 5th of April, General Harris took a strong position opposite the west side of Seringapatam. After besieging the place some time, a general attack was made on the 4th of May, 1799. The Sultan had scarcely finished his repast when he heard the noise of the assault. He instantly repaired towards a breach which the English had succeeded in making a few days before. His troops fled; he endeavoured to rally them; and so long as any of his men remained firm, he continued to dispute the ground against an English column which had forced the breach and gained the ramparts. Finding all his efforts against the enemy fruitless, he mounted his horse, and, in endeavouring to effect his retreat, arrived at a bridge leading to the inner fort; but the place was already occupied by the English, and in his attempts to proceed he was met by a party of Europeans from withinside the gate, by whom he was attacked. Owing to two wounds which he received in his breast, he fell from his horse; his attendants placed him upon a palankeen, in one of the recesses of the gateway, and entreated him to make himself known to the English. This he disdainfully refused to do. A short time afterwards some European soldiers entered the gateway, and one of them attempting to take off the Sultan's sword-belt, the wounded prince, who still held his sword, made a thrust at him and wounded him in the knee; upon which the soldier levelled his musket and shot him through the head. On the afternoon of the 5th of May he was buried in the mausoleum of Hyder Aly. Four companies of European troops escorted the funeral procession, which was strikingly solemn.

When Tippoo met his death he was in his fiftieth year. He was of dark complexion, and about five feet nine inches high; he had a round face, with large black eyes, and an aquiline nose, which gave much animation and expression to his countenance. Although after his misfortunes in 1792 he oppressed the people more than they had ever been in the time of his father, he was nevertheless very popular; and even now the Mysoreans consider him as a martyr to the faith, and as a prince who fell gloriously in the cause of his religion. He used to pass a great portion of his day in reading, and his library, consisting of about 12,000 volumes, was well selected. About one-half of this collection is preserved at the East India House, London; the other half was left at Fort William for the use of the college. The Museum and the Library of the East India House contain many articles both of value and curiosity which once belonged to Tippoo Saib.

('Memoirs of Tippoo Sultan,' in Stewart's *Descriptive Catalogue of the Oriental Library of the late Tippoo Sultan of Mysore*, Cambridge, 1809. This is the most authentic account of Tippoo's life.)

TIPTON. [STAFFORDSHIRE.]

TIRABOSCHI, GIRO'LAMO, born at Bergamo in 1731, studied in the college of Monza, and afterwards entered the order of the Jesuits. About 1766 he was made professor of rhetoric in the university of Milan, where he wrote his first work, the history of a monastic order long since suppressed, under peculiar circumstances: 'Vetera Humiliatorum Monumenta,' Milan, 1766. In 1770 he was appointed by the duke of Modena librarian of his rich library, in the place of Father Granelli, deceased. He now applied himself to the undertaking of his great work, 'Storia della Letteratura Italiana,' published at Modena, 1772-1783, which he completed in eleven years. The subject was vast and intricate; the only author who had yet attempted to write a general history of Italian literature, Gimma of Naples, had only sketched a rough and very defective outline of it in his 'Storia dell' Italia Letterata.' There were however local histories and biographies concerning particular towns and districts, and the rest of the materials had to be sought among the archives and libraries of Italy. Tiraboschi undertook to write the history of the literature of antient and modern Italy in the most extended sense of the word, including most of, if not all, the individuals deserving of mention in every department of learning, who have flourished in Italy, from the oldest times on record, beginning from the Etruscans and the Greek colonies of Magna Græcia and Sicily, and then proceeding with the history of Roman literature through its rise, progress, and decay, down to the invasion of the northern tribes, with which the second volume concludes. The author distributes the great divisions of learning in separate chapters, poetry, grammar, oratory, history, philosophy, medicine, jurisprudence, and the arts; he gives an account of the principal libraries, and of the great patrons of learning, and although he does not profess to write biography, properly speaking, yet he gives biographical notices of the more illustrious writers and of their productions. The third volume comprises the literary history of Italy during the dark ages, as they are commonly called, from the fifth to the twelfth century. The author makes his way through the scanty and obscure records of those times, and brings to light much curious information concerning the intellectual state of Italy under the Goths, the Longobards, and the Franks. The ecclesiastical writers come in for a great share of this part of the work. The fourth volume includes the period from 1183 to the year 1300. The revival of studies the formation of the Italian language, the foundation of universities, notices of the civilians and canonists who flourished in that age, an account of the Italian troubadours of the earliest Italian poets, and of the Italian Latinists, and a view of the splendid architectural works of Arnolfo di Lapo, of Niccolò and Giovanni of Pisa, and other artists, impart a cheering aspect to this period. The fifth volume embraces the 14th century, the age of Dante, Petrarca, and Boccaccio. The author is particularly diffuse in speaking of Petrarca. The sixth volume concerns the 15th century, an age of classical studies; the age of Cosmo and Lorenzo de' Medici, of Poggio, Filelfo, Niccoli, Palla Strozzi, Coluccio Salutati, Paolo Manetti, Cardinal Bessarion, and other collectors of MSS., founders of libraries, and encouragers of learning, and the age also of distinguished jurists and ecclesiastical writers. This volume is very large and is divided into three parts, whilst the preceding volumes are divided each into two parts, each part being subdivided into books and chapters. We cannot help thinking that this mode of division is too formal and cumbersome, and that it might have been simplified and made clearer.

The seventh volume of Tiraboschi's history treats of the 16th century, the age of Leo X., the Augustan age, as it is sometimes called, of Italian literature. This volume, which is still more bulky than the one preceding, is divided into four parts. After giving a sketch of the general condition of Italy during that period, of the encouragement to learning afforded by the various princes, of the universities, academies, libraries, and museums, the author treats first of the theological polemics which arose with the Reformation, then of the philosophical and mathematical studies, of natural history and medicine, of civil and ecclesiastical jurisprudence, of historical writing, and of the Italian Hellenists and Orientalists. He passes next in review the Italian poets, among whom Ariosto and Tasso hold a conspicuous place, and afterwards the Latin poets, the grammarians, rhetoricians, and pulpit orators, and lastly the artists, among whom Michael Angelo, Raffaello, Tiziano, and Correggio stand prominent. It is impossible to peruse this long list of illustrious names without being struck with the seemingly inexhaustible fertility of the Italian mind in almost every branch of knowledge.

The eighth volume embraces the 17th century, which in Italy is scornfully styled the age of the 'seicentisti,' or the age of bad taste, a reproach however which applies mainly to the poets, and not even to the whole of them. The department of history is filled with good names, as well as that of the mathematical sciences, in which Galileo holds the first rank. With the 17th century Tiraboschi concludes his work. Various reasons prevented his entering the field of contemporary history. This however has been done of late years by Lombardi, in his continuation of Tiraboschi's work: 'Storia della Letteratura Italiana nel Secolo xviii.'

Tiraboschi's work was highly esteemed, and went through numerous editions in various parts of Italy. The author himself superintended the second edition of 'Modena,' 1787-94, in which he made corrections and additions, chiefly in the shape of notes to the text. Antonio Landi made an abridgment of the work in French, which was published at Paris, and at Bern, in 1784; and J. Retzer made a similar abridgment of it in the German language. When the work of Tiraboschi appeared, no other country of Europe had a general history of its own literature. The learned Benedictines of St. Maur had begun a work of this kind concerning the literature of France, which however they left imperfect. The work of Tiraboschi does not give all the information that one might wish, but it contains probably as much information as could be collected and compressed together by any one man upon the subject. It has been said to be deficient in criticism, and in the analysis of conspicuous works, of which he has not given extracts; but this, as he says in his preface, did not form part of his plan, which was already extensive enough, or the work would have had no end. His accuracy and conscientiousness are undisputed. The tone of his remarks, especially on religious matters, is perhaps as temperate as could be expected from a man of his profession, times, and country, who was a sincere believer in the tenets of his church, though not a bigot. For a proof of this we might refer the reader to Tiraboschi's letter to Father Mamachi, a Dominican, who edited at Rome an edition of Tiraboschi's great work with corrections and notes to those passages which were not consonant with his own high notions of Papal prerogative and Roman supremacy, both spiritual and temporal. Tiraboschi's letter was published at Modena in 1785, and was afterwards inserted at the end of the last volume of the second Modena edition of the 'History of Italian Literature.' A tone of refined cutting irony, half veiled, under a most courteous style of language, pervades the whole of the letter. The French writer Ginguené has followed closely Tiraboschi's footsteps in his 'Histoire Littéraire d'Italie,' which however contains only the modern part, or the history of the literature of the Italian language. [GINGUENÉ.]

The duke of Modena, Ercole III. of Este, in consideration of Tiraboschi's useful labours, made him a knight, and appointed him member of his council in 1780. By the suppression of the order of Jesuits, Tiraboschi had become a secular priest. In 1781 he began to publish another work of bibliography and biography: 'Biblioteca Modenese, o Notizia della Vita e delle Opere degli Scrittori natii degli Stati del Serenissimo Duca di Modena,' 6 vols. 4to., Modena, 1781-86; to which he afterwards added a seventh volume, containing notices of the artists who were born in the dominions of the house of Este. Having thus illustrated the literary history of Modena, and of the other territories of the house of Este, he afterwards wrote the political history of the same country, in his 'Memorie Storiche Modenesi, col codice diplomatico, illustrato con note,' 3 vols. 4to., Modena, 1793. He also published the history of the antient monastery and abbey of Nonantola in the duchy of Modena, founded about the middle of the eighth century by Anselmus, Duke of Friuli, and afterwards greatly enriched by Charlemagne and other princes, and which became a powerful community during the middle ages: 'Storia dell' augusta Badia di S. Silvestro di Nonantola, aggiuntovi il codice diplomatico della medesima, illustrato con note,' 2 vols. folio, Modena, 1784. The other works of Tiraboschi are: 1, 'Vita del Conte D. Fulvio Testi.' Testi was a lyric poet of the seventeenth century, and enjoyed for a time a high office at the court of Modena, but ended his days in prison for state reasons. 2, 'Lettere intorno ai viaggi del Sigr. Bruce,' inserted in the 'Notizie Letterarie' of Cesena, 1792; 3, 'Memoria delle cognizioni che si avevano delle sorgenti del Nilo prima del Viaggio del Sigr. Jacopo Bruce,' inserted in the 1st vol. of the 'Memorie dell' Accademia delle Scienze di Mantova;' 4, Two memoirs on Galileo, his discoveries, and his condemnation by the Inquisition, inserted in the last vol. of the second Modena edition of the 'History of Italian Literature;' 5, 'Notizie della Confraternità di S. Pietro Martire;' 6, 'Vita di Sant' Olimpia, Vedova e Diaconessa della Chiesa di Costantinopoli;' 7, 'Elogio Storico di Rambaldo de Conti Azzoni Avogaro;' besides other minor writings, especially in answer to the critics of his 'History of Italian Literature.' He left unpublished: 1, 'Dizionario Topografico degli Stati Estensi,' published since at Modena, 1824-5; 2, 'Catalogo ragionato dei Libri del già Collegio dei Gesuiti di Brera;' 3, Lettera sulla Venuta di Gustavo Adolfo in Italia;' 4, 'Vita di Giannandrea Barotti Ferrarese;' 5, 'Notizie sulla Zecca di Brescello, sopra alcuni Luoghi del Modenese, ed Albero della casa Montecuccoli;' besides several dissertations and orations. His voluminous correspondence is preserved in the Modena Library.

Tiraboschi died at Modena, in June, 1794, of a disease brought on by sedentary life and constant application. He was buried in the church of SS. Faustino e Giovita, outside of the city, and a Latin inscription was placed on his tomb, written by Father Pozzetti, who succeeded him as librarian, commemorative of his labours and his virtues, among which modesty and charity were most conspicuous.

(*Elogio di Girolamo Tiraboschi*, by Pozzetti, prefixed to the later editions of the 'History of Italian Literature;' Ugoni, *Storia della Letteratura Italiana nella seconda metà del Secolo XVIII.*; Lombardi, *Storia della Letteratura Italiana nel Secolo XVIII.*)

TIRA'NO. [VALTELLINO.]

TIRHUT. [HINDUSTAN, p. 217.]

TIRIDA'TES, prince of Media, and afterwards king of Armenia, was the brother of Vologeses, king of the Parthians, that is, of Media. He first appears in history in A.D. 53, in the first war of Corbulo against Vologeses (Tacitus, *Hist.*, xii. 50), who was compelled to desist from his schemes upon Armenia in A.D. 54. In A.D. 58, however, the Parthians again overran Armenia, having been invited by the inhabitants of that country, and Vologeses ceded his conquest to his brother Tiridates, who thus became king of Armenia. As the Romans would not allow this country to become a possession of the Parthians, Corbulo directed his forces against the royal brothers, knowing that Vologeses was prevented from employing his army against him in consequence of an insurrection of the province of Hyrcania. Corbulo therefore soon persuaded Tiridates to submit to the emperor Nero, and to prefer a moderate dependence to an uncertain and dangerous independence. When they were about to meet, in order to settle the conditions of the peace, Tiridates suddenly became afraid of some treacherous design on the part of the Romans, and he therefore broke off the negotiations and renewed the war. Corbulo however defeated him at Artaxata on the Araxes, took and destroyed this old capital of Armenia, and forced the new capital, Tigranocerta [TIGRANOCERTA], to surrender after a short siege. (Tacitus, *Hist.*, xiv. 24; Frontinus, *Stratag.*, ii. 9, exempl. 5.)

Tiridates fled to his brother, who had taken the field against the Hyrcanians, and who entrusted him with the command of a new army, with which Tiridates hoped to expel the Romans from Armenia. He attacked them on the side of Mesopotamia, but the strong position which the Romans kept at Tigranocerta, and the care which they showed in watching the passages of the Euphrates, prevented him from either penetrating into the valley of the Upper Tigris, or from invading Syria, a manœuvre by which Corbulo would have been obliged to hasten to the relief of this province, and to leave Armenia to the incursions of Vologeses. Tiridates therefore listened once more to the pacific proposals of the Romans, who were anxious to avoid any war with the Parthians if they could do so on conditions which would secure their influence over Armenia. Their intention was not to make a Roman province of Armenia. Ambassadors from Tiridates arrived in the camp of Corbulo, and they declared, in the name of Tiridates and his brother Vologeses, that Tiridates was ready to submit to Nero, as a vassal-king, and that Vologeses would keep in future a better understanding with the Romans than before. In order to settle the peace, a day was fixed on which Tiridates was to appear in the camp of Corbulo, who sent Tiberius Alexander [TIBERIUS ALEXANDER] and his son-in-law Vivianus Annius as hostages into the camp of Tiridates (A.D. 63). When Tiridates entered the tent of Corbulo, he took off his royal diadem, and placed it at the foot of a portrait of the emperor Nero, taking an oath that he would not exercise any right of sovereignty in Armenia till he had again received the same diadem from the hands of the emperor in Rome. (Tacitus, *Hist.*, xv. 28, 29.) Tiridates arrived in Rome in A.D. 66, and when he approached the city a great number of people came out from the gates to behold the entrance of an oriental king descended from the mighty sovereigns of the Parthians. In Zumpt, 'Annales veterum Regnorum et Populorum, imprimis Romanorum,' the Armenian king who entered Rome in A.D. 66 is called Tigranes, but this is a typographical error. (Tacitus, *Hist.*, xvi. 23.) The latter circumstances of the life of Tiridates are unknown. [Parthia.]

TIRLEMONT (in Dutch, *Tienen*), situated in 50° 50′ N. lat. and in 4° 50′ E. long., is an inland town in the kingdom of Belgium, in the province of South Brabant, on a small river called the Great Geete. It is a pretty well-built town, and has 8000 inhabitants, who have considerable manufactures of flannel and stockings. There are also brandy distilleries, and breweries which produce a celebrated kind of beer. It is said to have been formerly more populous and thriving than at present. In the wars of the French revolution, several battles took place here between the French and the Austrians; first, in November, 1792, when the Austrians were defeated; secondly, on the 16th of March, 1793, when they again sustained a check, for which they took ample revenge two days afterwards by the decisive victory of Neerwinden.

(Hassel; Stein; Cannabich: Hörschelmann.)

TIRO. [Cicero.]

TIRVALORE, TABLES OF. [Viga Ganita.]

TIRY, or TYREE. [Hebrides.]

TIRYNS was an antient city of Argolis, in the Peloponnesus, situated in 37° 40′ N. lat. and 41° 1′ E. long., at no great distance from the head of the Argolic Bay, now the Gulf of Napoli di Romania. According to a legend in Strabo (viii., p. 373, Casaub.), it was built by Prœtus, an antient king of Argolis, who in the construction of the citadel employed masons from Lycia, who were called Cyclopes. The Greeks attributed most architectural works which were characterised by rude massiveness and great antiquity to the Cyclopes, and such works were consequently described as Cyclopean. Homer (*Iliad*, ii. 559) calls Tiryns the 'walled,' or rather the 'wally' Tiryns: and Pausanias (ii. 25), 1000 years after him, thus describes the remains, as they existed in the second century of our æra. 'The ruins of Tiryns,' he observes, 'were on the right of the road leading from Argos to Epidaurus. The wall of the fortification, which still remains, is the work of the Cyclopes, and is built of unwrought stones, so large that not even the least of them could be even moved by a pair of mules. The intervals between them have been long since filled up with smaller stones, so as to make the whole mass solid and compact.' No cement or mortar was used in these constructions, and it is evident that they were the first rude attempt at building with stone among the Pelasgic Greeks, and constituted their first style of architecture. The second is still visible in the remains of Mycenæ.

The ruins of Tiryns are thus described by Col. Leake, in his 'Morea,' vol. ii., p. 350:—'They occupy the lowest and flattest of several rocky hills, which rise like islands out of the level plain. The length of the summit of that of Tiryns is about 250 yards, the breadth from 40 to 80; the height above the plain from 20 to 50 feet; the direction nearly north and south. The entire circuit of the walls still remains more or less preserved. Some of the masses of the stone are shaped by art, some of them are rectangular; but these are probably repairs, and not a part of the original work described by Pausanias. The finest specimens of the Cyclopean masonry are near the remains of the eastern gate, where a ramp, supported by a wall of the same kind, leads up to the gate. The ruined wall of the fortress still exists to the height of 25 feet above the top of the ramp; but this is the only part in which the walls rise to any considerable height above the table summit of the hill within the fortress. On one side of this gateway I measured a stone of 10.6 by 3.9 by 3.6. Here the wall is 24½ feet in thickness; in other parts from 20 to 23. But the principal entrance was not here, I think, but on the southern side, adjacent to the south-east angle of the fortress, where a sloping approach from the plain is still to be seen, leading to an opening in the walls.'

In its general form the fortress appears to have consisted of an upper and a lower enclosure of nearly equal dimensions, with an intermediate platform. The southern entrance led, by an ascent to the left, to the upper level, and by a direct passage between the upper inclosure and the eastern wall of the fortress into the lower inclosure, having also a branch to the left into the middle platform, the entrance into which last was nearly opposite to the eastern gate already described. There was also a postern on the western side. In the eastern, as well as in the southern wall, there were galleries in the body of the wall of singular construction, the angle of the roof being formed by merely sloping the courses of the masonry. In the eastern wall there are two parallel passages, of which the outer has six recesses in the exterior wall. These niches were probably intended to serve for the protracted defence of the gallery itself, and the galleries for covered communications leading to places of arms at the extremities of them. One of these places of arms still exists at the south-west angle of the fortress, and there may have been others on either side of the great southern entrance. The passage which led from this entrance to the lower division of the fortress was about 12 feet broad; and about midway there still exists an immense door-post, with a hole in it for a bolt, showing that the passage might be closed upon occasion. In these contrivances for the progressive defence of the interior we find a great resemblance not only to Mycenæ, which was built by the same school of engineers, but to several other Grecian fortresses of remote antiquity. A deficiency of flank defence is another point of resemblance: it is only on the western side, towards the south, that this essential mode of protection seems to have been provided. On this side, besides the place of arms at the south-western angle, there are the foundations of another of a semicircular form, projecting from the same wall, fifty yards farther to the north; and at an equal distance, still farther in the same direction, there is a retirement in the wall, which serves in aid of the semicircular bastion in covering the approach to the postern of the lower inclosure. This latter division of the fortress was of an oval shape, about 100 yards long and 40 broad: its walls formed an acute angle to the north, and several obtuse angles on the east and west. Of the upper inclosure very little remains.

The fortress itself is only a third of a mile in circumference, so that in all probability it must have been no more than the citadel of the Tirynthii, the town itself being situated in a plain of two or three hundred yards in breadth, on the south-west of the fortress: beyond this plain lies a marsh, extending a mile farther towards the sea.

Prœtus, the reputed founder of Tiryns, was succeeded by his son Megapenthes, who is said to have transferred it to Perseus. Perseus transmitted it to his descendant Electryon, whose daughter Alcmena married Amphitryon. The latter prince was expelled from Tiryns by Sthenelus, king of Argos; but his son Hercules recovered his inheritance, and was in consequence called Tirynthius. (Diodorus, iv. 10; Pindar, *Olymp.*, x. 37.)

From Perseus to Amphitryon, Tiryns was a dependency of the neighbouring city Mycenæ. At the time of the Trojan war, Homer (*Iliad*, ii. 559) represents it as being subject to the kings of Argos. Subsequently it was partially destroyed by the Argives. The date of that event is uncertain; but from two passages of Herodotus (vi. 83, and ix. 28), in which mention is made of Tiryns, it appears that it existed up to B.C. 480, and it is probable that it was overthrown about the same time as Mycenæ, B.C. 468. (Clinton, *Fasti Hell.*, ii., p. 425.) According to Strabo (viii., p. 373), the Tirynthians, on leaving their homes, retired to Epidaurus: according to Pausanias (ii. 25), the greater part of them were sent to Argos.

Pausanias also notices what he calls the chambers (*θάλαμοι*) of the daughters of Prœtus lying between Tiryns and the sea; but he gives no description of them. Strabo speaks of some artificial caverns near Nauplia, which he places at the distance of only 12 stadia from Tiryns, and says that they were attributed to the Cyclopes. It is not improbable that he alludes to the same excavations as Pausanias; but Strabo had probably not seen them, for he never saw Mycenæ. The Tirynthian citadel was also called Licymnia, from Licymnius, a son of Electryon, and brother of Alcmena. (Pindar, *Olymp.*, vii. 49.)

(Leake's *Morea*, ii. 353; Cramer's *Greece*, iii. 253; Sir W. Gell's *Itinerary of the Morea and Argolis;* Dodwell, *Class. Tour*, ii., p. 250.)

TISCHBEIN, JOHN HENRY, called the Elder, one of the most celebrated painters of the eighteenth century, was the fifth son of a baker of Hayna near Gotha, where he was born in 1722. He was first apprenticed to an uncle on the mother's side, who was a locksmith; but he displayed so much talent for drawing, that an elder brother, John Valentine, took him away from his uncle and placed him, in his fourteenth year, with a paper-stainer and decorator in Cassel, of the name of Zimmermann. He received also some instruction from Van Freese, the court painter at Cassel, and soon gave proof of his ability. Tischbein met with an early and a valuable patron in Count Stadion, through whose assistance he was enabled, in 1743, to visit Paris, where he remained five years with Charles Vanloo, and acquired his style of painting. From Paris he went to Venice, and there studied eight months with Piazzetta: from Venice he went to Rome, where he remained two years; he again visited Piazzetta in Venice, and after a short time, in 1751, he returned to Cassel, where, in 1752, he was appointed cabinet painter to the landgrave.

Tischbein excelled in historical and mythological subjects, in which lines are his best pictures, painted from about 1762 until 1785; he died in 1789, as director of the Academy of Cassel, and a member of the Academy of Bologna. A biographical notice of Tischbein with criticisms upon his works was published in Nürnberg in 1797, eight years after his death, by J. F. Engelschall, entitled 'J. H. Tischbein, als Mensch und Künstler dargestellt.' In that work there is a list of 144 historical pieces by Tischbein, of which the following have been considered the best:—the Resurrection of Christ, very large figures, painted in 1763, for the altar of St. Michael's church at Hamburg; the Transfiguration, in the Lutheran church at Cassel, 1765; Hermann's Trophies after his Victory over Varus in the year 9, in the palace of Pyrmont, 1768; ten pictures of the Life of Cleopatra, painted in the palace of Weissenstein, 1769-70; sixteen from the life of Telemachus, in the palace of Wilhelmsthal; an Ecce Homo, in the Roman Catholic chapel at Cassel, 1778; a Deposition from the Cross, and an Ascension, altar-pieces in the principal church of Stralsund, 1787; Christ on the Mount of Olives, an altar-piece presented by him to the church of his native place Hayna, 1788; the Death of Alcestis, 1780; and the Restoration of Alcestis to her husband by Hercules, 1777.

Tischbein painted many pictures from the antient poets, and some from Tasso; several of which are now in the Picture-gallery at Cassel. He painted also a collection of female portraits, selected chiefly for their beauty, which is now at the palace of Wilhelmsthal near Cassel. He also frequently copied his own pictures. Nearly all his works remain in his own country, on which account he is little known out of it. It is remarkable that of all the great galleries of Germany, Münich is the only one that possesses a specimen of his works, and that is only a portrait.

Tischbein painted very slowly, but he was very industrious: he was generally at his easel by five in the morning in the summer time, and he painted until four in the afternoon. He painted in the French style; his colouring was a mixture of the French and the Venetian, and in large compositions very gaudy, but his drawing and chiar'-oscuro were very good. In costume however he was incorrect, yet he was as correct perhaps as his sources of information would allow him to be, and it is a fault that he had in common with most of the great painters, especially the Venetians; but according to the critics he generally contrived in his antient pieces to make his actors look much more like Frenchmen and Germans than Greeks or Romans. In his religious pieces he was more successful: he was no follower of Lessing's theory of beauty; he considered beauty of little consequence. He etched several plates after his own pictures:—Venus and Cupid; Women Bathing; Hercules and Omphale; Menelaus and Paris; Thetis and Achilles; and his great picture of the Resurrection of Christ, at Hamburg.

Tischbein was a man of very domestic habits: he had an old servant named Conrad Otto without whom he used to say he should be helpless; he had a cook also who lived with him 21 years. He was twice married, and yet was a husband scarcely four years: he married his first wife in 1756, by whom he had two daughters; he lived with her three years, when she died, and in 1759 he married her sister, with whom however he lived only a few months. His elder daughter Amalia was a clever painter; she was elected, in 1780, a member of the Academy of Cassel; she used to sit to her father for many of the females in his historical works. After Tischbein's death, the Landgrave of Cassel purchased all the works that were in his house, and placed them together in the palace of Wilhelmshöhe.

(Meusel, *Miscellaneen Artistischen Inhalts;* Füssli, *Allgemeines Künstler Lexicon;* &c.)

TISCHBEIN, JOHN HENRY WILLIAM, called the Younger, the youngest son of John Conrad Tischbein, and nephew of the preceding, with whom he is sometimes confounded, was born at Hayna in 1751. He was instructed by his uncle John Henry at Cassel in historical painting, and he afterwards studied landscape painting three years with his uncle John Jacob at Hamburg; in 1770 he went to Holland, where he remained two years, and in 1772 returned to Cassel and painted portraits and landscapes; he visited also Hanover and Berlin, and painted many portraits in both places. In 1779 he left Cassel, by the desire of the Landgrave, for Italy, but he spent about two years in Zürich, where he painted many portraits and made the design of his celebrated picture of Conradin of Suabia, playing, after his sentence to death, a game at draughts with Frederick of Austria. In 1781 Tischbein arrived in Rome, and his first studies were some copies in oil after Raphael and Guercino, and some drawings after Raphael, Domenichino, and Lionardo da Vinci. His first original picture was Hercules choosing between Vice and Virtue, after which he painted his picture of Conradin of Suabia, now in the palace of Pyrmont. In 1787 he went to Naples, and the next year painted the portrait of the crown-prince for the queen, who presented Tischbein with a valuable snuff-box and 200 ducats, expressing her complete satisfaction with the picture. In Naples he appears to have acquired laurels rapidly, for in 1790 he was appointed director of the Academy with a salary of 600 ducats per annum, which however he lost again in 1799, at the breaking out of the revolution at Naples, but he found no difficulty in obtaining permission from the French authorities to return to Germany with what property he chose to take with him. He accordingly embarked, with the painter Hackert and another, for Leghorn, taking with him the plates of his illustrations to Homer, his designs for Sir W. Hamilton's second collection of vases, and some other works of art: but the ship was driven by a storm upon the coast of Corsica, and was captured by a French ship of war; it was however set at liberty again, and after a troublesome journey of four months Tischbein at last reached Cassel in safety. During his residence in Naples he published there, in 1796, a remarkable work upon animals, in two parts, folio, entitled 'Têtes des Différents Animaux, dessinés d'après Nature, pour donner une idée plus exacte de leurs caractères.' The first part contains 16 designs of animals, and the first plate of this part is the celebrated design called in Italy Tischbein's Laocoon; it represents a large snake attacking and destroying a lioness and her young in their den; a design of remarkable power and spirit: the second part contains 8 plates only, consisting of characteristic heads of men and gods, as—Correggio, Salvator Rosa, Michael Angelo, Raphael, Scipio Africanus, Caracalla, Jupiter, and Apollo. Tischbein after his return to Germany lived principally at Hamburg and at Eutin in Oldenburg near Lübeck; the majority of his works are in the possession of the grand-duke of Oldenburg; the following paintings are three of his most celebrated works:—Ajax and Cassandra, painted in 1805; 'Let the Little Children come unto me,' painted in 1806, for the altar of the church of St. Angari at Bremen; and Hector taking leave of Andromache, painted in 1810. He painted also the portraits of Klopstock, of Heyne, and of Blücher.

In Göttingen in 1801-4 he published in royal folio his favourite work on Homer, with explanations by Heyne—'Homer, nach Antiken gezeichnet von Heinrich Tischbein, Direcktor, &c., mit erläuterungen von Chr. Gottl. Heyne,' i.-vi., each number containing 6 plates: the portraits of the Homeric heroes were engraved by R. Morghen. Tischbein's drawings for Sir W. Hamilton's second collection of vases, published at Naples from 1791, in 4 vols. folio, amount to 214: the work is entitled 'A Collection of Engravings from Antient Vases, mostly of pure Greek workmanship, discovered in Sepulchres in the Kingdom of the

Two Sicilies, but principally in the environs of Naples, during the years 1789 and 1790; now in the possession of Sir W. Hamilton, published by William Tischbein, director of the Royal Academy of Painting at Naples.' The text, which is in French and English, is by Italinsky. Tischbein published other works, and etched also several plates, after Paul Potter, Roos, Rosa di Tivoli, Rembrandt, &c. As a painter his drawing was correct, and his expression and colouring good, and he excelled in drawing animals. He died in 1829. There were many other artists of this family, of various degrees of merit, but they are unknown beyond their own circles.

(Füssli, *Allgemeines Künstler Lexicon;* Kugler, *Handbuch der Geschichte der Malerei.*)

TISIAS. [ORATORY.]

TISSAPHERNES. [CYRUS THE YOUNGER.]

TISSOT, SIMON ANDREW, an eminent Swiss physician, was born at Lausanne, in the canton de Vaud, in 1728. He studied first at Geneva, and then at Montpellier, from 1746 to 1749, where he took his degree of Doctor of Medicine. He then returned to Switzerland and settled at Lausanne, where he joined to an extensive practice a considerable degree of theoretical knowledge. His reputation spread rapidly through Europe in consequence of his medical publications, and caused him to be consulted from all parts. He was also offered at various times several important situations at different foreign courts and universities, all which he declined, and remained satisfied with the respect and comfort which he enjoyed at home, and with the office of professor of medicine at the college of Lausanne. However, in 1780, he could not resist the warm solicitations of the emperor Joseph II., who conferred on him the professorship of clinical medicine at the university of Pavia. Being thrown thus late in life into so difficult a post, and being naturally of a modest and shy disposition, he did not at first answer the expectations formed of him. However there soon after broke out in the province an epidemic bilious fever, as to the treatment of which the physicians of the place were not agreed. On this occasion the Count de Firmian, the celebrated minister under the archduke, gave orders that Tissot's directions should be followed, as he had treated a similar disorder with great success in the canton of Le Valais in 1755. His system was again successful, and the students not only celebrated his triumph with fêtes, but, wishing to render the memory of it more durable, they caused a marble inscription, beginning with the words *Immortali Præceptori*, to be placed under the portico of the school. After holding his professorship for three years, Tissot obtained permission to retire from office. During his stay in Italy he had made use of the vacations to travel through the finest parts of that country, and was everywhere received with the most marked and flattering attention. Pope Pius VI. signified his desire of seeing so estimable and eminent a man; he accordingly received him with much kindness, excused him (as being a Protestant) from the ceremonial customary at presentations at the Papal court, and made him a present of a set of the gold medals struck during his pontificate.

Having always lived economically and without any display, Tissot had saved while in Italy a sum of money sufficient for the purchase of a country-seat, which he intended to be the retreat of his old age. He had only engaged himself in the Austrian service for a very limited period; he had now finished the medical education of a favourite nephew; and, lastly, as he himself with characteristic playfulness expressed it, having received the title of 'Immortal,' he thought it prudent not to run any risk of descending from such a height, and of outliving (as he might easily do) his apotheosis. He was succeeded in his professorship at Pavia by the celebrated J. P. Frank, and died unmarried, on the 15th of June, 1797, in his native land, at the age of sixty-nine. A complete list of his works is given in the 'Biographie Médicale,' from which work the above account is taken: of these the following are the most interesting: 'Tentamen de Morbis ex Manustupratione Ortis,' Louvain, 8vo., 1760; which was translated into French, and has been frequently republished. 'Dissertatio de Febribus Biliosis, seu Historia Epidemiae Lausanensis anni 1755,' Lausanne, 1758, 8vo. 'Avis au Peuple sur sa Santé,' Lausanne, 1761, 12mo., which was translated into no less than seven different languages, and in less than six years reached the tenth edition. It has since been frequently reprinted, and contributed more than any of his other works to make the author's name known throughout Europe. It served also as the model and foundation for many similar popular works in more recent times. 'De Valetudine Litteratorum,' Lausanne, 8vo., 1766, which was translated into French, and frequently reprinted, and of which the latest and best edition is that by F. G. Boisseau, Paris, 1826, 18mo., with notes by the editor, and a memoir of the author. 'Essai sur les Maladies des Gens du Monde,' which has also gone through several editions. There is a complete edition of his works by J. N. Hallé, in 11 vols. 8vo., Paris, 1811, with notes by the editor and a memoir of the author. Besides these original works Tissot edited at Yverdun, 1779, in three volumes 4to., the treatise of Morgagni, 'De Sedibus et Causis Morborum per Anatomen Indagatis,' to which he prefixed a history of the Life and Works of the author.

TISSUES, VEGETABLE. The various organs of plants, as the leaves, flowers, roots, stem, &c., are composed of certain ultimate structures, which are called elementary organs or vegetable tissues. Most parts of a plant, when cut into, present to the naked eye an almost perfectly homogeneous character; and it is only by calling to our aid the microscope that we can distinguish the various structures of which they are composed. On taking a leaf or a portion of the stem of one of the higher plants, and submitting it to the microscope, it will be found to consist, 1, of a thin transparent homogeneous membrane, which is arranged in the form of cells or cylindrical tubes; 2, of fibres, which are arranged in a spiral form in the interior of the cells or tubes; and 3, a fluid of varying density, filling the cells and existing between them, and containing in it globules of various sizes and kinds. These parts constitute what are known respectively as 'elementary membrane,' 'elementary fibre,' and 'organic mucus.' Elementary membrane, and the fluid from which it is developed, are the only two which are constantly present in all plants. Fibre is only found in the higher forms of plants.

The primary form in which organization appears is that of a simple cell containing or surrounded by a fluid; and however complicated may be the forms which the tissues of plants may assume, they mostly originate in this primitive form. Some late researches on the development of tissues in animals seem to lead to the conclusion that some of these tissues are formed from a primitive fibre; and from analogy it has been supposed that the same may occur in vegetable organization. Whether however the cell or the fibre shall be determined to be the primitive form of tissue in the animal kingdom, there can be little doubt that the cell is so in the vegetable kingdom.

The development of the cell itself is a subject of much interest, and great light has been thrown on this obscure department of physiology by the late researches of Dr. Schleiden. It was long since observed by Robert Brown that in the cells of the tissue of Orchidaceous plants there was an opaque spot, or '*areola*,' in the interior of the cell: Schleiden, finding this spot very constant in the cells of certain plants, concluded that it must have some important relation to them, and submitted it to a very strict examination. He found that these bodies were the original particles from whence the cells were formed; hence he called them cytoblasts. The best parts of the plant for observing the phenomena to which these bodies give rise are, the large cell which exists between the embryo and the membranes of the seed, and in which the albumen is subsequently deposited, the embryonal sac, and the end of the pollen-tube, from which the embryo itself is developed. In the gummy fluid that exists in these parts in the process of growth a number of granules are developed, rendering this transparent homogeneous fluid opalescent, or almost opaque. It is among these granules, which assume a brownish-yellow colour under the influence of tincture of iodine, that the cytoblasts make their appearance. Whilst in this state the cytoblasts increase considerably in size, becoming larger than the granules of the gum; and as soon as they have attained their full size, a delicate transparent vesicle rises upon their surface: this is the young cell, which at first represents a very flat segment of a sphere, whose plane side is formed by the cytoblast, and the convex side by the young cell, which is situated on it, somewhat like a watch-glass on a watch. In its natural medium it is almost distinguished by this circumstance alone, that the space between its convexity and the cytoblast is perfectly clear and transparent, and probably filled with an aqueous fluid, and is bounded by the surrounding mucous granules, pressed back by its expansion. But if these young cells are isolated, the mucous granules may almost entirely be removed by shaking the stage of the microscope. This cannot however be long observed, as they entirely dissolve in a few minutes in distilled water, leaving the cytoblasts behind. The vesicle gradually gets larger and becomes more consistent, its parietes being formed entirely of vegetable gelatine (Gallerte), except the cytoblast, which always forms a portion of the wall. The whole cell now gradually enlarges beyond the edges of the cytoblast, and gets so large, that at last the latter appears as a small body enclosed in one of the side walls. At this point the cytoblast assumes the character of the areola described by Brown. The young cell frequently presents great irregularities, a proof that the expansion does not proceed regularly from a fixed point. The cell grows progressively, and becomes, under the influence of surrounding objects, more regular, and most frequently assumes the form of a rhomboidal dodecahedron. The cytoblast still remains in the cell, partaking of the life inherent in the cell, unless it is in cells destined to a higher development, when it is either reabsorbed in the walls of the cell, or cast off into the cell as a useless member, and there reabsorbed. It is only after the reabsorption of the cytoblast that secondary depositions are observed to commence on the inside of the walls of the cell. (Schleiden.)

The cytoblast remains in the cells in only a small number of cases. They are found in a portion of the cellular tissue of Orchidaceæ, also of Cactaceæ. In hairs likewise, and cells in which the function of cyclosis is carried on, they are very frequently permanent; also in the pollen granules of Abietinæ. Dr. Schleiden always found them present in recently-formed cellular tissue.

The increase of the bulk and size of plants depends upon the development, in the interior of the old or originally formed cells, of several new cytoblasts, each of which develops a new cell, and causes by its presence the absorption or destruction of the old one.

But all the parts of plants do not consist of simple cells; the cells become elongated, forming fibrous or woody tissue, and spiral fibres are generated both in cells and tubes, constituting the various forms of fibro-cellular and vascular tissue, and it will be necessary to say a few words on their development. One great error that has arisen from the naming and classification of the tissues of the plants has been the supposition that they were essentially distinct and possessed a different origin. This is seen in the theories of the origin of wood. Woody fibres are nothing more than elongated cells with thickened walls; but they were supposed to originate in a different manner from the cellular tissue; and an ingenious theory of Du Petit Thouars has been adopted by many eminent botanists for the purpose of explaining this phenomenon.

In referring to Du Petit Thouars' views, Dr. Lindley says, 'The wood is not formed out of the bark as a mere deposition, but it is produced from matter elaborated in the leaves sent downwards, either through the vessels of the inner bark along with the matter for forming the liber, by which it is subsequently parted with, or it and the liber are transmitted distinct from one another, the one adhering to the albumen, the other to the bark. I know of no proof of the former supposition; of the latter there is every reason to believe the truth.' And again, 'It is not merely in the property of increasing the species that buds agree with seeds, but that they emit roots in like manner; and that the wood and liber are both formed by the downward descent of bud-roots, at first nourished by the moisture of the cambium, and finally imbedded in the cellular tissue which is the result of the organization of that secretion.' This theory then supposes that woody tissue is sent down as a deposit from buds and leaves. But it is much too general, and whatever may be the agency of the leaves in elaborating the sap, and preparing the secretions of plants, they are certainly not the only agents engaged in developing the woody tissue. There are many parts of plants that possess no leaves, and some whole orders, as Cactaceæ, that possess no leaves that yet develop woody tissue. Trees also that have the bark removed in a circle from the stem at the spring of the year, before the leaves are developed, will at the end of the year exhibit between the bark and wood new woody tissue. This was proved by a series of experiments performed on beech-trees by Dr. Lankester. The existence of woody excrescences in the bark of trees is also another fact opposed to Du Petit Thouars' theory. These excrescences exist in the form of knobs, and are most frequent on the beech, projecting from the bark of the tree. On examining them it will be found that they have no connection with the wood of the tree, and consist of several layers of contorted woody tissue, enveloped in a bark of their own, consisting of liber and cellular integument. They are of all sizes, from a mere point to that of an orange. The smallest consist of cellular tissue, in the centre of which a darker spot is seen, as though the tissue was injured or diseased. It is around this spot that the fibres of woody tissue develop themselves. These bodies appear to have their origin in an undeveloped bud; hence they are called by Dutrochet *embryo-buds*; but as they go on increasing in size, and development occurs in a circular, rather than a longitudinal direction, they are described by Lankester as *abortive branches*. From the researches of Schleiden there can be little doubt but that the elongated tissue is developed in the same manner as cells. A question that still arises, and requires solution, is, as to whether the single fibres of woody tissue are the produce of a single cytoblast or of several. In the tissue called pitted or Bothrenchyma, there are evident indications of its cylindrical tubes being formed of several cells united together, and the walls, being absorbed at their point of union, have thus produced a continuous tube.

The above observations of Schleiden have set aside the supposition that the cell is composed entirely of spiral fibres intimately superposed. But still the question recurs as to whether fibre may not be generated independent of membrane. Meyen found fibres without membrane in the genus *Stelis*; Lindley observed them in *Collomia*; and many other instances are known in which fibres are found in plants without any apparently enveloping membrane. The late researches of Dr. Martin Barry on the development of animal tissue from the spiral fibre of the blood-globule have induced some botanists to examine this question; and Dr. Willshire, in a paper in the 9th volume of the 'Annals of Natural History,' has endeavoured to prove that the irregular-shaped bodies marked with dark lines, and found in the juices of many plants, are the cytoblasts of pure fibrous tissue. If such a development of fibre takes place, it can be only in exceedingly rare cases. Schleiden in his memoir on Phytogenesis states that fibres are never formed free, but always in the interior of cells, and that the walls of these cells in the young state are simple and of a very delicate texture.

Whether fibre is formed independent of membrane or not, there is no doubt of its formation in a large number of organs in the inside of cells and tubes forming the fibro-cellular and fibro-vascular tissues. According to Schleiden, the cells in which the development of fibre takes place are in the commencement of the formation of the fibres filled with starch, rarely with mucus or gum, although the starch passes into the state of mucus or gum, and then into that of gelatin (gallerte). From this latter vegetable fibres are formed which in their development always follow the direction of a spiral line, whose coils are narrower or wider according to circumstances. The development of the fibre is the same in the spiral vessel as in the spiral cell, there being no difference between the two but in their dimensions. In the first volume of the 'Transactions of the Microscopical Society of London' (1842), Mr. Quekett gives the following account of the development of fibre in the vascular tissue of plants:—'When the young vessels (that is, membranous tubes) are recognised, they appear as pellucid glossy tubes, with a cytoblast in some part of their interior; earlier than this they are not to be readily recognised from cells. As they grow older the cytoblast diminishes, and the contents, which at first were clear and gelatinous, become less transparent from containing thousands of granules, which are too small to allow of the passage of light, and consequently appear as dark points: these atoms are about the [illegible] of an inch in diameter, and have the motion known as "active molecules." If the vessel be wounded at this period, the gelatinous contents pour slowly out, and then the singular movements of these molecules are still more clearly seen. These atoms, from their freedom of motion, are arranged indiscriminately in the interior of the vessel, but in a short time some of them enlarge, and then transmit a little light, which, on account of their minute dimensions, is not suffered to pass as a white pencil, but is decomposed in its course, the granule thereby becoming of a greenish hue. The granules exhibiting this greenish hue are now in a fit state to enter into the composition of the fibre that is to exist in the interior of the membranous tube.' This is effected in the following manner:—'The granules which are in active motion in the viscid fluid near one of the ends become severally attracted to the inner wall of the vessel, beginning at the very point; those granules first attracted appear as if cemented to the spot by the viscid fluid in that direction losing some of its watery character; for there appears a string of a whitish colour, besides granules, in the line which the fibre is to occupy. As the other granules are attracted to those already fixed in an inclined direction, the spiral course is soon to be seen, and the same action progressively goes on from the end where it began towards the other, around the interior of the tube in the form of a spiral; the fibre being produced, like a root, by having the new matter added and continually attached to the growing point, thereby causing its gradual elongation.' Spiral cells and vessels thus formed exhibit a great variety of appearance, depending on the period in the age of the cell or tube at which the development of the fibre takes place, as well as the modifications that occur in the chemical changes of the substances from which the fibres are formed. The cause of the arrangement of the particles in a fibrous form is still not satisfactorily explained, and it is most commonly referred to an attraction between the sides of the membrane, of the cell, and the particles it contains, but why they form a spiral is a mystery yet to be solved. [SPIRAL STRUCTURE OF PLANTS.]

The various forms of vegetable tissue found in the different organs of plants are included in the following arrangement:—

I. FIBROUS.

Tissue in which elementary fibre is alone apparent.

II. CELLULAR.

Tissue composed of membrane in the form of cells whose length does not greatly exceed their breadth.

1. *Merenchyma*, the cells of which touch each other only at some points.
2. *Parenchyma*, the walls of the cells of which are generally united.
3. *Prosenchyma*, the cells of which are always fusiform, and overlie each other at their ends.

III. VASCULAR.

Tissue composed of cylindrical tubes of membrane continuous, or overlying each other at their ends.

1. *Pleurenchyma*, with the sides of the tubes thickened and tapering to each end.
2. *Cinenchyma*, the sides of the tubes of which anastomoze, and convey a peculiar fluid.

IV. FIBRO-CELLULAR.

Tissue composed of cells, in the inside of which fibres are generated.

a. Genuine.
1. Fibrous cells.
b. Spurious.
2. Porous cells.
3. Dotted cells.

V. FIBRO-VASCULAR.

Tissue composed of tubes, in the inside of which one or more spiral fibres are more or less perfectly developed.

a. Genuine.
1. Spiral vessels.
2. Annular vessels.
3. Moniliform vessels.
b. Spurious.
4. Scalariform vessels.
5. Porous vessels.
(Bothrenchyma.)
6. Dotted vessels.

This arrangement includes the principal forms of tissue observed in plants, but the divisions are not founded upon any essential difference in the structure or functions of the various tissues. The most important distinction exists between membrane and fibre, which are apparently developed under the influence of different forces. The cell and the tube differ but in their dimensions, and the same is true of them when fibre is generated in their inside.

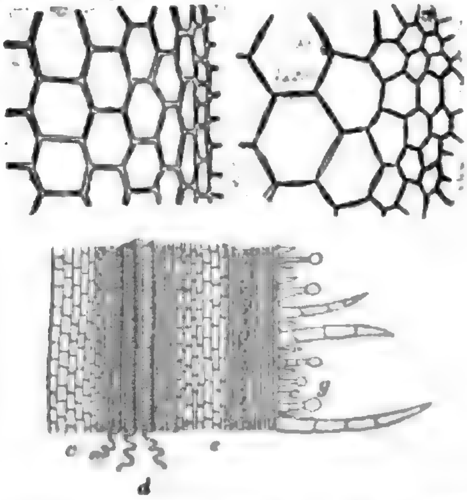
Fibrous Tissue.—Although the development of fibre independent of membrane is still undecided, many of the parts of plants exhibit fibres divested of membrane. Fibres spirally arranged and adhering only together by vegetable mucus, which is dissolved away by the application of water, were discovered by Brown, in the seed-coat of Casuarina, and by Lindley, in the same position in *Collomia linearis*. Meyen, who maintains that all cells may be composed of minute fibres, records many instances of vegetable structure in which fibre of a spiral form alone is most apparent, as the parenchyma of a species of Stelis, in the external layer or bark of the aerial roots of many species of Orchidaceæ, and also in species of Melocactus and Mammillaria. Fibres not assuming a spiral form, and independent of cells or tubes, have been described by Purkinje. In the lining of the anthers of Polygala Chamæbuxus they are found short, straight, and radiating; in the anthers of Linaria cymbalaria they form distinct arches; and in those of some species of Campanula, they are arranged like the teeth of a comb. The fibre in all cases is very minute, varying from $\frac{1}{3000}$ to $\frac{1}{10000}$ of an inch in diameter. It is most commonly transparent and colourless, but in some cases has been observed of a greenish colour. Purkinje, who has recently investigated it very attentively, asserts that it is hollow; but Lindley, Schleiden, and Morren are of opinion that it is solid.

Cellular Tissue; also called *utricular* and *vesicular tissue;* the Parenchyma of Lindley and Morren, *tela cellulosa* of Link, and *contextus* and *complexus cellulosus* of older writers; *Zellgewebe*, Germ.; *Tissu cellulaire*, French.—This tissue consists of cells or cavities, which are closed on all sides, and are formed of a delicate, mostly transparent membrane developed from a cytoblast. It is present in the whole vegetable kingdom; and all the lower forms of plants, constituting the class Acrogens, are composed entirely of it, and have hence been called *Cellulares*. In the higher plants it is most abundant in fruits and succulent leaves. It exists in larger quantity in herbs than trees, and the younger the plant is the more it abounds, and constitutes the entire structure of the embryo.

The normal form of the cells is spheroidal, and when they exist in this or in an elliptical form, and only touch each other at a few points without exerting pressure, they constitute the tissue called by Meyen *Merenchyma*. The cells in this case may form a regular or irregular layer, a distinction which may be of some importance. Such tissue is found in many parts of plants, especially those which are delicate and easily torn, as in the pulp of fruits like the strawberry, in the petals of the white lily, in the stem of Cactus pendulus, where they are spheroidal, and in the leaf of the Agave Americana, where they are elliptical. The cells also which constitute the entire of many of the lower plants belong to this division of cellular tissue. They are seen separate or loosely adhering to each other in the Protococcus nivalis, the plant of the Red snow [SNOW, RED], in many of the smuts and brands, as Ustilago and Uredo. Chroolepus, and many of the lower forms of algæ and fungi, consist of filaments which are entirely composed of spheroidal cells arranged one upon another.

In the higher forms of plants the vegetative force is greater, and a greater number of cells being generated in a given space, they press on each other on all sides, assuming a variety of forms, and constituting the tissue called by Meyen *Parenchyma*. The most common form which the cells present under these circumstances is the rhomboidal dodecahedron, which is the mathematical form that a globe assumes when subjected to the pressure of a number of globes touching each other at the same time. These cells when cut through, as in the section of a portion of pith, or the leaf of a plant, will present their cut margins, when seen through the microscope, in the form of hexagons. (*a* and *b* *Fig.* 1.) But the pressure is not always equal on all sides of the cells, so that a great number of secondary forms are the result. When the vesicles are elongated, the dodecahedrons assume the form of right-angled prisms, terminated by four-sided pyramids, whose faces replace the angle of the pyramids at varying degrees of inclination to the axis. Many of the forms thus assumed characterise parts of plants, and are very constant in the same species of plants. The principal varieties of Parenchyma distinguished by Meyen are

Fig. 1.



1. The *cubical*, which exists in the cuticle of some leaves, and is not unfrequently met with in bark and pith, as in the pith of Viscum album. (*c*, *Fig.* 1.)

2. The *columnar*, of which there are two varieties: the *cylindrical* (*cylindrenchyma* of Morren), examples of which may be seen in Chara and in Agaricus muscarius; the *prismatical* (*prismenchyma*), frequently seen in the pith and the bark of plants, and when compressed it becomes the muriform tissue (*e*, *Fig.* 1), which is constantly found in the medullary rays, and has its name from the cells being arranged as bricks in a wall.

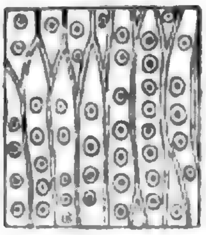
3. The *dodecahedral:* the natural form of parenchyma when the cells are of equal size and exert on each other equal pressure, and when cut present a hexagonal form. (*a*, *c*, *Fig.* 4.)

4. The *stellated* (*actinenchyma*), in which the cells, from the irregularity of their walls, assume a star-like form, seen in Musa.

5. The *tabulated*, seen in the epiphlœum of many plants: other forms, as conical (*conenchyma; h*, *Fig.* 1), oval (*ovenchyma*), fusiform (*atractenchyma*), sinuous (*colpenchyma*), branched (*cladenchyma*), entangled (*dædalenchyma*), have been described by Morren.

Prosenchyma differs from Parenchyma in the cells always having an elliptical form which taper to their extremities, where they overlie each other. This form of tissue is found only in the bark and wood, and is a transition from cellular to what is called woody tissue. Meyen applies this term especially to the tissue forming the wood of Coniferæ and Cycadaceæ. In these families this tissue is marked with dots, which are surrounded by a circle.

Fig. 2.



(*Fig.* 2.) These dots were formerly supposed to be glands, and to secrete the resinous matter which abounds in them, and hence it was called 'glandular woody tissue.' The researches of Mohl and others have however shown that these dots are the result of the development of fibre within the walls of the cells, and in this view the Prosenchyma not only constitutes a transition from cellular to vascular tissue, but also a transition from fibro-cellular to fibro-vascular tissue.

Contents of Cells.—The vesicle of cellular tissue when it rises from its cytoblast is a thin transparent membrane, which as it enlarges becomes thickened from within by the appropriation of proper nutriment which is contained in the cell. This cell in the early stages of its growth is filled with a fluid, at first clear, but afterwards opalescent from the development in it of minute granules. These granules are of various shapes and sizes, and always excessively minute. In their early stages they possess the characters of starch, more particularly the property of assuming a blue colour when brought in contact with tincture of iodine. In the older cells many of the granules lose the character of starch, and possess other properties. Some of them, and these more minute than those of starch, are not coloured by iodine, and are soluble in alcohol, and partake of a resinous character. They give the peculiar colour to the elaborated sap, whatever that may be, and in plants with milky juices constitute the caoutchouc which they yield. They seem also to be the constituents of the volatile oils, resins, balsams, gums, &c. that plants yield. [Secretions, Vegetable.] Another set of globules are also found present in old cells, and these constitute what is called *chlorophyl*, or *chromule*, and exist especially in the cells of plants on their surface, giving to them their peculiar colours. [Sap.] It is from the remaining granules of starch that the cells are nourished. Previous to being appropriated by the walls of the cell they are converted into a substance called by Meyen vegetable jelly (gallerte). It is from this substance, varying in almost every family of plants, that the cells are thickened, by which the delicate membrane in many cases becomes excessively hard, as in the stones of many fruits, the seed of the Phytelephas Macrocarpa, and the wood of many trees. In simple cellular tissue and in woody tissue this material is applied equally to the whole surface of the cell, forming regular layers: in the fibro-cellular and fibro-vascular tissues it is appropriated in the form of fibre.

Another class of bodies found in the interior of cells, and which appear to have nothing to do with the nutrition of the plant, are those crystalline bodies called Raphides. They occur singly or in bundles, and have an acicular form, and are long or short according to circumstances. In length they measure from $\frac{1}{40}$th to $\frac{1}{1000}$th part of an inch. These crystals were first observed in the proper juices of plants, and have been subsequently found in all parts of plants where cellular tissue exists. They were formerly supposed to exist between the cells, but later observers have seen them in cells, and they probably exist in both situations. The form of these bodies is not satisfactorily determined. Mohl describes them as right-angled four-sided prisms vanishing into points. Quekett, who is one of the latest observers on this point, says they are decidedly four-sided prisms, but not always right-angled. Those which are conglomerated are called crystal-glands (krystaldrüsen) by Meyen. They seldom present more than the pyramid of each little crystal composing them. The proportion in which they exist in plants is sometimes very great. In some species of Cactaceæ, according to Quekett, the crystals equal the weight of the dried tissue. One hundred grains of Turkey rhubarb-root yield between 30 and 40 grains of raphides; the same quantity of tissue of Scilla maritima yielded 10 grains. In most plants these crystals are composed of either oxalate or phosphate of lime. Raspail says the crystals of the oxalate of lime are four-sided prisms with pyramids of the same base; those of the phosphate, six-sided prisms. In Chara crystals of carbonate of lime occur in great abundance on the outside of the tissue, and we have observed them in the intercellular passages immediately under the epidermis, but they do not occur in the interior parts of the plant. Schübler found that the crystal-glands of Hydrurus crystallophorus consisted of carbonate of lime, and Saigey and De la Fosse found silica in the crystals of the Mirabilis Jalapa. Silica is a very prominent constituent of the Graminaceæ, but is seldom found crystallized. It gives the hardness to the epidermis of the Dutch rush, and is secreted in large quantities in the joints of the stem of the bamboo, and is used as an article of commerce under the name of *Tabasheer*. From the variable form of the crystals in plants it may be inferred that other salts form them besides the above. These bodies do not appear to be necessary parts of the tissues in which they occur, and they have been compared by Link to *calculi* and other concretions in the animal kingdom. This view is rendered very probable by the fact that they are always composed of those elements which the plants take up from the soil as necessary nutriment. Meyen has pointed out the fact that plants growing near the sea will throw off the superabundance of chloride of sodium in their tissues in the form of crystals; and we have found crystals of carbonate of lime most abundant in Chara flexilis, where the water in which it grew contained most of that substance. Phosphate of lime is necessary to the nutrition of many plants, and the elements of oxalic acid exist in the sap of all plants; and when these are in greater abundance than the vital energies of the plant can appropriate, the laws of chemical affinity come into play, and crystallization is the result.

Growth, Form, &c.—The vesicles of cellular tissue are very small, and cannot be distinguished with the naked eye; and in fact all investigations on the structure, development, and functions of the tissues of plants, can only be conducted with the aid of the microscope. The measurements of the cells give them a size varying from $\frac{1}{30}$th to the $\frac{1}{1000}$th of an inch in diameter. In the lower tribes, as in the Fungi, their generation is very rapid, and it is well known that mushrooms, puffballs, &c. will attain a great size in the course of a single night. The force too with which they are generated is very great, and there are many well-authenticated instances of agarics springing up beneath pavements and displacing stones of great weight and size.

The walls of the loose spheroidal cells in merenchyma consist of a single membrane, but the walls of the more closely-pressed cells of parenchyma consist of two membranes, originally distinct, but fused into one by growth. It frequently happens that the walls of the cells are not accurately applied to each other, and consequently spaces of various kinds occur between the cells. These are called *intercellular passages*. They occur in the greatest abundance in the loose merenchymatous tissue. When these passages exist between the walls of two cells whose sides are united in their middle and recede towards their margins, they are called by Link *meatus intercellulares*. These are most frequently met with in the epidermis of plants. Where the passages are formed of three or more cells the sides of whose walls do not touch, they are called *ductus intercellulares*. These are very well seen in the parenchyma of the stem of the iris and hyacinth, and Heracleum. These passages have been supposed by De Candolle and others to convey the sap; but this has probably arisen from an error in observation, as they are easily filled with sap when cut through. Others again confound these passages with the peculiar vascular tissue described by Schultes as Laticiferous tissue (Cinenchyma).

Another kind of intercellular formation are the *air-cells*, the *lacunæ intercellulares* of Link, which are large cavities formed in the tissue of plants, and whose walls are entirely formed of cellular tissue. They may be very distinctly divided into two kinds, the *regular* and the *irregular*. The regular exist under the epidermis of many plants and vary in size, but have in all cases a regularity of structure, their sides being formed of equal-sized cells of cellular tissue. They may be seen in the leaf-stalk of Calla æthiopica, the stem of Œnanthe Phellandrium, and the petioles of Nymphæa. They are very common in water-plants. They are always filled with air in these plants, and serve as a means of buoying them up in the water. The irregular air-cells, *lacunæ* of Link, are found in old plants; they arise from the growth of the plant tearing asunder the cellular tissue, or from a deficient development or even the absorption of this tissue in particular directions. They may be seen in the stem of the fronds of the Aspidium Filix Mas, of Hippuris and Equisetum, and in nearly the whole of the family Umbelliferæ.

The other organs which are formed by and found in the midst of the cellular tissue are the *sap-cells* and *glands*. The sap-cells, the *opangia* of Link, consist of enlarged cells of tissue, varying much in size, but always filled with elaborated sap. They are found in the skin of the fruit of the citron, pomegranate, &c. These are regular in form, but in the roots and rhizomata of such plants as the ginger, Archangelica, and Aristolochia, they are found of an irregular form. The glands, which are by some supposed to be the agents by which the peculiar secretions of the plant are immediately separated from the latex, are composed of cells pressed together, and assuming a variety of forms. When examined, these cells are found to contain in many instances the resin, gum, oil, &c. which give to the plant some of its peculiar physical properties.

The organs just enumerated as present in the cellular tissue are met with chiefly in the merenchymatous and parenchymatous forms.

Vascular or *Tubular Tissue* consists of continuous tubes of simple membrane, and comprehends the woody and the laticiferous tissues. On the one hand they are distinguished by their length from the forms of cellular tissue, and on the other hand by their plane membrane from those tissues of which fibre forms a constituent element.

Pleurenchyma, or *Woody Tissue* (*vasa fibrosa* of Link, and *Fasergefässe*, German), is found abundantly in the wood, and especially the liber, of all plants. It is composed of very long, thin, tough, transparent, membranous tubes. No bars or dots are seen in their walls, although when they cross each other the points at which they touch may be taken for such markings. They taper acutely to each end, and do not appear to have any communication one with the other, although they are occasionally seen with open extremities, which Slack supposes to arise from the breaking off of one fibre where it was united to another. In the wood and bark of dicotyledonous plants they are frequently mixed with prosenchyma, and in monocotyledonous plants with parenchyma. They grow by increasing in length both above and below. Their diameter varies from $\frac{1}{150}$ to $\frac{1}{2000}$ of an inch. The walls increase in thickness by the deposition of vegetable jelly, called by Turpin *sclerogen*, to their insides, and in the woody tissue of Betula alba and other trees the sclerogen may be seen forming successive layers around the sides of the tubes. Their form is mostly cylindrical, but in Cycas revoluta Link has observed them assuming a prismatic form.

The tubes of woody tissue are very tough, and will resist considerable force without breaking. It is on this account that they are used extensively in the manufacture of cloths of various kinds. The plants used most commonly for this purpose are the hemp and flax. The fibres of Tilia, Daphne, Lagetta, and of many of the plants of the order of Malvaceæ, are used for making mats, cordage, whips, &c. The following is a comparative statement of the relative strength of silk and some woody fibre:—

Silk supported a weight equal to	34
New Zealand Flax . . .	$23\frac{5}{11}$
Hemp	$16\frac{1}{3}$
Flax	$11\frac{3}{4}$
Pita Flax (Agave Americana) .	7

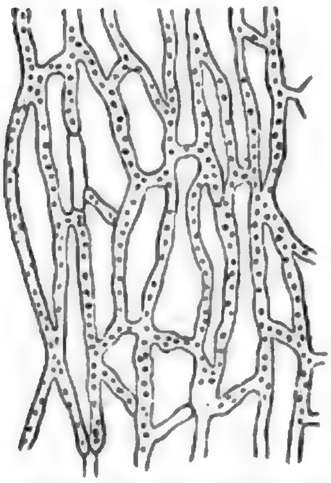
Woody tissue gives firmness and tenacity to the plant, and assists in conveying the sap from the roots to the leaves.

Cinenchyma, or *Laticiferous Tissue*, consists of tubes which are mostly branched and anastomosing; their walls are exceedingly delicate in young plants, and thicker in old ones; and they are characterised by conveying a fluid called the *latex*, which differs from the sap in other parts of the plant. [SAP.] The older botanists, Spigelius, Malpighi, and Grew described them, but they were generally confounded with woody tissue, till they were very fully investigated by Schultes. In older writers they are called *vasa propria* or *peculiaria*; by Link, *vasa opophora*. Some writers have supposed that they are nothing more than intercellular passages, and have denied that they possess membranous parietes; but their existence has been ascertained, and the observations of Schultes on their structure confirmed by Link, Meyen, Mohl, and others. The walls of these vessels are mostly plain, but have been sometimes observed marked with bars and fibres. They do not exist in all plants, and have not been found at all in the lower forms of Cryptogamia, nor in some of the Phanerogamous plants, as Valisneria and Stratiotes. Their most frequent position is on the sides of spiral vessels, or amongst the bundles of this tissue found in the midrib and nerves of leaves. They are most obvious in the order Euphorbiaceæ, where the latex is of a white colour. This juice is not always coloured or opalescent, but is sometimes quite clear. The tubes are not always regular in size. In some species, as in Glycine Apios, they are irregularly contracted and expanded; in Papaver nudicaule they have a moniliform appearance; in Acer platanoides they are very regular. In the stem they are generally simple, but in very young plants and the younger parts of plants they are branched, and anastomose. (*Fig.* 3.) Link has observed their terminating in blind extremities. In their distribution they gradually diminish in size, and have been traced into the most delicate parts of plants, as the hairs.

Schultes supposes that these vessels perform the same functions in the plant as the arteries and veins in animals. The fluid in them has a peculiar motion, which he calls *cyclosis*. [SAP.]

Fibro-cellular Tissue, or *Inenchyma*, consists of cells formed of membrane, in the inside of which fibre is de-

Fig. 3.



veloped. This tissue may be divided into two kinds, *genuine* and *spurious;* the genuine being that in which the fibre is distinctly marked on the inside of the cell, and the spurious that in which the fibre, either by absorption or the union of its various parts, forms rings, bars, dots, and other appearances on the sides of the cell. The genuine fibro-cellular tissue is mostly found in parenchymatous and prosenchymatous cells. It has been known for a long time amongst botanists, and was first described by Hedwig, who was followed by Moldenhawer and others. They are abundant in the external parchment-like layers of aerial roots of Orchidaceæ, and have been described by Meyen in Oncidium altissimum, Acropera Loddigesii, Brassavola cordata, &c. They occur in the hairs of the pericarp of many of the Compositæ, as in Perdicium taraxaci, Senecio flaccidus, and Trichocline humilis. Horkel has described them in the epidermis of many Labiatæ, as Ziziphora, Ocymum, and many Salviæ. The seed-coats of many plants possess them, as Gilia Ipomopsis, Polemonium Cantua, and Caldaria; and Kippist has lately demonstrated their presence in many of the species of Acanthaceæ. In some of these cases, and many others might be mentioned, the fibre appears to constitute the whole of the cell, as stated under fibrous tissue.

The fibre in these cells varies in its position and form. In the cells of the leaf of Oncidium altissimum they are very distinct, and occasionally branched. In the testa of the seed of Maanandya Barcleyana, where they were first pointed out by Lindley, the fibres run in different directions over each other, forming a network. In the endothecium of Calla æthiopiaca they are parallel, and in this form are very common in the same organ of other plants. In the endothecium of Nymphæa alba the fibres form regular arches arising from a plane base. In the elaters of Jungermannia and in the testa of Acanthodium the cells are greatly elongated, with a single spiral fibre in their interior.

The spurious fibro-cellular tissue includes the porous and dotted cells of many authors; the *cellulæ porosæ et punctatæ* of Link. If a portion of the parenchyma of Viscum album be examined, the inside of the cells will be found to possess a number of bright spots. They were first discovered by Treviranus in Cycas revoluta, and supposed by him to be granules. They were thought by other observers to be pores; hence their name porous cells. Sprengel, Mohl, and Link consider them little vesicles, but Meyen has given a different explanation of their nature. He ascribes their existence to a metamorphosis of the fibres generated in cells. They are often met with in the same cells as fibres, and it is by the union of some parts of the fibre and the absorption of others that the spaces are produced, which when first viewed appear as though they were granules, pores, or vesicles. The same appearance is frequently found in the various forms of fibro-vascular tissue, where there can be little doubt of the spots arising from the irregular formation of the fibres. Even those botanists who do not subscribe to Meyen's view on this point with regard to cellular tissue, admit its correctness in vascular tissue. As it must be admitted that there is no essential difference between the cellular and vascular tissues, it is undoubtedly a correct inference that these spots have the same origin in both tissues.

A transition from porous cells to porous tubes is seen in the tissue which has been called Bothrenchyma. In this tissue, which can be well seen in Phytocrene, as well as Cycas, a number of truncated porous cells are placed one on the other so as to form a cylinder, which becomes a tube by the absorption or removal of the cellular partitions. Porous vascular tissue is referred to this form by Lindley under the name of continuous Bothrenchyma, as the partitions or union of the cells are not visible. Where the points of union of the cells are evident, he calls it articulated Bothrenchyma.

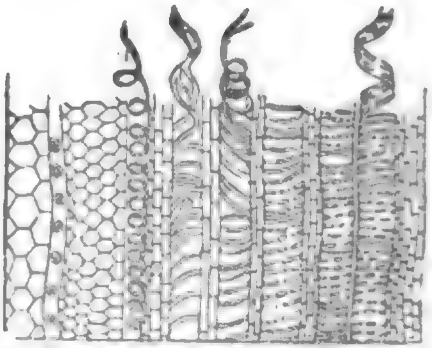
Dotted cells have their walls marked with dark spots. These cells have been observed in the pith of Calycanthus floridus and in the stem of Dracæna terminalis. They appear only to differ from the porous cells in the matter from which they are formed having greater opacity, and not transmitting the light so freely.

Fibro-vascular Tissue, or *Trachenchyma* (*vasa spiroidea* of Link), consists of tubes, in the inside of which spiral fibres are generated. The fibres of this tissue, like the last, are subject to metamorphosis, the consequence of which is, the tubes present the appearances of rings, bars, and bright and dark spots.

The tubes consist of a very delicate membrane, which is mostly cylindrical; it may however assume a prismatical form when the tubes are in bundles and closely pressed together, as in ferns and many monocotyledonous plants. The fibres generated in this tissue are mostly compressed, and wind up the sides of the tube in a spiral form. When the membrane is broken, the fibre in most cases may be unrolled. It is in the younger tubes that this is most easily effected; as in the older tubes those changes go on which connect the membrane and the fibre firmly together, and convert the latter into bars, dots, &c. The number of fibres included in a tube varies; it is frequently single, but in some instances as many as twenty-two have been counted. They have no fixed direction; some pass from right to left, others from left to right. Some difference of opinion has existed as to whether the fibres are tubular or not. Schleiden says in most instances they are solid, but where they are formed from large globules of jelly they appear to be tubular in both vascular and cellular tissue.

Link divides fibro-vascular tissue into *genuine* and *spurious;* the former includes all those vessels which possess perfect fibres. The principal forms of these are the *spiral*, *annular*, and *moniliform* vessels. The *spiral vessel* consists of a tube, in which one or more fibres run continuously along its sides from one end to the other. (*d*, *e*, *f*, *Fig*. 4.) When the fibres are single, they are called *simple;* when there is more than one, *compound*. The spiral vessels are most abundant in young plants, as their character becomes changed by age. When the fibres adhere to the sides of the membrane, they are said to be *closed*. The spiral vessel was at one time considered a very important tissue, performing especial vital functions. From the circumstance of air being frequently found in them, and this air containing a larger quantity of oxygen than the atmosphere, they were supposed to carry on the function of respiration. Subsequent observation however proves that they as frequently convey liquid as air, and Meyen supposes that they are only filled with air when a larger quantity of fluid ceases to be required by the plant.

Fig. 4.



Annular vessels or *ducts* consist of tubes with perfect rings of fibre on their sides. (*g*, *Fig*. 4.) These are evidently formed from the interruption of the spires, and the union of the broken ends, as they are frequently found present with a spiral fibre in the same tube. They are mostly larger than the spiral vessels, and the fibre is also thicker: they are very abundant in monocotyledonous ants; amongst dicotyledons they are found chiefly in ick-growing plants, as Cucurbitaceæ.

Moniliform vessels have successive dilatations and conactions of the tube, and a perfect spiral fibre in their inde. It has been proved by Slack that these vessels deve their peculiar form from accidental compression. They re found in the knots of trees where branches are given ff, in roots, and other parts where they meet with obstales to their longitudinal development.

Spurious fibro-vascular tissue includes *scalariform*, *orous*, and *dotted vessels*. The spurious vessels are not ound in the tissues of young plants, and are either deveIoped after the appearance of the genuine spiroids, or are formed from them. Meyen maintains the latter view, but Link and other botanists are still inclined to give to some of the barred and dotted tissues an original development. In the medullary sheath, the spurious spiroids are never found in the young plant, although they are sometimes in the albumen and bark; but it is not necessary that a pure spiral fibre should always be visible previous to its being converted into some one of the forms of spurious spiroids. If in a very large number of cases there is evidence that rings, bars, and dots are formed from the metamorphosis of spiral fibres, we may fairly conclude that in those cases where no observation proves to the contrary, the same effects are to be attributed to the same cause.

Scalariform vessels consist of tubes mostly prismatical, with spots on their walls resembling bars or straps. These bars are placed one above another in a ladder-like form; hence their name. They are abundant in ferns, where the prismatic form of the spiroid is most frequently seen.

Porous vessels are tubes with bright spots upon their walls (*h*, *i*, *Fig.* 4); they constitute the continuous Bothrenchyma of Lindley. They are found in greatest abundance in the old wood of Coniferæ, in the same positions where spiral vessels are found, in the young wood, and also in the roots of plants. The dots constituting what were erroneously thought to be pores, have the same character as those of fibro-cellular tissue. These vessels often attain a great size, measuring as much as a quarter of a line in diameter.

Dotted vessels constitute the tissue which has been called '*glandular woody tissue*,' and to which Meyen applies peculiarly the term *Prosenchyma*. (*Fig.* 3; *b*, *Fig.* 4.) The dotted vessel, like the dotted cell, has dark spots on the inside of its membranous walls; but in addition to the dot there is also a circle. This dot does not appear to be formed by the remains of a partly-absorbed fibre, or the crossing of the fibres, as in some of the forms of porous cells and vessels, but from the sinuous flexures of one or more fibres uniting together and forming between them a little cavity or depression: this is attended with depression of the external membrane, which gives the appearance of the larger circle surrounding the depression. (*Fig.* 2; *b*, *Fig.* 4.) These phenomena make their appearance very early in the tissues of Coniferous plants; but if buds and very young plants are examined, the sinuous spiral vessels, called by Link *vasa spiroida fibrosa*, may be easily seen.

Function.—The function of the tissues of vegetables is not so varied as their forms have led botanists to suppose. As a summary of them we give the following. In the simple cell we have the type of all the other tissues, and in the lowest forms of plants it alone performs all the functions of the higher plants. The cell of the Ustilago absorbs nutriment from without: this nutriment undergoes the changes that fit it for becoming a part of the structure of the cell. This is the process of nutrition. Within this cell another is generated, which is capable of performing the same functions as its parent. This is reproduction. As we ascend in the scale of organization of plants, the structure becomes more complicated. Cells are accumulated together; some simply absorb sap, others expose the sap to the atmosphere; whilst others separate peculiar secretions, and another set are employed as the depositaries of these secretions. As the functions of the plant become more localised in the organs called leaves and flowers, tissues strong enough to bear them up in the air are required, and the cells are elongated and strengthened by an increase of thickness in their membrane, and woody tissue is formed. Where the same objects are required, and at the same time space for a large quantity of fluid to pass through the cells, fibre is generated within the membrane; and for this reason fibro-cellular, and especially fibro-vascular, tissue is found abundant in succulent plants, and in those which require a large supply of moisture. These tissues are absent or very small in dry plants, as well as those which are constantly immersed in water. In the higher plants the conveyance of the prepared juices from one part of the plant to another is provided for by the Laticiferous tissue. It is upon the cell of the ovule in the Dicotyledonous and Monocotyledonous plants that the mysterious dynamic agency is exerted by another cell from the anther, the result of which is the production of another plant, similar to the one from which it is developed. It will thus be seen that all the tissues of plants partake more or less of the functions of the simple cell, which, as the fundamental form of vegetable organization, performs in all cases the most important functions. It is not so much by a difference in the form as by a difference in the function of particular cells that the complicated organs of the highest plants are distinguished from one another.

(The principal works consulted in preparing this article have been Meyen, *Pflanzen-Physiologie*, band i.; Link, *Elementa Philosophiæ Botanicæ*; De Candolle, *Organographie Végétale*; Lindley, *Elements of Botany*, and *Introduction to Botany*; Guadichaud, *Recherches sur l'Organographie, &c. des Végétaux*; Bischoff, *Lehrbuch der Botanik*. Papers:—Quekett, *On the Development of Vascular Tissues of Plants*, in 'Trans. Microscop. Soc.,' vol. i., 1842; Kippist, *On the Spiral Cells of Acanthaceæ*, 'Linnæan Transactions,' vol. xix., 1842; Schleiden, *Beiträge zur Phytogenesis*, Müller's 'Archiv,' 1838; Willshire, *On Vegetable Structure*, 'Annals of Natural History,' vol. ix.; Schultes, *Sur la Circulation dans les Plantes*; Lankester, *On the Origin of Wood*, 'Ann. of Nat. Hist.,' 1840.)

TITANIC ACID. [TITANIUM.]

TITA'NIUM. This metal was first recognised by Mr. Gregor, in 1791, as a distinct substance; he detected it in a black sand found in the bed of a rivulet near Menaccan in Cornwall. In 1795 Klaproth discovered it in some other minerals, and he gave it the name it now bears. The properties of titanium were not however satisfactorily determined until 1822, when Dr. Wollaston examined and described it as it occurred in its perfect metallic and crystallized state, in the slag of an iron-furnace at Merthyr Tydfil in South Wales. The form of the crystals is the cube; their colour resembles that of bright copper; they are sufficiently hard to scratch rock-crystal, and their specific gravity is 5·3.

Titanium is not acted upon by nitric, hydrochloric, or sulphuric acid, either cold or hot, concentrated or diluted; aqua regia, or nascent chlorine, is also powerless, but a mixture of nitric and hydrofluoric acid dissolves titanium: for fusion an extremely high temperature is required: when strongly heated with nitre, titanium is oxidized and rendered soluble in hydrochloric acid, and it is precipitated from solution by the alkalis in the state of a white oxide.

We shall now describe the principal minerals known to contain titanium, except PYROCHLORE, POLYMIGNITE, ZIRCONIA, &c., which are described under these heads.

Anatase, *Octaedrite*, or *Oisanite*.—This is protoxide of titanium nearly pure. It occurs in attached and imbedded acute octohedral crystals. Primary form a square prism. Cleavage parallel to the terminal planes, and to those of the octohedron. Fracture conchoidal, indistinct. Hardness: scratches phosphate of lime, and is scratched by quartz. By friction becomes negatively electrical, and when heated gives out a reddish yellow phosphorescent light. Colour, various shades of brown, more or less dark, sometimes indigo blue. Streak white. Lustre adamantine. Translucent, transparent. Specific gravity 3·826. It occurs in Cornwall, in Dauphiny, at Bourg d'Oisans, in Spain, Switzerland, and some other places. It consists almost entirely of oxide of titanium, probably the protoxide.

Rutile, or *Titanite: Peroxide of Titanium*, or *Titanic Acid.*—Occurs crystallized and in crystalline masses. Primary form a square prism. Cleavage parallel to the lateral planes. Crystals frequently geniculated. Fracture uneven. Hardness: scratches glass, and sometimes quartz. Colour red, reddish brown, and occasionally yellowish. Streak very pale brown. Lustre adamantine. Translucent, transparent, opaque. Specific gravity 4·249 to 4·4. Occurs not unfrequently inclosed in quartz, in fine red filamentous crystals. Rutile is found in Perthshire, Bohemia, Switzerland, especially at St. Gothard, and in various other parts of Europe; and also in Brazil and North America. It consists of, according to H. Rose—oxygen, 33·95; titanium, 66·05. It is frequently more or less mixed with oxide of iron and of manganese, and sometimes with oxide of chromium.

Brookite.—Probably a dimorphous variety of rutile. Occurs in attached crystals. Primary form a right rhombic prism. Cleavage parallel to the lateral planes and short diagonal. Fracture uneven. Hardness: scratches fluor-spar, and is scratched by phosphate of lime. Brittle. Colour, deep red, and reddish or yellowish brown. Streak yellowish white. Lustre adamantine. Translucent, transparent, opaque. Specific gravity unknown. Occurs in Dauphiny and Switzerland, but in larger crystals at Snowdon in Wales. It has not been completely analyzed, but appears to be titanic acid with traces of iron and manganese.

The minerals which we shall next describe are the titaniates of iron: they vary greatly both in form and composition, some being crystallized and others granular; the latter are frequently termed titaniferous iron-sand.

Kibdelophan; Axotomous Iron.—Occurs in imbedded crystals. Primary form a rhomboid. Cleavage perpendicular to the axis; distinct. Fracture conchoidal. Hardness 5·0 to 5·5. Brittle. Colour dark iron black. Streak black. Lustre imperfect metallic. Opaque. Specific gravity 4·661. Found at Gastein in Salzburg; in Sweden, and Siberia. Analysis of a specimen from Gastein, by Kobell:—titanic acid, 59·00; protoxide of iron, 36·00; peroxide of iron, 4·25; protoxide of manganese, 1·65.

Ilmenite.—Occurs in imbedded crystals. Primary form a right rhombic prism. No cleavage observed. Fracture uneven to conchoidal, with a vitreous lustre. Hardness 5·0; scratches glass slightly. Colour black. Opaque. Specific gravity 5·43. It is found near Lake Ilmen in Siberia. Analysis by Mosander:—titanic acid, 46·92; protoxide of iron, 37·86; peroxide of iron, 10·74; protoxide of manganese, 2·73; magnesia, 1·14.

Crichtonite.—Occurs in attached crystals. Cleavage parallel to the axis. Fracture conchoidal, splendent. Hardness: scratches fluor-spar, but not glass. Brittle. Does not obey the magnet. Colour shining black. Streak black. Lustre imperfect metallic. Opaque. Specific gravity 4. It has not been completely analyzed; but, according to Berzelius, it consists of titanic acid and oxide of iron.

Mohsite.—Occurs in attached macled crystals. Primary form a rhomboid. No visible cleavage. Fracture conchoidal, shining. Hardness: scratches glass readily. Brittle. Does not affect the magnet. Colour iron black. Streak black. Lustre metallic. Opaque. Found in Dauphiny. It appears to be a titaniate of iron, but has not been completely analyzed.

Of granular titaniate of iron and titaniferous iron-sand, we shall describe three varieties:—

Nigrin.—Occurs in flat rounded grains of about the size of a pea, with occasional indications of a crystalline form. Structure foliated. Very hard. Brittle. Colour greyish black. Lustre metallic. Specific gravity 4·445. Analysis by Klaproth:—titanic acid, 84; protoxide of iron, 14; protoxide of manganese, 2. Found in Transylvania.

Menaccanite.—Occurs in small angular grains. Structure imperfectly lamellar. Fracture fine-grained, uneven. Hardness—yields to the knife. Colour greyish black. Lustre glistening. Opaque. Specific gravity 4·427. Occurs in rivulets in the parish of St. Keverne, Cornwall; it has also been found in New South Wales. The picked grains, analyzed by Dr. Colquhoun, gave—titanic acid, 57·187; protoxide of iron, 39·780; protoxide of manganese, 2·175.

Iserine.—Occurs in very small flattish angular grains, which have a rough glimmering surface. Structure lamellar. Cross fracture conchoidal. Very hard. Slightly attracted by the magnet. Opaque. Lustre semi-metallic. Specific gravity about 4·5. Found on the Riesengebirge, near the origin of the river Iser in Silesia; in Bohemia; in the river Don in Scotland, and that of the Mersey opposite Liverpool. By the analysis of H. Rose, it consists of—titanic acid, 50·12; protoxide of iron, 49·88. It is probably a variety of Menaccanite.

Greenovite: Titaniate of Manganese.—Occurs in small amorphous masses and crystallized. Primary form probably an oblique rhombic prism. Hardness, greater than that of fluor-spar or phosphate of lime, but does not scratch glass. Colour deep rose red; the crystals are splendent, except the terminal faces, which are often dull and tarnished. Specific gravity 3·44. It is found in the manganese deposit of St. Marcel in Piedmont. Analysis by M. Carcarié:—titanic acid, 74·5; oxide of manganese, 24·8.

Sphène; Spinthère: Silico-titaniate of Lime.—Occurs in attached and imbedded crystals, and massive. Primary form an oblique rhombic prism. Cleavage indistinct. Fracture even, slightly conchoidal. Hardness: scratches phosphate of lime, but is scratched by felspar. Colour, various shades of grey, green, yellow, and brown. Streak white or greyish-white. Lustre adamantine, resinous. Transparent, translucent, opaque. Specific gravity 3·468 to 3·6. Sphène is found interspersed in primary rocks, as in granite and gneiss, and more particularly in syenite, in Norway, Germany, Switzerland, and also in America. The results of the analysis of sphene vary considerably; the following is by Klaproth:—titanic acid, 33; silicic acid, 35; lime, 33.

Aeschynite.—Titaniate of zirconia and cerium, &c. Occurs crystallized. Primary form a right rhombic prism. Cleavage difficult, and only parallel to the basis of the primary form. Fracture conchoidal. Hardness: scratches phosphate of lime, and is scratched by felspar. Colour black; streak greyish-black. Lustre resinous. Opaque. Specific gravity 5·14. Found at Miask, in the Uralian Mountains, Siberia. Analysis by Hartwall:—titanic acid, 56·0; zirconia, 20·0; oxide of cerium, 15·0; lime, 3·8; oxide of iron, 2·6; oxide of zinc, 0·5.

The principal natural substances containing titanium being now described, we proceed to consider its artificial compounds.

Oxygen and Titanium.—It has already been stated that these combine with difficulty by direct means. When rutile, or titanic acid, is dissolved in hydrochloric acid, a piece of zinc immersed in the solution occasions the formation and precipitation of a deep purple-coloured powder, which is protoxide of titanium: so great however is the facility with which it returns to the state of peroxide, that it cannot be collected; and hence the composition of this oxide has not been perfectly determined. It is however probably composed of—

One equivalent of oxygen .	8
One equivalent of titanium .	24
Equivalent . .	32

When also titanic acid is exposed to a strong heat, a portion of it loses oxygen, and a black mass is formed, which is the protoxide; it has an earthy fracture, is insoluble in acids, and difficult to reconvert to the titanic acid. It has been already mentioned that anatase is probably the protoxide of titanium.

Peroxide of Titanium, Titanic Acid.—Rutile is titanic acid nearly pure: when it is reduced to fine powder and fused in a platina crucible, with three times its weight of carbonate of potash, titaniate of potash is obtained, mixed with some excess of carbonate of potash; this is to be removed by washing with water, and titanic acid is then precipitated by dilution and heat; and after washing with dilute hydrochloric acid, is nearly pure titanic acid. Its properties are, that when pure it is quite white, very infusible, and after it has been heated is soluble only in hydrofluoric acid. Its acid powers are feeble; it is insoluble in water, and does not act on vegetable blues; it combines however with alkalis and metallic oxides, forming salts which are termed *titaniates.* It is probably composed of—

Two equivalents of oxygen .	16
One equivalent of titanium .	24
Equivalent . .	40

Chlorine and Titanium combine when the gas is passed over metallic titanium at a red heat. It is a colourless transparent fluid, and boils at a little above 212°, is volatilized, and condenses unchanged. When exposed to the air it deliquesces, and when a few drops of it are mixed with an equal bulk of water, combination takes place with considerable violence and the evolution of intense heat. It absorbs dry ammoniacal gas, and from the compound s obtained Liebig prepared metallic titanium. It appears to consist of—

Two equivalents of chlorine	72
One equivalent of titanium .	24
	—
Equivalent . .	96

Tincture of galls, when added to a solution of titanic acid, occasions an orange-red colour, probably owing to the tannic acid which the tincture contains; this is very characteristic of the presence of titanic acid.

The other compounds of titanium are but little known; the peroxide, or titanic acid, unites both with bases and acids to form saline compounds: the former are called *titaniates*.

TITANS (Τιτᾶνες, fem. Τιτανίδες) is the name by which in the mythology of antient Greece a certain class of sons and daughters of Uranus and Gaea are designated. The original name of Gaea was said to have been Titaea, from which Titans was derived. (Diodorus Sic., iii. 56.) The beings generally comprised under the name of Titans were Oceanus, Coeus, Crius, Hyperion, Iapetus, Cronus, Thetys, Rhea, Themis, Mnemosyne, Phœbe, Dione, and Theia. (Apollodor., *Biblioth.*, i. 1, 3; Diodorus Sic., v. 66.) Other writers, as Stephanus of Byzantium (*s. v.* Ἄδανα), Pausanias (viii. 37, 3), and others, differ both in the names and numbers of the Titans. Uranus had by Gaea two other sets of children, viz. the Hecatoncheires (centimani, or beings with a hundred arms), and the Cyclops; and these two he cast into Tartarus, at which Gaea, their mother, was so indignant, that she induced the Titans to revolt against their father, Uranus, and gave to Cronus an adamantine sickle with which he castrated his father. Oceanus took no part in this rebellion. After Uranus was deprived of the sovereignty, and the Hecatoncheires together with the Cyclops were led back from the lower world, the supreme power was given by the brothers to Cronus. But Cronus again threw them into Tartarus, and married his sister Rhea; as however Gaea and Uranus had prophesied to him that he would be deprived of the sovereignty by his own children, he devoured all the children whom Rhea bore him. But when she was pregnant with Zeus, she withdrew to Crete, where she gave birth to him in a cavern, and afterwards had him educated by the Curetes and nymphs. To deceive Cronus, she had given him a stone wrapt up like a child, which he devoured. When Zeus had grown up, he took Metis, the daughter of Oceanus, and with her assistance he administered a poison to Cronus, which made him vomit out the children he had swallowed, viz. Hestia, Demeter, Hera, Pluto, and Poseidon, and with their aid Zeus now commenced a war against his father, which lasted for ten years. This struggle, celebrated in mythology as the war of the Titans, was terminated by Zeus relieving the Cyclops from Tartarus, and by his gaining with their weapons the victory over the Titans, who were now cast into Tartarus, and were guarded there by the Hecatoncheires. Zeus and his brothers now divided the sovereignty of the world among themselves. (Apollodor., *Biblioth.*, i. 1 and 2.)

The name Titan has also been given to those superhuman beings who were descended from the Titans, such as Prometheus, Hecate, Latona, Pyrrha, Helios, &c. It moreover occurs as a designation of a very early race of men in Crete and Egypt.

(Lobeck, *Aglaophamus*, p. 763; Böttiger, *Ideen zur Kunstmythologie*, p. 217, &c.; Völcker, *Mythologie des Japetischen Geschlechtes*, p. 280, &c.)

TITCHFIELD. [Hampshire, vol. xii., p. 32.]

TITHES are the tenth part of the increase yearly arising and renewing from the profits of lands, the stock upon lands, and the personal industry of the inhabitants, and are offerings payable to the church by law.

Under the theocratic government of the Jews the tenth part of the yearly increase of their goods was due to the priests by divine right. 'And behold I have given the children of Levi all the tenth in Israel for an inheritance, for their service which they serve, even the service of the tabernacle of the congregation.' (*Numbers*, xviii. 21.) And again, 'Thou shalt truly tithe all the increase of the seed, that the field bringeth year by year.' (*Deut.*, xiv. 22.) 'And all the tithe of the land, whether of the seed of the land or of the fruit of the tree, is the Lord's; it is holy unto the Lord.' 'And concerning the tithe of the herd or of the flock, even of whatsoever passeth under the rod, the tenth shall be holy unto the Lord.' (*Levit.*, xxvii. 30, 32.)

In the earliest ages of the Christian church offerings were made by its members at the altar, at collections, and in other ways, and such payments were enjoined by decrees of the church and sanctioned by general usage. For many centuries however they were voluntary, and not enforced by any civil laws. When the church was struggling against persecution, the Christians brought all their worldly goods into a common stock for the benefit of all. 'And the multitude of them that believed were of one heart and of one soul: neither said any of them that aught of the things which he possessed was his own; but they had all things in common.' 'Neither was there any among them that lacked; for as many as were possessors of lands or houses sold them, and brought the prices of the things that were sold, and laid them down at the apostles' feet: and distribution was made unto every man according as he had need.' (*Acts*, iv. 32, 34, 35.) They then had no other object than the defence and support of their faith; they required no compulsion to make offerings to their infant church. But when the church had increased in power, and began to number amongst its members many who adhered to it because it was the prevailing religion, rather than on account of any enthusiasm or reverence for its divine origin and doctrines, it was found necessary to enforce certain fixed contributions for the support of the ministers of religion. The church relied upon the example of the Jews, and required a tenth to be paid. Meanwhile the conversion of temporal princes to Christianity, and their zeal in favour of their new faith, enabled the church to obtain the enactment of civil laws to compel the payment of tithes. In England the first instance of a law for the offering of tithes was that of Offa, king of Mercia, towards the end of the eighth century. He first gave the church a civil right in tithes, and enabled the clergy to recover them as their legal due by the coercion of the civil power. The law of Offa was at a later period extended to the whole of England by king Ethelwulph. (Prideaux, *On Tithes*, 167.)

At first, though every man was obliged to pay tithes, the particular church or monastery to which they should be paid appears to have been left to his own option. In the year 1200, however, Pope Innocent III. directed a decretal epistle to the archbishop of Canterbury, in which he enjoined the payment of tithes to the parsons of the respective parishes in which they arose. This parochial appropriation of tithes has ever since been the law of the land. (Coke, 2 *Inst.*, 641.) The same pope gave similar instructions in other countries at about the same time.

The tithes thus payable were of three kinds, viz. *prædial*, *mixed*, and *personal*. *Prædial* tithes are such as arise immediately from the ground, as grain of all sorts, fruits, and herbs. *Mixed* tithes arise from things nourished by the earth, as colts, calves, pigs, lambs, chickens, milk, cheese, and eggs. *Personal* tithes are paid from the profits arising from the labour and industry of men engaged in trades or other occupations; being the tenth part of the clear gain, after deducting all charges. (Watson, *On Tithes*, c. 49.)

Tithes are further divided into *great* and *small*. The former consist of corn, hay, wood, &c.; the latter of the prædial tithes of other kinds, together with mixed and personal tithes. This distinction is arbitrary, and not dependent upon the relative value of the different kinds of tithe within a particular parish. Potatoes, for instance, grown in fields have been adjudged to be small tithes, in whatever quantities sown (Smith *v.* Wyatt, 2 Atk., 364), while corn and hay, in the smallest portions, still continue to be treated as great tithes. The distinction is of material consequence, as great tithes belong, of right, to the rector of the parish, and small tithes to the vicar.

No tithes are paid for quarries or mines, because their products are not the increase, but are part of the substance of the earth. Neither are houses, considered separately from the soil, chargeable, as having no annual increase. By the common law of England no tithe is due for things that are *feræ naturæ*, such as fish, game, &c.; but there are local customs by which tithe has been paid from such things from time immemorial, and in those places such customary tithes may be exacted. Tame animals kept for pleasure or curiosity are also exempt from tithes.

Tithes were all originally paid in kind, *i.e.* the tenth wheat-sheaf, the tenth lamb or pig, as the case might be, belonged of right to the parson of the parish as his tithe. The inconvenience and vexation of such a mode of payment are obvious. The practice could only have originated in times and in countries in which barter formed the only means of exchange, and the products of the earth were the sole test of value. The improved habits and civilization of centuries were nevertheless unable to alter what had been sanctioned by custom since the memory of man, and no attempt had been made in this country, until very recently, to introduce a general improvement in the mode of collection. The inconvenience of paying tithes in kind must long since have been felt, and certain modes of obviating it were occasionally practised. Sometimes the owner of land would enter into a composition with the parson or vicar, with the consent of the ordinary and the patron of the living, by which certain land should be altogether discharged from tithes, on conveying other land, or making compensation. In other words, the owner of the land purchased an exemption from tithes. Such arrangements between landowners and the church were recognised by law, but it was found that they were often injurious to the church by reason of an insufficient value being given for the tithes. The acts 1 Elizabeth, c. 19, and 13 Elizabeth, c. 10, were accordingly passed, which disabled bishops, colleges, chapters, parsons, and vicars from making any alienation of church property for a longer term than twenty-one years or three lives. In order to establish an exemption from tithes on the ground of a real composition, it is therefore necessary to show that such composition had been entered into before the statute of Elizabeth. Since that time compositions have rarely been made, except under the authority of private acts of parliament.

Another method of avoiding the payment of tithes in kind was that of a *modus decimandi*, commonly known as a *modus*. This consists of any custom in a particular place, by which the ordinary mode of collecting tithes has been superseded by some special manner of tithing. In some parishes the custom has prevailed, time out of mind, of paying a certain sum of money annually for every acre of land, in lieu of tithes. In others a smaller quantity of produce is given, and the residue is made up in labour, as every 12th sheaf of wheat instead of the 10th, but to be housed or threshed by the owner.

A large portion of the land of this country is tithe-free, from various causes. Some has been exempted under real composition, as already explained, and some by prescription, which supposes a composition to have been formerly made. The most frequent ground of exemption is that the land once belonged to a religious house, and was therefore discharged in this manner. All abbots, priors, and other chief monks originally paid tithes from the lands belonging to them, until Pope Paschal II. exempted all spiritual persons from paying tithes of lands in their own hands. This general discharge continued till the time of King Henry II., when Pope Adrian IV. restrained it to the three religious orders of Cistercians, Templars, and Hospitalers, to whom Pope Innocent III. added the Præmonstratenses. These four orders, on account of their exemption, were commonly called the privileged orders. The Council of Lateran, in 1215, further restrained this exemption to lands in the occupation of those religious orders of which they were in possession before that council. Bulls were however obtained for discharging particular monasteries from the payment of tithes, which would not otherwise have been exempt; by which means much land has been ever since tithe-free. Another mode by which lands belonging to religious houses became not liable to the payment of tithes, was that of *unity of possession;* as where the lands and the rectory belonged to the same establishment, which would not, of course, pay tithes to itself. Yet the lands were not absolutely discharged by this unity of possession, for upon any disunion the payment of tithes was revived; so that the union only suspended the payment. The act 31 Hen. VIII., c. 13, which dissolved several of the religious houses, continued the discharge of their lands from tithes, though in the possession of the king or any other person. Many monasteries had previously been dissolved by act of parliament, but as no such clause as that contained in the 31 Hen. VIII. had been introduced into other acts, the lands of the monasteries dissolved by them became chargeable with tithes.

We have stated enough concerning the nature of tithes and the various circumstances affecting them, to show how complicated must be the laws, and how entangled the interests of different parties who had to pay or to receive them. But apart from such considerations it may be well to inquire whether tithes be, in their original nature, a fit mode of supporting a religious establishment; and if not, in what manner they might be made so. There can scarcely be a doubt that the payment of tithes in kind is a cause of constant irritation and dispute between a clergyman and his parishioners. With the best intentions on both sides, the very nature of tithes is such, that doubts and difficulties must arise between them; and even where there is no doubt, the form and principle of payment are odious and discouraging. The hardships and injustice of tithes upon the agriculturist are well described by Dr. Paley:—'Agriculture is discouraged by every constitution of landed property which lets in those who have no concern in the improvement to a participation of the profit: of all institutions which are in this way adverse to cultivation and improvement, none is so noxious as that of tithes. A claimant here enters into the produce who contributed no assistance whatever to the production. When years perhaps of care and toil have matured an improvement; when the husbandman sees new crops ripening to his skill and industry; the moment he is ready to put his sickle to the grain, he finds himself compelled to divide his harvest with a stranger.' (*Moral and Political Philosophy*, chapter xii.)

If tithes then be in principle an injurious and restrictive tax upon agriculture, and if the mode of collection be vexatious and unpopular, it became the duty of a legislature to provide a remedy for these evils. But tithes are unlike any other tax, which being found injurious to the state, may be removed on providing others. They are not the property of the state, but of its subjects; they are payable not only to the church, but to *lay impropriators*; they have been the subject of innumerable private bargains; *land* has been sold at a higher price on account of its exemption from tithe; the value of the patronage of the greater portion of the livings of this country is dependent upon the existing liability of land to tithes; in short, the various relations of society have been for centuries so closely connected with the receipt and payment of tithes, that to have abolished them would have been a gross injustice and spoliation to many, and no advantage to the community; for the whole profit would immediately have been enjoyed by those whose lands were discharged from payments to which they had always been liable, and subject to which they had most probably been purchased.

As for these reasons the extinction of tithes was impracticable, a commutation of them has been attempted and has been found most successful. Dr. Paley, who saw so clearly the evils of tithes, himself suggested this improvement. 'No measure of such extensive concern appears to me so practicable, nor any single alteration so beneficial, as the conversion of tithes into *corn-rents*. This commutation, I am convinced, might be so adjusted as to secure to the tithe-holder a complete and perpetual equivalent for his interest, and to leave to industry its full operation and entire reward.' (*Moral and Political Philosophy*, chapter xii.) This principle of commutation was first proposed to be applied by the legislature to Ireland. In addition to the common evils of a tithe system, that country was labouring under another. Its people were paying tithes for the support of a clergy possessing a religion at variance with their own. Resistance to the payment of tithes occasioned by this appropriation of them had become so general, that a commutation was deemed absolutely necessary for the safety of the church of Ireland. It was recommended by committees of both houses of parliament in 1832, but not finally carried into effect until 1838.

The statutes for the general commutation of tithes in England are the 6 & 7 Will. IV., c. 71, the 7 Will. IV. and 1 Vict., c. 69, the 1 & 2 Vict., c. 64, the 2 & 3 Vict., c. 32, and the 5 & 6 Vict., c. 54. Their object is to substitute a rent-charge, payable in money, but fluctuating according to the average price of corn for seven preceding years, for all tithes, whether payable under a *modus* or composition, or not. A voluntary agreement between the owners of the land and of the tithes was first promoted, and in case of no such agreement, a compulsory commutation was to be effected by commissioners. In case of dispute, provision was made for the valuation and apportionment of tithe in every parish. The rent-charge was to be thus calculated:—The comptroller of corn returns is required to publish in January the average price of an imperial bushel of British wheat, barley, and oats, computed from the weekly averages of the corn returns during seven preceding years. Every rent-charge is to be of the value of such number of imperial bushels and decimal parts of an imperial bushel of wheat, barley, and oats, as the same would have purchased at the prices so ascertained and published, in case one-third of such rent-charge had been invested in the purchase of wheat, one-third in barley, and the remainder in oats. For example, suppose the value of the tithe of a parish to have been settled by agreement or by award at 300*l*., and that the average price of wheat for the seven preceding years had been 10*s*. a bushel, of barley 5*s*., and of oats 2*s*. 6*d*.; the 300*l*. would then represent 200 bushels of wheat, 400 bushels of barley, and 800 bushels of oats. However much the average prices of corn may fluctuate in future years, a sum equal in value to the same number of bushels of each description of corn, according to such average prices, will be payable to the tithe-owner, and not an unvarying sum of 300*l*. The quantity of corn is fixed, but the money payment to the tithe-owner varies with the septennial average price of corn. Land not exceeding 20 acres may also be given by a parish, on account of any spiritual benefice or dignity, as a commutation for tithes to ecclesiastical persons, but not to lay impropriators. (6 & 7 Will. IV., c. 71, s. 26-28.)

By the last Report of the tithe commissioners, it appears that already voluntary proceedings have commenced in 9381 tithe districts; 6348 agreements have been received, of which 5804 have been confirmed; 2178 notices for making awards have been issued; 1355 drafts of compulsory awards have been received, of which 1030 have been confirmed; 5220 apportionments have been received, of which 4347 have been confirmed. Of the whole business of assigning rent-charges and apportioning them, about half is completed.

The complete and final commutation of tithes must be regarded as a most valuable measure. It is perfectly fair to all parties, and is calculated to add security and permanence to the property of the church, and to remove all grounds of discord and jealousy between the clergy and their parishioners. Nor must we omit to mention an improvement in the mode of recovering tithes, consequent upon the commutation. There were formerly various modes of recovery, in the ecclesiastical as well as in the civil courts, and before justices of the peace, all more or less leading to unseemly litigation. The present mode of recovering the rent-charge, if in arrear, is by distraining for it in the same manner as a landlord recovers his rent; and if the rent-charge shall have been forty days in arrear, possession of the land may be given to the owner of the rent-charge until the arrears and costs are satisfied. Indeed the whole principle of the tithe commutation Acts is to strip tithes of the character of a tax, and to assimilate them as much as possible to a rent-charge upon the land.

[AGRICULTURE; BENEFICE; FIRST-FRUITS; IMPROPRIATIONS; TAX, TAXATION; TAXATIO ECCLESIASTICA; TENTHS.]

TITHING (*Tithinga*; from the Saxon, *Theothunge*) is an antient municipal division of land in England under the Saxon kings. The whole country was divided into tithings and hundreds by Alfred the Great. The former was a district containing ten heads of families; the latter comprised ten tithings, or one hundred heads of families. Every tithing had its chief man annually appointed to preside over the rest, who was called the tithing-man or borsholder, and sometimes the headborough or borough's elder. Each of these little communities was bound to keep the peace within their own jurisdiction, and the members were responsible for each other. So important were these associations deemed to be, that no man was allowed to abide in England above forty days without being enrolled in some tithing. Although the institution has long ceased, the name and division are still retained in many parts of England.

TITI, SANTI DI, an Italian painter and architect, born of a noble family at Borgo San Sepolcro in Tuscany, 1538, was a scholar of Bronzino's, and, according to Lanzi, also studied under Cellini. While at Rome he was employed upon some subjects in the chapel of the Palazzo Salviati, and painted a St. Jerome in San Giovanni de' Fiorentini, besides executing several works in the Belvedere of the Vatican. He returned to Florence in 1566, with a reputation for great ability in design; nor was such reputation at all diminished by the works he there produced, for among them are some of his best, including his Resurrection and Supper at Emmaus, in Santa Croce; of which, and of his other performances, a full account is given by Borghini, in his 'Reposo.' It was also at Florence that he chiefly exercised his profession of architect. The Casa Dardanelli, the Villa Spini at Peretola, and his own house at Florence, are enumerated among his works of that class, but without much commendation; although he is said to have displayed great taste in some of his architectural backgrounds in painting, in which he also showed great knowledge of perspective. His pencil was frequently employed on merely temporary decorations, either on occasions of solemn funeral obsequies or splendid festivities, of which latter kind were those which he painted at the celebration of the nuptials of the duke of Bracciano. Santi died in 1603, leaving a son named Tiberio, who was also an artist, and who did not long survive him.

(*Biogr. Universelle*; Lanzi; Milizia; Vasari.)

TITIAN. [VICELLIO, TIZIANO.]

TITICA'CA, LAKE. [BOLIVIA, vol. v., p. 86.]

TITLARKS. Mr. Swainson characterises the *Titlarks* (genus *Anthus*) as slender-shaped birds, having the plumage and long hinder toes of the true larks, but with the slender bills of the *Wagtails*; and he places the former next to the East Indian genus *Enicurus*, which in his view succeeds to the Wagtails (*Motacilla* and *Budytes*). *Anthus* indeed seems to him to have its position at the very extremity of the DENTIROSTRES, just as the family of the *Alaudinæ*, or True Larks, is in the circle of the *Conirostres*; 'in other words, they are not only analogous, but this analogy actually blends into an affinity.' (*Classification of Birds*. [LARKS.] In the *Synopsis*, at the conclusion of the work, *Anthus* is arranged as the last genus of the *Motacillinæ*, with the following

Generic Character.—Bill very slender, the sides compressed, the upper mandible longest, with the tip deflected over the lower, and distinctly notched. Wings moderate; the four first quills nearly equal: tertials obtuse, lengthened. Tail moderate, slightly forked. Legs slender, black. Tarsus and middle toe equal. Lateral toes and claws of the same length and size. Example, *Anthus aquaticus* (*Fauna Boreali-Americana*, pl. 44). The Prince of Canino also places the genus *Anthus* among the *Motacillinæ*, which, in his arrangement, is the sixth subfamily of the *Turdidæ*.

The True Larks are placed by the Prince, in the same highly useful work (*Birds of Europe and North America*), under the *Alaudinæ*, the fourth subfamily of the *Fringillidæ*, standing between the *Emberizinæ* and the *Loxinæ*.

The *Alaudinæ* of the Prince comprise the following

Genera.—*Certhilauda*, Sw.; *Alauda*, Linn.; *Galerida*, Boie; *Phileremos*, Brehm (*Eremophilus*, Boie); and *Melanocorypha*, Boie. Mr. G. R. Gray (*List of the Genera of Birds*) also makes *Anthus* one of the genera of his *Motacillinæ*, placing it between *Ephthianura*, Gould, and *Corydalla*,* Vigors. The *Motacillinæ*, in Mr. Gray's arrangement, form the seventh subfamily of his *Luscinidæ*.

The True Larks (*Alaudinæ*) are arranged by him as the sixth subfamily of the *Fringillidæ*, with the following

Genera.—*Alauda*, Linn.; *Galerida*, Boie; *Otocoris*, Bonap.; *Melanocorypha*, Boie; *Saxilauda*, Less.; *Erana*, G. R. Gray; *Mirafra*, Horsf.; *Calandrella*, Kaup; *Fringalauda*, Hodgs.; *Megalophonus*, G. R. Gray; *Macronyx*, Sw.; and *Certhilauda*, Sw.

The *Alaudinæ* are placed by this zoologist between the *Emberizinæ* and the *Pyrrhulinæ*.

But we must now return to the *Titlarks*, and we quite agree with Mr. Yarrell, who, in his *British Birds*, observes that it would assist correct definition if, among ourselves, the term *Titlark* could be discontinued entirely; 'the Tree

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* In the Appendix Mr. Gray states that *Pipastes*, Kaup, and *Lemoniptera*, Kaup, should come next to *Anthus*, and that Mr. Swainson's genus *Agrodroma* should be placed here.

Pipit being called the Titlark by some, the Meadow Pipit a Titlark by others; and round the sea-coast, where the Rock Pipit is generally the most frequent of the three, that is also called Titlark.

Bechstein separated the Pipits from the true Larks, giving the former the generic appellation of *Anthus*, and Mr. Yarrell elevates them into a family, *Anthidæ*.

The following species are British:—

The Tree Pipit, *Anthus trivialis;* the Meadow Pipit, *Anthus pratensis;* the *Rock Pipit*, *Anthus obscurus* (*Anthus petrosus*, Flem., Jen.; *Anthus aquaticus*, Selby, Gould; *Alauda obscura*, Auct.); and *Richard's Pipit*, *Anthus Ricardi*.

The *Titlark* of Pennant is the *Meadow Pipit* of the above list; and Mr. Yarrell well observes that scarcely any two British birds have been so frequently confounded together as the Tree and the Meadow Pipits; but when the two species are examined in hand, obvious and constant distinctions appear; and there are, he adds, besides, differences in the habits of these birds, as well as in the localities they each frequent. 'The Tree Pipit is rather the larger bird of the two; the beak is stouter and stronger; the spots on the breast longer and fewer in number; the claw of the hind toe is not so long as the toe itself; the tertial feathers of the wings are rather longer in proportion to the primaries; the white on the outer tail-feather on each side is neither so pure in colour, nor is it spread over so large a portion of the feather; and, as far as my own observation goes, it does not appear to be so numerous as a species as the Meadow Pipit.'

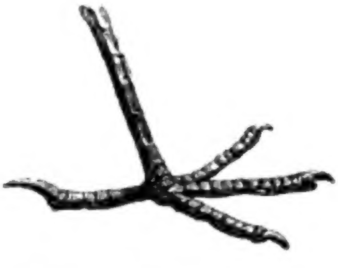
Unlike the Meadow Pipit, the *Tree Pipit* is a summer visitor, only arriving in our well-wooded enclosures towards the end of April. The male generally begins his agreeable song from the top of a bush or an upper branch of some 'hedge-row elm;' from his perch he rises into the air, his wings shivering, till he has reached an elevation about as high again as the tree from which he started. As soon as he has attained his greatest height he poises his wings, spreads his tail and slowly descends, singing all the while, to the same station whence he rose, or the top of some neighbouring tree. The nest, placed generally on the ground, is framed of moss, root-fibres, and withered grass, lined scantily with bents and hairs. The eggs, four or five in number, vary much in colour in different nests. Mr. Yarrell considers the most characteristic hue to be greyish-white clouded and spotted with purple-brown or purple-red; the length of the egg about 10 lines, diameter 8. Food, insects and worms. Total length of the bird about 6¼ inches. This bird must not be confounded with the Wood-Lark.

The winter-quarters of this species are probably in Northern and Western Africa. It is a Madeira bird, and also inhabits Japan.

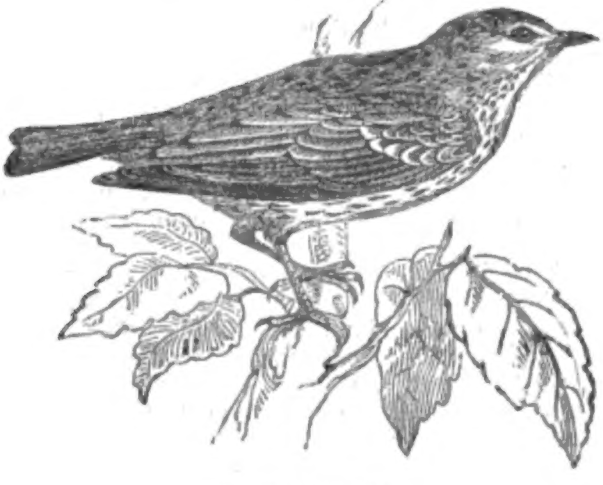
The *Meadow Pepit* remains with us throughout the year, and is the smallest and most common species, its total length being 6 inches only. It haunts heathy and hilly districts, as well as meadows and marsh-lands. Mr. Yarrell thus describes its habits:—'When progressing from place to place, the flight of this bird is performed by short unequal jerks; but when in attendance on its mate and undisturbed, it rises with an equal vibratory motion, and sings some musical soft notes on the wing, sometimes whilst hovering over its nest, and returns to the ground after singing. Occasionally it may be seen to settle on a low bush; but is rarely observed sitting on the branch of a tree, or perched on a rail, which is the common habit of the Tree Pipit. The Meadow Pipit, when standing on a slight mound of earth, a clod, or a stone, frequently moves his tail up and down like a wagtail; and Mr. Neville Wood mentions that he has heard him sing while thus situated on or very near the earth. The Meadow Pipit seeks its food on the ground, along which it runs nimbly in pursuit of insects, worms, and small slugs. In the stomach of one of these birds, examined in the month of December, Mr. Thompson, of Belfast, found two specimens of *Bulimus lubricus*. It is, according to the last-named zoologist, the *Moss-cheeper* of the north of Ireland, a name which Sibbald gives as applied to it in Scotland.

Nest on the ground, generally among grass, made of dried bents on the outside, with a lining of finer ones and a few hairs: eggs from four to six, reddish brown mottled with darker; length nine lines by seven.

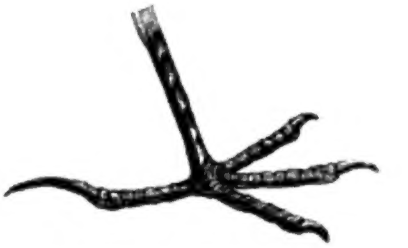
Pennant gives *Cor Hedydd* as the Welsh name of the Titlark, and *Hedydd y cae* as that of the Field-lark, *Alauda minor*.



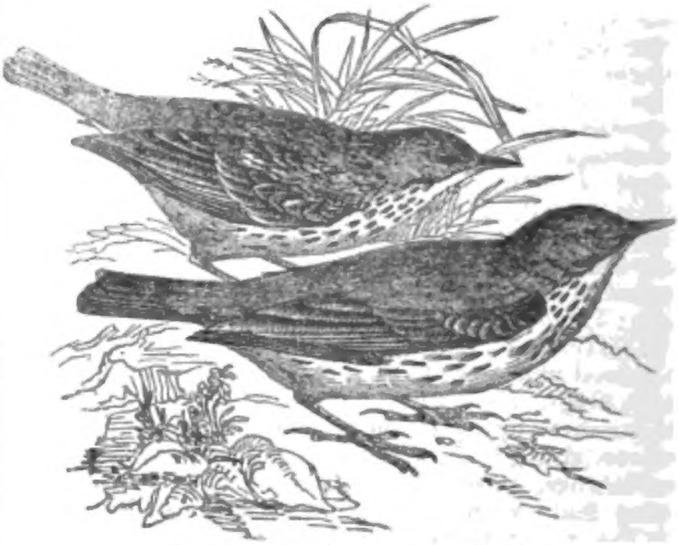
Foot of the Tree Pipit. (Yarrell.)



Tree-Pipit. (Gould.)



Foot of Meadow Pipit. (Yarrell.)



Meadow Pipit, male and female. (Gould.)

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